# BrightStor™ CA-Vtape™ Virtual Tape System

## User Guide

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Chapter

1

# Introduction

This guide provides instructions for the operation of BrightStor CA-Vtape Virtual Tape System (VTS), Release 2.0.

To find out more about BrightStor CA-Vtape Virtual Tape System, see the *Getting Started* guide and the *Messages Guide*.

## CA-Vtape Overview

Congratulations on purchasing CA-Vtape, the only product that lets you use your existing mainframe hardware to implement a virtual tape solution!

Using CA-Vtape, you can create a virtual tape environment from any combination of OS/390 disk and tape hardware, including resources you already own. You can even add or upgrade resources as needed to take advantage of advancements in capacity and performance, regardless of manufacturer. And because it is software, not hardware, it easily scales to meet your needs without additional hardware costs.

CA-Vtape is an automated virtual tape management system designed to help you control tape usage. It creates Virtual Tape Devices and Virtual Tape Volumes that reduce physical tape drive costs while improving performance and making automation more efficient.

CA-Vtape provides you with the following capabilities:

- allows you to greatly reduce costs by using virtual tape units in place of real devices
- can reduce the need for tape drive hardware
- can reclaim valuable floor space
- fully automated tape stacking, including separation by retention periods and other attributes you specify
- can dramatically reduce wasted capacity on each cartridge
- can help make automation more efficient

CA-Vtape can use any combination of OS/390 disk and tape hardware to create a virtual tape capability. This hardware independent solution provides management of stacked tape data sets without the high costs and hardware dependencies of a hardware based solution.

Virtual devices are created directly in OS/390 and are used to access virtual volumes through high performance data space techniques. The data is actually written to a DASD buffer pool, also called cache, that you predefine. Under your total control, CA-Vtape also copies the virtual volume to a physical tape in stacked format, retaining it in cache as long as there is room for it. Least recently used data sets are deleted from cache as space is required. Since later access to tape data sets usually occurs soon after their creation, this feature avoids many tape mounts.

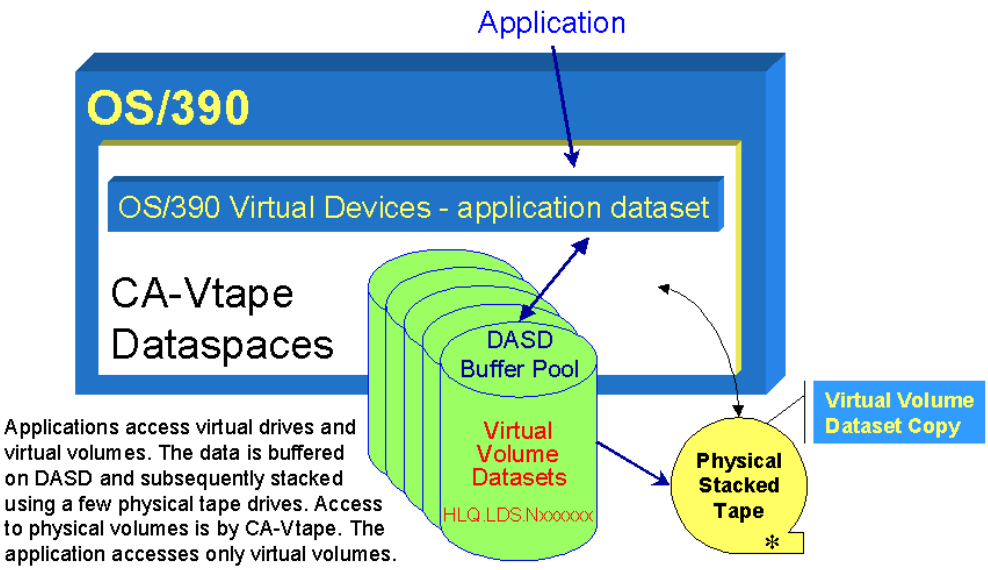
When retrieval requires the data set to be restored from physical tape, the application receives the data as it is being restored. The application does not have to wait for the data to be fully restored.

Stacking on physical tape volumes is done intelligently, under your control. You can direct CA-Vtape to stack data sets in one of five ways:

1. By expiration date
2. By location
3. By a forced separation requirement
4. With an optional duplex copy to be used for Disaster Recovery or local recovery in case the physical cartridge is lost or damaged
5. With an optional export copy to send user format tapes to sites not using CA-Vtape

This intelligent stacking function makes it easier for you to manage vaulting and recovery of your data sets. Retrieval performance is generally equal to or better than native performance. Because CA-Vtape recalls the entire virtual volume, subsequent access to any data set on the virtual volume occurs without having to use a physical tape device or wait for the operator to mount the tape.

**FIGURE 1-1 CA-Vtape Overview**




## Why a Software Solution?

Using OS/390-based software as the intelligence for this virtual tape product allows any combination of vendor hardware products to be used, making a CA-Vtape solution the most flexible virtual tape product. As vendors provide new disk or tape hardware for OS/390, you can select the hardware product that best suits your requirements and CA-Vtape supports it. CA-Vtape provides a fully scalable solution supporting a DASD buffer pool up to 50 TB and up to 500,000 virtual volumes per CA-Vtape complex. A CA-Vtape complex is defined as a shared DASD environment with one or more OS/390 images sharing a single Tape Management System catalog.

### Automation Impact

Most OS/390 tape environments use only a small portion of the total tape capacity. For example, if an OS/390 site has 3490 class, 36 track drives installed, they have an average capacity of 1.2 gigabytes with standard cartridges, if you accept the average of 3:1 compression capability of these drives. Most sites find the average tape contains only 300 megabytes of data.

This occurs because extra management resources are consumed to aggressively stack tape data. You can see abends or extended delays if access to more than one data set is attempted concurrently from a stacked tape.

CA-Vtape maximizes the effectiveness of tape automation and minimizes tape library slot management.

## Multi-system Considerations

In a multi-system environment, physical tape data sets may not be concurrently accessed by more than one system at a time. A tape created on one system can only be read or modified on a different system after the first system has released it.

With a shared DASD cache and shared control data set, CA-Vtape fully emulates this process but with virtual drives and virtual volumes.

When a virtual volume is requested for use by a system, the CA-Vtape software on that system writes a unique system name in the control data sets' entries for that virtual volume.

**Note:** The unique system name defaults to the system symbolic "&SYSNAME variable."

You can see the value by using the "D SYMBOLS" OS/390 command. This value can be overridden at CA-Vtape start-up by issuing the following command:

```
S SVTS,SYSID=xxxx
```

where *xxxx* is unique for each OS/390 image in a CA-Vtape complex

## Operating Considerations

With CA-Vtape operating in a multi-system environment, virtual volumes can be read or modified on another system after the first system is done using it. Each system can access the virtual volume as often as required, but only one at a time and as protected by the tape management system.

Virtual devices with the same device number are independent from those on another system. A virtual device address “F05” on CPU-A is completely unrelated and independent of virtual device address “F05” on another system in the complex.

# System Requirements

The system requirements for CA-Vtape are:

- 3480 or 3490 emulation.
- Maximum number of virtual devices per complex: 512.
- DASD buffer pool (cache) maximum per complex: 50 TB.
- Maximum number of virtual volumes is 500,000.
- Hardware cache and back store requirements:
  - any OS/390 DASD device is supported. If you want maximum virtual drive throughput, implement the DASD buffer pool using RAID devices with high sequential ratings like HDS 7700E, EMC 5700 RAID-1, IBM or STK RVA2 Turbo, IBM RAMAC 3 or equivalent. If you are using different DASD models, consult your vendor to find the device with better sequential read/write rating.
  - any OS/390 physical tape/cartridge device is supported.
  - automation in Silos, 349x or other OS/390 library is supported.
- Software requirements:
  - OS/390 2.6 and above and z/OS 1.1 and above running in 31-bit or 64-bit mode.
  - If STK's HSC is in the system, release 2.0.1 level 9801 or later plus PTF L1H07L8 or HSC 2.1.0 is required. Prior HSC maintenance levels can be used if the HSC SLSUX02, provided with CA-Vtape, is implemented.
  - Any Tape Management System.

CA-Vtape supports the following:

- Computer Associates CA-1

- Computer Associates DYNAM/TLMS
- IBM's DFSMSrmm
- BMC's Control T
- ASG-Zara (Automedia)

## Interfaces

CA-Vtape works with:

- OS/390 SubSystem Interface or SSI.
- OS/390 Dynamic Address Chain Insertion for certain control blocks.

Note that:

- CA-Vtape installs without an IPL.
- CA-Vtape does not replace or rename any IBM modules.

Chapter

2

# Using the Basic Components

CA-Vtape builds virtual devices in OS/390. Although the hardware devices do not physically exist, they appear to the OS/390 system as if they did. The CA-Vtape software routines respond as if a real device were attached. The software is similar to the microcode that normally controls a hardware device.

The devices are defined to OS/390 as a part of the installation. The software definition under IBM's Hardware Configuration and Definition (HCD) is required. The hardware definitions are not necessary. These definitions are possible without an IPL.

The virtual device software uses data spaces to provide data movement. The application data is mapped to disk data sets for interim storage and is later copied in a stacked format to physical tape. Each unique virtual volume can use up to 10 VSAM Linear data sets preallocated in the DASD buffer pool and a unique data space to perform the data management.

When an application completes processing to a particular virtual device and the associated virtual volume, the virtual device is released for other use. The virtual volume is now available for other CA-Vtape uses as well. A copy function is scheduled to copy the virtual volume to a physical tape cartridge. After the virtual volume has been copied to a data set on physical tape, its space can be reclaimed from the disk buffer pool.

Further requests made to that virtual volume are satisfied from the disk buffer cache unless that volume's space has been reclaimed from the cache. After the virtual volume's space has been reclaimed in the cache, further requests for that virtual volume cause a copy function to stage the data back into the cache.

# Virtual Tape Volumes

CA-Vtape Virtual Tape Volumes are groups of VSAM Linear data sets (LDSs) that combine to form a virtual volume. Ten LDSs are assigned when the virtual volume is mounted. After close processing, only LDSs with user data on them remain associated with that virtual volume. The other LDSs are released to be available for other virtual volume use.

After the data from the virtual volume has been copied to a physical tape, the LDSs can be reclaimed for use with other virtual volumes.

The virtual volume serial numbers exist only as a place holder or label that points to a virtual volume that contains the actual data. The virtual volume can reside only in the DASD buffer pool, in both the DASD buffer pool and a physical tape in stacked format, or on the physical tape.

The virtual volume ranges are defined to the tape management system and to CA-Vtape as a part of the CA-Vtape installation. The virtual volumes are managed by the tape management system as if they are a physical volume. The only communication required directly between CA-Vtape and the tape management system is to synchronize which volumes are in scratch status.

The tape management system is queried during "open" processing as a physical tape to verify the status and ownership of the volume. As with physical tape, even if a non-scratch virtual volume is incorrectly mounted as a scratch volume, the tape management system protects it from use.

# Virtual Volume Data Spaces

The CA-Vtape data spaces are the buffers for CA-Vtape. As an application reads or writes to a virtual volume, the CA-Vtape routines and data spaces move the data to and from the channel program and virtual volume LDS.

When a mount occurs for a virtual device with a virtual volume, a data space is created specifically to process data for that unique combination of device and volume. That data space has no other tasks or functions.

I/O to the virtual volume LDS are of 4k blocks or frames which are chained together to form very long and efficient I/Os. Using these data spaces allows extremely high data movement performance to and from the virtual volume LDS.

The data space processing to the disk data set is not significantly affected by the blocksize of the original tape data since the data is mapped to the DIV (Data In Virtual) structure. If an application is using tape efficiently, CA-Vtape also runs efficiently. Applications that do not use efficient blocksizes for tape appear to be processed more efficiently since the DIV process masks the inefficiencies of the small blocksize.

The virtual volume data spaces are shared data spaces.

## Creating Tape Data Sets

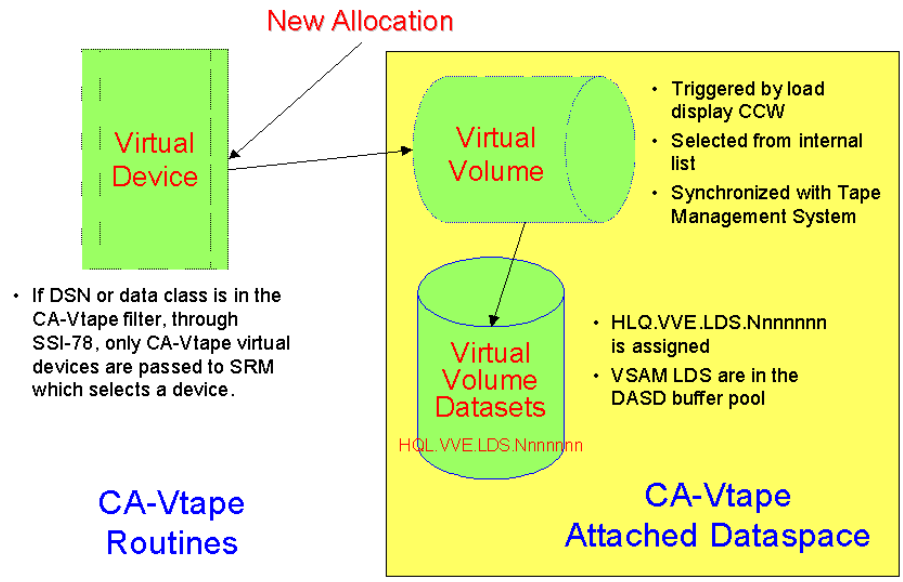
DISP=NEW processing implies scratch usage unless a VOL=SER reference is specified. When allocation processing occurs at the tape selection exit (SubSystem Interface 78), a determination is made whether to handle allocation by using CA-Vtape data set filters and Dataclass tables.

CA-Vtape manages the allocation by removing all but its virtual devices from the eligible device list, and declines to manage it by removing all its virtual devices. The System Resources Manager (SRM) of OS/390 makes the actual selection.

When the scratch mount request for the CA-Vtape device occurs, a “load display” CCW 9F is issued to that selected device from OS/390 requesting a scratch mount. This signals CA-Vtape that a scratch virtual volume is to be provided from a list of scratch volumes kept internally by CA-Vtape. That internal list is synchronized with the tape management system.

CA-Vtape initiates an allocation request to create the appropriate virtual volume by selecting from the DASD buffer pool 10 VSAM linear data sets. These linear data sets are preallocated and preformatted using the standard naming convention of “HLQ.VVE.LDSnnnnnn” where HLQ is the high level qualifier defined for CA-Vtape itself, and nnnnn is a sequence number. After the virtual volume is closed by the application, any non-used VSAM linear data sets are returned to the pool.

**FIGURE 2-1 New Scratch Allocations**




# Using Existing Tape Data Sets

If an application requests an existing cataloged data set, OS/390 performs a catalog search. If an entry is found, the virtual volume required will be provided to satisfy the allocation request. As that request is passed to the tape selection exits, CA-Vtape recognizes the use of a virtual volume and again uses the SSI 78 exit to remove all but CA-Vtape virtual devices from the list of eligible devices.

SRM selects the actual device from this list and requests a mount of the specific virtual volume on that selected device.

CA-Vtape detects the mount message using the CCW 9F (Channel Command Word) which is the load display command. CA-Vtape initiates an allocation request to open the appropriate virtual volume. The first step is to check if the virtual volume is still in cache. If it is found, the corresponding VSAM LDSs are opened.

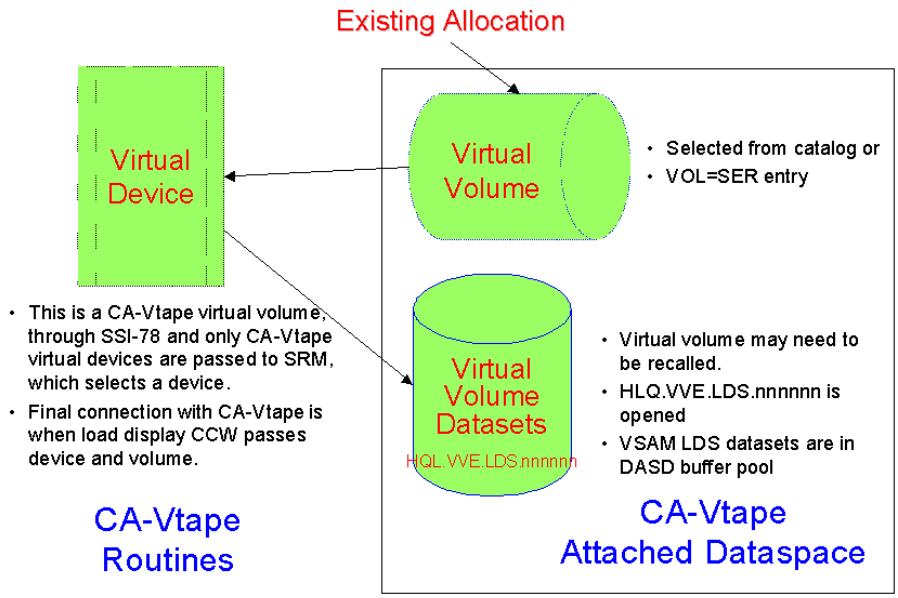
If the virtual volume disk data set is not found in cache, it must be recalled from physical tape. As with a new allocation, 10 VSAM LDSs are selected from the pool.

To locate the physical tape, CA-Vtape searches the ICF catalog. It looks for the standard name HLQ.VVE.Vxxxxxx.PRIMARY, where HLQ is the high level qualifier defined for CA-Vtape itself, and xxxxx is the volume serial of the required virtual volume. If the entry is not found, a new search is initiated looking now for the entry HLQ.VVE.Vxxxxxx.DUPLEX. If this entry is also not found, an EOV is written to the first VSAM LDS and the mount is completed.

**Note:** The naming convention is "HLQ.VVE.LDSnnnnnn" where HLQ is the high level qualifier defined for CA-Vtape itself, and nnnnnn is the sequence number utilized during the virtual volume creation.

If the PRIMARY or DUPLEX entries are found, the corresponding physical tape is requested and positioned by OS/390 to the corresponding file. After the virtual volume is opened and recall has begun processing, the virtual volume mount request is satisfied and data begins passing to the device.

**FIGURE 2-2 Old Allocations**




## Close Processing

All data must be written to the virtual volume LDS before "allocation close" or any tape mark processing is allowed. This is to ensure data integrity and tape position synchronization between the application and the virtual volume LDS at the appropriate times.

The CCW '0F' (Rewind / Unload) signals the demount of a virtual volume to CA-Vtape. After the demount, the copy of the virtual volume LDS to physical tape is scheduled by placing the data set name in the appropriate group output queue.

## Sense Processing

CA-Vtape provides sense and error recovery information emulating a simple 3480 or 3490 device. The sense data emulates single path, non-automated drives without autoloaders.

## Virtual Volume VSAM LDS Data Sets

CA-Vtape uses LDS to cache virtual volumes. These LDSs are defined and preformatted during installation. Ten LDSs are assigned to a particular virtual volume when it is first used. If the virtual volume size is 800 megabytes (i.e., 3490 device), the size of each LDS is 80 megabytes. If the virtual volume size is 400 megabytes (i.e., 3480 device), the size of each LDS is 40 megabytes. After the tape data set and the virtual volume is closed, unused LDSs are released and used for a different virtual volume.

Any subsequent opening of the virtual volume causes the originally used LDSs to be opened, plus any empty LDSs necessary to restore the total LDS count back to 10. This allows any modify processing to use the full 400/800 megabytes of capacity in a virtual volume.

After access to the virtual volume is completed, the LDSs can be externalized to physical tape. The externalization is controlled by the user using the SVTS SET BACKSTORE command. For more information, see SET BACKSTORE= in the section “SVTS SET Commands” in the chapter “Using CA-Vtape.”

The DASD volumes to be used for the cache are selected during the installation of CA-Vtape. You can also use a specific DFSMS storage group. In this case, a unique storage group for this pool is recommended. The DASD volumes or DFSMS storage group selected are only used during the installation process to generate the IDCAMS jobs that will allocate the virtual volume VSAM LDS data sets. The volume list or DFSMS storage group are not registered in CA-Vtape, allowing the user to move the VSAM LDS data sets, after the initial allocation, to different volumes.

Devices that provide many concurrent high performance sequential operations and DASD control units with large numbers of channel paths are recommended.

See section “System Requirements” in the chapter “Introducing CA-Vtape” for examples of some RAID DASD models with high performance sequential operations.

The sequential throughput capabilities of the data set pool directly impact the apparent performance of the emulated devices. Higher performance DASD in the virtual volume LDS pool provides higher performance emulated devices.

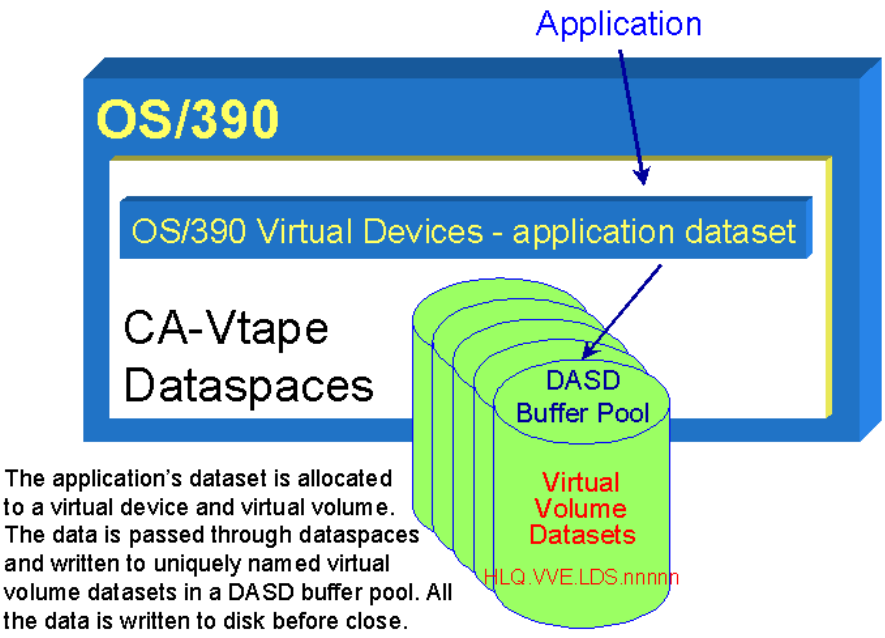
It is possible to share the DASD volumes with other applications but it is not recommended. Other applications accessing these volumes can cause significant contention when the pool is supporting high activity tape emulation.

Large tape data sets are segmented into multiple virtual volumes, allowing virtual volumes that have completed processing to be copied (destaged) to physical tape if the externalization process for the corresponding group/subgroup is active.

## CA-Vtape Output and Modify Processing

CA-Vtape provides the ability to write to virtual tape devices directly in OS/390. These devices are accessed by the application as if they were real physical devices.

**FIGURE 2-3 CA-Vtape Output Processing**



## Data space Processing

The data being written to a virtual volume is saved on VSAM linear data sets in a disk buffer pool that are the save area or "backing" for the data space. The data is mapped into the VSAM linear data sets along with its data structure information or "meta" data.

The data spaces exploit DIV performance techniques provided by OS/390. This provides users with significant performance improvements since the DIV functions transfer data in very large chains of CCWs per I /O operation. The data space also allows data written to the data space virtual volume to occur asynchronously with the writing of the data to the DASD pool. The application only waits for each block of data to be moved to the data space before receiving channel end. All data is written to disk before close processing or the writing of any tape mark is signaled complete.

When multiple virtual devices are processing concurrently, multiple data space tasks are concurrently writing the data to the disk buffer pool to avoid "single thread" processes. Since the virtual devices are actually high performance DIV objects, the virtual devices may accept data from applications faster than their disk buffer can accept it. CA-Vtape detects delays in saving the data to disk and throttles the virtual device by presenting "busy conditions." The throttle prevents excessive use of virtual storage and excessive paging.

## ICF Catalog Processing

For a particular application data set, if the data set is cataloged, the OS/390 catalog contains the virtual volume the data set resides on and it remains so until it is uncataloged by the user. Requests for that virtual volume are passed to CA-Vtape for processing. If the virtual volume is still in the cache, CA-Vtape uses information from its own internal catalog, the Global VCAT, to select the appropriate virtual volume VSAM LDS data sets.

If the virtual volume is not in the cache, the ICF catalog is searched for the data set name "HLQ.VVE.Vxxxxxx.PRIMARY" or "HLQ.VVE.Vxxxxxx.DUPLEX" as described in the section "Using Existing Tape Data Sets" in this chapter.

In the case of output processing for a data set on a scratch tape, the virtual volume serial is selected from an internal list of scratch virtual volumes candidates kept synchronized with the Tape Management System. To satisfy the virtual volume scratch allocation, 10 VSAM LDS data sets candidates are picked from the available cell list and the ICF catalog is then searched for the actual location of each data set and to complete the open.

## Multi-Volume Output Processing

CA-Vtape forces an "End Of Volume" condition during output processing when a previously determined size file is met. This setting is determined during installation as 400 or 800 megabytes. For more information about installation, see Figure A-5, CA-Vtape Install Panel, in Appendix A.

For very small buffer sizes, using small volume sizes makes more sense since that allows better utilization of the cache by forcing multi-volume early and, if the externalization is active for the particular group/subgroup where the virtual volume is on, allowing the initial volumes to be moved to physical tape while the job continues on subsequent volumes.

For large cache sizes, the volume size should be more in accordance with the device type in use. For 3480 class devices, use 400 megabytes. For 3490 class devices, use 400-800 megabytes. Smaller volume sizes can require a change to volume count parameters if the job uses more than the default minimum of five volumes.

## Multi-file Processing to Virtual Volumes

Multi-file processing to virtual volumes is supported. Large numbers of files (>255) per virtual volumes are not recommended since they may have recall performance or recovery implications. For this reason, a volume switch is forced before the 256$^{th}$ file is written to a virtual volume. Applications written to process multi-volume formats recognize the volume switch and proceed normally.

A single file per virtual volume provides the best recall performance and recovery. CA-Vtape automatically provides the stacking function to the physical devices.

If more than one data set is written to a virtual volume, all subsequent data sets written to the virtual volume will assume the same output group as that of the first data set on the volume. This will occur for the second and subsequent data sets regardless of the output group implied by the data set filter list or dataclass filter list.

## Uncataloged Data Sets

Uncataloged data sets on the virtual volumes are supported. VOL=SER references describe the requested virtual volume instead of a catalog lookup. Other processing remains unaffected.

## Temporary Data Sets

Temporary data sets on the virtual volumes are supported, whether dynamically allocated or explicitly specified by the user. Either a data set filter or a data class filter should be created to select candidate data sets via the system generated data set name.

## Unit Affinity Processing

Unit Affinity processing is supported in CA-Vtape when all of the data sets referenced by the Unit Affinity are in the CA-Vtape virtual volumes.

## Reference Backward Processing (Refer Backs)

"Refer back" processing is the referencing of a previous DD and is supported if all of the data set names are all invoking CA-Vtape.

## Concatenation Processing

Concatenation processing can have references to both a data set serviced by CA-Vtape and not serviced by CA-Vtape in the same step.

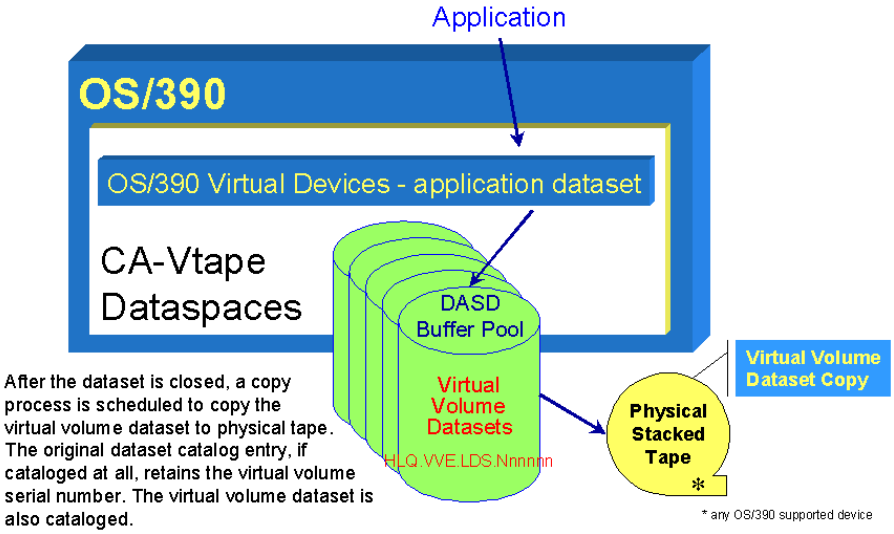
## Special Processing Conditions

| | |
|---|---|
| OPTCD=W | specified in JCL causes "Tape Write Immediate" which on physical 3480s and 3490s forces a physical write to tape before returning channel end and device end to the host. CA-Vtape processes OPTCD=W if requested; however, some records may be in flight and not yet saved on disk or tape when channel end and device end are returned to the host. |
| OPTCD=C | specified in JCL forces "channel command chaining" and is accepted by CA-Vtape. |
| OPTCD=Z | specified in JCL indicates shortened error recovery for physical. This OPTCD is accepted by CA-Vtape but does not affect processing. |
| LABEL=n | Use of tape label types not supported by the tape management system (that is, LABEL=AL), may result in the tape management system exhausting all available virtual tapes. Use of unsupported label types, whether for a specific or a non-specific volume request, should be avoided. |

# Automated Tape Data Set Stacking

The tape data set stacking function is complementary to the output and modify processing components of CA-Vtape. When output processing completes, the data set now resides on the disk data sets but still needs to be copied to physical tape. The virtual volume is immediately scheduled to be copied to physical tape after the virtual volume is dismounted. To improve the utilization of the capacity of tape volumes, the data sets are stacked with more than one data set per volume. The actual externalization process is controlled by the user using the SVTS BACKSTORE command. For more information about the BACKSTORE command, see SET BACKSTORE= in the section "SVTS SET Commands" in the chapter "Using CA-Vtape."

**FIGURE 2-4 Simplified Stacking Process**




## Stacking Groups

The groups are designed to provide a vehicle that allows data sets with similar characteristics and requirements to be stacked together. These groups are predefined by various attributes and are selected by data set name filters or DFSMS dataclass filters. These filters are controlled by the CA-Vtape administrator and require minimal ongoing management when using stable naming conventions. Each group/subgroup combination will use a separate physical tape during the externalization process. The stacking groups can be used to stack by:

- Additional Copy Requirements. A primary copy is always made. You can also create a:
  - Duplex copy for media or disaster recovery.

  - Export copy for off-site use.
  - Combination of any three copies.
- Expiration date—the Stacking Groups have subgroups that automatically separate the data sets based on expiration date which helps to minimize fragmentation of free space on cartridges over time.
- Desired esoteric or storage location—for example, local versus disaster vault.
- A user assigned separator group—for example, a user may want to ensure the second copy of the database logs are on different physical tape volumes.

## Duplex Copies

Duplexing provides a second copy of the data sets processed by that group. This provides 100% redundancy for media and disaster recovery.

Duplex copies can also be used with a different system, such as an off-site location, using another copy of CA-Vtape.

**Note:** Duplex copies are automatically accessed for recalls if the Primary copy is not cataloged.

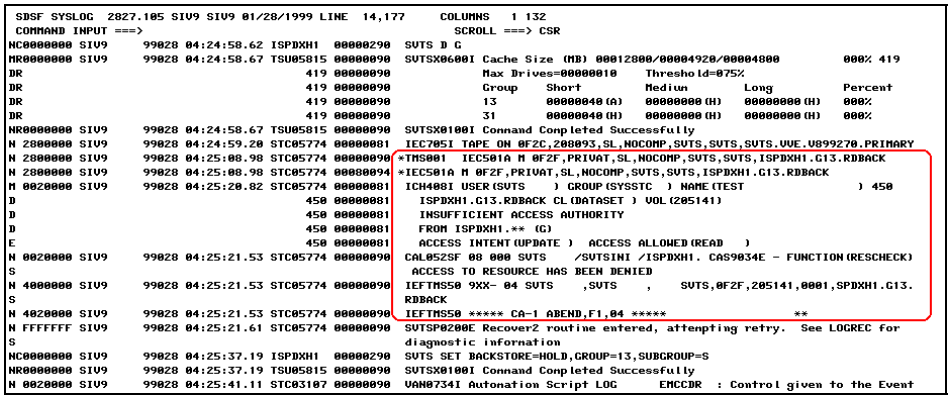
## Export Copies

Export automatically creates a native format copy of the tape data sets. This format is directly readable by users. Original data set names are kept so these data sets are uncataloged to avoid catalog conflicts. You can use this copy at a site that does not use CA-Vtape.

Initiate the export copy by assigning a filter list to a "Group ID" that has a valid esoteric in the "Export Eso" field. By default, Group IDs with either an x3 or x4 create an export copy. For example, see Figure 3-2 CA-Vtape Group Display Panel, in the chapter "Using the Interface." As you can see in the partial list of Figure 3-2, Group IDs 3, 4, 13, and 14 creates an export copy.

You need to provide UPDATE or OUTPUT authority to CA-Vtape SVTS address space for data sets being used by Export. If you do not, you receive security errors similar to the following:

**FIGURE 2-5 Export Error Messages caused by Insufficient Authority**



```
 SDSF SYSLOG  2827.105 SIV9 SIV9 01/28/1999 LINE  14,177     COLUMNS   1 132
 COMMAND INPUT ===>                                          SCROLL ===> CSR
NC0000000 SIV9     99028 04:24:58.62 ISPDXH1  00000290  SVTS D G
MR0000000 SIV9     99028 04:24:58.67 TSU05815 00000090  SVTSX0600I Cache Size (MB) 00012800/00004920/00004800          000% 419
DR                                    419 00000090             Max Drives=00000010     Threshold=075%
DR                                    419 00000090             Group     Short         Medium         Long           Percent
DR                                    419 00000090             13        00000040(A)   00000000(H)    00000000(H)    000%
DR                                    419 00000090             31        00000040(H)   00000000(H)    00000000(H)    000%
NR0000000 SIV9     99028 04:24:58.67 TSU05815 00000090  SVTSX0100I Command Completed Successfully
N 2800000 SIV9     99028 04:24:59.20 STC05774 00000081  IEC705I TAPE ON 0F2C,208093,SL,NOCOMP,SVTS,SVTS,SVTS.VVE.V899270.PRIMARY
N 2800000 SIV9     99028 04:25:08.98 STC05774 00000090 *TMS001  IEC501A M 0F2F,PRIVAT,SL,NOCOMP,SVTS,SVTS,ISPDXH1.G13.RDBACK
N 2800000 SIV9     99028 04:25:08.98 STC05774 00000094 *IEC501A M 0F2F,PRIVAT,SL,NOCOMP,SVTS,SVTS,ISPDXH1.G13.RDBACK
M 0020000 SIV9     99028 04:25:20.82 STC05774 00000081  ICH408I USER(SVTS     ) GROUP(SYSSTC  ) NAME(TEST                  ) 450
D                                     450 00000081    ISPDXH1.G13.RDBACK CL(DATASET ) VOL(205141)
D                                     450 00000081    INSUFFICIENT ACCESS AUTHORITY
D                                     450 00000081    FROM ISPDXH1.** (G)
E                                     450 00000081    ACCESS INTENT(UPDATE )  ACCESS ALLOWED(READ   )
N 0020000 SIV9     99028 04:25:21.53 STC05774 00000090  CAL052SF 08 000 SVTS    /SVTSINI /ISPDXH1. CAS9034E - FUNCTION(RESCHECK)
S                                                        ACCESS TO RESOURCE HAS BEEN DENIED
N 4000000 SIV9     99028 04:25:21.53 STC05774 00000090  IEFTMS50 9XX- 04 SVTS    ,SVTS    ,    SVTS,0F2F,205141,0001,SPDXH1.G13.
S                                                        RDBACK
N 4020000 SIV9     99028 04:25:21.53 STC05774 00000090  IEFTMS50 ***** CA-1 ABEND,F1,04 *****                **
N FFFFFFF SIV9     99028 04:25:21.61 STC05774 00000090  SVTSP0200E Recover2 routine entered, attempting retry.  See LOGREC for
S                                                        diagnostic information
NC0000000 SIV9     99028 04:25:37.19 ISPDXH1  00000290  SVTS SET BACKSTORE=HOLD,GROUP=13,SUBGROUP=S
NR0000000 SIV9     99028 04:25:37.19 TSU05815 00000090  SVTSX0100I Command Completed Successfully
N 0020000 SIV9     99028 04:25:41.11 STC03107 00000090  VAN0734I Automation Script LOG      EMCCDR  : Control given to the Event
```

## Group Definitions

The following table shows the supported Group Definitions:

**Examples**

- Group 01 is a group with no export or duplex copies.
- Group 71 also has no export or duplex copies but can be allocated to a different physical device like a remote vault.
- Group 74 can also be defined with unique output devices and have both export copies and duplex copies created for its data sets.

TABLE 2-1 Group Definitions

| Group Number | Primary | Duplex Copy | Export Copy |
|---|---|---|---|
| Group x1 [a] | n | | |
| Group x2 | n | n | |
| Group x3 | n | | n |
| Group x4 | n | n | n |

a. x = a predefined Group ID of 0 through 7. Up to eight groups of each type can be defined to provide guaranteed separation and selection of alternate physical output devices.

## The Stacking Process

The tape data sets in the CA-Vtape cache are normally managed using a "least recently used" process where the oldest tape virtual volume LDS is invalidated when disk buffer space needs to be reclaimed. To provide a more streamlined de-stage process, you can control when data sets are selected and copied to physical tape. After it has been copied to physical tape, it is eligible for disk space reclamation.

As tape data sets are destaged to physical tape, CA-Vtape catalogs the location of the various copies which point to the virtual volumes. You can select how many tasks can be concurrently de-staging data to physical tape. Since each task requires an output tape drive, consider how many drives are available versus the impact slow de-staging has on your disk buffer pool size. Each task de-stages from its assigned queue, stacking data sets on the same physical tape.

If the queue becomes empty, the tape drive and volume remain allocated for a set duration governed by a user parameter. If the set time is exceeded, the drive and volume are deallocated but the volume and last used file sequence number are retained for use when the queue has work to perform. Then the task restarts, using the same volume and next file sequence number.

Based on parameters defined during the CA-Vtape installation, each expiration date subgroup is able to de-stage data to up to 8 physical drives simultaneously.

Although these stacked tape data sets are cataloged as virtual volumes, they are cataloged in the normal OS/390 process. Export copy tapes can be recataloged and the data accessed directly without CA-Vtape.

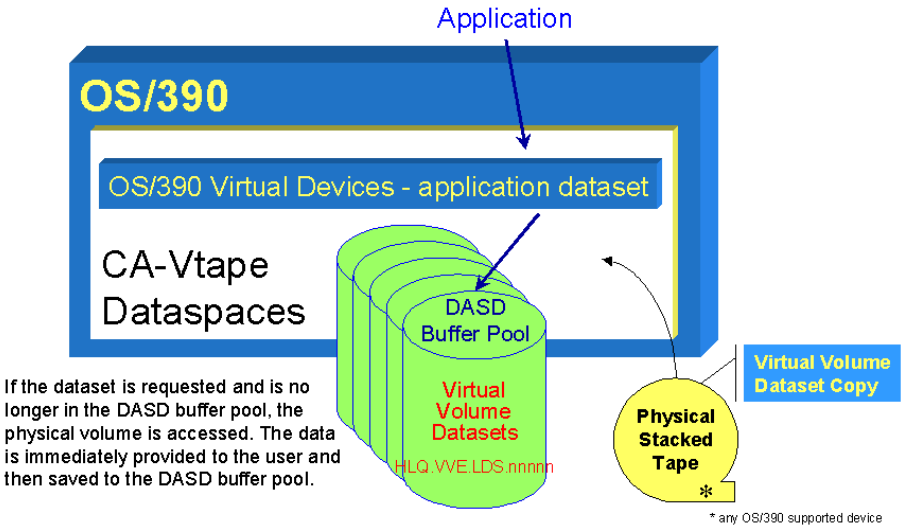
CA-Vtape primary and duplex copies can be used with CA-Vtape at an alternate site. If the original CA-Vtape ICF catalog is not available, follow standard ICF catalog recovery procedures to rebuild the catalog entries for the virtual volume locations.

If more than one data set is written to a virtual volume, all subsequent data sets written to the virtual volume will assume the same output group as that of the first data set on the volume. This will occur for the second and subsequent data sets regardless of the output group implied by the data set filter list or dataclass filter list.

# Retrieving Tape Data Sets From Stacked Tapes

CA-Vtape virtual volumes are stacked on physical tape volumes. When retrieving virtual volumes from a physical tape, CA-Vtape immediately provides the data to the application.

**FIGURE 2-6 Diagram Of Simplified Retrieval Processing**




The application utilizes virtual volumes and its serial numbers and never accesses any of the physical tapes directly. The physical tapes are only referenced and used by CA-Vtape. Immediately after the retrieval of a data set to the disk buffer is complete, the physical volume is free for use with any other data set request preventing any of the abends or extended delays usually associated with stacked tape.

Chapter

3

# Using the Interface

After you install and configure CA-Vtape, it is ready to use. If you are using a PC with an emulator software, your screens look similar to the examples shown in this guide. If you are working on a 3270 terminal, your screens contain the same information, but may look different.

**Note:** For installation instructions, see the appendix "Installing CA-Vtape."

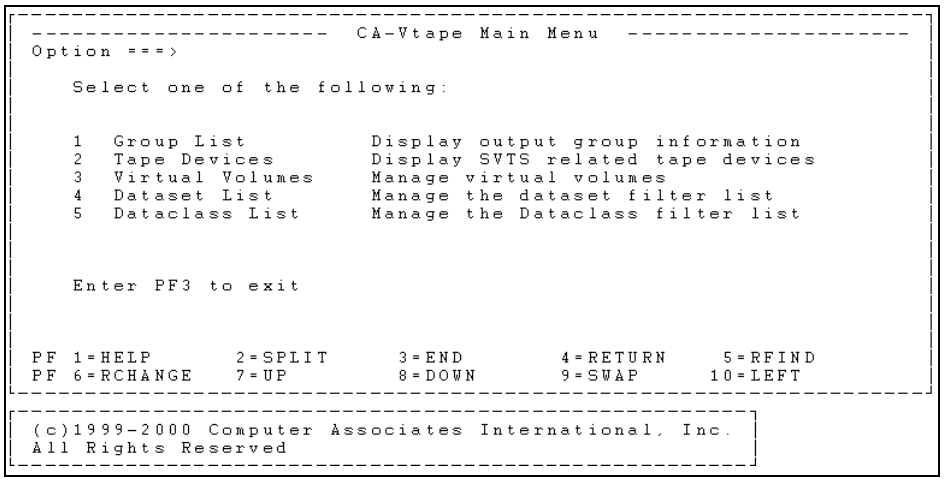
## Using the Main Menu

All of the controls are reached by starting the CA-Vtape Main Menu. The Main Menu is started by typing the TSO command:

```
EXEC hlq.version.SVTJCL(SVTSMON)
```

After you start CA-Vtape, the Main Menu appears.

**FIGURE 3-1 Main Menu**




From the CA-Vtape Main Menu, you can select from the following:

| | | |
|---|---|---|
| 1 | Group List | Shows information about the CA-Vtape output groups. |
| 2 | Tape Device | Shows information about the available Virtual Tape Drives. |
| 3 | Virtual Volumes | Shows information about virtual tape volume serial numbers activated during the install process. |
| 4 | Data set List | Shows information that allows you to manage the CA-Vtape data set list filter. |
| 5 | Dataclass List | Shows information that can be used to display and manage the Dataclass entries used by CA-Vtape. |

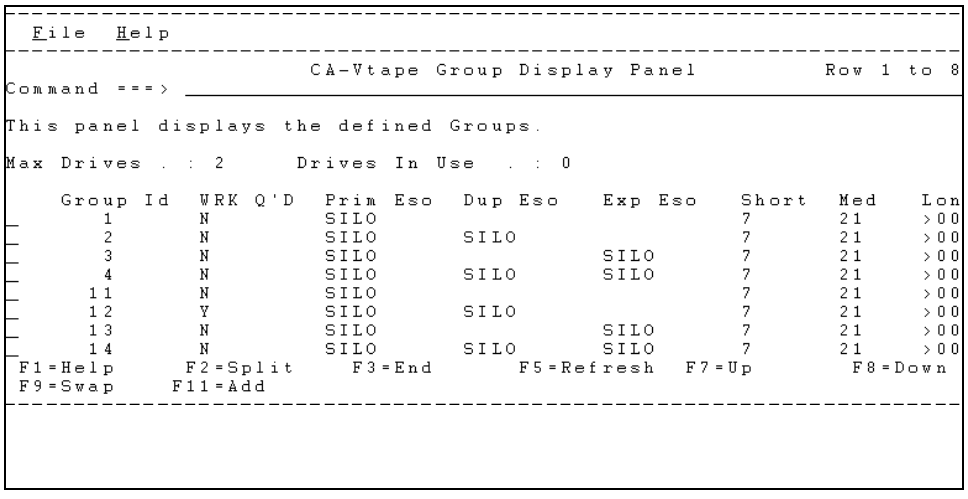
See the following sections for specific information about each area.

# Using the Group Display Panel

When you select Option 1 from the Main Menu (Figure 3-1), information about the CA-Vtape output groups appears. These groups, created during the install process, provide a method that allows data sets with similar characteristics and requirements to be stacked together. For more information about the installation process, see Figure A-10, SVTS Install Panel 2, in the appendix "Installing CA-Vtape."

These groups are controlled and managed by the CA-Vtape administrator. There are 32 possible groups that you can use.

**FIGURE 3-2 CA-Vtape Group Display Panel**



The information shown includes:

| | |
|---|---|
| Max Drives | Maximum number of drives that the CA-Vtape can use for externalization |
| Drives In Use | Number of drives currently in use |
| Group ID | Name of the individual work queues |
| WRK Q'D | Whether or not work is presently queued |
| Prim Eso | Device type or esoteric to use when creating the primary tape |
| Dup Eso | Device type or esoteric to use when creating the duplex copy |
| Exp Eso | Device type or esoteric to use when creating the export (in user readable format) copy. |
| Retention Periods | Backstore data is externalized to physical tape based on the expiration date, assigned to one of three retention date categories: |

| | |
|---|---|
| Short | user-defined during initial installation. |
| Medium | user-defined during initial installation. |
| Long | overflow period. If the data does not fit into one of the first two categories, then it ends up in this category. |

You can issue the following line commands in this panel:

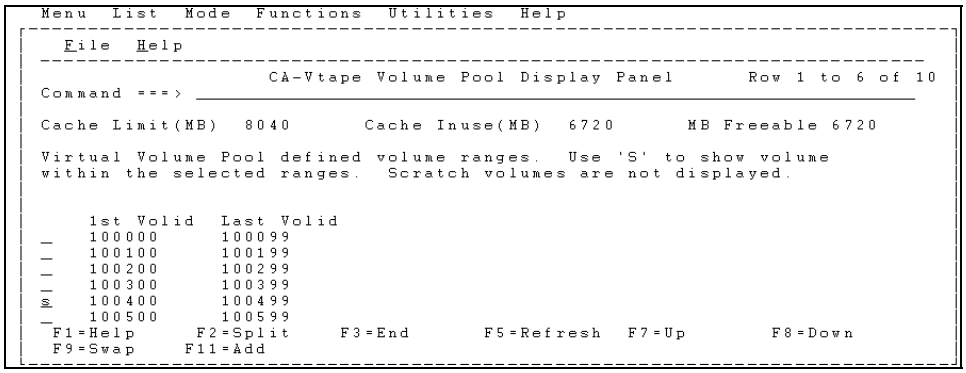
| | |
|---|---|
| Q | Shows another panel, listing the items waiting in the queue to be externalized. |
| S | Shows another panel, listing more specifics for the selected group. |

# Using the Tape Device Status Display Panel

When you select option 2 from the Main menu, the CA-Vtape Tape Device Status Display panel appears. These are the virtual tape drives created during the install process. For more information about creating virtual tape drives, see Step 13 Varying the Virtual Devices Online, in the section "The Customization Process" in the appendix "Installing CA-Vtape."

The Tape Device Status panel looks like the following:

**FIGURE 3-3 Tape Device Status Display Panel**




The information shown includes:

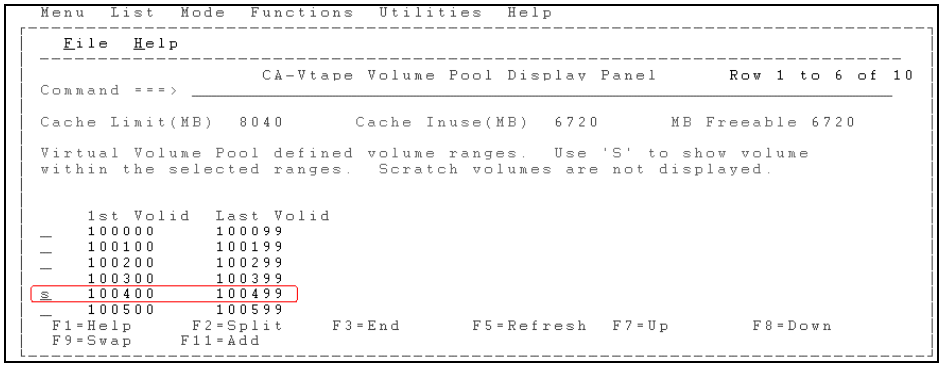
| | |
|---|---|
| Cache Limit (MB) | Maximum amount of DASD available for virtual volumes |
| Cache Inuse (MB) | Amount of DASD currently in use by virtual volumes |
| MB Freeable | Amount of DASD currently in use by virtual volumes that have been externalized |
| Volume | Volume serial number associated with the device |
| Dev# | Virtual UCB address |
| Status | Whether or not the device is busy |
| Devt | Virtual UCB device type |
| Jobname | Jobname that has the device allocated |
| # SIOs | Number of Start I/O's to the device |
| Seq # | The data set sequence number on the current volume. |

| | |
|---|---|
| Phy/Virt | Shows if the device is real or virtual |
| % | Progress of the device. Virtual devices always show zero. |

# Using the Volume Pool Display Panel

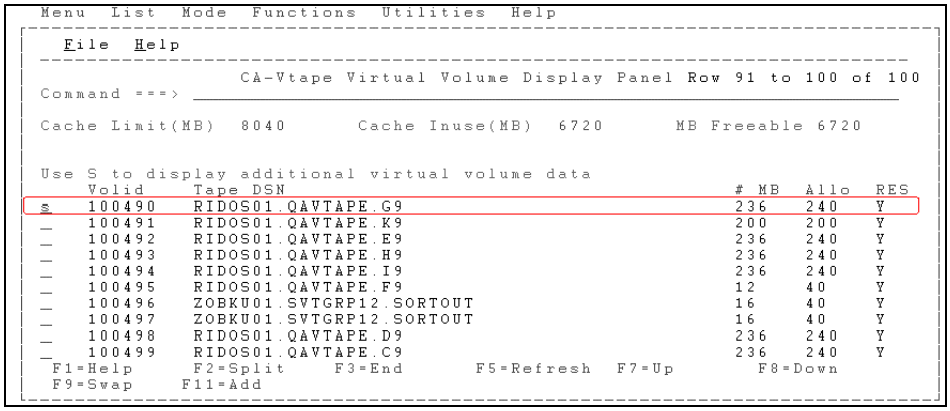
When you select Option 3 from the Main menu, the CA-Vtape Volume Pool Display panel appears. These are the virtual tape volume serial numbers activated during the install process. For more information about the installation process, see the appendix "Installing CA-Vtape."

**FIGURE 3-4 Volume Pool Display Panel**




Review detail information for a range of volumes by issuing the (S)elect line command. The panel shown below appears.

**FIGURE 3-5 Virtual Volume Display Panel**

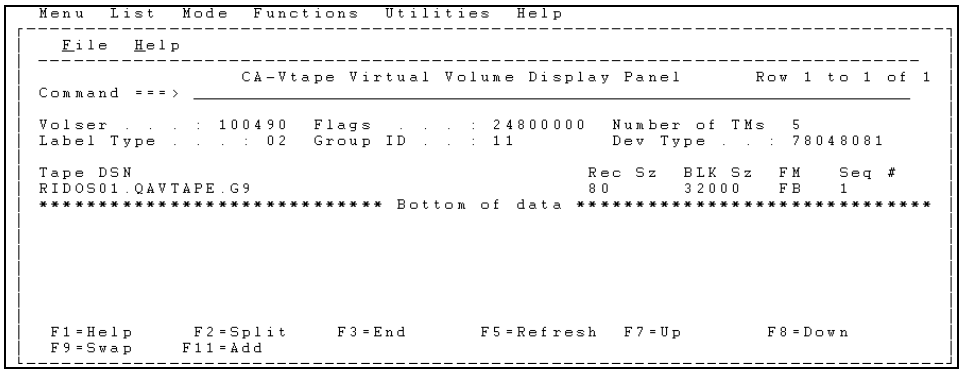


The information shown includes:

| | |
|---|---|
| Cache Limit (MB) | Maximum amount of DASD to be used for the virtual volumes. |
| Cache Inuse (MB) | Amount of DASD currently in use. |
| MB Freeable | Amount of DASD currently in use by virtual volumes that has been externalized. This space is reclaimable for use by new virtual volumes on a least frequently used basis. |
| Volid | Identification of the virtual volume. |
| Tape DSN | DSN associated with the virtual volume. If the volume consists of multiple DSNs, a plus sign (+) is shown next to the Volid. To view all of these multiple DSNs, select the entry by placing an 'S' next to the entry as shown in Figure 3-5. |
| # MB | Size of the virtual volume. They are allocated in 4MB segments with the first segment containing CA-Vtape control information. |
| Allo | MB allocated to the virtual volume. |
| RES | Shows if the virtual volume resides in the cache. |

Review detail information for each volume by issuing the (S)elect line command. The panel shown below appears.

**FIGURE 3-6 Virtual Volume Display Panel**



The information shown includes:

| | |
|---|---|
| Volser | Virtual volume being displayed. |
| Flags | See Table 3-1, Virtual Volume Flags Fields and their meanings. |
| Number of TMs | Amount of Tape Marks on the virtual volume. |
| Label Type | See Table 3-2, List of Label Types and their meanings. |
| Group ID | Externalization group. |
| Dev Type | Device type the virtual volume was created on. |
| Tape DSN | DSN(s) contained on the virtual volume. |
| Rec Sz | Record Size of the data set. |
| BLK Sz | Block size of the data set. |
| FM | Format Type of the data set. |
| Seq # | Sequence number of the data set on the virtual volume. |

TABLE 3-1 Virtual Volume Flags Fields and their meanings

| Byte # | Binary | Hex | Meaning |
|---|---|---|---|
| VVEFLAG1 | 1000 0000 | 80 | CANNOT BE FREED |
| | 0100 0000 | 40 | MUST BE EXTERNALIZED |
| | 0010 0000 | 20 | VVE IN CACHE |
| | 0000 1000 | 08 | BYPASS BSDS |
| | 0000 0100 | 04 | PRIMARY |
| | 0000 0010 | 02 | DUPLEX |
| | 0000 0001 | 01 | EXPORT |
| VVEFLAG2 | 1000 0000 | 80 | NOT SCRATCH |
| | 0100 0000 | 40 | NL SL LABELED |
| | 0010 0000 | 20 | MULTI VOLUME DSN |
| VVEFLAG3 | 0100 0000 | 40 | RECALLING VVE |
| | 0010 0000 | 20 | VVE INITIALIZED |
| VVEFLAG4 | 1000 0000 | 80 | LDS ALLOCATED |

| Byte # | Binary | Hex | Meaning |
|---|---|---|---|
| | 0010 0000 | 20 | DIV IDENTIFIED |
| | 0001 0000 | 10 | DIV ACCESSED |
| | 0000 1000 | 08 | DATA SPACE CREATED |
| | 0000 0100 | 04 | MOUNTED |
| | 0000 0010 | 02 | RECALL ACTIVE |
| | 0000 0001 | 01 | MAPPED |

TABLE 3-2 List of Label Types and Their Meanings

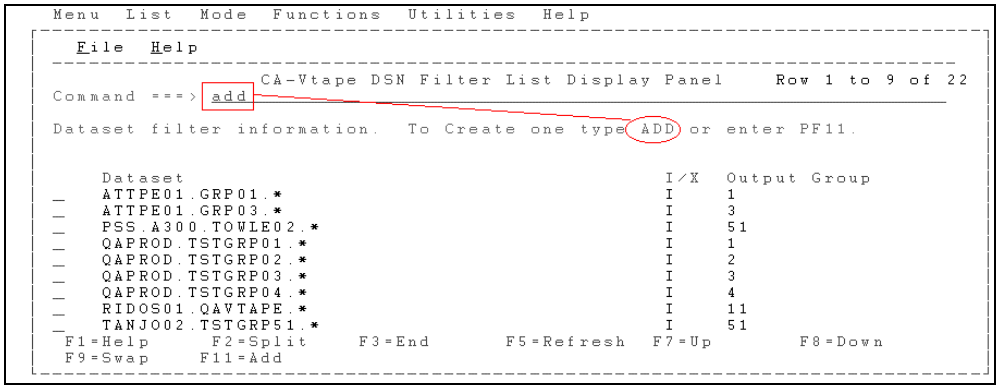
| Label Name | Binary | Hex | Meaning |
|---|---|---|---|
| JFCDSEQN | 1000 0000 | 80 | DATA SET SEQUENCE NUMBER Specified |
| JFCBAL | 0100 0000 | 40 | AL: ISO/ANSI (ver 1)<br>ISO/ANSI/FIPS (ver 3) |
| | 0100 1000 | 48 | AUL User labels and AL type labels |
| JFCBLTM | 0010 0000 | 20 | LTM LEADING TAPE MARK<br>**Note:** OPEN/CLOSE/EOV AND RESTART must space over a tape mark if one exists. |
| JFCBLP | 0001 0000 | 10 | BLP BYPASS LABEL PROCESSING |
| JFCSUL | 0000 1010 | 0A | SUL STANDARD and USER LABELs |
| JFCNSL | 0000 0100 | 04 | NSL NONSTANDARD LABEL |
| JFCSL | 0000 0010 | 02 | SL STANDARD LABEL (default) |
| JFCNL | 0000 0001 | 01 | NL NO LABEL. |

# Using the Data Set Filter List Display Panel

When you select Option 4 from the Main menu, the panel that allows you to manage the CA-Vtape data set list filter appears.

**Note:** If you have activated the enhanced data set filter mode, you will not be able to use the ISPF display interface to display the filter lists. You will need to browse the PARMLIB library for the appropriate member. For more details on CA-Vtape PARMLIB support and enhanced filter mode, see the section "Summary of PARMLIB Features" in the appendix "Using the PARMLIB Feature."

**FIGURE 3-7 DSN Filter List Display Panel**

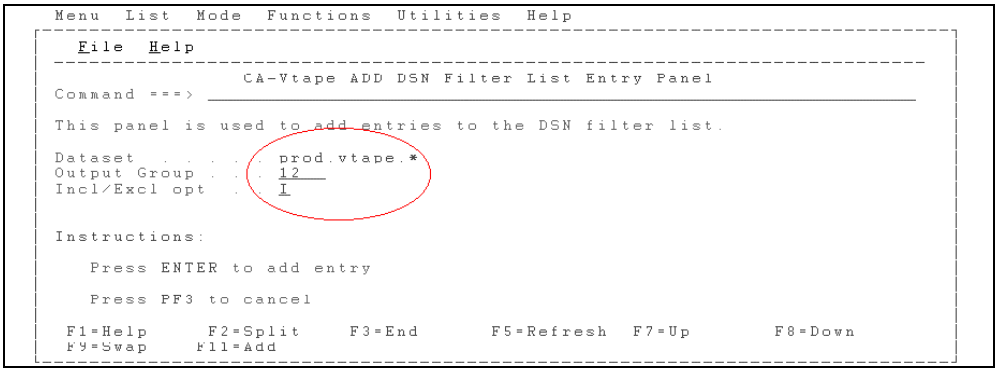



The information shown includes:

| | |
|---|---|
| Data set | The partial or fully qualified DSN used for filtering. Partial names must end with an asterisk (*). |
| I/X | Specifies if the data set is intercepted (I) or excluded(X). |
| Output Group | The associated offload group of the data set. |

You can add a data set filter to CA-Vtape. When you type the ADD command, the ADD DSN Filter panel appears.

**FIGURE 3-8 ADD DSN Filter List Entry Panel**

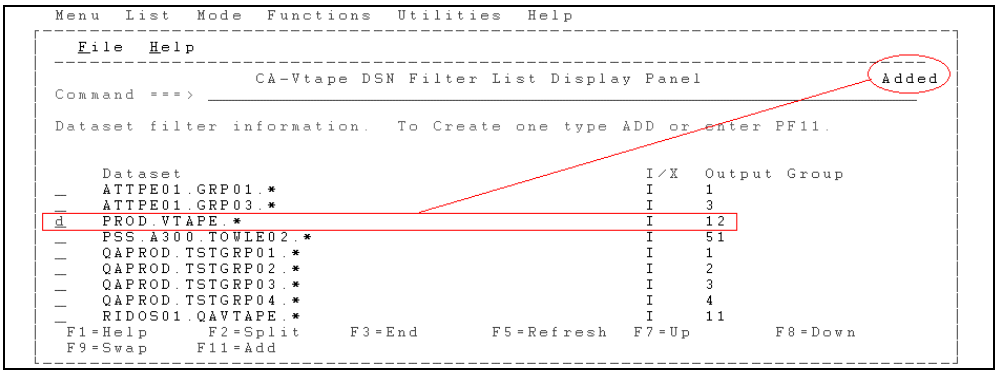



The information shown includes:

| | |
|---|---|
| Data set | The partial or fully qualified DSN used for filtering. Partial names must end with an asterisk (*). |
| Output Group | The associated offload group of the data set. The default is 1. |
| Incl/Excl opt | Specifies if the data set is intercepted (I) or excluded(X). The default is to intercept the entry. |

After you are done entering information, press the Enter key to accept the DSN filter into CA-Vtape and see the DSN Filter List Display panel.

**FIGURE 3-9 DSN Filter List Display Panel**

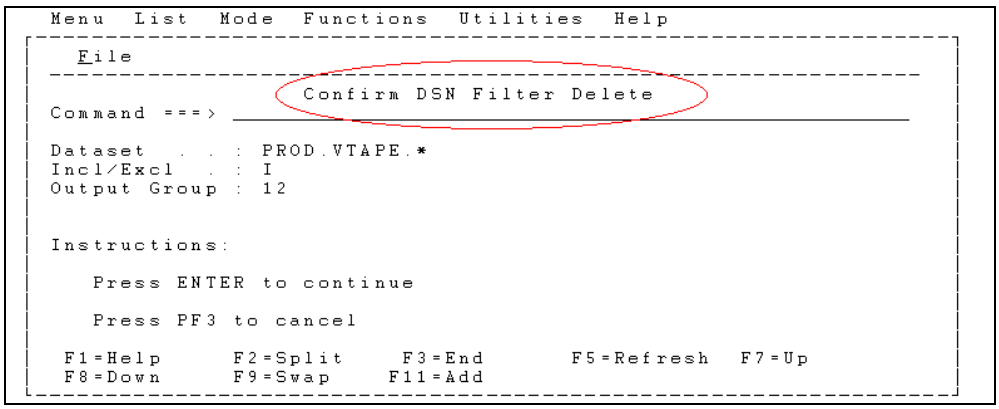



In the upper right hand corner, the results of the ADD line command are shown. The Output Group for the new entry is shown as **12**.

To change a filter entry, you must delete the entry and then issue the ADD line command again. This is shown by the “d” line command in Figure 3-9.

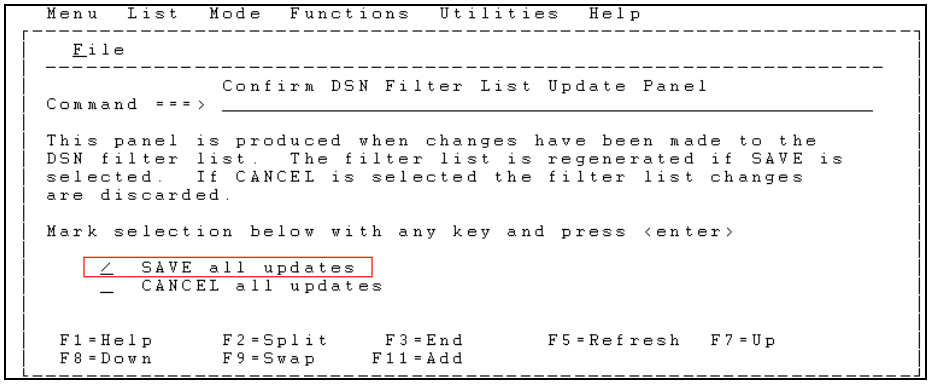
Pressing the Enter key in Figure 3-9 opens the Confirm DSN Filter Delete panel.

**FIGURE 3-10 Confirm DSN Filter Delete Panel**




After you are done adding/deleting filters from CA-Vtape, a final confirmation panel appears.

**FIGURE 3-11 Confirm DSN Filter List Update Panel**




Select the SAVE option to save all the updates to the VCAT or select the CANCEL option to discard all changes during this session. A help panel is also available by pressing the PF1 key.

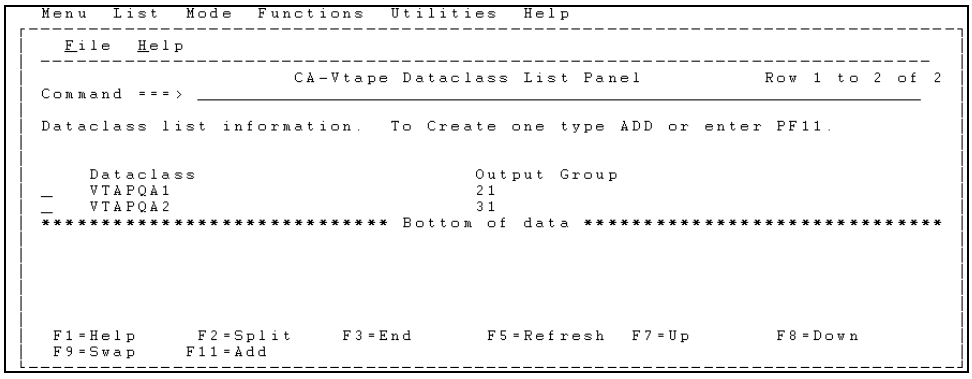
# Using the Dataclass List Panel

You can use IBM's DFSMS Dataclasses to control CA-Vtape. A one-to-one relationship is built between a dataclass and an output group. This relationship is defined by using the Dataclass List panel. This also moves all of the filtering and selection process to the dataclass ACS (Automatic Class Selection) routines. This function allows a common point of control for storage management and these ACS routines allow for management by unit type, job name, program name, data set name, esoteric, etc.

**Note:** If you have activated the enhanced data set filter mode, you will not be able to use the ISPF display interface to display the filter lists. You will need to browse the PARMLIB library for the appropriate member. For more details on CA-Vtape PARMLIB support and enhanced filter mode, see the section "Summary of PARMLIB Features" in the appendix "Using the PARMLIB Feature."

To use a dataclass to select a CA-Vtape group, select the dataclass list by selecting option 5 from the Main menu. The Dataclass List panel appears.

**FIGURE 3-12 Dataclass List Panel**



Chapter

4

# Using CA-Vtape

The sets of commands used to control CA-Vtape are:

- OS/390 START (S) and STOP (P) commands
- Internal CA-Vtape (SVTS) operator commands
- SVTSUTIL batch commands

**Note:** See the appendix "Enhanced Externalization and Recall Feature" to find out about the new commands as a result of the new Externalization and Recall feature. These new commands allow you to gain greater control over the back end processing.

## OS/390 Commands

### START | S

The OS/390 START command (S SVTS) starts the CA-Vtape address space and initializes the subsystem.

**Syntax**

```
S SVTS
```

After the subsystem is initialized, the virtual tape devices defined in the installation process can be varied online. The console command which varies them online is as follows:

```
(V)ary xxxx-xxxx,ONLINE
```

where *xxxx-xxxx* is the range of virtual devices.

After the address space is active, you can begin defining data set names or dataclass names to be used by CA-Vtape. See the section "Using the Data Set Filter List Display Panel" in the chapter "Using the Interface" in this guide, for a description of how to use or change filter lists.

For more information about the typical messages issued during the start-up process, see Figure A-13 Sample SYSLOG Messages Issued During CA-Vtape Start-up, in the appendix "Installing CA-Vtape."

### STOP | P

The OS/390 STOP command (P SVTS) stops the CA-Vtape address space and brings down the subsystem. Normally, you want to deallocate and vary the virtual devices offline first. If this is not done, the online virtual devices will be varied offline by the terminating subsystem. The console command which varies them offline is as follows:

```
(V)ary xxxx-xxxx,OFFLINE
```

where *xxxx-xxxx* is the range of virtual devices.

**Syntax**

```
P SVTS
```

## SVTS Operator Commands

The SVTS console commands show the status of CA-Vtape, and take action against the SVTS started task. The commands are divided into 3 categories, ACTION commands, DISPLAY commands, and SET commands.

**Note:** New operator commands were added to support dynamic changes of PARMLIB members without stopping and restarting the CA-Vtape subsystem. The new operator commands are; SVTS REFRESH=OPTIONS, SVTS REFRESH=GROUP, SVTS REFRESH=FILTERS. For more information about these new commands see the appendix "Using the PARMLIB Feature."

**Note:** You can always type `SVTS HELP` to see the syntax for all valid commands.

TABLE 4-1 SVTS Operator Commands

| Command | Description |
|---|---|
| ADD VVP= | Adds virtual volume segments into CA-Vtape. Volumes are added in 100 volume increments. |
| CHECK BACKSTORE | Checks the virtual volume pools for any volumes that need externalization which are not queued. |
| DISPLAY \| D | Displays status, activity, or group information. |
| DELETE VVP= | Deletes virtual volume segments from CA-Vtape. Volumes are deleted in 100 volume increments. |

| Command | Description |
|---|---|
| DUMP | Takes a dump of the SVTS & SVTSIO address spaces and the VCAT data space. |
| HELP | Provides on-console syntax for all valid commands. |
| INTERRUPT= | Use to interrupt a Virtual Device. |
| MIHCLEAR | Conditionally turns off the device busy bit. |
| MOUNT | Re-mounts the previously mounted virtual volume and the recall will be re-initiated. |
| RTM_VTU | Enables the customer to terminate the SVTSVTU task. |
| SET BACKSTORE= | This command controls BACKSTORE processing functions. |
| SET CPU= | Allows Vtape to be run in either Standard or Isolation mode. |
| SET HSOPEN= | Allows you to activate or deactivate the high speed open option used by Vtape for externalizing or recalling virtual volumes to or from physical BACKSTORE files. |
| SET IDRC= | Activates and deactivates IDRC compression support for physical drives. |
| SET MAXDRIVES= | Allows dynamic changes to the number of physical units assigned to CA-Vtape. |
| SET RECALL= | Overrides the default order during recalls so the Duplex volume will be selected first even if a Primary catalog entry exists. |
| SET THRESHOLD= | Used to alter the cache monitoring threshold percentage. |
| SET WRITPROT= | Allows for virtual volumes to be “read only” to a system that did not create the virtual volume. |

# SVTS ACTION Commands

## ADD

The ADD command adds virtual volume segments into CA-Vtape. These are the actual tape volumes reserved within the Tape Management System for CA-Vtape to use.

**Note:** The Tape Management System must have virtual volumes defined before the volumes can be mounted for use.

**Syntax**

The ADD command is issued from the Operator's console. For example, if you defined the segment 899000 within your Tape Management System, to activate the first 100 virtual volumes within this string, issue the following command:

```
SVTS ADD VVP=nnnn00
```

where *nnnn* is 8990

After the command completes, a volume range 899000 through 899099 is ready to use.

Using the same defined segment of 899000, if you want to add more than 100 virtual volume segments, you can optionally issue the following variation of the ADD command:

```
SVTS ADD VVP=899000,nnnn
```

where *nnnn* is a number in 100 units such as 100 or 200, to a maximum of 1000.

### Virtual Volume Shortage

If you do not define enough virtual volumes, a SVTSV0424W message appears.

A sample of this message and instructions on how to resolve this situation are shown in the appendix “Installing CA-Vtape”, see Step 14 Add Scratch Tapes.

## DELETE

The DELETE command deletes virtual volume segments from CA-Vtape.

These segments are only deleted if the entire range (100 volumes) are in scratch status. Use it to delete unwanted ranges.

**Syntax**

The DELETE command is issued from the Operator's console. For example, if you defined the segment 890000 to 899299 within your Tape Management System, to remove the range from 899200 through 899299, issue the following command:

```
SVTS DELETE VVP=nnnn00
```

where *nnnn* is 8992

**Note:** Repeat this command for each additional 100 range segments you plan to delete.

After the command completes, CA-Vtape no longer recognizes the virtual volume range from 899200 through 899299.

## DUMP

The DUMP command takes a dump of the SVTS & SVTSIO address spaces and the VCAT data space. This is useful in problem determination to gather consistent documentation.

**Syntax**

```
SVTS DUMP=nnnn
```

where *nnnn* is the address of the virtual device.

## INTERRUPT

The INTERRUPT command interrupts a virtual device. Be very careful and only use this command when a device is not responding.

**Syntax**

```
SVTS INTERRUPT=nnnn
```

where *nnnn* is the address of the virtual device.

## MIHCLEAR

The MIHCLEAR command will conditionally turn off the device busy bit. CA-Vtape will allow IBM's MIH to take recovery action for a device if the busy bit is off. If CA-Vtape is no longer active in the system as a result of a forced termination or FORCE SVTS,ARM command, MIH will automatically take control and clear all the virtual drives with pending status. MIH will usually clear the devices in more than one cycle and might require several minutes to bring all the virtual drives offline.

This command should only be executed to clear pending conditions and be used instead of the INTERRUPT command. As a result of this command the user task that was using the affected virtual drive will get I/O errors and be abnormally terminated. If executed with the DUMP option a system DUMP of all related areas will be generated.

**Syntax**

```
SVTS MIHCLEAR
SVTS MIH=nnnn
```

where *nnnn* is the address of the virtual device.

Or you can use SVTS MIHCLEAR, DUMP or SVTSMIH=nnnn, DUMP. The DUMP operand is optional, using the DUMP operand will provide the same information that using the DUMP command gives.

## MOUNT

The MOUNT command will re-mount the previously mounted virtual volume and the recall will be re-initiated.

There are a few instances when a mount pending condition arises and the SVTSVTU task does not initiate the mount, that is, CA-Vtape is forced down while a recall from a physical tape is taking place. When CA-Vtape is restarted the virtual device associated with the recall will be kept active with a mount pending condition. The MOUNT command will re-mount the previously mounted virtual volume and the recall will be re-initiated. This command was previously available via submitting a batch job with the SVTSUTIL interface.

**Syntax**

```
SVTS MOUNT=nnnn
```

where *nnnn* is the address of the virtual device.

### RTM_VTU

The RTM_VTU command enables the customer to terminate the SVTSVTU task.

When a virtual device becomes hung, this command enables the customer to terminate the SVTSVTU task. A new mount/dismount or internal routines will start a new task when needed. This command was previously available via submitting a batch job with the SVTSUTIL interface.

**Syntax**

```
SVTS RTM_VTU=nnnn
```

where *nnnn* is the address of the virtual device.

## SVTS DISPLAY Commands

### CHECK BACKSTORE

The CHECK BACKSTORE command checks the virtual volume pools for any volumes that need externalization which are not queued. The SVTS subsystem periodically executes this command internally, but you can issue it manually.

**Syntax**

```
SVTS CHECK BACKSTORE
SVTS CHECK BACK
```

## DISPLAY | D A

This command displays virtual device activity.

**Syntax**

```
SVTS D A
```

**Example;**

**FIGURE 4-1 Sample output from the SVTS D A Command**

```
SVTSX0200I  Cache  Size (MB) 00012600/00008960/00007440           012% 495
            Volser   Cua ----Status---- Ds       Type Jobname    #I/O  Last
            n/a      0F20                        3480            00004
            n/a      0F21                        3480            00007
            n/a      0F22                        3480            00004
            n/a      0F23                        3480            00007
            n/a      0F24                        3480            00007
            n/a      0F25                        3480            00007
            n/a      0F26                        3480            00007
SVTSX0100I Command Completed Successfully
```

## DISPLAY | D G

There are two ways to execute this command:

1. Without options. This is the default which displays groups that contain data to be externalized. Sample output is shown in Figure 4-2.
2. Using the ALL option. This shows all groups within CA-Vtape, regardless of whether work is pending or not. Sample output is shown in Figure 4-3.

**Syntax**

```
SVTS D G
SVTS D G,ALL
```

**Example;**

**FIGURE 4-2 Sample Output from the SVTS D G Command**

```
SVTSX0200I  Cache  Size (MB) 00012600/00008960/00007440           012% 495
            Volser   Cua ----Status---- Ds       Type Jobname    #I/O  Last
            n/a      0F20                        3480            00004
            n/a      0F21                        3480            00007
            n/a      0F22                        3480            00004
            n/a      0F23                        3480            00007
            n/a      0F24                        3480            00007
            n/a      0F25                        3480            00007
            n/a      0F26                        3480            00007
SVTSX0100I Command Completed Successfully
```

Figure 4-2 and Figure 4-3 show the following information:

(A) the group/subgroup is in Active status

(H) the group/subgroup is in Hold status

(R) the group/subgroup is in Release status

Percent The DASD buffer pool percentage for each group being used by the OS/390 image where the command is executed.

**FIGURE 4-3 Sample Output from the SVTS D G,ALL Command**

```
SVTS D G,ALL
SVTSX0300I   Cache Size (MB) 00012600/00007400/00005280      016% 563
       Max Drives=00000003      Threshold=050%
       Group     Short           Medium        Long            Percent
       01        00000000(A)     00000000(A)   00000000(A)     000%
       02        00000000(H)     00000000(H)   00000000(H)     000%
       03        00000000(H)     00000000(H)   00000000(H)     000%
       04        00000000(H)     00000000(H)   00000000(H)     000%
       11        00000000(A)     00000000(A)   00000000(A)     000%
       12        00000000(H)     00000000(H)   00000000(H)     000%
       13        00000000(H)     00000000(H)   00000000(H)     000%
       14        00000000(H)     00000000(H)   00000000(H)     000%
       21        00000040(H)     00000000(H)   00000000(H)     000%
       22        00000000(H)     00000000(H)   00000000(H)     000%
       23        00000000(H)     00000000(H)   00000000(H)     000%
       24        00000000(H)     00000000(H)   00000000(H)     000%
       31        00000000(R)     00000000(H)   00000000(H)     000%
       32        00000000(H)     00000000(H)   00000000(H)     000%
       33        00000000(H)     00000000(H)   00000000(H)     000%
       34        00000000(H)     00000000(H)   00000000(H)     000%
       41        00000080(H)     00000000(H)   00000000(H)     000%
       42        00000000(H)     00000000(H)   00000000(H)     000%
       43        00000000(H)     00000000(H)   00000000(H)     000%
       44        00000000(H)     00000000(H)   00000000(H)     000%
       51        00000000(R)     00000000(R)   00000000(R)     000%
       52        00000000(R)     00000000(R)   00000000(R)     000%
       53        00000000(R)     00000000(R)   00000000(R)     000%
       54        00000000(R)     00000000(R)   00000000(R)     000%
SVTSX0100I Command Completed Successfully
```

### DISPLAY | D STATUS

This command displays status information about CA-Vtape control flags and user options.

**Syntax**

```
SVTS DISPLAY STATUS
SVTS D S
```

**Example;**

Sample output from the SVTS D S Command;

```
SVTSX0224I Subsystem Status Display

          Field                  Current State
          ---------------------  --------------------------
          Version                V2R00
          Subsystem              Active
          System id              XE61
          TM Catlg EXPDT         99000
          Trace flag             Off
          IDRC                   On
          Highspeed open         On
          CPU isolation          Off
          DSN prefix             QAPROD.VVE
          Max drives             00000006
          Phy Retention          00003000
          Threshold              00000080
          Backstore Rtry         00000006
          Recall Order           Primary
          ParmDirectory          VTPARMS
          StartuUpOptions        VTPARMS
          DynamicOptions         VTPARMS
          GroupDefinitions       VTGRUOP
          VirttualDeviceList     VTDRIVE
          DataSetFilters         FILTERS
SVTSX0100I Command Completed Successfully
```

## SVTS SET Commands

### SET CPU=

SVTS can be run in one of two modes: ***STANDARD*** or ***ISOLATION***. This is controlled by an operator command to the SVTS system.

```
SVTS SET CPU=STANDARD
SVTS SET CPU=ISOLATION
```

See STANDARD MODE and ISOLATION MODE in the section “CPU Performance Versus Memory Utilization” in the chapter “Implementing Multi-system Configurations” in this guide, for more information.

## SET BACKSTORE=

This command controls Backstore processing.

Several options are supported for this command:

- DEQUEUE,VOLUME=volser

  Looks for any GRR(s) matching the volser and dequeue those GRR(s).

- EXCLVOL,GROUP=[,SUBGROUP=,TYPE=*]:

  This option releases the physical tape last used for externalization, directing the next externalization to use a new scratch tape. You may explicitly specify a volume serial number, or direct CA-Vtape to release any volumes within some combination of GROUP, SUBGROUP, and TYPE.

  GROUP=nn where nn identifies the Group ID for the physical tapes that should be removed from the backstore processing. Say GROUP=* to specify all groups.

  SUBGROUP=x (optional, default value:*(asterisk) ) is an optional parameter to further identify the subgroup. Enter an asterisk for all subgroups, S for short, M for medium, and L for long.

  TYPE=x (optional, default value: D ) is an optional parameter to further identify the type of group. Enter an asterisk for all types, P for primary, D for duplex, B for both primary and duplex, and E for export.

  **Example;**

  ```
  SVTS SET BACKSTORE,EXCLVOL,GROUP=24
  SVTS SET BACKSTORE,EXCLVOL,GROUP=22,TYPE=*
  ```

- EXCLVOL,VOLSER=

  This option allows you to remove a physical volume from CA-Vtape backstore processing function. You select a specific volser or a collection of volumes within a group/subgroup combination.

  **Example;**

  ```
  SVTS SET BACKSTORE,EXCLVOL,VOLSER=201372
  ```

- HOLD|RELEASE,GROUP=nn,SUBGROUP=x

  This option places all backstore processing functions on hold or releases the hold function. While the backstore function is on hold, processing can still occur to data sets in disk cache until the cache becomes full.

GROUP=nn: holds/releases processing on a Group ID. You can see a list of Group IDs under Option 1 of the ISPF interface. For example, see Figure 3-2, CA-Vtape Group Display Panel in chapter 3. Say GROUP=* to specify all groups.

SUBGROUP=S|M|L: holds or releases processing on a subgroup of a group.

- RETRY,COUNT=n

  Sets the retry counter n from 1 to 9.

**Syntax**

```
SVTS SET BACKSTORE=DEQUEUE,VOLUME=volser
SVTS SET BACKSTORE,EXCLVOL,GROUP=[SUBGROUP=,TYPE=*]
SVTS SET BACKSTORE,EXCLVOL,VOLSER=
SVTS SET BACKSTORE=HOLD,GROUP=nn,SUBGROUP=x
SVTS SET BACKSTORE=RELEASE,GROUP=nn,SUBGROUP=x
SVTS SET BACKSTORE=RETRY,COUNT=n
```

"SET BACKSTORE=" may also be coded "SET BACKSTORE," for any option.

SET BACKSTORE= supports the following abbreviations:

| | |
|---|---|
| BACKSTORE | BACK |
| DEQUEUE | DEQ |
| GROUP | G |
| SUBGROUP | SG |
| VOLSER | VOL |
| VOLUME | VOL |
| TYPE | T |
| HOLD | H |
| RELEASE | R |

VOLUME and VOLSER may be used interchangeably, as well as being abbreviated VOL.

**Examples:**

| | |
|---|---|
| SVTS SET BACK=H,G=* | Hold all groups and subgroups. |
| SVTS SET BACK=EXCLVOL,G=11,T=* | Exclude all volumes previously used to externalize group 11. |

| | |
|---|---|
| SVTS SET BACK=EXCLVOL,G=*,T=* | Exclude all volumes for all groups and subgroups. The next externalization will call for a scratch tape. |

## SET HSOPEN=

This command activates or deactivates the high-speed open option used by CA-Vtape for externalizing or recalling virtual volumes to or from physical backstore files.

Virtual volumes are saved as files and stacked onto physical cartridges. Modern 10gb and 20gb cartridge devices can hold large numbers of these physical files. Open processing performed by the operating system normally positions to a relative file by issuing the forward space file channel command. This can result in significant delays as the relative position of a file increases (files near the front of the tape can be accessed quickly while files near the end of the tape take much longer). Applications can provide the block ID for open and this can significantly reduce the time to position to a specific file.

In order to use the high-speed open option CA-Vtape records block IDs in the owner field of the catalog entry for the backstore files it creates on physical cartridges.

**Note:** Only the backstore files used by CA-Vtape (that is, HLQ.VVE.Vnnnnnn.PRIMARY/DUPLEX) are affected by the high-speed open option. Catalog entries for the user data sets written onto virtual volumes are not affected in any way by this option.

When the high-speed open option is activated, CA-Vtape uses the owner field to record the block id.

When the high-speed open option is deactivated, CA-Vtape does not record and/or use any information in the owner field.

While most shops do not use the owner field of the catalog, some shops may have other requirements which may prevent them from allowing CA-Vtape to this field in this manner. By activating or deactivating the high-speed open option you can control CA-Vtape's use of this field.

Once activated or deactivated the high-speed open option remains in effect across IPLs until specifically deactivated or activated. In multi-system CA-Vtape configurations, the high-speed open option must be activated or deactivated on each individual system.

**Syntax**

The syntax of the SET HSOPEN command to **activate** the high-speed open option is:

```
SVTS SET HSOPEN=ON
```

The syntax of the SET HSOPEN command to **deactivate** the high-speed open option is:

```
SVTS SET HSOPEN=OFF
```

## SET IDRC=

This command activates and deactivates the IDRC support. DEFAULT is the system default as specified in SYS1.PARMLIB(DEVSUPxx).

**Syntax**

```
SVTS SET IDRC=ON
SVTS SET IDRC=OFF
SVTS SET IDRC=DEFAULT
```

## SET MAXDRIVES=

MAXDRIVES is the number of physical units the backstore externalization process can use. It is originally set during the installation process, described in Figure B-10, SVTS Install Panel 2, at Step 8 in the Section "To Begin the Install Process" in the appendix "Installing CA-Vtape."

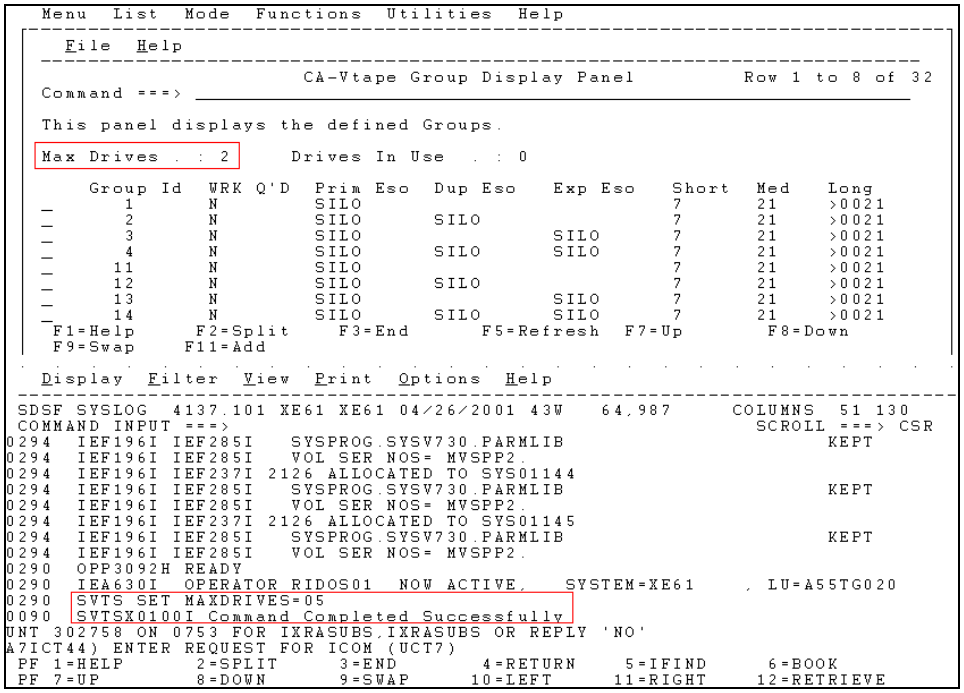
Using this command, you can dynamically change the number of physical units CA-Vtape can use, relieving throughput stress during peak externalization periods.

**Syntax**

```
SVTS SET MAXDRIVES=nn
```

where *nn* is the new value.

**FIGURE 4-4 Sample Output from the SVTS SET MAXDRIVES= Command**




The top portion of this screen is taken from option 1 of the CA-Vtape Main Menu. Max Drives is set to 2.

The bottom portion of this screen is an example of the MAXDRIVES= command. This command dynamically changed the maximum drive count from 2 to 5. You can verify this by pressing the Enter key on the top portion of the screen. The 2 changes to 5.

## SET RECALL=

This command was created for Disaster Recovery flexibility. The default order for Recall from Backstore is from the Primary backstore data set. In a DR site it is likely the Duplex should be used, if it exists. This command allows the order to be switched at the local system (LPAR) level. The current value is displayed as the Recall order field via the SVTS STATUS command. The value is maintained across SVTS restarts.

**Syntax**

```
SVTS SET RECALL=PRIMARY|DUPLEX or
SVTS SET RECALL=P|D
```

## SET THRESHOLD=

The threshold command is used to monitor cache status. It is a three digit number that represents the percentage that, when met, writes the following message to SYSLOG:

```
SVTSI4308I SVTS Cache Shortage - nnn% Utilization Reached
```

A normal setting is 070-085. The default setting of 000 instructs CA-Vtape to keep the backstore active for all groups/subgroups. The virtual volumes are then externalized as soon they are closed. If the threshold is set to a value > 000, CA-Vtape initializes the backstore in held status for all groups/subgroups. This allows you to schedule the SVTS command, using any automation tool, to release one or more groups/subgroups and/or to react if the threshold is reached.

**Syntax**

```
SVTS SET THRESHOLD=nnn
```

where *nnn* is the threshold.

The value specified for THRESHOLD must be three characters. Otherwise, the SET command is rejected.

## SET TMCAT=

Tape management systems accept a special EXPDT to specify retention while the data set is catalogued. CA-Vtape uses a default of EXPDT=99000. If your tape management system uses a different value, you can specify the proper value using the following SET command:

```
SVTS SET TMCAT=yyddd
```

Currently, the acceptable values are 99000 and 00000. CA-Vtape remembers your selection in the local VCAT.

### SET WRITPROT=

Separate Vtape complexes can be allowed to read each others physical tapes simply by sharing the Vtape ICF Catalog that contains the Vtape catalog entries.

However, the system that will read the tapes should not be allowed to update the physical volume as this will cause the system that created the tape to be unaware of any changes and thus data loss ***will*** occur. To overcome this condition, the virtual volumes on the reading system need to be write protected. This is accomplished by using the SET WRITPROT operator command.

**Syntax**

```
SVTS SET WRITPROT ON,VVE=nnnnnn
SVTS SET WRITPROT OFF,VVE=nnnnnn
SVTS SET WRITPROT ON,VVP=nnnn00
SVTS SET WRITPROT OFF,VVP=nnnn00
```

Specification of this command will cause a virtual volume to be either *Write Protected* or *U*N-*Write Protecte*d. When a virtual volume is *Write Protecte*d, it cannot be used or re-used until *the Write Protection* is turned off. Use the VVE specification of the command to Write Protect/*UN-Write Protect* an individual virtual volume. Use the VVP specification of the command to Write Protect/*UN-Write Protect* a range of virtual volumes. See the chapter "Implementing Multi-system Configurations" for additional information.

## SVTSUTIL Batch Commands

Table 4-2 provides a brief description of SVTSUTIL Batch Commands, some of the commands have a more detailed explanation following the table.

TABLE 4-2 Brief Description of SVTSUTIL Batch Commands

| Command | Description |
|---|---|
| ANALYZE=COMPRESSION | Produces a report showing the number of megabytes per CPU second that the can compress data. Since the compression code relies on hardware instructions this may vary on different processors. |
| BACKUP=VCAT | Saves local information (filter lists, etc.) to a flat file. This file can be used as input to the RESTORE=VCAT. |
| EXPAND CDS,VOLUMES= | Used to increase the size of the BSDS and Global VCAT to accommodate added virtual volumes. |

| Command | Description |
|---|---|
| EXTRACT | Reads the original data set from the externalized version of the virtual volume and writes the data set to a physical tape when CA-Vtape is unavailable. For this to work the tape management system must support bypass label processing (BLP). Can also be used when CA-Vtape is up, but is discouraged. |
| INITIALIZE=BSDS1 | Initializes the BSDS to binary zeros. Should only be run at global system initialization. |
| INITIALIZE=GLOBAL | Initializes the global VCAT to binary zeros and creates the LDS, scratch and Virtual volume cell pools. Should only be run at global system initialization. |
| INITIALIZE=VCAT | Initializes the Local VCAT to contain system specific values and to format various cell pools. This procedure is run once for each system using the CA-Vtape software during the installation process. |
| INTERRUPT= | Resets virtual drives that have encountered IOS errors. The software will automatically issue this command if appropriate, but the command can also be issued using the console or a batch job. |
| LDS_ADD= | Initially adds LDSs to the Global VCAT or to re-establish them when recovering the Global VCAT, if lost due to device failure. |
| LDS_FREE,VVE= | Releases the cache LDSs associated with a virtual volume. The "CANNOT_BE_FREED" flag is checked before Release. The primary use of this command is to test Recall from Backstore without waiting for the cache to be overwritten by another virtual. |
| LDS_INITIALIZE= | Initializes the LDS data set after the VSAM Define. |
| LIST=BACKSTORE | Generates a report showing which physical volumes are used by each of the virtual volumes. |
| LIST=CACHE | Generates a report showing which virtual volumes are used by each of the LDSs. |
| LIST=MODULE | Diagnostic command used to display the maintenance levels of all modules in CA-Vtape. |

| Command | Description |
|---|---|
| LIST=EMPTY | Used to report empty virtual volumes after CA-Vtape is cancelled. |
| RECLAIM | Used to assist in recovering from LDS cache failure. |
| RECOVER=GLOBAL | Recovers a damaged GLOBAL from the BSDS data set. You can also add the optional parameter BYPASS=CACHE_ERRORS to this command, see below for details. |
| RECOVER=VCAT | Recovers a damaged LOCAL VCAT from a backup copy made with the BACKUP=VCAT command. |
| RESTORE=VCAT | Used in conjunction with BACKUP=VCAT to initialize a VCAT and restore any local information (filter lists). |
| VVE_FREE= | Releases the system id ownership of a virtual volume. Used only when needed. |
| VVE_SCRATCH= | Returns volumes to scratch status in the Global VCAT. |
| VVE_WRITE= | Forces a virtual volume to be externalized. Used only when needed. |

## EXPAND CDS,VOLUMES=

The batch command EXPAND CDS,VOLUMES= is used to increase the size of the BSDS and Global VCAT to accommodate added virtual volumes.

**Syntax**

```
EXPAND CDS,VOLUMES=nnnnnn
```

where *nnnnnn* is the total number of virtual volumes.

nnnnnn is a number between 000001 and 500000 that equals the total number of virtual volumes that will exist after the expansion is complete (existing virtual volumes plus the additional virtual volumes needed).

If the number of volumes specified is smaller than what is already defined to the existing Control Data Sets (CDS), the command completes and no action is taken against those CDSs. If the number of volumes specified is greater than the number of existing volumes, the number of existing volumes is subtracted from the number specified on the command, rounded up to the nearest 100, and the CDSs are expanded accordingly.

Example (assuming an existing CDS with 1000 volumes):

- Using the command:

  ```
  EXPAND CDS,VOLUMES=000100
  ```

  will result in no action taken because 100 is less than the existing 1000.

- Using the command:

  ```
  EXPAND CDS,VOLUMES=009999
  ```

  will expand for an additional 9000 volumes (009999 –1000 = 8999, rounded to 9000).

## RECOVER=GLOBAL

The batch command RECOVER=GLOBAL recovers a damaged GLOBAL from the BSDS data set. Data in cache at the time of the failure is lost, but if the volume was externalized, it will be recalled at the next reference. Any virtual volumes that cannot be recovered due to environmental issues (loss of cache volume) will require manual response to messages SVTSU0604W, SVTSU0636W, or SVTSU0640W. This command is intended for 'normal' recovery situations, such as a GLOBAL volume failure, or the temporary loss of a cache volume.

**Syntax**

```
RECOVER=GLOBAL
```

### RECOVER=GLOBAL,BYPASS=CACHE_ERRORS

You can also add the parameters BYPASS=CACHE_ERRORS to this command. The optional parameter BYPASS=CACHE_ERRORS will automate virtual volume recovery, and is intended for use in those scenarios where it is known that environmental differences exist. These differences could be caused by the loss of cache volumes, or encountered during disaster recovery testing. Any virtual volume that has not been externalized and cannot be recovered will be scratched.

**Syntax**

```
RECOVER=GLOBAL,BYPASS=CACHE_ERRORS
```

# CA-DYNAM/TLMS Catalog Update Utility

When extracting a tape data set from backstore format to native tape, CA-Dynam/TLMS creates a catalog entry which has a system-generated temporary data set name associated with the newly created tape volser. i.e., the CA-Dynam/TLMS catalog entry does not reflect real data sets on the newly extracted volume.

The utility, which creates CA-DYNAM/TLMS update cards, works with single or multiple virtual volumes with only one data set.

An error message is issued to indicate bypassing CA-Dynam/TLMS update if there is more than one data set on the volume(s).

To use the utility, you provide:

- The parameter VTDSN= with virtual tape data set name
- //STEP00.SYSIN with CA-Vtape EXTRACT command
- //STEP01.SYSIN with CA-Dynam/TLMS DVA command
- Correct library names defined in the PROC

The utility has four steps:

1. Run CA-Vtape EXTRACT and write the report (//SYSPRINT) to a temporary data set.
2. Run the Dynam/TLMS DVA report against the virtual volume (last 6 characters of the 3rd node of the virtual tape data set name) and write the report (//SYSPRINT) to a temporary data set.
3. Run the REXX program to read reports from the previous two steps and generate CA-Dynam/TLMS catalog update commands then write them to a temporary data set (//UPDCMD).
4. Run the CA-Dynam/TLMS update using commands generated from the previous step.

The utility also creates its own report in //SYSTSPRT that includes:

- EXTRACT return code and volser of newly created volume.
- Dynam/TLMS DVA report.
- Dynam/TLMS update commands.
- Optionally, any error conditions.

You can verify Dynam/TLMS update results by checking the //SYSPRINT from STEP03. CA-Dynam/TLMS prints each update command and its associated results.

# Missing Interrupt Handler (MIH) support

This feature allows CA-Vtape to interact with IBM's Missing Interrupt Handler. Instead of turning MIH off via the SETIOS MIH,nnnn,TIME=00:00 command, MIH will be activated via the SETIOS command with a time value of 00:15 (15 seconds). SVTSMIH is called by MIH whenever a MIH event is detected. The events are:

- Primary status interrupt pending
- Secondary status interrupt pending
- Start pending condition
- Idle with work queued
- Mount pending

CA-Vtape will internally modify all events to look like START PENDING conditions and for that reason any corrective action taken by MIH will be for this kind of event.

The following CA-Vtape Operator Commands are added as part of the MIH functionality:

- SVTS DUMP
- SVTS MIHCLEAR|MIH=nnnn|,DUMP
- SVTS MOUNT=nnnn
- SVTS RTM_VTU=nnnn

See Table 4-1 “SVTS Operator Commands” and the section SVTS ACTION Commands for more information about these commands.

Chapter 5

# Implementing Multi-system Configurations

There are several different ways of implementing CA-Vtape. This chapter describes the factors to help you decide which way is best for your environment.

## Multi-system Configurations

In a multi-system environment, physical tape data sets may not be concurrently accessed by more than one system at a time. A tape created on one system may be read or modified on a different system after the first system has released it.

With a shared DASD cache and shared control data set, CA-Vtape fully emulates this process but with virtual drives and virtual volumes.

When a virtual volume is requested for use by a system, the CA-Vtape software on that system writes a unique system name in the control data sets' entries for that virtual volume.

**Note:** The unique system name defaults to the system symbolic "&SYSNAME variable."

The unique system name value can be displayed using the "D SYMBOLS" OS/390 command. This value can be overridden at CA-Vtape start-up by issuing the following command:

```
S SVTS,SYSID=xxxx
```

where xxxx is unique for each OS/390 image in a CA-Vtape complex.

The assignment of a system to virtual volume relationship allows the virtual volume to be "owned" by that specific system. An owned virtual volume can only be used by the owning system. When that system completes its use of the virtual volume, the system ownership field in the CA-Vtape control data set is cleared, and the virtual volume is available to be owned and used by another system. If a second system attempts to access a virtual volume owned by another system, a WTOR is issued, indicating the virtual volume is "reserved" elsewhere. The system ownership field is present in both the Boot Strap Data Set (BSDS) and Global VCAT and access to these data sets is protected via a MVS RESERVE request for the UCB associated for the BSDS and Global VCAT data sets. These data sets must be placed on separate DASD volumes. Care should be taken to ensure that no other critical system data sets reside on the volumes that the BSDS and Global VCAT data sets are placed on due to the nature of the hardware reserve.

An example of the message is:

```
SVTSV0740W 0F03,899085,Volume reserved, Reply R(etry) or C(ancel)
```

CA-Vtape distributes scratch volumes from a common pool as necessary and ensures only a single system has any particular scratch volume as it is being readied for mounting.

## Requirements

For a multi-system environment:

- The Global VCAT and Bootstrap Data sets (CDSs) must be on separate volumes shared by all systems.
- The cache must be on shared DASD to allow virtual volumes to be read from other systems.
- The physical tape drives that are the backstore should be shared if recalls can be requested from other that the originating system.
- The ICF catalog containing the entries for CA-Vtape must be shared across all systems.
- Sysplex is supported but not required.
- The shared DASD must be configured to provide adequate performance from each system.
- Some form of serialization or reserve/release processing must be in place to manage the shared data sets.
- One Tape Management System catalog must be shared and accessible to all systems.

At installation time, the global multi-system components are installed first on all systems. A second set of installation procedures are followed to customize those items specific for each individual system. See the appendix "Installing CA-Vtape" for more information.

**Note:** More than one CA-Vtape complex can be installed in the same site if, for example, different Tape Management System catalogs are used for different sets of OS/390 images. However, in this configuration, virtual volumes created in one CA-Vtape complex are not accessible to other complexes.

## Operating Considerations

With CA-Vtape operating in a multi-system environment, virtual volumes can be read or modified on another system after the first system has completed using it. Each system can access the virtual volume as often as required, but only one at a time and as protected by the tape management system.

Virtual devices in the same CA-Vtape complex with the same device addresses are independent from those on another system. A virtual device address "F05" on CPU-A is completely unrelated and independent of virtual device address "F05" on another system in the complex.

The CA-Vtape panels that monitor CA-Vtape functions displays cache and virtual volume information from the multi-system perspective. Pressing Enter refreshes the screen for local system information only. Pressing PF5 refreshes all systems in the complex.

The panels that display virtual tape drive, physical tape drive, and group information only show the components and activity associated with that specific system.

You must check recovery procedures to ensure the state of the CA-Vtape complex is correct for a particular procedure.

## Special Considerations

The following items are unique to each system's CA-Vtape software in a multi-system environment:

- The data set name filter lists.
- The dataclass filter lists.
- Virtual drive definitions.
- Even though the group definitions and physical tape esoterics used for output can differ from system to system, we recommend keeping the same definitions across OS/390 images in the complex. This makes it easier to automate the stacking process, as well as administering and using CA-Vtape.
- Group displays.
- Virtual drive displays.
- Physical drive displays.
- The local VCAT.
- A local Authorized library.
- Externalization requests.

## Shared Items

The following items are common to all of the CA-Vtape images:

- The Global VCAT.
- The BSDS.
- The VSAM linear data sets that form the cache.
- The CA-Vtape libraries.
- A globally shared Authorized library.
- All virtual volumes must be shared by all systems in the CA-Vtape complex from the TMC perspective.
- The CA-Vtape ICF Catalog.
- The Tape Management System Catalog.

# Planning Output Groups

When you add a new entry to the filter list, an entry must be made to select the appropriate output group. The output group provides a means of grouping like data sets together. For example, all of the data sets to be removed for vaulting should be in a unique group to prevent intermixing with data sets that are not removed for vaulting.

Grouping can also be used to force separation of data sets. For example, an application can create two separate copies of journals or logs with the second copy being used as an alternative in case the first is unreadable or lost. Selecting a separate group ensures the data sets are copied to separate physical tapes to ensure continued redundancy.

Since subgroups automatically group by expiration date to minimize fragmentation, it is not necessary nor recommended that users attempt to group data sets by expiration.

**Note:** Using groups to stack GDG processing together can reduce fragmentation in the backstore.

The output group numbers also select the use of duplex and / or export copies of data in addition to the actual primary copy. The second character of the output group number controls this relationship.

- x1 selects primary only.
- x2 selects primary with a duplex copy.
- x3 selects primary with an export copy.
- x4 selects primary with a duplex copy and an export copy.

Selecting duplex copies or export copies requires additional tape drive and processor resources; therefore, be careful if you use these options.

The following table represents the supported Group Definitions:

TABLE 5-1 Group Definitions

| Group Number | Primary | Duplex Copy | Export Copy |
|---|---|---|---|
| Group x1 [a] | n | | |
| Group x2 | n | n | |
| Group x3 | n | | n |
| Group x4 | n | n | n |

a. x = a predefined Group ID of 0 through 7. Up to eight groups of each type can be defined to provide guaranteed separation and selection of alternate physical output devices.

## An Example of Group Usage

- You probably have two configurations, one for local tapes and one for those going offsite.
- That means two groups, each with a different output device and/or volumes.
- Do you need forced separation in each of these locations? Probably two groups in each location to give the option of forced separation. That implies two groups in each of two locations for a total of four groups.
- For planning purposes in this example, use the following groups:
  - Group 11 -- the default for local processing
  - Group 21 -- the default for tapes going offsite
  - Group 31 -- the forced separation from Group 11
  - Group 41 -- the forced separation from Group 21

If duplexing for an important subset of the local default workload is required, then add Group 12 to use as the local default but with a duplex.

Offsite work may need an export copy at the recovery site in case CA-Vtape is not available. Group 23 can be used in addition to, or in place of, Group 21 to signal the creation of export copies for the appropriate data sets.

**Examples;**

- Group 01 is a group with no export or duplex copies.
- Group 71 also has no export or duplex copies but can be allocated to a different physical device like a remote vault.
- Group 74 can also be defined with unique output devices and has both export copies and duplex copies created for its data sets.

The stacking groups can be used to stack by:

- Additional Copy Requirements. A primary copy is always made. You can also create a:
  - Duplex copy for redundancy.
  - Export copy for off site use.
  - Combination of all three copies.
- Expiration date — the Stacking Groups have subgroups that automatically separate the data sets based on expiration date. This helps to minimize fragmentation of free space on cartridges over time.
- Desired esoteric or storage location—for example, local versus disaster vault.

A user assigned separator group—for example, a user wants to ensure the second copy of his or her database logs are on different tape volumes.

## Changing the Scope of CA-Vtape Processing

You can change the scope of CA-Vtape processing to meet the unique needs of your site.

Changing the scope can also be thought of as responding to a change in the CA-Vtape workload. Under normal data processing conditions, CA-Vtape does not require any user management. If the CA-Vtape administrator wants to change the scope of the workload the CA-Vtape is handling or if the workload itself has changed, then the user may need to modify some of the CA-Vtape user controls.

The administrator can modify any of the following:

- Which workloads allocations are processed using CA-Vtape. Controlling those allocations is covered in the following paragraphs.
- How large the CA-Vtape cache buffer is, where the disk buffer resides, and the virtual device addressing is a function of Step 13 “Varying the Virtual Devices Online” in the section “To Begin the Install Process” in the appendix “Installing CA-Vtape.”

# Controlling the Work Processed

CA-Vtape is invoked for tape allocations only. Its use is determined by a control panel that provides filter lists to exclude or include each allocation based on combinations of data set names or by using a particular dataclass. It is recommended that a design strategy be documented for the use of CA-Vtape and its filter tables. The strategy should include the use of the output group selections and provide recommendations for use.

## Controlling By Data Set Filter List

The filter lists control the use of CA-Vtape. The routine selects the first match in the filter lists and performs the appropriate include or exclude function. An asterisk is a wild card character. It indicates that any allocation that matches the characters up to the asterisk is considered a match and characters at the position of the asterisk and beyond do not affect this selection.

For example “test.*” on the data set filter panel indicates the filter function applies to any data set that has a high level qualifier of test. A data set beginning with “tests” is not included. A data set beginning with “test.s....” is included.

The filter criteria can specifically cause filter includes or excludes as coded in the appropriate column.

To change the filtering for data set names, the administrator updates Option 4 on the CA-Vtape Main menu. An example of this is in Figure 3-7, DSN Filter List Display Panel.

The Filter List Control Panel is a display of the active data set filter criteria. The administrator determines the entry to be made and then selects PF11 to add a new entry through the Add Filter Panel. The data set filter, the include or exclude character and output group are selected on this panel.

Press Enter when the entry is complete and the Confirm Add Panel appears.

Press Enter to confirm the change.

**Note:** If more than one data set is written to a virtual volume, all subsequent data sets written to the virtual volume will assume the same output group as that of the first data set on the volume. This will occur for the second and subsequent data sets regardless of the output group implied by the data set filter list or dataclass filter list.

Chapter

6

# Performance and Customization

There are several methods you can use to improve performance of CA-Vtape. This chapter explains these methods and the situations where they are best used.

## Monitoring CA-Vtape

### Virtual Tape Devices

SMF data is created for the virtual drives just as it is created for physical devices. Online monitors also show the virtual devices. Since the virtual devices have no physical components, the response times are accumulated in "pend time" category.

Any tools used to measure tape response times or mount rates measure the virtual devices and virtual volume mounts as well. For example, IBM's RMF monitors can be used to display the virtual device activity rates and response times.

### Physical Tape Devices

The physical devices are online to OS/390 and use the standard reporting vehicles. Using a separate range of volumes and devices for the CA-Vtape backstore aids in monitoring the CA-Vtape backstore; however, it is usually more cost effective to share the drives with non CA-Vtape applications.

### Disk Buffer Cache

The disk buffer cache can be monitored in the same manner as other DASD volumes.

In general, check all DASD volumes using personnel or automation to ensure response times remain adequate and that channel paths do not become overloaded.

Vtape Cache is usually a sequential write-intensive workload. Different vendor's RAID implementations can vary dramatically in how they perform sequential write workloads; therefore, consult your particular vendor to ensure their product can meet your desired throughput.

Be careful when monitoring channel paths to differentiate between total channel paths and concurrent transfer capability. A DASD device can have 32 channel paths connecting it yet may be able to perform only eight concurrent transfers. If each of the 32 paths averages 25% busy, then each of the eight concurrent transfer paths are actually at 100% and are considered over committed.

Tape processing under CA-Vtape is normally sequential in nature and is transfer path intensive. Spreading the disk cache buffer across several control units with many paths and concurrent transfers provides the best throughput performance.

## Specific Workload Considerations

### IBM DFSMSdss or Similar Products

DFDSS can use CA-Vtape including the stacking functions.

Use separate groups for each offsite location and a separate group for local processing. Using the compress option under DFDSS is supported. DFDSS dumps using compress normally consume less cache space than a non compress dump.

CA-Vtape does support >32K blocksizes such as the 64K blocksize sometimes used by DFDSS.

## DATABASE Logs and Journals

CA-Vtape works very well with database logs and journals.

Using different output groups keeps the second journal or log separate from the first. Performance of "roll forward" or "roll backward" recoveries under CA-Vtape is expected to be superior to the same recovery on physical tape.

Logs and journals often only use small portions of the available space on high capacity cartridges therefore the CA-Vtape stacking function can be used.

## Batch Master File Processing

CA-Vtape can process master files as input or output. If high performance DASD is used as the buffer pool, performance can be as high or better than native high performance tape drives.

Retrieving a master file from physical tape is expected to be similar to native tape in performance since CA-Vtape allows the application access during the retrieval process. Master files tend to be large in size and may not benefit as much from stacking versus small files.

## Other Common Batch Processing

CA-Vtape provides an excellent vehicle for processing batch files. They are quite variable in size and benefit greatly from CA-Vtape stacking. If the process is a nightly event, and if the cache was sized to hold up to 24 hours of tape processing, then the previous version is resident in cache until the next version is created.

# DASD Buffer Pool Health Checks

Check the DASD buffer pool during peak operating hours to determine its general health. If the pool has available space to be freed in it, its health is OK. The "available to be freed space quantity" is found on the virtual volume display panel and also on the device status display panel. As the virtual tape workload increases due to normal workload growth, the freeable space reduces during peak periods.

If the amount of freeable space approaches zero or message SVTSI4308I is received, then action should be taken. The actions include:

- Ensure sufficient physical drives and control units are available to move the data from the pool to physical tape. A smaller number of higher performance drives is recommended over many slower drives.
- Ensure there are sufficient channel paths from the processor to the pool to move that data from the pool to the physical tape drives while satisfying virtual tape activity. A rule of thumb is to have an additional DASD channel path (control unit function) per 100 GB of disk buffer pool.
- More paths results in better virtual drive performance.
- If necessary, add more DASD volumes to the pool.
- Issue the command "SVTS D,G" to display all the groups with data in the cache and check the externalization engine status for each subgroup:
  - active
  - (H) Halt

  Start all the externalization for the required group/subgroups to relieve the condition. Use the "SVTS SET MAXDRIVES" command to define more physical drives and speed up the process.

As the workload grows, virtual volumes and the data sets they store reside in cache for shorter periods of time. The reduction in residency time increases recalls from physical tape. If recall delays begin to affect performance, additional volumes can be added to the cache to restore residency times.

# Disk Buffer Sizing

## CA-Vtape Disk Buffer Sizing With DFSMS/VMA

The DFSMS Volume Mount Analyzer tool ships with DFSMS in "SYS1.SAMPLIB." The tool provides the capability for analysis of tape processing by analyzing SMF data. Use VMA or a similar tool to determine the concurrent drive requirements and the amount of data transferred over time.

When sizing the buffer pool, you first determine what files to service by CA-Vtape. This can range from just a few small data sets to all of the data sets at your site, including backups. CA-Vtape with a properly configured disk buffer can perform as an excellent backup vehicle, therefore we assume all but site interchange tape is processed by CA-Vtape.

Run VMA extracts for dates that are considered good examples of the tape processing requirements. Analysis of large time frames (30 days, for example) can be run to validate that the sample is accurate.

The VMA report runs should be coded to use data set exclusion filtering to exclude those data sets or drives not expected to be serviced by CA-Vtape. The "Usage" and "GB" reports are the primary focal points for the report. The "GB" report provides the total gigabytes processed on an hourly basis.

The recommendation for sizing cache is to use 24 hour residency on the disk buffer as a goal. This allows the old version to be resident until the next version is created for daily jobs.

The GB totals for a day can be used to roughly size the cache size with an accommodation to decrease that number by that amount of reads being performed. The read activity does not require additional cache space if it was written during the same analysis period.

If the tape activity is 25% reads, then reduce the GB cache size by 25%.

### Size Requirements

Size the physical drive requirement by the number of drives required to offload the data. High performance drives are recommended to reduce the number required. Additional drives are required to satisfy recall staging for access to data outside the 24 hour cache residency.

As a rule of thumb, use an additional drive for every output drive needed.

## General Sizing

With the following general assumptions about tape processing, some conservative estimates can be made to size a CA-Vtape solution. The assumptions are:

- Read/Write Ratio: 75% writes
- Peak period length hours: 12 hours
- Average Control Unit (CU) function utilization: 67%

Assuming tape processing happens almost exclusively during a 12 hour period and averages a high 67% utilization and 75% writes, an estimate can be made for how many gigabytes are required to replace a given tape control unit.

The number of drives is irrelevant since they are to be replaced by virtual devices.

The cache is sized by how much tape data could flow as a worst case.

Using these assumptions and the table below, the following estimates can be made:

- An approximate cache size estimate per control unit function being replaced.
- An approximate backstore drive count can be made per control unit function being replaced. Round up to the next drive. Use the minimum if the calculated drive count is smaller.

**Example:** Replacing 40 type 3480 drives and 5 type 3480 control unit functions with CA-Vtape, an estimated 65 gigabytes x 5 control unit functions is 325 GB. A 325 GB cache buffer should effectively contain 24 hours of tape information for this configuration.

The number of drives required for the backstore is.8 x 5 or 4 drives to support backstore processing. Use the larger of:

- twice the number of calculated drives
- minimum number of drives

TABLE 6-1 Device Control Unit Types

| Device Control Unit Type [a] | Gigabytes per CU function replaced | Backstore / Minimum |
|---|---|---|
| IBM 3480 OEMI [b] Channel | 65 | .8 / 3 minimum |
| IBM 3490 OEMI Channel | 65 | .8 / 3 minimum |
| IBM 3490E OEMI Channel | 65 | .8 / 3 minimum |
| IBM 3490E ESCON | 108 | 1.4 / 3 minimum |
| Stortek 4480 OEMI Channel | 65 | .8 / 3 minimum |
| Stortek 4490 OEMI Channel | 65 | .8 / 3 minimum |

a = Use the lower of number of control unit functions or number of channels attached.

b = Original Equipment Manufacturer Interface, also known as parallel channels or "Bus and Tag."

# Compression

Using compression options for workloads like DFDSS significantly impacts CA-Vtape resource usage. Compression causes a significant increase in the processor resources consumed by the job; however it results in compressed data in the data space real storage in use and on the disk buffer.

DFDSS reputedly has an average compression ratio of approximately 2:1. This implies a reduction in DFDSS disk buffer usage by 50% meaning for this workload a 100 gigabyte buffer is as effective as a 200 gigabyte buffer without compression.

If the processor is unconstrained while the DFDSS programs are running, it is recommended that DFDSS compress be used.

# Memory Usage and Paging

The data in the data spaces is accessible at any given moment to the application in microseconds, implying extremely high performance. The data in the data space does consume more processor storage and that should be planned for as a part of the installation.

The more active a device is, the more recently its storage frames will appear to have been referenced and the more storage will be consumed.

Although the data spaces do consume storage, tape usage is often heaviest at night when online platforms are under minimal load or down for backups. The storage frames may be available during this time frame without adding additional memory to the processor.

If the application is writing data faster than the "write to" disk buffer process can move the data to the disk, the write queue for the disk buffer will grow. When the queue reaches a pre-set depth, a busy condition is presented to the application by the virtual devices which ensures the application will not overrun the "write to disk" process and thereby cause excessive memory usage and potentially paging.

# Retrieval (Staging) Performance

The request to CA-Vtape for a data set that resides on a stacked tape volume results in the application allocating a virtual device and virtual volume.

CA-Vtape allocates the appropriate physical volume and a device capable of mounting that particular volume.

After the physical volume is mounted on the physical device, data transfer begins.

The staging process uses data spaces and large I/O chains to provide maximum staging throughput.

You are given access to data immediately after the first large data I/O completes so that you can begin processing data immediately. The complete data set is staged to the data space at high speed while the user processes. The physical drive and volume are released and the application continues to process.

As the data space data ages, it is written to the disk buffer pool synchronously with the user access. With small data sets, it is possible (but not probable) for the user's application to complete processing of the data before any of the data is written to the disk buffer.

As an example of this process, a 100 megabyte data set can be completely staged in as little as 40 seconds from the first byte of data if a Timberline or Magstar drive is used. Immediately thereafter, the physical volume and drive are released.

**Note:** In this example, input physical drive residency is reduced from 10 minutes to 40 seconds with one physical input drive now able to handle the workload of 10 drives.

The staging time depends on the type of DASD and tape drives doing the staging. If the total time to stage were as long as a minute, and normal input tape residency were 10 minutes, then a substantial savings in physical drives for input processing is possible.

## Non-Sequential Performance

A "block space forward" on a physical 3480 or 3490 tape drive requires all of the block to be read and the data transferred to the control unit. With CA-Vtape, it is an index search in real memory, followed by an access of the data in storage or from DASD. CA-Vtape can do in milliseconds that which takes an extended amount of time with a physical device.

A search or locate block command on a physical 3480 or 3490 tape drive causes a high speed mechanical movement to the requested block. This mechanical motion requires an average minimum of 10 seconds and up to 30 seconds depending on the type and model of drive and the length of the cartridge in use. With CA-Vtape, that search is accomplished in milliseconds through the index search and DASD access.

**Note:** With physical tape, searches and spacing operations are mechanical processes taking many seconds to complete. With CA-Vtape, these same operations are completed in milliseconds.

## Read Backward Performance

On physical 3490E class machines, auto blocking requires that read backward processing be accomplished by a rewind to the beginning of the next block and read forward. The cycle is also known as a "back hitch" and is a time consuming mechanical process. Using CA-Vtape, the data is staged from the data space or from the virtual volume in the DASD buffer pool. CA-Vtape provides read backward processing at processor storage speeds or DASD speeds.

# Tape Data Set Pre-Staging

If you are using tape data sets, you can reduce delays caused by the mount and search time of your tape devices. Using CA-Vtape, if you know which data sets are needed in a job stream, a simple job such as IDCAMS PRINT with COUNT(1) mounts those data sets and stages into the cache buffer pool. When the real job stream starts, the data is immediately accessible without physical mount and staging time.

This can be particularly important for OS/390 sites with no automation since these pre-staged mounts are effectively automated while they reside in cache.

# Tape Data Set Caching

After a tape data set has been given a virtual volume and staged into the data space, that data set can remain in this state for extended periods of time without being used.

Using larger cache buffer pools allows the virtual volumes to reside on DASD longer, further reducing recalls and mount processing.

# CPU Performance Versus Memory Utilization

CA-Vtape uses Data In Virtual (DIV) to map data spaces to its linear data set cache. The memory occupied by these data spaces is used to queue virtual volume data as it is also scheduled to be written to the linear data set cache. This provides higher throughput performance for jobs reading or writing data to CA-Vtape virtual volumes. Unchecked, these data space queues would normally require a large storage footprint. However, CA-Vtape throttles the use of these data space queues to ensure that they do not burden memory resources. CA-Vtape also provides you with the control to prioritize its use of memory versus CPU utilization within your environment.

CA-Vtape can be run in one of two modes: STANDARD or ISOLATION. This is controlled by an operator command to the SVTS system.

## STANDARD MODE

In the STANDARD mode, CA-Vtape maximizes available memory at the expense of some additional CPU overhead. In this mode, CA-Vtape actively manages the amount of storage it uses by frequently releasing the data space memory pages that have been written to its linear data set cache. CA-Vtape does this by periodically issuing a DIV RESET command for memory pages which have been previously saved to DASD. By releasing these memory pages, CA-Vtape helps to maximize available memory for use by other tasks running within the operating system.

**Note:** The SET CPU command setting is stored in the CA-Vtape VCAT and remains in effect across IPLs until specifically changed. In a multi-system CA-Vtape configuration, it is perfectly valid to allow different system images to have different SET CPU settings.

## ISOLATION MODE

ISOLATION mode reduces its CPU utilization at the expense of slightly higher memory utilization. In this mode, CA-Vtape allows the operating system to manage the size of its virtual storage footprint. The operating system will not allow the real storage requirements of an address space to grow beyond the parameters you configure for storage isolation. When additional pages are required, the operating system can release pages which have been previously saved. This can result in significant CPU savings since CA-Vtape does not need to issue DIV RESET in order to release saved memory pages.

On heavily loaded online systems with high paging rates and low tape utilization it may be preferable to run CA-Vtape in the STANDARD mode. This helps to reduce the size of memory used by CA-Vtape on highly batch oriented systems, where tape throughput is critical to overall system throughput, consider ISOLATION mode to reduce CPU cycles needed to manage memory resources. Either way the SET CPU command allows you to control CA-Vtape's use of memory versus CPU utilization.

**Note:** To use ISOLATION mode, you must correctly configure Storage Isolation within your operating system. Refer to the Storage Isolation in IBM's *OS/390 Initialization and Tuning Guide* and/or consult with your Systems Programmer to determine the optimum settings for Storage Isolation within your environment.

Chapter

7

# Creating Reports

This chapter describes the reports that show information about key elements of the CA-Vtape system.

You can generate four reports:

- LIST=BACKSTOR
- LIST=CACHE
- LIST=MODULE
- ANALYZE=COMPRESSION

Only one report command can be included per execution of the utility.

## LIST Command

Reports that list out certain areas of CA-Vtape can be created by executing a batch job. Examples are located in HLQ.VxRxx.SVTJCL(BACKSTOR) or (LISTCACH).

**Syntax**

The LIST command has the following syntax:

```
LIST=BACKSTOR
```

or

```
LIST=CACHE
```

or

```
LIST=MODULE
```

## LIST=BACKSTOR Command

Provides a list of all virtual volume serial numbers in volume serial number order. The report shows each user data set name on each virtual volume and the real primary volume serial numbers where the data sets are contained in the backstore, as well as duplex volume serials, group and subgroup information, virtual volume size in megabytes, actual virtual volume size in megabytes, and compression percentage. Compression percentage will be set to zero for any volumes that do not contain compressed data. Totals of volumes, compressed volumes and uncompressed volumes are displayed at the end, along with total virtual volume size, as well as total actual size and compression percentage for compressed volumes. This report does not show virtual volumes stored in the cache but not yet in the backstore.

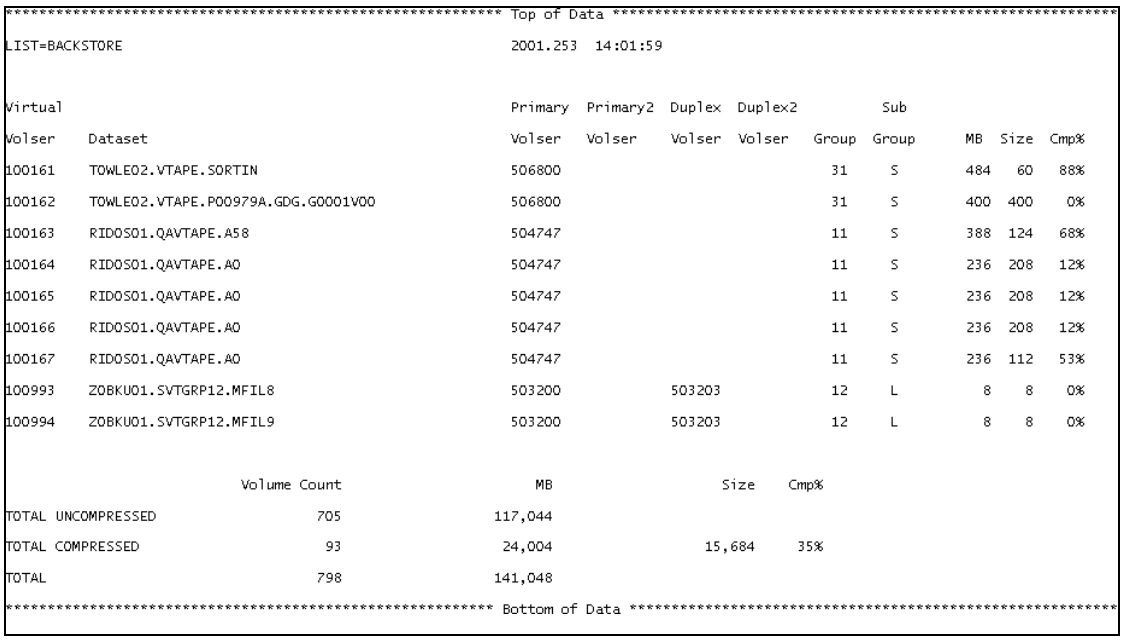
**Note:** You can run this report when CA-Vtape is active or inactive. When CA-Vtape is inactive, include the BSDS1 and GLOBAL DD statements and point to your local and global CA-Vtape VCATs.

A sample of the list utility can be found in "HLQ.VxRxx.SVTJCL(BACKSTOR).

A sample is shown below:

```
//*
//* LIST INFORMATION FOR VIRTUAL VOLUMES ON BACKSTORE
//*
//DEL       EXEC PGM=IDCAMS
//SYSPRINT  DD SYSOUT=*
//SYSIN     DD *
 DELETE SVTS.REPORT.BACKSTOR
//*
//UTILITY   EXEC PGM=SVTSUTIL
//STEPLIB   DD DISP=SHR,DSN=SVTS.LOADLIB
//SYSPRINT  DD SYSOUT=*,DCB=(LRECL=80,RECFM=F,BUFNO=1)
//*UNCOMMENT IF SVTS IS DOWN OR VCAT IS SHARED ON MULTIPLE SYSTEMS
//*BSDS1      DD DISP=SHR,DSN=SVTS.BSDS
//*GLOBAL     DD DISP=SHR,DSN=SVTS.GLOBAL.VCAT
//SYSUT1    DD DISP=(,CATLG),
//          DSN=SVTS.REPORT.BACKSTOR,
//          SPACE=(TRK,(5,5),RLSE),UNIT=SYSDA
//SYSIN     DD *
LIST=BACKSTOR
/*
```

**FIGURE 7-1 Example of the BACKSTOR Report**



```
******************************************************** Top of Data ********************************************************
LIST=BACKSTORE                                          2001.253  14:01:59

Virtual                                                 Primary  Primary2  Duplex  Duplex2          Sub
Volser    Dataset                                       Volser   Volser    Volser  Volser   Group  Group      MB  Size  Cmp%
100161    TOWLE02.VTAPE.SORTIN                          506800                                31     S         484    60   88%
100162    TOWLE02.VTAPE.P00979A.GDG.G0001V00            506800                                31     S         400   400    0%
100163    RIDOS01.QAVTAPE.A58                           504747                                11     S         388   124   68%
100164    RIDOS01.QAVTAPE.AO                            504747                                11     S         236   208   12%
100165    RIDOS01.QAVTAPE.AO                            504747                                11     S         236   208   12%
100166    RIDOS01.QAVTAPE.AO                            504747                                11     S         236   208   12%
100167    RIDOS01.QAVTAPE.AO                            504747                                11     S         236   112   53%
100993    ZOBKU01.SVTGRP12.MFIL8                        503200             503203             12     L           8     8    0%
100994    ZOBKU01.SVTGRP12.MFIL9                        503200             503203             12     L           8     8    0%

                            Volume Count                    MB                   Size    Cmp%
TOTAL UNCOMPRESSED                   705               117,044
TOTAL COMPRESSED                      93                24,004                 15,684     35%
TOTAL                                798               141,048
******************************************************** Bottom of Data *****************************************************
```

## LIST=CACHE Command

Lists every cache LDS on the system and their associated data set names. Virtual volume serial numbers are displayed for every LDS that contains active cache data. A column is shown to indicate if cache data has been written to the physical tape backstore. This report can be used to determine how much of the cache has been written to backstore and the amount of cache used and available for use.

**Note:** The sample for the CACHE report is in the member name LISTCACHE. A Global DD is required for the LIST=CACHE report. The local VCAT DD will be used if supplied. If not supplied, the local VCAT name will be dynamically allocated based on the Global DSN. An Alias pointing to the customized name created during installation may also be used.

The output written to the SYSPRINT DD statement provides step return code messages. Reports generated are written to the SYSUT1 DD statement. Provided JCL directs this output to a permanent data set where you can browse and print it. You can direct SYSUT1 to a SYSOUT data set by using the following DD statement:

```
// SYSUT1 DD SYSOUT=
```

A sample is shown below:

```
//*
//* LIST INFORMATION FOR VIRTUAL VOLUMES ON LDS CACHE
//*
//DEL       EXEC PGM=IDCAMS
//SYSPRINT  DD SYSOUT=*
//SYSIN     DD *
DELETE SVTS.REPORT.CACHE
//*
//UTILITY   EXEC PGM=SVTSUTIL
//STEPLIB   DD DISP=SHR,DSN=SVTS.LOADLIB
//SYSPRINT  DD SYSOUT=*,DCB=(LRECL=80,RECFM=F,BUFNO=1)
//* A GLOBAL DD IS REQUIRED FOR LIST=CACHE OR LIST=EMPTY
//* A VCAT DD WILL BE USED IF SUPPLIED, OR WILL BE DYNAMICALLY
//* ALLOCATED BASED ON THE GLOBAL DSNAME IF ABSENT.
//GLOBAL    DD DISP=SHR,DSN=SVTS.GLOBAL.VCAT
//*VCAT      DD DISP=SHR,DSN=SVTS.SYSID.VCAT
//SYSUT1    DD DISP=(,CATLG),
//          DSN=SVTS.REPORT.CACHE,
//          SPACE=(TRK,(5,5),RLSE),UNIT=SYSDA
//SYSIN     DD *
LIST=CACHE
/*
```

**FIGURE 7-2 Sample Output Created From Using the CACHE Parameter**

```
   Menu  Utilities  Compilers  Help
  ------------------------------------------------------------------------
  BROWSE    ISPDLM1.REORT.CACHE
  Command ===>_____________________________________________________________
****************************************** Top of Data *****************
LIST=CACHE                                          1998.347  23:07:5700

Linear                                        Virtual         Externalize
Volser         Dataset                        Volser          Indicator
VL5161         SVTS.VVE.LDS00000              899001          Yes
VL5162         SVTS.VVE.LDS00001              899003          Yes
VL5163         SVTS.VVE.LDS00002              899005          Yes
VL5164         SVTS.VVE.LDS00003              899006          Yes
VL5165         SVTS.VVE.LDS00004              899007          Yes
VL5166         SVTS.VVE.LDS00005               n/a            n/a
VL5167         SVTS.VVE.LDS00006               n/a            n/a
VL5168         SVTS.VVE.LDS00007               n/a            n/a
VL5169         SVTS.VVE.LDS00008               n/a            n/a
VL516A         SVTS.VVE.LDS00009               n/a            n/a
VL516B         SVTS.VVE.LDS00010               n/a            n/a
VL516C         SVTS.VVE.LDS00011               n/a            n/a
VL5161         SVTS.VVE.LDS00012               n/a            n/a
VL5162         SVTS.VVE.LDS00013               n/a            n/a
VL5163         SVTS.VVE.LDS00014               n/a            n/a
VL5164         SVTS.VVE.LDS00015               n/a            n/a
VL5165         SVTS.VVE.LDS00016               n/a            n/a
VL5166         SVTS.VVE.LDS00017               n/a            n/a
```

The volser on the far left is the DASD volume serial number the LDS resides on. Up to 10 linear data sets can exist on a virtual volume. In this case, virtual volume 899001 is currently comprised of LDS00000 which resides on DASD volumes VL5161.

The externalize indicator of yes means the copy to physical tape has completed, but since it is listed here, it still resides in cache. If the externalize indicator is no, then the copy to physical tape is not complete. If the Cache report indicates any "Lost" entries, see the section "Recovering from LDS Cache Failure" in the chapter "Recovering."

## LIST=MODULE Command

Lists every module required by CA-Vtape. This report can be used to determine the latest maintenance that has been applied to a module. The output written to the SYSPRINT DD statement provides step return code messages. The generated report is written to the SYSUT1 DD statement.

A sample is shown below:

```
//*
//* LIST INFORMATION FOR VTAPE MODULES
//*
//UTILITY EXEC PGM=SVTSUTIL
//STEPLIB DD DISP=SHR,DSN=SVTS.LOADLIB
//SYSPRINT DD SYSOUT=*,DCB=(LRECL=80,RECFM=F,BUFNO=1)
//SYSUT1 DD SYSOUT=*,DCB=(LRECL=80,RECFM=F,BUFNO=1)
//SYSIN DD *
LIST=MODULE
/*
```

## ANALYZE=COMPRESSION Command

Calculates and produces a report showing the effective CPU cost for using hardware compression. The CA-Vtape compression routines rely on the use of certain hardware instructions. This report can estimate how much additional CPU overhead is required to compress data using these hardware instructions.

The additional CPU cost is expressed in terms of megabytes per CPU second. This reflects the amount of data the hardware compression instructions themselves are capable of moving. Using information from this report you can estimate your additional CPU cost for hardware compression based on the number of megabytes of data you intend to process with this Vtape feature. You can also use the information on this report to determine how to adjust CA-Vtape's MaximumCPURate PARMLIB attribute. This attribute can be used to reduce or increase the additional CPU cost by reducing or increasing overall compression effectiveness. In other words by reducing the amount of data compressed, CPU cost can be reduced. Likewise if you increase the amount of data compressed CPU cost is higher.

The analysis report tends to vary on different physical machines due to the hardware implementation of the compression instructions. The output written to the SYSPRINT DD statement provides the report along with the step return code messages.

Sample JCL is shown below:

```
//*
//* Analyze the effective CPU cost for compression
//*
//UTILITY EXEC PGM=SVTSUTIL
//STEPLIB DD DISP=SHR,DSN=SVTS.LOADLIB
//SYSPRINT DD SYSOUT=*,DCB=(LRECL=80,RECFM=F,BUFNO=1)
//SYSIN DD *
ANALYZE=COMPRESSION
/*
```

Sample Report Output is shown below:

```
Compression Call Performance Analysis

     Type       Method    MB/Inp   CpuSec  MB/Sec
     ------     --------  ------   ------  ------
     CMPSC      SVTHC#01      13     .250      56
     CMPSC      SVTHC#02      14     .250      59
     CMPSC      SVTHC#03      16     .250      66
     CMPSC      SVTHC#04      16     .250      66
     CMPSC      SVTHC#05      15     .250      62

         Average Velocity mb/SEC               61


ANALYZE=COMPRESSION                              SVTSUT60, RC=     0

Number of commands processed:           1
```

Chapter

8

# Backing up and Restoring

This chapter describes key elements of the CA-Vtape system, availability issues regarding these elements, and backup procedures you can use in case these elements become lost or damaged.

## CA-Vtape Control Data Sets

CA-Vtape uses a set of files to record system and configuration information. Collectively this set of files is called control data sets or CDS's. The CA-Vtape control data sets consist of:

- The local volume catalog control file or local VCAT. This file is used to record information specific to a single MVS image. Each MVS image has its own unique local VCAT. The local VCAT contains information pertaining to data set and data class filters, back store processing, virtual tape devices, group and subgroup definitions.
- The global volume catalog control file or global VCAT is used to record multi-system control information such as virtual volume status. This file is shared by all of the MVS images participating in a CA-Vtape complex.
- This CDS allows virtual tapes created on one MVS image to be mounted on a completely different system.
- The bootstrap data set or BSDS is used to record information necessary to recover from failure conditions. Like the global VCAT, this file is shared by all of the MVS images participating in a CA-Vtape complex. The global VCAT can be recovered using information contained in the BSDS and the BSDS can be recovered using information contained in the global VCAT.

CA-Vtape control data sets should be considered critical system files. Keeping these files on high performance and reliable media such as RAID compliant DASD will help to improve overall performance and minimize potential system outages. CA-Vtape uses reserve processing to serialize access to its control data sets. The need to perform volume reserves may require you to isolate these CA-Vtape control data sets from other critical system data sets. For example, the control data sets used by the coupling facility should not be placed on the same volume as those used by CA-Vtape. Maintaining current backups and keeping the global VCAT and BSDS on separate DASD devices is critical to insuring recoverability in the event of unexpected hardware failures.

# Backing up and Restoring

Of the two main elements in CA-Vtape (BSDS and VCAT), both have their own unique processes when it comes to backup and restore.

## Backing up the BSDS or the Global VCAT

Two of CA-Vtape's control data sets are unique because one file can be used to recover information in the other. The BSDS and the global VCAT both maintain similar information that is synchronized on DASD. For this reason they should be implemented on physically separate devices. This allows you to recover certain error conditions and avoid a single point of failure for DASD devices.

The ability to recover the BSDS and the global VCAT is an important feature in CA-Vtape. We also recommend that you maintain regular back ups of the BSDS. In the unlikely event that both the BSDS and the global VCAT are accidentally deleted or destroyed, the BSDS can be restored from a back up tape and then used to recover the global VCAT.

**Note:** Since the global VCAT can be recovered from the BSDS, you do not need to backup both of these data sets.

We recommend that you back up the BSDS using CA-Disk, DFDSS, FDR, or any other back up product which implements concurrent or snapshot copy.

Concurrent or snapshot copy allows you to create backups without bringing down the SVTS address space. Backups should be maintained on DASD or on physical cartridge tapes which provide access to the back up data set even when CA-Vtape is inoperative. Using generation data sets to maintain multiple back up copies of the BSDS provides additional security by eliminating or reducing the risk of any single backup tape failures when restoration is required.

Sample JCL to backup the BSDS:

```
//JOBNAME    JOB …
//BACKUP     EXEC PGM=ADRDSSU,REGION=4M
//SYSPRINT   DD SYSOUT=*
//INPUT      DD DISP=SHR,DSN=HLQ.BSDS1
//OUTPUT     DD DISP=(,CATLG),DSN=HLQ.BSDS.BACKUP(+1),
//       LABEL=(1,SL),UNIT=REAL3490
//SYSIN      DD *
    DUMP DATA SET(INCLUDE(HLQ.BSDS1)) -
         INDDNAME(INPUT) -
 OUTDDNAME(OUTPUT) -
 CANCELERROR OPTIMIZE(4)  CONCURRENT WAIT(20,20) –
         TOL(ENQF)
//
```

## Restoring the BSDS or the Global VCAT from a Backup Copy

Chapter 9, Recovering, describes the recovery process. CA-Vtape utilities can be used to recover the BSDS from the global VCAT or the global VCAT from the BSDS. If one of these files is intact you may generally use it to recover the other. However, if both files are deleted or corrupted, back up copies of the BSDS allow you to restore both the CA-Vtape BSDS and the global VCAT.

CA-Vtape must be down or inactive on all MVS images in order to restore the BSDS or the global VCAT.

**Note:** If necessary, follow the procedures outlined in Chapter 9, Recovering, to recover the global VCAT using the restored BSDS as input.

Sample JCL to restore the BSDS from a DFDSS backup copy.

```
//JOBNAME    JOB …
//RESTORE    EXEC PGM=ADRDSSU,REGION=4M
//SYSPRINT   DD SYSOUT=*
//INPUT      DD DISP=SHR,DSN=HLQ.BSDS.BACKUP(+0)
//OUTPUT     DD DISP=SHR,UNIT=3390,VOL=SER=XXXXXX
//SYSIN      DD *
  RESTORE DATA SET(INCLUDE(HLQ.BSDS1)) -
        INDDNAME(INPUT) -
 OUTDDNAME(OUTPUT) -
 REPLACE
//
```

## Backing Up the Local VCAT

The local VCAT is used to record information specific to a single MVS image. Each MVS image has its own unique local VCAT. The local VCAT contains information pertaining to data set and dataclass filters, backstore processing, virtual tape devices, group, and subgroup definitions.

Back up the local VCAT using the CA-Vtape SVTSUTIL program. SVTSUTIL allows you to make back up copies of the information contained in the local VCAT while CA-Vtape remains available and active. Each local VCAT should be backed up frequently using generation data sets.

**Note:** The VCAT DD statement is optional if CA-Vtape is up. However if you remove the DD statement, you must run the backup on the appropriate system. Remember that each system has its own copy of the local VCAT. You cannot backup the local VCAT of another system unless you specifically code the VCAT DD.

Sample JCL to backup the local VCAT can be found in HLQ.SVTS.sysid.SVTJCL (BACKVCAT):

```
//JOBNAME    JOB …
//UTILITY    EXEC PGM=SVTSUTIL
//STEPLIB    DD DISP=SHR,DSN=SVTS.APF.LIB
//VCAT DD    DISP=SHR,DSN=HLQ.SYSID.VCAT
//SYSUT1     DD DISP=(,CATLG),UNIT=REAL3490,
//           DSN=HLQ.SYSID.VCAT.BACKUP(+1)
//SYSPRINT   DD SYSOUT=*,DCB=(LRECL=80,RECFM=F,BUFNO=1)
//SYSIN      DD *
BACKUP=VCAT
//
```

## Restoring the Local VCAT from a Backup Copy

To recover the local VCAT, a new local VCAT is defined and then the appropriate information is restored to the new VCAT from the backup. This process allows old VCATs to be restored or to be copied for possible use on a different system.

The CA-Vtape for this particular SMFID must be shutdown for the recovery.

Other systems and their CA-Vtape can be operating.

**Note:** During product installation, MVS system specific customization values are assembled and linked into a special version of SVTSUTIL. This module is placed in a separate local load library for each MVS image. CA-Vtape uses these customized values to restore the local VCAT, so you must ensure that the STEPLIB refers to the appropriate local load library for the MVS image running the RESTVCAT job.

Sample JCL to restore the local VCAT can be found in HLQ.SVTS.sysid.SVTJCL (RESTVCAT):

```
//JOBNAME    JOB …
//DELDEF     EXEC PGM=IDCAMS
//SYSPRINT   DD SYSOUT=*
//SYSIN      DD *
  DELETE HLQ.SYSID.VCAT
 SET MAXCC=0
  DEFINE CLUSTER (NAME(HLQ.SYSID.VCAT) -
         VOLUMES(VCATVOL) -
      RECORDS(8194 1) SHAREOPTIONS(3 3) LINEAR )
//RESVCAT    EXEC PGM=SVTSUTIL
//STEPLIB     DD DISP=SHR,DSN=HLQ.SYSID.LOAD       <- Local load library
//VCAT    DD DISP=SHR,DSN=HLQ.SYSID.VCAT
//SYSUT1  DD DISP=SHR,DSN=HLQ.SYSID.VCAT.BACKUP(+0)
//SYSPRINT DD SYSOUT=*,DCB=(LRECL=80,RECFM=F,BUFNO=1)
//SYSIN     DD *
RESTORE=VCAT
//
```

After successfully restoring the local VCAT from a backup copy, you must rebuild the Group Request Records (GRRs) by executing the sample JCL in HLQ.SVTS.sysid.SVTJCL(GRRJCL). GRRJCL ensures clean GRR chains by not restoring possibly corrupted chains from the VCAT backup because GRRJCL rebuilds the chains from the VVEs.

Chapter

9

# Recovering

This chapter describes the recovery techniques you can follow to restore control data sets used by CA-Vtape. It is unlikely that you need to use the techniques described by this chapter, but they are included to fully document CA-Vtape recovery.

## Types of Recovery

CA-Vtape is shipped with a utility program called SVTSUTIL. This utility controls a wide range of commands, from Backup and Restore, to Listing and Recovery.

### Recovering the Global VCAT

The BSDS and the global VCAT maintain similar information that is synchronized on DASD. Either data set can be recovered from the other. You should place them on physically separate devices. This ensures that a single hardware failure does not destroy both data sets.

While the ability to recover the BSDS and the global VCAT is an important feature of CA-Vtape, we also recommend that you maintain regular backups of the BSDS. In the unlikely event that both the BSDS and the global VCAT are both accidentally deleted or destroyed, the BSDS can be restored from a back up tape and then used to recover the global VCAT.

Perform these basic steps in order to recover the global VCAT from the BSDS:

1. Bring down CA-Vtape on all MVS images.
2. Using IDCAMS, delete and then define the global VCAT. Use the MODEL parameter of DEFINE CLUSTER to ensure that the BSDS and the global VCAT have matching characteristics. Sample JCL to delete and define the global VCAT:

```
//JOBNAME JOB …
//IDCAMS    EXEC PGM=IDCAMS
//SYSPRINT  DD SYSOUT=*
//SYSIN DD *
  DELETE HLQ.GLOBAL.VCAT
  SET MAXCC=0
  DEFINE CLUSTER (                        -
         NAME(HLQ.GLOBAL.VCAT)            -
         MODEL(HLQ.BSDS1)                 -
         VOLUMES(SYSVL6)                  -
         )
//
```

3. Run SVTSUTIL to recover the information from the BSDS into the newly defined global VCAT. Sample JCL to recover the global VCAT from information contained in the BSDS:

```
//JOBNAME    JOB …
//UTILITY    EXEC PGM=SVTSUTIL
//STEPLIB    DD DISP=SHR,DSN=HLQ.VxRxx.LOAD
//VCAT       DD DISP=SHR,DSN=HLQ.SYSID.VCAT
//BSDS1      DD DISP=SHR,DSN=HLQ.BSDS1
//GLOBAL     DD DISP=SHR,DSN=HLQ.GLOBAL.VCAT
//SYSPRINT   DD
SYSOUT=*,DCB=(LRECL=80,RECFM=F,BUFNO=1)
//SYSUDUMP   DD SYSOUT=*
//SYSIN      DD *
RECOVER=GLOBAL
//
```

4. Bring up CA-Vtape on at least one system.

5. On a system running CA-Vtape, use LDS_ADD to add back your cache definitions to the global VCAT. Use the LDSADDxx jobs created in HLQ.VxRxx.JCL as part of the installation of CA-Vtape to accomplish this. These jobs can be used to create the appropriate LDS_ADD commands. Sample JCL to perform LDS_ADDs:

```
//JOBNAME  JOB …
//UTILITY   EXEC PGM=SVTSUTIL
//STEPLIB   DD DSN=SVTS.TAPE.LOAD,DISP=SHR
//LDS00000  DD DSN=SVTS.VVE.LDS00000,DISP=SHR
//LDS00001  DD DSN=SVTS.VVE.LDS00001,DISP=SHR
//LDS00002  DD DSN=SVTS.VVE.LDS00002,DISP=SHR
//LDS00003  DD DSN=SVTS.VVE.LDS00003,DISP=SHR
…
//LDS00009  DD DSN=SVTS.VVE.LDS00009,DISP=SHR
//SYSPRINT  DD SYSOUT=*,DCB=(LRECL=80,RECFM=F)
//SYSIN     DD *
LDS_ADD=LDS00000
LDS_ADD=LDS00001
LDS_ADD=LDS00002
LDS_ADD=LDS00003
…
LDS_ADD=LDS00009
```

If you have defined additional LDS data sets after initial installation, you can run job LDSADDAJ in HLQ.VxRxx.JCL to generate jobs in data set HLQ.LDSADD.JCL. The generated jobs add LDS data sets in increments of 1000 files. This also streamlines the LDS add process if you have a large number of LDS files.

## Recovering the Bootstrap Data Set (BSDS)

The BSDS can be recovered from information contained in the global VCAT using the IDCAMS program.

Perform these basic steps in order to recover the BSDS from the global VCAT.

1. Bring down CA-Vtape on all MVS images.
2. To recover the BSDS from information contained in the global VCAT, use IDCAMS to delete, define and then REPRO the BSDS from the global VCAT. Use the MODEL parameter of DEFINE CLUSTER to ensure that the BSDS and the global VCAT have matching characteristics. Sample JCL to delete, define, and then reproduce the BSDS:

```
//JOBNAME  JOB …
//DELDEF     EXEC PGM=IDCAMS
//SYSPRINT   DD SYSOUT=*
//SYSIN      DD *
  DELETE HLQ.BSDS1
  SET MAXCC=0
  DEFINE CLUSTER (
        -
             NAME(HLQ.BSDS1)           -
             MODEL(HLQ.GLOBAL.VCAT)    -
             VOLUMES(SYSVL3)           -
             )
  REPRO INDATASET(HLQ.GLOBAL.VCAT)     -
             OUTDATASET(HLQ.BSDS1)
//
```

## Recovering CA-Vtape Virtual Volumes

Initially, CA-Vtape records virtual volumes in linear data sets which are used primarily as a DASD cache device. After a virtual volume is closed, the backstore process copies and stacks the virtual volume data onto a physical cartridge tape as a data set. These virtual volume data sets are maintained in an internal format and are automatically recalled by CA-Vtape if the volume is referenced and the information is no longer held on DASD. LDS cache data sets, physical cartridge tapes, and virtual volume data sets represent additional items which must be considered for recoverability purposes. Recovery must allow for:

- Recalling a virtual volume from a duplex copy.
- Physical loss or damage to a cartridge tape. This could result in the loss of several virtual volumes data sets.
- I/O errors when reading a physical cartridge tape for a specific virtual volume data set.
- Physical loss or damage to the LDS cache.
- Extracting a virtual volume if the SVTS address space is down or inoperative.

The recovery from each of these scenarios is described here:

## Recalling a Virtual Duplex Copy

Group definitions allow you to control which virtual volume data sets are placed to primary, duplex, and or export copies. Duplexed virtual volume data sets are copied onto separate back store volumes. This allows you to recover from certain types of failure conditions by simply forcing CA-Vtape to refer to the duplexed copy.

During CA-Vtape recall processing, CA-Vtape attempts to locate the primary data set name first and the duplex second. To use a duplex copy, the primary copy needs to be uncataloged after verifying the duplex exists. The data set names are standardized. To uncatalog the data set, use the name "HLQ.VVE.Vxxxxxx.PRIMARYx." For example, virtual volume 899186 has the data set names:

```
SVTS.VVE.V899186.PRIMARY
SVTS.VVE.V899186.PRIMARY2
SVTS.VVE.V899186.PRIMARY3
```

You can verify the existence of the duplex using a similar naming convention and specifying duplex instead of primary.

```
SVTS.VVE.V899186.DUPLEX
SVTS.VVE.V899186.DUPLEX2
SVTS.VVE.V899186.DUPLEX3
```

After the primary is uncataloged, the duplex can be automatically accessed. If duplex copies are used for disaster recovery, multiple primaries can be uncataloged in the same job.

ISPF panels can be used to display or uncatalog these duplex copies. A batch job calling IDCAMS can also be used. IDCAMS allows the replacement of an entire qualifier with an asterisk but does not allow partial replacement of the qualifier.

**Note:** ISMF does not display the tape data sets and cannot be used.

Refer to the IBM manuals for additional information on uncataloging data sets.

## Recover from Physical Cartridge Failures

Virtual volume data sets are stacked onto physical cartridges. Losing a single cartridge causes the loss of several virtual volumes.

To recover the virtual volume data sets on a physical cartridge, run a BACKSTORE report. This allows you to identify the virtual volumes and the data set names. For duplexed virtual volume data sets you may follow the procedures defined above for recalling a duplex copy. For non-duplexed virtual volume data sets, no data can be recovered but the data sets should be placed in scratch status in order to re-use the virtual volumes.

CA-Vtape's scratch processing will synchronize the status of these data sets with the tape management system and return these volumes to scratch status.

## Recover from Physical Cartridge I/O Errors

An I/O error on a physical cartridge backstore tape may signal the loss of a virtual volume, but other virtual volume data sets on the same physical cartridge tape may be completely valid and usable. Consider keeping the physical cartridge since other virtual volume data sets may be correctly accessed depending on the extent of tape damage. The tape may also be analyzed and copied using a utility such as DITTO. Copied cartridges can be processed by CA-Vtape as long as the volser, file sequence numbers, and data structures are correctly retained.

**Note:** If the I/O error was detected by a Recall request, you may need to reply Cancel to the CA-Vtape SVTSU0800W message. This forces an equipment check and releases resources held by the job requiring the Recall.

For duplexed virtual volume data sets, you may follow the procedures defined above for recalling a duplex copy. For non-duplexed virtual volume data sets, no data can be recovered but the data sets should be placed in scratch status in order to re-use the virtual volumes. CA-Vtape's scratch processing synchronizes the status of these data sets with the tape management system and returns these volumes to scratch status.

## Disaster Recovery Scenarios

An option for Disaster Recovery testing has been provided by the SVTS SET RECALL=PRIMARY|DUPLEX command. This changes the order during Recalls so the Duplex may be selected first even if a Primary catalog entry exists. Both copies will be checked for a catalog entry, only the order changes. The command operates at the local system/LPAR level allowing testing and eliminating the need for uncatalog work before Disaster Recovery begins. Except for the order change, Recall processing proceeds as described below.

By default during CA-Vtape recall processing, CA-Vtape attempts to locate the primary data set name first and the duplex second. This order can changed by using the SET RECALL command. If any of the copies is not cataloged the other copy will be requested instead.

## Recovering from LDS Cache Failure

If a DASD volume containing a portion of the CA-Vtape cache is lost, the list cache report (see the section "LIST Command" in the chapter "Creating Reports") shows the specific virtual volumes that have been impacted. If the virtual volume was externalized, a valid copy can be recalled from physical tape.

In the case of a DASD volume being lost when the data was not yet externalized, you can determine the virtual volume(s) affected using the cache report. The tape management system should determine the full list of data sets. The affected virtual volumes should be returned to scratch status in order to re-use the virtual volumes.

The LIST CACHE report will also identify 'Lost' LDS data sets. These may result when abends occur or when WTOR requests are cancelled. VCAT Used cell and Free cell information may be out of synchronization. 'Lost' cache will be unusable until reclaimed. Recovery normally consists of running the RECLAIM svtsutil command when system activity is low. If Reclaim does not return all cache, then run the IPCS VERBX and check for a nonblank VVESYS field. If the VVE is not in use on any system (use the SVTS D A command), the VVESYS field may be cleared using the VVE_FREE=vvevol command, or by stopping and restarting SVTS. Once cleared Reclaim will process the LDSs for this VVE.

A sample of the utility is in "HLQ.VxRxx.SVTJCL(RECLAIM)", is also provided below.

```
//ISPDASIX JOB (SMMDSK,279302,SSW,44),'DAS- VTAPE',
//          MSGCLASS=X,TIME=(3),NOTIFY=ISPDAS1
//* JOB GENERATED BY VTAPE INSTALL
//*
//* RECLAIM ANY LOST LDS CHAINS, SYNCH VVE/LDS STATUS
//*
//UTILITY   EXEC PGM=SVTSUTIL
//STEPLIB   DD DISP=SHR,DSN=SVTS120.CUST.LOADLIB
//BSDS1     DD DISP=SHR,DSN=SVTS120.ISPDAS1.BSDS
//GLOBAL    DD DISP=SHR,DSN=SVTS120.ISPDAS1.VCAT
//SYSPRINT  DD SYSOUT=*,DCB=(LRECL=80,RECFM=F,BUFNO=1)
//SYSIN     DD *
RECLAIM
```

**FIGURE 9-1 Sample output from the RECLAIM utility.**

```
------------------------------------------------------------------------
LDS Dataset Name Freed      LDSVOL  VVEVOL      Reason
----------------------      ------  ------      --------------------
SVTS.VVE.LDS00104           899079  V99079      Volser invalid
SVTS.VVE.LDS00105           899077  899077      VVE was scratched
SVTS.VVE.LDS00106           899080  899080      Not in VVE table
SVTS.VVE.LDS00107           899089  899089      LDS table mismatch
SVTS.VVE.LDS00108           899090  899089      LDS table mismatch

Total number of FREED LDS = 00000011

RECLAIM                                 RC = 00000000

The number of input commands was    00000001
```

**Volser invalid -** The LDS points to an invalid virtual volser.

**VVE was scratched -** The LDS VVE is an unmounted scratch volser.

**Not in VVE table -** The LDS was not found in its VVE table.

**LDS table mismatch -** All LDS table entries must point to one VVE.

CA-Vtape automatically handles scratched data sets and WTOR for data sets unable to be allocated. A reply of 'Cancel' flags the LDS as ineligible. A DASD Cache LDS report shows what is INELIGIBLE and those entries can be added again using the LDS_ADD command to reclaim their space.

**Note:** It is highly recommended that you use CA-Vtape with RAID DASD to minimize the potential for data loss.

## Extracting A Virtual Volume

CA-Vtape provides the capability of extracting a tape data set directly from the CA-Vtape backstore format to native tape. It allows extraction to a new volume, or to the volser that was originally defined as a virtual volume. It recovers all of the virtual volume regardless of the number of physical volumes the data resides on.

**Syntax**

The EXTRACT command can be executed in one of three ways using the following syntax:

```
EXTRACT
EXTRACT,VOLSER=INPUT
EXTRACT,VOLSER=vvvvvv
```

**EXTRACT** - provides default processing that uses the volser from the inserted output tape.

**EXTRACT,VOLSER=INPUT** - provides a way to maintain the volser from the virtual volume. For example, you can use this method with products that remember what volsers they originally wrote to and cannot tolerate change (for example, DFSMShsm).

**EXTRACT VOLSER=vvvvvv** - allows you to override which volser is used on the output device.

A sample of the extract utility is in “HLQ.VxRxx.SVTJCL(SVTSUTIL)”, also provided below.

**FIGURE 9-2 Sample SVTJCL Member — EXTRACT**

```
  File  Edit  Confirm  Menu  Utilities  Compilers  Test  Help
------------------------------------------------------------------------------
EDIT       SVTS.V1R01.JCL(EXTRACT) - 01.10               Columns 00001 00072
Command ===> _____________________________________________ Scroll ===> CSR
****** ***************************** Top of Data ******************************
000100 //ISPDCM1A JOB (SMMALL,279302,B19,00),'MULLINGS',CLASS=A,
000200 //         NOTIFY=ISPDCM1,MSGLEVEL=(1,1),MSGCLASS=X
000300 //UTILITY  EXEC PGM=SVTSUTIL
000400 //STEPLIB   DD  DSN=SVTS.TAPE.LOAD,DISP=SHR
000500 //SYSPRINT  DD  SYSOUT=*,DCB=(LRECL=80,RECFM=F,BUFNO=1)
000600 //SYSUT1    DD  DISP=SHR,DSN=SVTS.VVE.V999920.PRIMARY
000700 //SYSUT2    DD  DISP=(,KEEP),UNIT=3400-6
000800 //SYSUDUMP  DD  SYSOUT=*
000900 //SYSIN     DD  *
001000   EXTRACT
001100 /*
****** **************************** Bottom of Data ****************************
```

## CA-Vtape ICF User Catalog

CA-Vtape records virtual volumes as data sets on physical tapes. These virtual volume data sets are cataloged to a CA-Vtape user catalog. While no special requirements are necessary for CA-Vtape, your existing ICF backup and recovery procedures should be reviewed to ensure that the CA-Vtape user catalog is also maintained.

## Tape Management System

Follow the recommended backup and recovery process defined by your existing tape management system. The only synchronization required between CA-Vtape and a tape management system is to determine status of volumes as scratch or private. Accomplish this by running the return to scratch process for that particular tape management system after the system is recovered. CA-Vtape is automatically synchronized by that process.

Chapter

10

# Using the Recycle Utility

User data sets created on CA-Vtape virtual volumes are stored in files which are stacked onto physical backstore tape volumes. When initially created, these physical tape volumes are filled to capacity. Over time, as user data sets are released through tape management processing, these physical tape volumes become fragmented and partially used.

Tape fragmentation can occur because of:

- Subgroups that have a wide range of tape expiration dates: When files in a group/subgroup have vastly different expiration dates, fragmentation can occur as files with short retention periods expire while other files with longer retention periods remain. This requires the physical volume to be kept even though its storage capacity may not be fully utilized.
- Catalog Control Tape Management Techniques: Sometimes tape data sets expire based on their cataloged status. EXPDT=99000 type catalog control data sets are stored on short group/subgroup volumes.
- Manually expired tapes: Tape data sets that are not given expiration dates, but instead are scratched manually, are stored in the short group/subgroup volumes.

The RECYCLE utility reorganizes the files on these physical backstore volumes.

It reclaims unused space by merging active files onto new physical tape volumes.

The original volumes can then be returned to the scratch pool for reuse through normal tape management processes.

RECYCLE is an OS/390 batch process which can be scheduled manually or through automated job submission facilities. The frequency at which you should run RECYCLE depends on the rate at which physical volumes reach a level of fragmentation that is unacceptable in your environment.

# RECYCLE Features

- Merges CA-Vtape backstore files onto new physical tape volumes without using CA-Vtape DASD buffer pool. Data is moved, tape to tape, keeping the physical volume reorganization fast and efficient.
- RECYCLE must be run with CA-Vtape active, however all user data remains accessible during its processing.
- Threshold based processing reduces volume reorganization requirements to a minimum and keeps system overhead low.
- Command options enable processing by selected groups so you may further control RECYCLE processing overhead.
- RECYCLE can optionally create duplicate tapes for merged volumes.
- Any number of concurrent RECYCLE processes may run allowing you to take maximum advantage of your system resources.
- SIMULATE processing provides tools for testing and evaluating different processing threshold parameters so that you may tune the performance and optimization of your physical backstore volumes.
- Reports provide extensive knowledge of all actions taken. They provide valuable feedback on how efficiently your system is operating.
- RECYCLE scheduling and duration is user specified and can be modified at any time to give you control over virtual tape management tasks in your environment.

**Note:** Because RECYCLE serializes its processing at a group level, concurrent processing of the same group is prevented by design.

# Running RECYCLE

## Guidelines for RECYCLE Implementation

The following guidelines describe some considerations for setting up RECYCLE processing:

- RECYCLE is a physical tape to tape process. A minimum of two tape drives is needed for processing; one for the input tape and another for the output tape. If duplex tapes are being created, a third drive is necessary for the duplex tape. Ensure you plan for sufficient physical drives for RECYCLE processing.
- Although RECYCLE can be run at any time, it does require approximately the same CPU and tape channel time as any other tape to tape job. Consider if you should run RECYCLE during non-peak processing times when tape drive activity is low.
- Avoid recycling the same data sets repeatedly. It is not usually advisable to merge tapes that will expire within a few days. There may not be a need to move groups/subgroups that have relatively short expiration dates.
- Evaluate your tape library scratch needs in order to establish an appropriate percentage threshold. Higher percentage values select more physical volumes, requiring longer processing runs. Lower percentage values select fewer tapes and result in shorter, but more frequent, processing runs.

## RECYCLE JCL

The following JCL example is provided in the CA-Vtape distribution SKELS library as RECYCLE@. RECYCLE runs as a batch process and more than one job may be run at the same time, however RECYCLE serializes its processing at a group level so concurrent processing of the same group is prevented by design.

```
//JOBCARD JOB ..., MSGLEVEL=0,MSGCLASS=X,NOTIFY=&SYSUID
//*****************************************************************
//* RECYCLE SIMULATION OF CA-VTAPE PHYSICAL BACKSTORE VOLUMES
//*****************************************************************
//RECYCLE EXEC PGM=SVTRCYCL,PARM='START=SVTRC100',REGION=4M
//*
//* * * IF NECESSARY CHANGE STEPLIB CONCATENATION
//*
//STEPLIB   DD DISP=SHR,DSN=YOUR.SVTS.LOADLIB <- NEEDS YOUR LOADLIB
//*
//* * * IF NECESSARY CHANGE SYSEXEC CONCATENATION
//*
//SYSEXEC   DD DISP=SHR,DSN=YOUR.SVTS.REXX <- YOUR VTAPE REXX LIB
//*
//* * * OUTPUT REPORTS
//*
//SYSTSPRT  DD SYSOUT=*,DCB=(DSORG=PS,RECFM=VBA,LRECL=125)
//DEBUGDD   DD SYSOUT=*,DCB=(DSORG=PS,RECFM=VBA,LRECL=125)
//SYSPRINT  DD SYSOUT=*,DCB=(DSORG=PS,RECFM=VBA,LRECL=125)
//REPORTS   DD SYSOUT=*,DCB=(DSORG=PS,RECFM=VBA,LRECL=125)
```

```
//SYSUDUMP  DD SYSOUT=*
//*
//SYSTSIN   DD DUMMY,DCB=BLKSIZE=80
//*
//* * * RECYCLE ATTEMPTS TO SERIALIZE ITS PROCESSING BASED ON
//* * * GROUP. THIS PREVENTS DIFFERENT JOBS ON THE SAME OR
//* * * DIFFERENT SYSTEMS FROM MERGING THE SAME FILES.
//* * *
//* * * RECYCLE USES ONE OF TWO TECHNIQUES TO SERIALIZE
//* * * GROUP ACCESS, DEPENDING ON THE PRESENCE OR ABSENCE
//* * * OF THE GROUPENQ DD.
//* * *
//* * * IF THE GROUPENQ DD IS PRESENT, SVTRCYCL WILL SERIALIZE
//* * * BY USING A DATASET ON A SHARED PACK. THIS SINGLE TRACK
//* * * DATASET IS ACCESSED SERIALLY USING RESERVE PROCESSING.
//* * * NO GRS RING IS REQUIRED. THE RSETGRP@ JCL MEMBER WILL
//* * * ALLOCATE AND INITIALIZE THE GROUP ENQ FILE. ONCE
//* * * YOU HAVE CREATED YOUR, FILE SIMPLY POINT THE GROUPENQ DD
//* * * IN ALL OF YOUR RECYCLE JOBS TO THIS SINGLE DATASET.
//* * *
//*GROUPENQ DD DISP=SHR,DSN=YOUR.SVTS.GROUPENQ <-YOUR SHARED GROUPENQ
//* * *
//* * * IF THE GROUPENQ DD IS NOT PRESENT, SVTRCYCL USES
//* * * A SYSTEMS LEVEL ENQUEUE WHICH REQUIRES A GRS RING
//* * * IN A MULTI-SYSTEM ENVIRONMENT.
//* * *
//*
//* * * WORK FILES
//*
//SYSUT1    DD SPACE=(TRK,(20,20)),UNIT=SYSDA,
//             DCB=(DSORG=PS,RECFM=VB,LRECL=256)
//SYSUT2    DD SPACE=(TRK,(20,20)),UNIT=SYSDA,
//             DCB=(DSORG=PS,RECFM=VB,LRECL=256)
//SYSUT3    DD SPACE=(TRK,(20,20)),UNIT=SYSDA,
//             DCB=(DSORG=PS,RECFM=VB,LRECL=256)
//*
//* * * SORT WORK FILES MAY NOT BE NECESARY DEPENDING ON YOUR
//* * * SHOP'S DEFAULT SORT OPTIONS FOR DYNAMIC ALLOCATION OF
//* * * SORTWORK
//*
//SORTWK01  DD SPACE=(TRK,(20,20)),UNIT=SYSDA
//SORTWK02  DD SPACE=(TRK,(20,20)),UNIT=SYSDA
//SORTWK03  DD SPACE=(TRK,(20,20)),UNIT=SYSDA
//SORTWK04  DD SPACE=(TRK,(20,20)),UNIT=SYSDA
//*
//SYSIN     DD * INPUT CONTROL CARDS

* (COMMENTS CONTAIN AN ASTERISK IN COLUMN#1)

* SETUP ENVIRONMENT

* SET DEBUG                 (OPT)   DEBUG MODE (PRINTS SORT STATS)

  SET MODE(SIM),             (OPT)   SIMULATE|LIVE|SYNTAX CHECK
      LINECOUNT(60),         (OPT)   MAX LINES PER PAGE
      CART3480(00400),       (OPT)   DEFINE DEFAULT CARTRIDGE SIZES
      CART3490(00800),       (OPT)   IN MEGABYTES FOR 3480, 3490 & MAGSTAR
      CART3590(10000)        (OPT)   *

* SET MODE(SYNTAX)          (OPT)   ONLY PERFORM A CC SYNTAX CHECK

*
* YOU CAN OPTIONALLY CONTROL WHICH REPORTS ARE PRODUCED BY THE
* RECYCLE PROCESS USING THE REPORT CONTROL CARD:
*
* REPORT CANDIDATE(ALL),     (OPT)   LIST DETAIL|SUMMARY|ALL DATASETS
```

```
*        SELECTED(ALL),      (OPT)   LIST DETAIL|SUMMARY|ALL DATASETS
*        PROCESSED(ALL)      (OPT)   LIST DETAIL|SUMMARY|ALL DATASETS
*

* RUN A RECYCLE FOR GROUP# 21

  RECYCLE GROUP(21),         (REQ)   GROUP
  SUBGROUP(*),               (OPT)   SUBGROUP *=ALL, S|M|L
  SOURCE(PRI),               (OPT)   INP VOLUMES PRIMARY|DUPLEX
  TARGET(BOTH),              (OPT)   OUT VOLUMES PRIMARY|DUPLEX|BOTH
  PERCENT(50),               (OPT)   MAX % USED FOR SELECTION
  MAXVOLS(1000),             (OPT)   MAX # VOLUMES TO SELECT
  DEVTYPE(*),                (OPT)   SELECT 3480,3490,3590, *=ALL
  PRIORITY(LMS)              (OPT)   SELECTION PRIORITY

* RUN A RECYCLE FOR GROUP# 22....

  RECYCLE GROUP(12),         (REQ)   GROUP
  SUBGROUP(*),               (OPT)   SUBGROUP *=ALL, S|M|L
  SOURCE(PRI),               (OPT)   INP VOLUMES PRIMARY|DUPLEX
  TARGET(BOTH),              (OPT)   OUT VOLUMES PRIMARY|DUPLEX|BOTH|*
  PERCENT(300),              (OPT)   MAX % USED FOR SELECTION
  MAXVOLS(100),              (OPT)   MAX # VOLUMES TO SELECT
  DEVTYPE(*),                (OPT)   SELECT 3480,3490,3590, *=ALL
  PRIORITY(LMS)              (OPT)   SELECTION PRIORITY

* RECYCLE MORE GROUPS AS NEEDED..

//
* $$ EOJ
```

## Command Input

The RECYCLE utility accepts various commands that contain specifications for execution parameters.

Example:

```
SET MODE(SIM)
SET LINECOUNT(60)
SET CART3480(00400),CART3490(00800),CART3590(10000)
RECYCLE GROUP(21),SUBGROUP(*),PERCENT(50),
SOURCE(PRI),TARGET(BOTH)
```

## SET Command

The SET command establishes criteria for the overall utility operation. It establishes the environment for the current run of RECYCLE.

Syntax:

```
SET
MODE(SIM|LIVE|SYNTAX),LINECOUNT(nn),CART3480(nnnnn),
          CART3490(nnnnn),CART3590(nnnnn)
```

**MODE(SIMULATE |LIVE |SYNTAX) – optional, default value: LIVE**

SIMULATE runs RECYCLE in a test mode. SIMULATE allows you to:

- Test the effects of the commands provided without making any changes to your CA-Vtape system, system catalogs, tape management catalogs, or tape data.
- Understand the average percentage of utilization in the physical backstore volumes. SIMULATE produces reports that shows which physical volumes would be processed.
- Tune your selection criteria in order to minimize processing cycles while producing a significant number of scratch tapes.

Specifying LIVE causes RECYCLE to merge files onto new tape volumes. It reads and consolidates tape data sets and catalogs them onto new physical tape volumes. LIVE is the default.

Specifying SYNTAX instructs RECYCLE to perform a syntax check of the remaining control card commands.

**LINECOUNT(nn) – optional, default value: 60**

This parameter determines the number of lines per page printed on output reports. The default value is 60 if LINECOUNT is not specified.

**CART3480(nnnnnn) – optional, default value: 400**

Specifies the estimated megabyte capacity for 3480 tape cartridge devices. This parameter is used to:

- Calculate the percentage of cartridge utilization.
- Estimate or project the number of output cartridge volumes for simulation purposes.

**CART3490(nnnnnn) – optional, default value: 800**

Specifies the estimated megabyte capacity for 3490 tape cartridge devices. This parameter is used to:

- Calculate the percentage of cartridge utilization.
- Estimate or project the number of output cartridge volumes for simulation purposes.

**CART3590(nnnnnn) – optional, default value: 10000**

Specifies the estimated megabyte capacity for 3590 tape cartridge devices. This parameter:

- Calculates the percentage of cartridge utilization.
- Estimates or project the number of output cartridge volumes for simulation purposes.

## REPORT Command

The REPORT command determines the level of detail produced in various printed RECYCLE reports.

Syntax:

```
REPORT CANDIDATE(ALL|DETAIL|SUMMARY|NONE),
SELECTED(ALL|DETAIL|SUMMARY|NONE),
PROCESSED(ALL|DETAIL|SUMMARY|NONE)
```

**CANDIDATE(ALL|DETAIL|SUMMARY|NONE) – optional, default value: ALL**

The CANDIDATE report displays all virtual volume files considered for selection. This command option allows you to control the level of detail, which is printed in this section of the reports.

**SELECTED(ALL |DETAIL |SUMMARY |NONE) – optional, default value: ALL**

The SELECTED report displays all virtual volume files selected for RECYCLE. The files selected for processing are determined by parameters specified in other control cards. This command option allows you to control the level of detail, which is printed in this section of the reports.

**PROCESSED(ALL |DETAIL |SUMMARY |NONE) – optional, default value: ALL**

The PROCESSED report displays all virtual volume files merged by RECYCLE. This command option allows you to control the level of detail, which is printed in this section of the reports.

## RECYCLE Command

The RECYCLE command specifies the selection criteria for each group/subgroup process. Multiple commands may be specified for each execution of the utility.

When multiple requests are specified, they are processed in the order specified. To run multiple requests concurrently, create a separate job for each RECYCLE request.

Syntax:

```
RECYCLE GROUP(nn),SUBGROUP(*|S|M|L),SOURCE(PRIMARY|DUPLEX),
TARGET(*|PRIMARY|DUPLEX|BOTH),PERCENT(nn),MAXVOLS(nnnn),
DEVTYPE(*|3480|3490|3590),PRIORITY(L|M|S)
```

**GROUP(nn) - required**

Specify the group number to be processed. Each command processes a single virtual volume group. Only files from a single group are stored on any one physical volume (files from different groups/subgroups are not placed on the same physical volume). RECYCLE processing is serialized at a group level. If RECYCLE determines another job is attempting to process the same group, it will print an error message and continue processing at the next command.

**SUBGROUP(* |S |M |L) – optional, default value: L**

Specify a specific subgroup to be selected for processing. Specify an asterisk (*) to select all subgroups. Specify S, M or L to include physical volumes from the SHORT, MEDIUM, or LONG retention period subgroups. RECYCLE keeps all data sets for each subgroup on separate output physical volumes.

Example of SUBGROUP selection:

```
SUBGROUP(*)
SUBGROUP(L)
```

**SOURCE(PRIMARY|DUPLEX) – optional, default value: PRIMARY**

Indicates the source of the input physical volumes to be used for processing. PRIMARY instructs RECYCLE to read primary virtual tape volumes. DUPLEX instructs RECYCLE to read the duplex copy of the virtual tape volumes.

**Note:** Duplex data sets are only created for CA-Vtape groups defined with a duplex unit type. If DUPLEX is specified for a group which is not defined to have a duplex unit an error message is produced. If BOTH is specified, RECYCLE ignores the duplex output and only produces the primary.

**TARGET(* |PRIMARY |DUPLEX |BOTH) – optional, default value: * (asterisk) all**

RECYCLE can create output as primary, duplex or both types of virtual volumes. An asterisk (*) indicates that the backstore data sets created by RECYCLE are to be the same type as the input data sets. PRIMARY or DUPLEX indicates that the output data sets are to be primary or duplex, regardless of the input data set. BOTH specifies that the primary and duplex copy are to be created regardless of input type.

**PERCENT(nnnnnn) – optional, default value: 999999**

Determines the used space threshold selection criteria to be used in determining which physical backstore volumes are to be processed. Selection is determined based on the percentage of used space on a physical volume. If not specified, 999999 is used which indicates that all volumes regardless of percentage of utilization are to be selected. PERCENT(40) selects group tapes having less than 40% unexpired data (60% of the data on the tape is expired).

**MAXVOLS(nnnnnn) – optional, default value: 999999**

Specifies a maximum number of input physical tape volumes to process. This parameter is a way of limiting the elapsed run time. For example, specify MAXVOLS(50) to limit RECYCLE processing to 50 volumes.

**Note:** MAXVOLS can be overridden by RECYCLE processing. If a virtual volume consists of several backstore files spanning multiple physical volumes, all of the files are moved even if this causes RECYCLE to exceed the MAXVOLS parameter.

**DEVTYPE(* |3480 |3490 |3590) – optional, default value: 3480**

Specifies a physical volume device type from which input physical volumes are to be selected for processing. DEVTYPE(3490) selects only input physical tape volumes stored on that device type.

This can be helpful in recycling physical volumes from one device type to another. An asterisk indicates to select all device types and is the default value.

**Note:** DEVTYPE can be overridden by RECYCLE processing. If a virtual volume consists of several backstore files spanning multiple physical volumes and some of those volumes are of different device types, then all of the files are moved, even if this causes RECYCLE to override the DEVTYPE parameter.

**PRIORITY(SML |SLM |MSL |MLS |LSM |LMS) – optional, default value: LMS**

Specifies the preference or processing order for selecting subgroups. If not specified, RECYCLE selects and processes subgroups in LONG, MEDIUM, SHORT order. To modify this processing order, specify an alternate processing sequence. When used in combination with the MAXVOLS parameter, this parameter helps to insure the most important subgroup volumes are selected for processing first. For example: specifying PRIORITY(MLS) indicates to process MEDIUM, LARGE and then SHORT volumes.

## Reports

RECYCLE creates several reports to assist in analyzing its processing and tuning your parameters. This can help you to achieve the best results.

## Candidate Virtual Volume Files

This report shows a list of all candidate virtual volume files that are considered for selection. Only virtual volume files for the selected groups and subgroups are shown.

```
RECYCLE.SVTRC125.A CA-VTAPE COPYRIGHT(C)1999, COMPUTER ASSOCIATES SOFTWARE 09:49:20 06/01/99
PAGE# 1
 CA-VTAPE V1.2.0                CANDIDATE VIRTUAL VOLUME FILES
 GROUP# 21                       SORTED BY PHYSCIAL FILENAME

VIRTUAL DSN    PHYSICAL   FILE    ESTIMATED
GROUP   SUB     VOLSER    SEQ      VOLSER     SEQ#   #MB.USED     PHYSICAL FILENAME          REF#
-----   ---    ------     ---     ------    ------  --------     -------------------------- ----
   21     S    899000     P       211060      20        312      SVTS.VVE.V899000.PRIMARY     61
   21     L    899001     P       200219       1         12      SVTS.VVE.V899001.PRIMARY      1
   21     L    899002     P       202939       2        352      SVTS.VVE.V899002.PRIMARY      9
   21     L    899003     P       200219       2         72      SVTS.VVE.V899003.PRIMARY      2
   21     L    899006     P       200219       3          8      SVTS.VVE.V899006.PRIMARY      3
   21     L    899008     P       200219       5          8      SVTS.VVE.V899008.PRIMARY      4
   21     S    899009     P       211060      21        312      SVTS.VVE.V899009.PRIMARY     62
   21     L    899010     P       202939       3          8      SVTS.VVE.V899010.PRIMARY     10
   21     S    899011     P       211060       4        400      SVTS.VVE.V899011.PRIMARY     58
   21     S    899012     P       209955       7        400      SVTS.VVE.V899012.PRIMARY     39
   21     S    899013     P       211060       1        224      SVTS.VVE.V899013.PRIMARY     57
   21     S    899014     P       211060       5         68      SVTS.VVE.V899014.PRIMARY     59
   21     S    899015     P       211060       6        312      SVTS.VVE.V899015.PRIMARY     60
   21     S    899016     P       209030       7        312      SVTS.VVE.V899016.PRIMARY     24
   21     S    899024     P       212128      13        156      SVTS.VVE.V899024.PRIMARY     84
   21     S    899024     P2      212467       1        156      SVTS.VVE.V899024.PRIMARY    285
   21     L    899029     P       202939       4          8      SVTS.VVE.V899029.PRIMARY     11
   21     S    899030     P       211060      22         76      SVTS.VVE.V899030.PRIMARY     63
```

## Candidate Physical Backstore Volume Utilization

This report shows a list of the candidate physical backstore volumes that were considered by the selection process. Only volumes for the specified group and subgroup are shown.

```
RECYCLE.SVTRC125.1 CA-VTAPE COPYRIGHT(C)1999, COMPUTER ASSOCIATES SOFTWARE 09:49:20 06/01/99
PAGE# 5
CA-VTAPE V1.2.0         CANDIDATE PHYSICAL BACKSTORE VOLUMES
GROUP# 21            UTILIZATION STATISTICS SORTED BY PHYSICAL VOLSER

             PHYSICAL           -- ESTIMATED --              AVERAGE
GROUP   SUB  VOLSER    DEVT     %USED   #MB.USED   #FILES   #MB/FILE   VDSXREF#   REF#
-----   ---  ------    ----     ------  --------   ------   ---------  --------  --------
 21      L   200219    3480       25       100        4        25.0       1         1
 21      S   200786    3480       44       176        3        58.6       5         2
 21      L   202939    3480      104       416        4       104.0       8         3
 21      L   203248    3480        2         8        1         8.0      12         4
 21      S   203943    3480       87       350        3       116.6      13         5
 21      S   204587    3480       57       228        2       114.0      16         6
 21      S   204819    3480       56       224        2       112.0      18         7
 21      L   206875    3480        2         8        1         8.0      20         8
 21      S   209030    3480      350      1400        4       350.0      21         9
 21      S   209141    3480      105       420        4       105.0      25        10
 21      S   209149    3480      178       712        5       142.4      29        11
 21      S   209744    3480       29       116        3        38.6      34        12
 21      S   209955    3480      217       870        3       290.0      37        13
 21      S   210009    3480      122       488        3       162.6      40        14
```

```
 21      S    210080    3480        11       44          1        44.0      43        15
```

## Candidate Physical Backstore Volume Utilization

This report summarizes the overall status of CA-Vtape physical backstore volumes prior to the RECYCLE process.

```
RECYCLE.SVTRC125.3 CA-VTAPE COPYRIGHT(C)1999, COMPUTER ASSOCIATES SOFTWARE       09:49:22
06/01/99 PAGE# 7
CA-VTAPE V1.2.0            CANDIDATE PHYSICAL BACKSTORE VOLUMES
GROUP# 21        UTILIZATION STATISTICS SUMMARIZED BY DEVICE TYPE & SUBGROUP

- - - - - - - - - I N P U T - - - - - - - - - -
DEVICE       SHORT      MEDIUM      LONG         TOTAL          DESCRIPTION
------   ---------   ---------   -------     ---------   --------------------------
3480           8.8         0.0       0.6           9.5           #GB USED
                18           1         5            24       #PHYSICAL VOLUMES
             122.6        24.0      31.4          59.3       AVG#(%USED/VOLUME)
             490.6        96.0     125.6         398.1     AVG#(#MB.USED/VOLUME)
                61           8        18            87        #PHYSICAL FILES
               3.3         8.0       3.6           3.6       AVG#(FILES/VOLUME)
             144.7        12.0      34.8         109.8      AVG#(#MB.USED/FILE)

TOTALS         8.8         0.0       0.6           9.5           #GB USED
                18           1         5            24       #PHYSICAL VOLUMES
             490.6        96.0     125.6         398.1     AVG#(#MB.USED/VOLUME)
                61           8        18            87        #PHYSICAL FILES
               3.3         8.0       3.6           3.6       AVG#(FILES/VOLUME)
             144.7        12.0      34.8         109.8      AVG#(#MB.USED/FILE)
```

## Selected Virtual Volume Files

This report provides a list of the virtual volume files that were selected for processing based on input command parameters.

```
RECYCLE.SVTRC125.C CA-VTAPE COPYRIGHT(C)1999, COMPUTER ASSOCIATES SOFTWARE       22:55:35
06/16/99 PAGE# 4
CA-VTAPE V1.2.0              SELECTED VIRTUAL VOLUME FILES
GROUP# 21

          VIRTUAL  DSN  PHYSICAL  FILE  ESTIMATED
GROUP  SUB  VOLSER  SEQ  VOLSER    SEQ#  #MB.USED     PHYSCIAL FILENAME
-----  ---  ------  ---  ------  ------  --------     -------------------------------------
  21    S  899341  P    210965       1         8     SVTS.VVE.V899341.PRIMARY
  21    S  899342  P    210965       2         8     SVTS.VVE.V899342.PRIMARY
  21    S  899317  P    210965       3         8     SVTS.VVE.V899317.PRIMARY
  21    S  899319  P    210965       4         8     SVTS.VVE.V899319.PRIMARY
  21    S  899069  P    211982       3        12     SVTS.VVE.V899069.PRIMARY
  21    S  899070  P    211982       4        12     SVTS.VVE.V899070.PRIMARY
  21    S  899072  P    211982       5        12     SVTS.VVE.V899072.PRIMARY
  21    S  899065  P    212662       1        12     SVTS.VVE.V899065.PRIMARY
  21    S  899079  P    212662       2        12     SVTS.VVE.V899079.PRIMARY
  21    S  899090  P    212662       3        12     SVTS.VVE.V899090.PRIMARY
  21    S  899035  P    212662       4        56     SVTS.VVE.V899035.PRIMARY
  21    S  899036  P    212662       5        56     SVTS.VVE.V899036.PRIMARY
  21    S  899458  P    200786      45         8     SVTS.VVE.V899458.PRIMARY
  21    S  899460  P    200786      47         8     SVTS.VVE.V899460.PRIMARY
  21    S  899266  P    200786      52       160     SVTS.VVE.V899266.PRIMARY
  21    S  899266  P2   210213       1       160     SVTS.VVE.V899266.PRIMARY2
```

## Output Projection for Selected Virtual Volume Files

This report summarizes the results of the RECYCLE process. The left side of the report shows the input statistics and the right side shows the estimated results of performing a LIVE merge run.

```
RECYCLE.SVTRC125.4 CA-VTAPE COPYRIGHT(C)1999, COMPUTER ASSOCIATES SOFTWARE 09:49:23 6/01/99 PAGE#
9
CA-VTAPE V1.2.0    PROJECTED OUTPUT FOR SELECTED VIRTUAL VOLUME FILES
GROUP# 21          UTILIZATION STATISTICS SUMMARIZED BY DEVICE TYPE & SUBGROUP

- - - - I N P U T - - - - - P R O J E C T E D O U T P U T -
DEVICE  SHORT   MEDIUM    LONG   TOTAL   DESCRIPTION        SHORT    MEDIUM     LONG    TOTAL
------  ------   ------    ----  ------ ------------------ ------   -------   ------   -----
3480     0.0       0.0    0.2    0.3   #GB USED           0.0       0.0        0.2     0.3
           0         1      4      5   #PHYSICAL VOLUMES    0         1          1       2
         0.0      24.0   13.2   18.6   AVG#(%USED/VOLUME) 0.0      24.0       53.0    38.5
         0.0      96.0   53.0   61.6   AVG#(#MB.USED/VOL) 0.0      96.0      212.0   154.0
           0         8     14     22   #FILES (DATA SETS)   0         8         14      22
         0.0       8.0    3.5    4.4   AVG#(FILES/VOLUME) 0.0       8.0       14.0    11.0
         0.0      12.0   15.1   14.0   AVG#(#MB.USED/FILE)0.0      12.0       15.1    14.0

TOTALS   0.0       0.0    0.2    0.3   #GB USED           0.0       0.0        0.2     0.3
           0         1      4      5   #PHYSICAL VOLUMES    0         1          1       2
         0.0      96.0   53.0   61.6   AVG#(#MB.USED/VOL) 0.0      96.0      212.0   154.0
           0         8     14     22   #FILES (DATA SETS)   0         8         14      22
         0.0       8.0    3.5    4.4   AVG#(FILES/VOLUME) 0.0       8.0       14.0    11.0
         0.0      12.0   15.1   14.0   AVG#(#MB.USED/FILE)0.0      12.0       15.1    14.0
```

## Processed Exception Report

This report provides a list of the virtual volume data sets that while selected were not actually processed by RECYCLE.

```
RECYCLE.SVTRC130.E CA-VTAPE COPYRIGHT(C)1999, COMPUTER ASSOCIATES SOFTWARE       23:29:55
06/16/99 PAGE# 6
CA-VTAPE V1.2.0               RECYCLE PROCESSING EXCEPTIONS
GROUP# 21                     REPORTED IN PROCESSING ORDER

         VIRTUAL DSN          RETCODE
GROUP SUB VOLSER SEQ MESSAGE# RSNCODE DESCRIPTION
----- --- ------ --- -------- ------- ------------------------------------------------------------

NO PROCESSING EXCEPTIONS.
```

## Processed Virtual Volume Data Sets

This report provides a list of the virtual volume data sets that were merged by RECYCLE.

```
RECYCLE.SVTRC130.D CA-VTAPE COPYRIGHT(C)1999, COMPUTER ASSOCIATES SOFTWARE       23:29:55
06/16/99 PAGE# 7
CA-VTAPE V1.2.0        VIRTUAL VOLUME FILES RECYCLED TO PRIMARY
GROUP# 21              REPORTED IN PROCESSING ORDER

           VIRTUAL DSN  PHYSICAL  FILE ESTIMATED
GROUP  SUB VOLSER  SEQ  VOLSER    SEQ#   #MB.USED     PHYSCIAL FILENAME
----- --- ------  ---  ------  ------   -------    ----------------------------------
   21   S  899341   P   201743       1          8     SVTS.VVE.V899341.PRIMARY
   21   S  899342   P   201743       2          8     SVTS.VVE.V899342.PRIMARY
   21   S  899317   P   201743       3          8     SVTS.VVE.V899317.PRIMARY
   21   S  899319   P   201743       4          8     SVTS.VVE.V899319.PRIMARY
   21   S  899069   P   201743       5         12     SVTS.VVE.V899069.PRIMARY
   21   S  899070   P   201743       6         12     SVTS.VVE.V899070.PRIMARY
   21   S  899072   P   201743       7         12     SVTS.VVE.V899072.PRIMARY
   21   S  899065   P   201743       8         12     SVTS.VVE.V899065.PRIMARY
   21   S  899079   P   201743       9         12     SVTS.VVE.V899079.PRIMARY
   21   S  899090   P   201743      10         12     SVTS.VVE.V899090.PRIMARY
   21   S  899035   P   201743      11         56     SVTS.VVE.V899035.PRIMARY
   21   S  899036   P   201743      12         56     SVTS.VVE.V899036.PRIMARY
   21   S  899458   P   201743      13          8     SVTS.VVE.V899458.PRIMARY
   21   S  899460   P   201743      14          8     SVTS.VVE.V899460.PRIMARY
   21   S  899266   P   201743      15        258     SVTS.VVE.V899266.PRIMARY
   21   S  899266   P2  201899       1         62     SVTS.VVE.V899266.PRIMARY
```

## Processed Physical Backstore Volume Utilization

This report summarizes the results of the RECYCLE process. The left side of the report shows the primary output statistics and the right side shows duplex output statistics.

```
RECYCLE.SVTRC130.5 CA-VTAPE COPYRIGHT(C)1999, COMPUTER ASSOCIATES SOFTWARE       23:29:56
06/16/99 PAGE# 8
CA-VTAPE V1.2.0       RESULTS FOR RECYCLED VIRTUAL VOLUME DATA SETS
GROUP# 21        UTILIZATION STATISTICS SUMMARIZED BY DEVICE TYPE & SUBGROUP

-   - - - P R I M A R Y - - - - - - - - - D U P L E X - - - - - - -
DEVICE    SHORT   MEDIUM  LONG    TOTAL      DESCRIPTION       SHORT MEDIUM   LONG   TOTAL
-------  -----   ------  ----     ----   -------------------  ----- ------  -----  -----
3480       0.5     0.0     0.0      0.5   #GB USED               0.0   0.0     0.0    0.0
             2       0       0        2   #PHYSICAL VOLUMES        0     0       0      0
          69.0     0.0     0.0      2.0   AVG#(%USED/VOLUME)     0.0   0.0     0.0    0.0
         276.0     0.0     0.0    276.0   AVG#(#MB.USED/VOLUME)  0.0   0.0     0.0    0.0
            16       0       0       16   #PHYSICAL FILES          0     0       0      0
           8.0     0.0     0.0      8.0   AVG#(FILES/VOLUME)     0.0   0.0     0.0    0.0
          34.5     0.0     0.0     34.5   AVG#(#MB.USED/FILE)    0.0   0.0     0.0    0.0
TOTALS     0.5     0.0     0.0      0.5   #GB USED               0.0   0.0     0.0    0.0
             2       0       0        2   #PHYSICAL VOLUMES        0     0       0      0
         276.0     0.0     0.0    276.0   AVG#(#MB.USED/VOLUME)  0.0   0.0     0.0    0.0
            16       0       0       16   #PHYSICAL FILES          0     0       0      0
           8.0     0.0     0.0      8.0   AVG#(FILES/VOLUME)     0.0   0.0     0.0    0.0
          34.5     0.0     0.0     34.5   AVG#(#MB.USED/FILE)    0.0   0.0     0.0    0.0
```

## Operator Commands

You can stop at a data set boundary logically by issuing a modify or stop command against the RECYCLE job. Enter a modify command such as:

```
F jobname,end
```

Or issue a stop command such as:

```
P jobname
```

The RECYCLE job completes the current physical file and then ends its processing.

## Multisystem Considerations

In LIVE mode, a number of RECYCLE jobs can be run concurrently as long as each is processing a different group. RECYCLE attempts to serialize processing at a group level, using either a systems level enqueue or through a flag in a shared data set which is serialized using hardware reserve. The method used by RECYCLE depends on the presence or absence of the GROUPENQ DD.

When //GROUPENQ DD is present, RECYCLE uses a systems level enqueue. This type of enqueue requires a GRS to operate safely in a multi-cpu environment. If you are running multiple RECYCLE jobs in a multi-cpu environment across multiple processors, this type of enqueue mechanism requires a GRS ring. If your environment does not have a GRS ring or you are concerned about performance you can alternately select to use a shared data set.

When //GROUPENQ DD is not present, RECYCLE uses flags in a share data set which are serially accessed under a hardware reserve. This type of serialization can safely operate in a multi-cpu environment without a GRS. This is accomplished by placing a data set on a shared pack that is accessible to all of the participating systems. Using hardware reserves the RECYCLE ensures that only one system has access to this shared data set at any one time. RECYCLE jobs issue a reserve, place a flag in the file representing a given group, and then releases or dequeues the file. This allows all RECYCLE jobs to determine if a given group is currently being processed. This type of serialization can also provide some performance advantages over GRS in a ring topology as long as the share pack does not have a significant contention.

For RECYCLE to use a shared file you must allocate and initialize the data set referenced by the GROUPENQ DD. This can be accomplished using the following jcl (this JCL is in the RSETGRP@ member).

```
//JOBCARD JOB ..., MSGLEVEL=0,MSGCLASS=X,NOTIFY=&SYSUID
//*****************************************************************
//* TO INITIALLY ALLOCATE AND INITIALIZE THE GROUPENQ FILE...
//* TO RUN MULTI-SYSTEM MAKE SURE THIS FILE IS ALLOCATED
//* ON A SHARED PACK.
//*****************************************************************
//MAKEGRP   EXEC PGM=SVTRCYCL,PARM='RESETGRP=ALL'    <-GROUP# = ALL
//STEPLIB   DD  DISP=SHR,DSN=YOUR.SVTS.LOADLIB       <-YOUR LOADLIB
//GROUPENQ  DD  DISP=(NEW,CATLG,DELETE),
//              DSN=&HLQ.RECYCLE.GROUPENQ,           <- SHARED MULTI-SYSTEM
//              UNIT=SYSDA,SPACE=(TRK,(1,0)),        <- FILE AND PACK
//              DCB=(DSORG=PS,RECFM=F,LRECL=4096,BLKSIZE=4096)
//
```

If RECYCLE is cancelled after it begins processing, the flag representing the current group may not be cleared. Subsequent RECYCLE jobs do not attempt to process a group whose flag has not been cleared. If a flag is left on in error, you can manually clear it by deleting and then redefining the shared data set. Doing this clears all of the flags in the file. Alternatively, you can opt to simply clear a single flag using the following sample JCL:

```
//JOBCARD JOB ..., MSGLEVEL=0,MSGCLASS=X,NOTIFY=&SYSUID
//*****************************************************************
//* IN THE EVENT OF A ENQ PROBLEM YOU CAN RESET A SPECIFIC
//* GROUP# LIKE THIS. OTHERWISE YOU CAN ALWAYS DELETE AND
//* REDEFINE THE FILE...
//*****************************************************************
//RSETAGRP  EXEC PGM=SVTRCYCL,PARM='RESETGRP=21'    <-GROUP# = nnn or ALL
//STEPLIB   DD DISP=SHR,DSN=YOUR.SVTS.LOADLIB       <-YOUR LOADLIB
//GROUPENQ  DD DISP=SHR,DSN=&HLQ.RECYCLE.GROUPENQ.
```

Chapter

# 11 Troubleshooting

If a job or application appears to stop or "hang" on a virtual device, use the steps described in this chapter to resolve any problems with a CA-Vtape virtual device. If the hang condition cannot be resolved, additional steps can be taken to gather additional documentation and to protect the system.

## System Console Activity

Perform one of the following console commands:

1. Issue a "D R,L", looking for any outstanding messages requesting a reply that can be affecting the job, CA-Vtape, or a virtual device. Follow the instructions for any specific message and its reply.
2. Issue "SVTS D A" to display virtual device activity. This also places information into the system log for later reference, if necessary.
3. Issue a "D U,,,xxxx,1" where xxxx is the address of the virtual device to record additional information.
4. Allow the CA-Vtape missing interrupt handler time to perform its function of detecting and correcting missing interrupts. Wait 10 minutes before proceeding. If the device still appears hung, create a dump of CA-Vtape and the job or application to help diagnose the problem.
5. If other system resources appear to be impacted by the device, do the following:

   **Note:** Use with caution and only when a device is not responding.

   – Issue "D GRS,RES(SYSIEFSD,Q4) - If CA-Vtape is holding this resource exclusively, then issue "SVTS INTERRUPT=xxxx" where xxxx is the virtual device exclusively holding the resource.

     For related information, see the command INTERRUPT in the section "SVTS ACTION Commands" in the chapter "Using CA-Vtape."

   – If the problem appears to effect several devices, check the system log for messages such as the ones shown in Figure 11-1.

**FIGURE 11-1 SDSF SYSLOG Example 1**

```
0290   SVTS D G
0090   SVTSX0300I  Cache Size (MB) 00008040/00008040/00000280      096% 289
0090               Max Drives=00000002   Threshold=050%
0090               Group   Short         Medium        Long        Percent
0090               11      00004560(A)   00000000(H)   0000000(H)  056%
0090               12      00000080(H)   00000000(H)   0000000(H)  000%
0090   SVTSX0100I  Command Completed Successfully
0090   SVTSD0908I  SVTS Cache Shortage - 096% Utilization Reached
0090  *53 SVTS0432W 3504,100556, Cache shortage, Reply R(etry) or C(ancel)
0090  *53 SVTS0432W 3501,100557, Cache shortage, Reply R(etry) or C(ancel)
0090   CTS014              IEF23E K 3507,100544,PVT,RIDOSDI4
0094   IEF234E     K 3507,100544,PVT,RIDOSD14
0094   IEF404I     RIDOSD14 - ENDED - TIME=17.56.48
0090   SVTSD0908I SVTS Cache Shortage - 077% Utilization Reached
0094   GSVX321W (MVSDATA) Threshold CPU CPU% ALL NORMAL V=16% W=90% P=95%
0094   GSVX321W (MVSDATA) Threshold CPU CPU% 0000 NORMAL V=16% W=90% P=95%
0290   SVTS SET THRESHOLD=080
0090   SVTSX0100I   Command Completed Successfully
0090   SVTSD0912I   SVTS Cache Shortage Relieved
```

**Note:** If the disk cache reaches 100% utilization, all virtual devices stop.

SVTSD0908I is sent every minute after the cache threshold is reached, and continues to be sent until the cache is relieved (SVTSD0912I).

This can be caused by any of the following reasons:

- An insufficient cache pool size.
- Insufficient number or types of physical drives externalizing the virtual volumes to physical tape.
- The externalization is not active for the group/subgroup using most of the cache.

Corrective action includes the following:

- Select option 3 on the CA-Vtape main menu to display the virtual volumes.
- Review the “MB freeable” field. This indicates the amount of the cache space available to be reclaimed for use by new output processing. If this value approaches zero, CA-Vtape cannot write new data and present busy to the output tasks. Before this value reaches zero:
  - Check for problems with physical drives.
  - Make additional drives available to CA-Vtape and ensure the maximum number of drives setting is not too low.
  - The number of drives in use and the maximum setting are found on the Group Display panel. There may be a problem with a specific group queue. Select Q to display the group queue and to view the progress of a specific queue. Both virtual and physical devices are shown by selecting option 2 on the Main menu to view any pending mounts that are not resolved. This is the device status panel.

- To verify the situation, use the SVTS D,G command to show all the groups with data in cache, and check the externalization engine status for each subgroup.
  - (A) active
  - (H) Halt

  Start all the externalization for the required group/subgroups to relieve the condition. Use the SVTS SET MAXDRIVES command to define more physical drives and speed up the process.

## GTF Trace

The virtual devices are provided with GTF Trace capability with output that formats exactly like a physical volume GTF trace.

## WTO Messaging

SVTS provides user enabled WTO messaging. The messages are generated at various points in the allocation, mount, staging and release phases of operation to provide easy reporting on operation progress if desired.

## IPCS

SVTS is provided with an IPCS VERBX exit to detail SVTS control block structures used in problem determination, viewed in system dumps or active data.

## Reporting on EMPTY Virtual Volumes

When processing does not complete successfully or when operators reply C(ancel) to Vtape processing, empty or apparently empty virtual volumes may be created.

CA-Vtape will try to recover from all known error paths, but occasionally recovery may not be complete. Recreation of the problem, or documentation of the problem may be impossible to obtain. We have identified at least one condition that falls into this category, and the symptom is a S813 abend on the virtual volume at some point after the failure. A report to show virtual volumes in this condition selects those virtual volumes which indicate they are Non-Scratch, reside In-Cache but have no Data Set Files associated with the volume.

The report is generated by running the LIST=EMPTY report. The same JCL used in the LIST=CACHE report should be used. It is suggested the report be scheduled weekly. If any errors are shown it may be helpful to run more frequently until diagnosis is complete.

If any Virtual Volumes are listed on this report, please call technical support to help diagnose the error conditions and recovery procedures required. Normally at least the IPCS Verbx output, a LIST=CACHE report, and an Idcams print of the first few blocks of the 1st LDS in the Verbx LDS table for the virtual will be required.

Appendix

A

# Installing CA-Vtape

This appendix provides the information necessary to install and run the CA-Vtape software. Read the installation instructions completely before starting the install process.

To ensure a successful installation, the following prerequisites must be met:

- OS/390 2.6 and above and z/OS 1.1 and above running in 31-bit or 64-bit mode with JES2 and TSO/ISPF access.
- Access to SYS1.PROCLIB or similar library in the JES2 proclib concatenation.
- Enough security authority to permit the SVTS, SVTSIO and SVTSAS STCs full access to its own data sets.
- Any Tape Management System (TMS).
- IBM APAR OW27191: ABEND18A.

The overall steps to install CA-Vtape are:

1. Decide on CA-Vtape load library names and APF authorize them. See the section "Before Starting" in this appendix.
2. Unload the tape that came with these instructions. See the section "SMP/E Installation of CA-Vtape" in this appendix.
3. Follow the SMP/E installation instructions beginning with "Prepare the SMP/E Environment" in the section "SMP/E Installation of CA-Vtape" in this appendix.
4. Follow the Customization instructions beginning with the section "The Customization Process" in this appendix.
5. Start CA-Vtape using the instructions under the topic "Start the SVTS Subsystem" in the section "To Begin the Install Process" in this appendix.
6. Activate the virtual volumes by completing the topic "Varying the Virtual Devices Online" in the section "To Begin the Install Process" in this appendix.
7. Verify the installation was successful by executing some test jobs as described in the section "Verifying the Installation" in this appendix.
8. Complete the installation by following the instructions in the section "IVP Process" in this appendix.

# Before Starting

CA-Vtape can install into the same target libraries and target/distribution zones as CA-Vantage, CA-Compress and CA-Allocate. Or, you can install CA-Vtape into separate libraries and zones.

The RIMLIB data set on the distribution tape contains all the jobs you need to install CA-Vtape with SMP/E.

You are asked to substitute variables throughout the RIMLIB, for example "Change YOUR.SAMS to your high level qualifier for SAMS products." The variable YOUR.SAMS is used consistently throughout RIMLIB, so if your facility mass updates PDS members, you can change all of the YOUR.SAMS values at one time.

After you are done with the SMP/E portion of the installation, you work with a series of panels to customize CA-Vtape to your particular installation and to allocate the files that are needed to operate CA-Vtape.

If you are going to run CA-Vtape in a multi-system configuration then review the section "Multi-system Configurations" in the chapter "Performance and Customization" of this guide.

If you have STK tape hardware controlled by STK's Host Software Component (HSC), please refer to the section "Host Software Component (HSC) for STK Tape Devices" in this appendix for important installation considerations.

## Decide the following:

| | |
|---|---|
| **CA-Vtape Prefix:** | A prefix (1 or more qualifiers) for the CA-Vtape software libraries. If you are installing into an existing zone and libraries, your high level must match the high level you are already using. Installing CA-Vtape creates additional libraries under this prefix. |
| **GLOBAL Volume:**<br>**Target Volume:**<br>**Distribution Volume:** | DASD volumes for the GLOBAL, target, and distribution data sets. You can also place all of these data sets on the same volume. |
| **SMPTLIB Volume:** | A volume for SMPTLIB data sets. These data sets are deleted after you accept the base function. |
| **PROCLIB Name:** | The system proclib where the CA-Vtape started task JCL will reside. |
| **RIMLIB:**<br>**PGMDIR:** | The name of your Related Installation Materials (RIMLIB) and Program directory (PGMDIR) data sets. |

| | |
|---|---|
| **LDS Database HLQ:** | A high level qualifier for the CA-Vtape cache and database data sets. This name is release independent. |

## APF Authorize the Load Libraries

After you have decided the values above, you know the data set names and volsers of the APF authorized libraries. Doing this in advance allows you to test executions immediately after installation and during customization of CA-Vtape.

**Miscellaneous Items**

There are several tasks you can accomplish before you receive the installation tape:

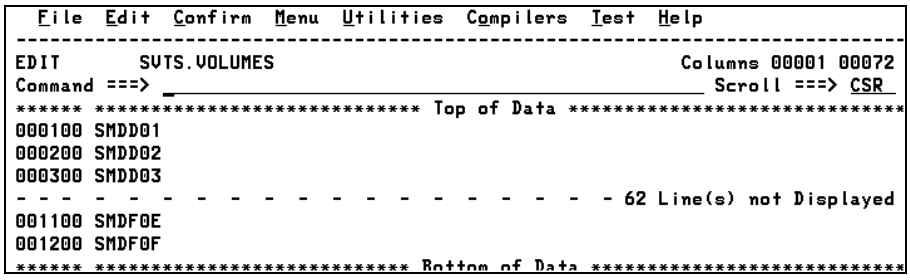
1. **JOBCARD information:** You are prompted for JOBCARD information. Having this information available makes the install process run smoothly.
2. **Virtual Device Addresses:** These addresses can be established ahead of time by your systems programmer. Initially define at least 16 (xx0-xxF) virtual addresses, but you can add to this total as your virtual world expands.
3. **Security Access:** SVTS and SVTSIO must be defined as Started Tasks and ensure the SVTS started task has enough authority to access all of its own CA-Vtape data sets. The minimal access required is UPDATE or OUTPUT, depending on your security package.
4. **Data set for DASD Cache:** This is a sequential data set that stores private volumes to be used for DASD cache. Use the following SPACE and DCB attributes:

   ```
   SPACE=(TRK,(2,1)),DCB=(LRECL=80,BLKSIZE=23440,RECFM=FB)
   ```

   **Note:** This data set is only required if you do not plan to use a DFSMS Storage Group to allocate the cache data sets.

Entries in the DASD Cache data set will contain only one line per volume as shown in Figure A-1.

**FIGURE A-1 ISPF Display of DASD Cache Volumes**




# Determining DASD Volumes for Cache

The effective capacity for the various DASD device types is less than the total DASD device capacity. What follows is a breakdown for each device type, for both the 400Mb and 800Mb virtual volume sizes. Assumptions for all of the device types are that the devices contain no other data, and that two cylinders contain the VTOC, VTOC Index, and the VVDS. Each virtual volume is backed by up to 10 LDS data sets of either 40 or 80Mb to make up the 400Mb or 800Mb virtual volume.

The calculations used to calculate the figures in the table below are as follows:

Effective tracks are total cylinders per device minus 2 (VTOC, VVDS, etc.) multiplied by 15 tracks per cylinder. Tracks per LDS are actual values. Maximum LDS = Effective Tracks / Tracks per LDS. Effective Capacity Mb = Maximum LDS * 40Mb or 80Mb. Using the 3380-K in the first table as an example:

39,795 / 1025 = 38.82 which is truncated to 38.

38 * 40 = 1,520

Therefore, when using 3380-K as CA-Vtape cache devices, you can use the Effective Capacity Mb multiplied by the number of volumes to calculate the appropriate cache size. However, since the installation REXX procedure rounds down the number of LDS files allocated to correspond to a whole number of virtual volumes (10 LDS for each virtual volume), there are circumstances when less than the maximum number of LDS files are allocated.

TABLE A-1 Device Capacity Table for 400Mb Virtual Volumes and 40Mb LDS Files

| Device Type | Effective Tracks | Tracks per LDS | Maximum LDS | Effective Capacity Mb |
|---|---|---|---|---|
| 3380-K | 39,795 | 1025 | 38 | 1520 |
| 3390-3 | 50,055 | 854 | 58 | 2320 |
| 3390-9 | 150,225 | 854 | 175 | 7000 |

TABLE A-2 Device Capacity Table for 800Mb Virtual Volumes and 80Mb LDS Files

| Device Type | Effective Tracks | Tracks per LDS | Maximum LDS | Effective Capacity Mb |
|---|---|---|---|---|
| 3380-K | 39,795 | 2049 | 19 | 1520 |
| 3390-3 | 50,055 | 1707 | 29 | 2320 |
| 3390-9 | 150,225 | 1707 | 88 | 7040 |

# The SMP/E Process

The installation is done with SMP/E using the Receive-Apply-Accept method. SMP/E invokes the linkage editor and IEBCOPY to download the distribution tape, and to install it into the target and distribution libraries.

We have provided sample jobs to set up a complete SMP/E environment. If you already have an established SMP/E environment, skip the steps you do not need to perform.

All of the data sets needed to install SAMS products with SMP/E are internally defined as DDDEF entries. There is no need for an SMP/E proc. Execute the SMP program using "PARM=`CSI=...." as documented in the SMP/E manual. You can also use the ISPF interface provided with SMP/E.

This installation process installs CA-Vtape under the FMID of **SVT1120**.

CA-Vtape is distributed on a standard label tape. The VOLSER of the distribution tape and its format is documented in the current CA-Vtape  Cover Letter.

# SMP/E Installation of CA-Vtape

Step 1 Download Related Installation Materials Library

- The JCL needed to install CA-Vtape is in the Related Installation Materials Library (RIMLIB) on the distribution tape (file 2). Important information related to the installation process is provided in the Program Directory Library (PGMDIR) on file 4. Run the following JCL to allocate both of these libraries and download them from tape.

**Note:** SMP/E is equipped with ISPF panels to help you to download the RIMLIB and PGMDIR libraries.

**FIGURE A-2 Sample RIMLIB JCL**

```
  File  Edit  Confirm  Menu  Utilities  Compilers  Test  Help
------------------------------------------------------------------------------
EDIT       RIDOS01.XAD1.SPFTEMP1.CNTL                    Columns 00001 00072
****** ***************************** Top of Data ******************************
000001 //JOCARD JOB (####,###),'NNNNNNNN',CLASS=A,MSGCLASS=X
000002 //S1       EXEC PGM=IEBCOPY
000003 //SYSPRINT DD SYSOUT=*
000004 //SYSUT3   DD SPACE=(CYL,(2,2)),DISP=(NEW,DELETE),UNIT=SYSDA
000005 //SYSUT4   DD SPACE=(CYL,(2,2)),DISP=(NEW,DELETE),UNIT=SYSDA
000006 //TAPE     DD DSN=RIMLIB,DISP=(SHR,PASS),LABEL=(2,SL),
000007 //             VOL=SER=VVVVVV,UNIT=TAPE
000008 //TARGET   DD DSN=YOUR.RIMLIB,
000009 //             SPACE=(TRK,(15,3,6),RLSE),
000010 //             DISP=(NEW,CATLG)
000011 //SYSIN    DD *
000012   COPY          INDD=TAPE,OUTDD=TARGET
000013 //*
000014 //S2       EXEC PGM=IEBCOPY
000015 //SYSPRINT DD SYSOUT=*
000016 //SYSUT3   DD SPACE=(CYL,(2,2)),DISP=(NEW,DELETE),UNIT=SYSDA
000017 //SYSUT4   DD SPACE=(CYL,(2,2)),DISP=(NEW,DELETE),UNIT=SYSDA
000018 //TAPE     DD DSN=PGMDIR,DISP=(SHR,PASS),LABEL=(4,SL),
000019 //             VOL=SER=VVVVVV,UNIT=TAPE
000020 //TARGET   DD DSN=YOUR.PGMDIR,
000021 //             DCB=(RECFM=FBA,BLKSIZE=3120,LRECL=80),
000022 //             SPACE=(3120,(20,5,27),,,ROUND),
000023 //             DISP=(NEW,CATLG)
000024 //SYSIN    DD *
000025   COPY          INDD=TAPE,OUTDD=TARGET
000026 //*
****** **************************** Bottom of Data ****************************
```

- The RIMLIB data set contains jobs to install the base product with SMP/E.
- Full Product Distribution Tapes contain the base release and SMP/E formatted PTFs. If there are PTFs on the distribution tape, you can receive them at the same time that you receive the base product. However, you apply and accept the base release before you apply any PTFs.

Step 2 Prepare the SMP/E Environment

- Customize and submit RIMLIB member SMP01GBL to define the GLOBAL CSI data set, allocate the SMPPTS and SMPLOG data sets, and initialize the GLOBAL zone.
- Customize and submit RIMLIB member SMP02TGT to define the target CSI data set, allocate the SMPMTS, SMPSCDS, and SMPSTS data sets, and initialize the target zone.
- Customize and submit RIMLIB member SMP03DLB to define the distribution CSI data set and initialize the distribution zone.

Step 3 Allocate CA-Vtape Data Sets

- Customize and submit RIMLIB member VTA01ALC to create target and distribution data sets for CA-Vtape.

Step 4 Set DDDEF Entries

- Customize and submit RIMLIB member VTA02DDD to create DDDEF entries for CA-Vtape in the target and distribution zones.

Step 5 Receive CA-Vtape Base and PTFs

- Customize and submit RIMLIB member VTA03REC to receive CA-Vtape. If there are PTFs on the distribution tape, they are also received at this time. Do not apply the PTFs until after you have accepted the base function for CA-Vtape.
- If you want, you can use RIMLIB member RECEIVE to receive all sysmods and hold data on the distribution tape.

Step 6 Apply CA-Vtape Base

- Customize and submit RIMLIB member VTA04APP to apply the base function for CA-Vtape.

Step 7 Accept CA-Vtape Base

- Customize and submit RIMLIB member VTA05ACC to accept the base function for CA-Vtape.

Step 8 Apply CA-Vtape PTFs

- Maintenance to CA-Vtape is shipped on your distribution tape and is received at the same time as the Base function. Apply this maintenance now.
- Customize and submit RIMLIB member VTA06PTF to apply the PTFs. Accept the PTFs, according to the policies of your installation. If you do not have a policy on accepting PTFs, you can customize and submit RIMLIB member VTA07PTF to accept the PTFs.
- When you apply maintenance, you normally encounter SMP/E hold data. Computer Associates uses hold data to notify your SMP/E system of sysmods that have errors or special conditions.
- There are two different kinds of hold data:

    1. **Internal hold data:** Data that is an in stream part of the sysmod instructing you of special conditions:

        ACTION You must perform special processing either before or after you apply this sysmod.

        DEP This sysmod has a dependency that you must externally verify.

DELETE — This sysmod deletes a load module. You cannot reverse this type of sysmod with the SMP/E RESTORE command.

DOC — There is a documentation change with this sysmod.

EC — This sysmod requires a hardware engineering change. An EC hold sysmod usually does not have an effect on the product unless the EC is present on the hardware device.

UCLIN — Perform a UCLIN either before or after you apply this sysmod.

You must code a bypass operand on your APPLY command to install sysmods that have internal holds. Only code the bypass operand after you have performed the required action or, if appropriate, you are performing the action after the apply.

2. **External hold data:** External hold data is not a part of the PTF. It resides in a separate file. On SAMS product tapes, there is a HOLDDATA file. External hold data is usually used for sysmods that are distributed, and later are discovered to cause problems.

   To take advantage of the external hold data, you must receive it into your SMP/E environment. If you use the jobs supplied by Computer Associates, SMP/E receives the hold data.

   If a sysmod has an unresolved hold error, SMP/E does not install it unless you add a bypass to your apply command. You can bypass an error hold in situations that do not affect you. For example, a problem that only happens with a hardware device that you do not have, or in a product feature that you do not use.

   When Computer Associates issues the sysmod that resolves the hold, the resolving sysmod supersedes the hold error. This allows you to apply the original sysmod in conjunction with the fixing sysmod.

   There is a special hold data class called ERREL. This means that Computer Associates has determined that the problem fixed by the sysmod is more important than the one that it causes. Computer Associates recommends that you apply these sysmods.

The easiest and most reliable way to manage external hold data is to allow SMP/E to manage it automatically. When you allow SMP/E to manage the process, the only manual task you need to do is running a REPORT ERRSYSMODS. This report identifies any held sysmods that are already applied to your system. If the resolving sysmod is in receive status, SMP/E identifies the sysmod that you need to apply to correct the situation.

# The Customization Process

The install process uses several data sets that are not managed by SMP/E, but are needed to complete the installation of CA-Vtape. The installation dialog box uses these files for output.

**Allocate GLOBAL and LOCAL Data sets**

Customize and submit RIMLIB member VTA08NON to allocate one GLOBAL SVTJCL data set, a LOCAL SVTJCL data set, and a LOADLIB data set for each image where CA-Vtape executes. Use the SMF ID (sysid) of the LOCAL system as the middle qualifier.

The SVTJCL libraries are PDS' which, if you are regenerating the installation JCL multiple times for testing or training, will need to be compressed to prevent space abends. Large cache sizes, chosen during the GLOBAL Base Installation, will generate larger JCL members to allocate more LDS'. As a result, the SVTJCL library may need to be reallocated to a larger size or compressed prior to each regeneration of the installation JCL.

**Note:** You need LOCAL data sets even if you are only running CA-Vtape on a single system image.

**Authorize LOCAL Loadlib(s)**

The LOCAL or image loadlib(s) must be APF authorized. See the section "APF Authorize the Load Libraries" in this appendix for more information.

**Customization**

There are two parts to the customization process: the first part is the GLOBAL Install. This sets up the GLOBAL or Shared resources used by all systems. After you have completed the base install, you must perform the second part of the customization. The second part is called the LOCAL System Customization. It sets up the LOCAL system or image specific resources. It must be run for each system or image where CA-Vtape will be active.

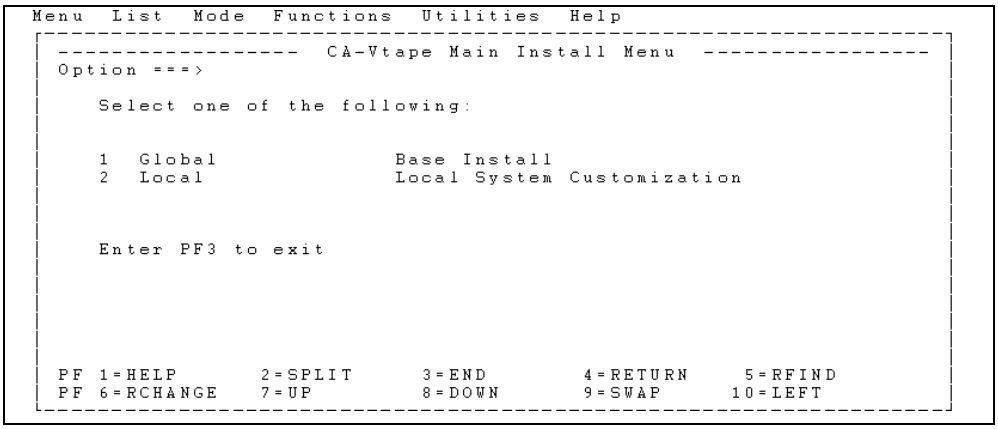
## To begin the Install Process

Step 1 **Type the following commands:**

```
PROFILE NOPREFIX
EXEC 'your.sams.samexec(INSTALL)'
```

The Main Install Menu appears.

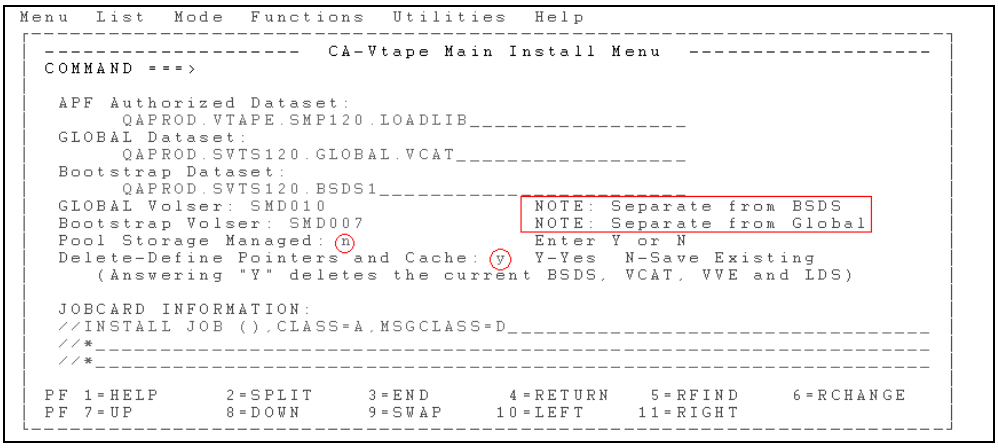
**FIGURE A-3 Main Install Menu**




Step 2 **Select Option 1 GLOBAL.**

The GLOBAL Install panel appears.

**FIGURE A-4 GLOBAL Install Panel**




You may need to edit this screen. If you completed the steps in the section "Before Starting" in this appendix thoroughly, this editing is minimal. Complete the following information.

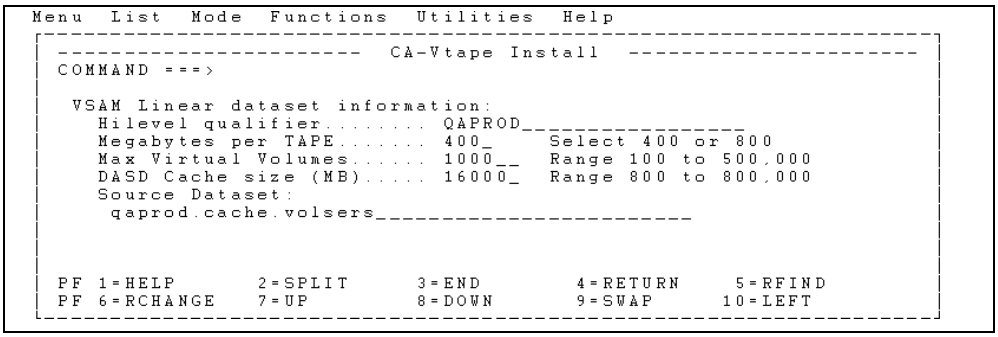
| | |
|---|---|
| APF Authorized Data Set | The name of the authorized library you are using for SVTS. Use a library created for this purpose. |
| GLOBAL Data Set | The name that is used to create the GLOBAL data set. This Virtual catalog is shared across all images, containing information about volumes and LDSs. |
| Bootstrap Data Set | The name that is used to create the Bootstrap data set. This data set contains information required for recovery in the event of an abnormal system shutdown, a software abend or a hardware failure. |
| GLOBAL Volser | Identifies the volume to be used for VCAT and GLOBAL allocations. The VCAT is the area where SVTS places its control information. |
| Bootstrap Volser | Identifies the volume used for Bootstrap data set allocation. For recovery purposes, this volume should be different from the GLOBAL Volser. |
| Pool Storage Managed | Enter Y or N. This field determines the next panel that appears. If a list of private volumes is to be used, type N. If the pool of LDSs that make up the cache are to be DFSMS managed, type Y. |
| Delete-Define Pointers in Cache | On the initial installation of CA-Vtape, this field must be Y.<br><br>**CAUTION:** If you are upgrading from a previous release, specifying Y deletes the GLOBAL VCAT. To save this data set, you must specify N. |
| JOBCARD INFORMATION | A jobcard is created in the 'hlq.SVTS.VnRxx.SVTJCL' data set, data set (member name of JC) which is used in the jobs created by the install process. |

Step 3 **If you answered "N" to the question "Pool Storage Managed"**

If you answered "N" to the question "Pool Storage Managed" in Figure A-4, GLOBAL Install Panel, the next panel appears— CA-Vtape Install.

If you answered "Y", the panel in Figure A-6, CA-Vtape Install Panel2, appears. Go to step 4.

**FIGURE A-5 CA-Vtape Install Panel**




Provide the following information:

| | |
|---|---|
| Hilevel qualifier | Linear files used as the tape cache and the physical tape data set names are prefixed with this qualifier. The data set names generated are HLQ.VVE.LDSnnnnn and HLQ.VVE.Vxxxxxx.PRIMARYz (where nnnnn is the sequential number of the linear file, xxxxxx is the volume serial number of the virtual volser, and z is the sequential number of the physical volumes the virtual volume resides on). |
| Megabytes per TAPE | Determines the maximum size of the linear files used for the tape virtual volume in the DASD cache. 400Mb is recommended. |
| Max Virtual Volumes | Defines the maximum number of virtual volumes to support. It is used to calculate the BSDS and GLOBAL VCAT sizes.<br><br>**Note:** Due to the procedures required to expand these data sets, overstate this value, if possible. |
| DASDCache size (MB) | The maximum cache size is 50TB. This value creates the JCL that allocates the DASD cache linear data sets. Ten Jobs are created (LDSJOBn where n is 0 thru 9) that define and initialize the LDSs. These jobs are submitted later in this process. See the section "Adding Cache After Installation" in this appendix for more information. |

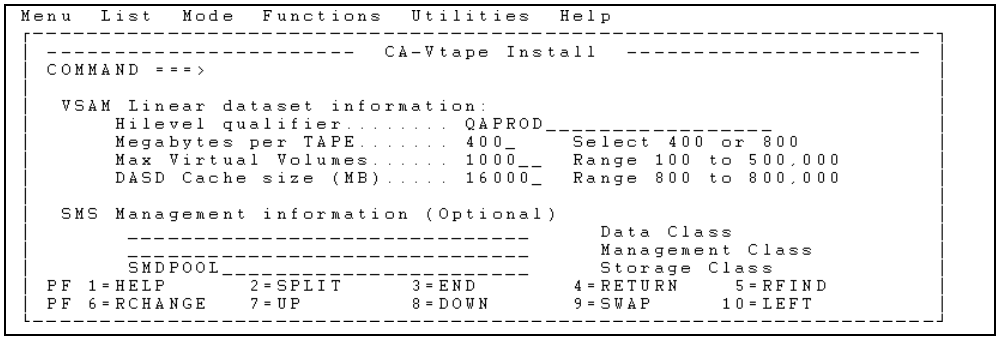
| | |
|---|---|
| Source Data set | This is a data set created in the section "Before Starting" in this appendix, with an 80 byte record size that contains a list (1 per line) of private volumes to be used for CA-Vtape DASD cache. The maximum number of volumes that are used is 128. Duplicates are rejected internally. |

When you are done providing the above information, press the Enter key to accept the information and begin a tailoring process within the SVTJCL data set. Go to step 5.

Step 4 **If you answered "Y" to the question "Pool Storage Managed"**

If you answered "Y" to the question "Pool Storage Managed" in Figure A-4 GLOBAL Install Panel, the following screen appears.

**FIGURE A-6 CA-Vtape Install Panel 2**




| | |
|---|---|
| Hilevel qualifier | Linear files used as the tape cache and the physical tape data set names are prefixed with this qualifier. The data set names generated are HLQ.VVE.LDSnnnnn and HLQ.VVE.Vxxxxxx.PRIMARYz (where nnnnn is the sequential number of the linear file, xxxxxx is the volume serial number of the virtual volser, and z is the sequential number of the physical volumes the virtual volume resides on). |
| Megabytes per TAPE | Determines the maximum size of the linear files used for the tape virtual volume in the DASD cache. 400Mb is recommended. |
| Max Virtual Volumes | Defines the maximum number of virtual volumes to support. It is used to calculate the BSDS and GLOBAL VCAT sizes. Due to the procedures required to expand these data sets, overstate this value, if possible. |

| | |
|---|---|
| DASD Cache size (MB) | The maximum cache size is 50TB. This value creates the JCL that allocates the DASD cache linear data sets. Ten Jobs are created (LDSJOBn where n is 0 thru 9) that define and initialize the LDSs. These jobs are submitted later in this process. See the section "Adding Cache After Installation" in this appendix for more information. |
| Data Class | Use if the DASD cache is to be allocated to a specific DATACLASS in a managed environment. |
| Management Class | Use if the DASD cache is to be allocated to a specific MANAGEMENTCLASS in a managed environment. |
| Storage Class | Use if the DASD cache is to be allocated to a specific STORCLASS in a managed environment. |

Step 5 **Review GLOBAL JCL**

When file tailoring completes, you are in EDIT mode, allowing you the opportunity to review the GLOBAL JCL member in the SVTJCL data set.

Figure A-7 is the first page of this member.

**FIGURE A-7 Sample SVTJCL Member GLOBAL**

```
DIT       QAPROD.VTAPE.SMP120.SVTJCL(GLOBAL) - 01.01       Columns 00001
ommand ===> _____________________________________________ Scroll ===
***** ****************************** Top of Data ***********************
00001 //JOBCARD  JOB '01026000',CLASS=A,
00002 //    MSGCLASS=X,NOTIFY=TANJO02,TIME=1440
00003 //*
00004 //*******************************************************************
00005 //***       JCL INSTREAM ASSEMBLER
00006 //*******************************************************************
00007 //ASM       PROC P='(NOTERM,NODECK,OBJ)',M=
00008 //ASM       EXEC PGM=ASMA90,REGION=5M,
00009 //          PARM=&P
00010 //SYSLIB    DD DSN=QAPROD.VTAPE.SMP120.SVTJCL,DISP=SHR
00011 //          DD DSN=SYS1.MACLIB,DISP=SHR
00012 //          DD DSN=SYS1.MODGEN,DISP=SHR
00013 //SYSPRINT DD SYSOUT=*
00014 //SYSPUNCH DD DUMMY
```

**Note:** The GLOBAL job cleans up after itself, so there is no harm in executing the GLOBAL job multiple times during this initial install of CA-Vtape. However, be careful before executing this JCL after a successful install. The GLOBAL contains several DELETE steps that can delete data sets that may require backup before deletion.

- The APF attributes must be in effect to run the jobstream.
- Review and customize this JCL jobstream. For example:
  - The first EXEC statement shown in Figure A-7 may not be appropriate for your installation. If you are using an older release of the Assembler, change this to IEV90 or equivalent.

  - Use caution when changing a volume or DSN value. These values are generated from the panel displayed in Figure A-4, GLOBAL Install Panel. If you change any of them, make sure you propagate the change throughout the jobstream.

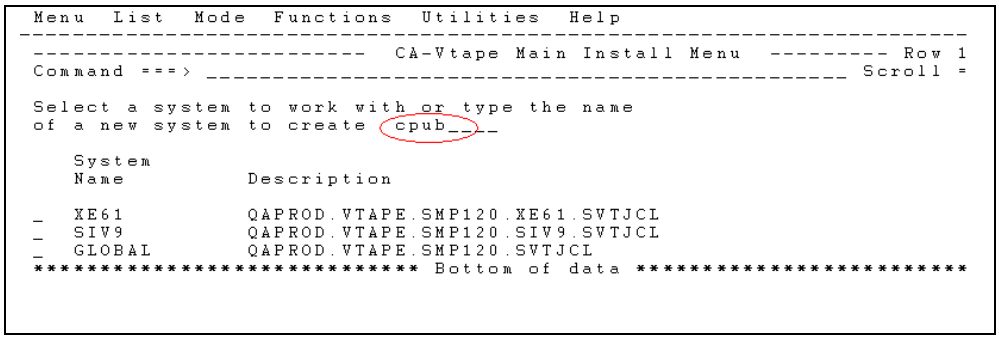
- Submit this jobstream and verify that all job steps complete successfully with return code 0. If any of them were not 0 (most of the problems you can experience have to do with insufficient space or security problems with data set naming conventions), take appropriate corrective action and re-run the job.

Step 6 **LOCAL Customization**

To continue the installation with the LOCAL system customization, END the EDIT session for GLOBAL and the Main Menu panel appears(as shown in figure A-3, "Main Install Menu").

Select option 2, LOCAL, to display the LOCAL system customization panel. Listed are the systems where CA-Vtape is installed and the corresponding SVTJCL data set. The GLOBAL or shared resources are also displayed, but can not be selected.

**FIGURE A-8 CA-Vtape System Customization Panel**




Enter the system ID for the system to be customized.

Step 7 **Define LOCAL Customization**

After the data shown in Figure A-8 is complete, the LOCAL Install panel appears.

**FIGURE A-9 CA-Vtape LOCAL Install panel**

```
Menu  List  Mode  Functions  Utilities  Help
┌──────────────────────────────────────────────────────────────────────────┐
│ ------------------  CA-Vtape Main Install Menu  ------------------       │
│ COMMAND ===>                                                             │
│                                                                          │
│  Required Pre-existing Libraries:                                        │
│       File Tailoring Output:                                             │
│            QAPROD.VTAPE.SMP120.CPUB.SVTJCL_____________                  │
│       APF Authorized Dataset:                                            │
│            QAPROD.VTAPE.SMP120.LOADLIB_________________                  │
│       Local APF Authorized Dataset:                                      │
│            QAPROD.VTAPE.SMP120.CPUB.LOADLIB_____________                 │
│       Proclib Dataset:                                                   │
│            USER.PROCLIB_____________________________                     │
│       Delete-Define Local VCAT: _  Y-Yes N-Save Existing                 │
│       VCAT Dataset:                                                      │
│            QAPROD.VTAPE.CPUB.VCAT_______________________                 │
│       VCAT Volser:     NOTE: Separate from BSDS and Global               │
│            ------                                                        │
│                                                                          │
│   JOBCARD INFORMATION:                                                   │
│   //INSTALL JOB (),CLASS=A,MSGCLASS=D_____________________________       │
│ PF 1=HELP      2=SPLIT     3=END       4=RETURN    5=RFIND               │
│ PF 6=RCHANGE   7=UP        8=DOWN      9=SWAP     10=LEFT                │
└──────────────────────────────────────────────────────────────────────────┘
```

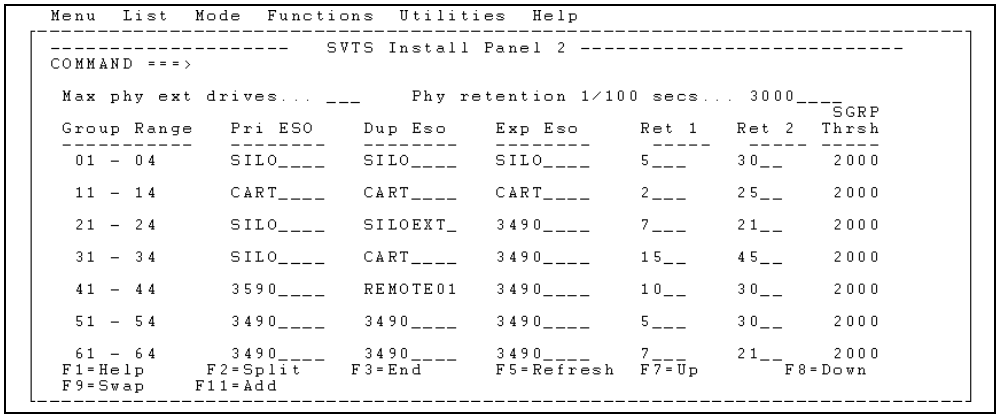
| | |
|---|---|
| File Tailoring Output | Identifies the DSN to use for the LOCAL SVTJCL data set. |
| APF Authorized Data set | Identifies a Common library used for the load modules created by the GLOBAL installation process.<br><br>**Note:** This library name is filled in by the customization process and should not be changed. It must match the library used in the GLOBAL install. |
| LOCAL APF Authorized Data Set | Each system running CA-Vtape requires a non-shared LOCAL library for the load modules that are tailored with system specific information. |
| Proclib Data Set | Identifies the proclib that the SVTS, SVTSIO and SVTSAS procs are to be placed in.<br><br>**Note:** SVTS will automatically start SVTSAS address space when enabled with a future enhancement. |
| Delete-Define LOCAL VCAT | On the initial installation of CA-Vtape, this field must be Y. |
| VCAT Data Set | This data set will be created by the LOCAL install for information unique to the system image the installation is occurring on. |
| VCAT Volser | Volume to be used for the LOCAL VCAT. The LOCAL VCAT data sets must not reside on the same volume as the GLOBAL VCAT. |

**Caution:** If you are upgrading from a previous release, specifying Y deletes the LOCAL VCAT. To save the data set you must specify N.

Step 8 **Define Output Groups**

After Figure A-9 is filled out completely, press the Enter key to accept the information. The SVTS Install panel 2 appears. You can leave all the default values on this screen and just press enter. Any required changes can easily be made later by editing PARMLIB member VTGROUP as explained in the "Using the PARMLIB Feature" appendix .

**FIGURE A-10 SVTS Install Panel 2**




The SVTS Install panel 2 defines output groups to CA-Vtape. Each group describes certain device characteristics, along with three sets of data set retention periods.

| | |
|---|---|
| Max phy ext drives | Defines the limit for the maximum number of drives used on the LOCAL system for externalization. |
| Phy retention 1/100 secs | This field affects the tape retention on the physical unit used for externalization. This is the dismount time — the default value of 3000 converts to 30 seconds. |
| Group Range | Groups range in a pattern of XY where X is between 0 and 7 and Y is between 1 and 4. The X portion allows for separation and the Y determines externalization characteristics. Y=1 Primary; Y=2 Primary and Duplex; Y=3 Primary and Export; Y=4 all three. |
| Pri ESO | Defines the device type the primary externalization copy is to be written to. All groups write a primary copy to physical tape. |
| Dup Eso | Defines the device type the duplex externalization copy is to be written to. Groups (XY) where Y = 2 or 4 will write a duplex copy to physical tape. |

| | |
|---|---|
| Exp Eso | Defines the device type the export externalization copy is to be written to. Groups (XY) where Y = 3 or 4 write a export copy to physical tape. Export is a user readable format. |
| Ret 1 | Define the expiration date range for the SHORT subgroup of data sets to a tape. For example, in Figure A-10 the value 7 will group data sets that expire <= today+7. The objective is to group data sets by similar expiration dates. Define the expiration date ranges for the MEDIUM and LONG subgroups. |
| Ret 2 | In Figure A-10 the value 21 will group data sets that expire >today+7 and <=today+21. Any data sets that expire >today+21 are grouped in the Ret 3 subgroup. |
| SGRP Thrsh | The Storage Group Threshold manages the amount of data (default 2000MB or 2GB) CA-Vtape accommodates in each externalization queue for each subgroup. If more than this amount of the DASD cache has been consumed by a subgroup, for example, group 21 subgroup SHORT, CA-Vtape will start more than one externalization task to speed up externalization and free up cache. For example, if 4GB are detected - 2 tasks, if 8GB - 4 tasks, and so on. The maximum number of tasks per subgroup is eight. |

Step 9 Define Virtual UCBs

After you have customized the SVTS Install panel, the SVTS Virtual UCB Definition appears. Add only one valid UCB to this panel and press enter. Once PARMLIB member VTDRIVE is generated you can proceed to edit the member as explained in the appendix “Using the PARMLIB Feature.” The VTDRIVE member features virtual drive definitions as ranges or lists and the ability to identify those drives that CA-Vtape must vary online during startup.

**FIGURE A-11 SVTS Virtual UCB Definition Panel**

```
Menu  List  Mode  Functions  Utilities  Help
┌──────────────────────────────────────────────────────────────────────────┐
│ --------------------  CA-Vtape UCB Definition Panel  --------------------  │
│ Command ===> ____________________________________________________________  │
│                                                                          │
│ This panel may is used to define the virtual devices. First blank        │
│ field ends list. At least UCB0 must contain a valid hex address.         │
│                                                                          │
│  UCB0 . . . . . 3500          Virtual tape UCB device address            │
│  UCB1 . . . . . 3501          Virtual tape UCB device address            │
│  UCB2 . . . . . 3502          Virtual tape UCB device address            │
│  UCB3 . . . . . 3503          Virtual tape UCB device address            │
│  UCB4 . . . . . 3504          Virtual tape UCB device address            │
│  UCB5 . . . . . 3505          Virtual tape UCB device address            │
│  UCB6 . . . . . 3506          Virtual tape UCB device address            │
│  UCB7 . . . . . 3507          Virtual tape UCB device address            │
│  UCB8 . . . . . 3508          Virtual tape UCB device address            │
│  UCB9 . . . . . 3509          Virtual tape UCB device address            │
│  UCBA . . . . . 351A          Virtual tape UCB device address            │
│  UCBB . . . . . 351B          Virtual tape UCB device address            │
│  UCBC . . . . . 351C          Virtual tape UCB device address            │
│  UCBD . . . . . 351D          Virtual tape UCB device address            │
│  F1=Help     F2=Split     F3=End      F5=Refresh  F7=Up       F8=Down    │
│  F9=Swap     F11=Add                                                     │
└──────────────────────────────────────────────────────────────────────────┘
```

This panel defines the UCB addresses that are used as virtual tape drives. The UCBs provided must be defined to OS/390 prior to use as tape devices. No physical tape unit should be accessible at the selected locations. Software only definition through IBM's Hardware Configuration and Definition (HCD) dialogs is the recommended procedure.

**Note:** These are the addresses you created in the section "Before Starting" in this appendix.

After you are satisfied with your virtual UCB addresses, press the Enter key to accept the addresses and begin a tailoring process within the LOCAL SVTJCL data set.

Step 10 Review LOCAL Customization

When the tailoring completes, you are left in EDIT mode, where you can review and customize the LOCAL member in the LOCAL SVTJCL data set.

Figure A-12 is the first page of this member.

**FIGURE A-12 Sample sysid.SVTJCL Member LOCAL**

```
------------------------------------------------------------------------------
IT       QAPROD.VTAPE.SMP120.XE61.SVTJCL(LOCAL) - 01.02  Columns 00001 00072
mmand ===> _____________________________________ Scroll ===> CSR
     ****************************** Top of Data ******************************
0001 //JOBCARD  JOB '01026000',CLASS=A,
0002 //    MSGCLASS=X,NOTIFY=TANJO02,TIME=1440
0003 //*********************************************************************
0004 //***       JCL INSTREAM ASSEMBLER
0005 //*********************************************************************
0006 //ASM       PROC P='(NOTERM,NODECK,OBJ)',M=
0007 //ASM       EXEC PGM=ASMA90,REGION=5M,
0008 //         PARM=&P
0009 //SYSLIB    DD DSN=QAPROD.VTAPE.SMP120.SVTJCL,DISP=SHR
0010 //          DD DSN=SYS1.MACLIB,DISP=SHR
0011 //          DD DSN=SYS1.MODGEN,DISP=SHR
0012 //SYSPRINT DD SYSOUT=*
0013 //SYSPUNCH DD DUMMY
0014 //SYSIN     DD DISP=SHR,DSN=QAPROD.VTAPE.SMP120.XE61.SVTJCL(&M)
0015 //SYSUT1    DD UNIT=SYSALLDA,SPACE=(CYL,(2,2))
0016 //SYSLIN    DD  DSN=&&OBJ,UNIT=SYSALLDA,SPACE=(80,(200,50)),
0017 //          DISP=(MOD,PASS)
0018 //ASM       PEND
0019 //*********************************************************************
0020 //***       JCL INSTREAM PROCS
0021 //*********************************************************************
```

JES SYSID

- The APF attributes must be in effect to run the jobstream.
- Review and customize the JCL jobstream from HLQ.sysid.SVTJCL(LOCAL).
- The first EXEC statement shown in Figure A-12 may not be appropriate for your installation. If you are using an older release of the Assembler, change this to IEV90 or equivalent.
- Use caution when changing a volume or DSN value. These values were generated from the panel displayed in Figure A-9, CA-Vtape LOCAL Install panel. If you change any of them, make sure you propagate the change throughout the jobstream.

- Submit this jobstream and verify all return codes are 0. If any of them were not 0 (most of the problems you can experience probably have to do with insufficient space or security problems with data set naming conventions), take appropriate corrective action and re-run the job.

**Note:** The LOCAL job cleans up after itself, so there is no harm in executing it multiple times during this initial install of CA-Vtape. However, be careful before executing this JCL after a successful install. It contains several DELETE steps that can delete data sets that may require backup before deletion.

CA-Vtape is now ready to be started and the cache data sets added.

Step 11 **Activating PARMLIB**

Review the appendix "Using the PARMLIB Feature" to create one or more PARMLIB libraries, copy and customize the generated sample members and update the SVTS proc with the name of the new PARMLIB libraries. By customizing PARMLIB you will enable CA-Vtape virtual drives, group definitions, system options, enhanced data set name filters and data class lists.

Step 12 **Start the SVTS Subsystem**

To start CA-Vtape, enter "S SVTS" on the system console. Several start-up messages will be issued with the final key message stating that SVTS is initialized. Some of the typical messages issued during the start-up process are displayed in Figure A-13.

**FIGURE A-13 Sample SYSLOG Messages Issued During CA-Vtape Start-up**

```
IEF695I START SVTSXE61 WITH JOBNAME SVTSXE61 IS ASSIGNED TO USER SVTSXE61
$HASP373 SVTSXE61 STARTED
ACF9CCCD USERID SVTSXE61 IS ASSIGNED TO THIS JOB - SVTSXE61
IEF4031 SVTSXE61  -  STARTED  -  TIME=10.48.20
SVTSI0701I Warm start initiated BrightStor CA-Vtape VTS V2R00
SVTSM0001I Warm Start resources acquired
IEEE252I  MEMBER   VTPARMS FOUND IN  QAPROD.VTAPE.SMP120.PARMLIB
IEEE252I  MEMBER   VTPARMS FOUND IN  QAPROD.VTAPE.SMP120.PARMLIB
IEEE252I  MEMBER   VTPARMS FOUND IN  QAPROD.VTAPE.SMP120.PARMLIB
IEEE252I  MEMBER   VTDRIVE FOUND IN  QAPROD.VTAPE.SMP120.PARMLIB
IEEE252I  MEMBER   VTGROUP FOUND IN  QAPROD.VTAPE.SMP120.PARMLIB
IEEE252I  MEMBER   FILTERS FOUND IN  QAPROD.VTAPE.SMP120.PARMLIB
SVTSI4314I  VTAPE in Standard Mode
SVTSR3500I  <IncludeDataSets> entries in Enhanced Filter List      14
SVTSR3501I  <IncludeDataClass> entries in Enhanced Filter List       2
SVTS16001I  SVTSGDG=89623000 LENGTH=00002080
SVTSG0001I  HOOKCODE-Located  at 8410B6E0 OLD=47F0F01C16C9C5C6C1C2F4
SVTSI0000I  Subssytem(V2R00) initialized
VARY  3500.ONLINE
VARY  3501.ONLINE
VARY  3502.ONLINE
VARY  3503.ONLINE
VARY  3504.ONLINE
VARY  3505.ONLINE
VARY  3506.ONLINE
VARY  3507.ONLINE
VARY  3508.ONLINE
VARY  3509.ONLINE
VARY  350A.ONLINE
VARY  350B.ONLINE
VARY  350C.ONLINE
VARY  350D.ONLINE
VARY  350E.ONLINE
VARY  350F.ONLINE
IEE252I MEMBER VTPARMS FOUND IN QAPROD.VTAPE.SMP120.PARMLIB
IEE252I MEMBER FILTERS FOUND IN QAPROD.VTAPE.SMP120.PARMLIB
```

CA-Vtape consists of three started tasks:

1. SVTS
2. SVTSIO (STEP SSCH)
3. SVTSIO (STEP CSCHHSCH)

Step 13 **Submit the LDSADDn Jobs**

With CA-Vtape or the SVTS started task active, submit the LDSADDn jobs from the GLOBAL SVTJCL data set to add the cache data sets to CA-Vtape.

Step 14 **Varying the Virtual Devices Online**

If you defined your virtual devices in the VTDRIVE member as Online=xxxx-yyyy you must skip this step because CA-Vtape already varied the devices online. However if the virtual devices are defined in the VTDRIVE member as Offline=xxxx-yyyy you must manually vary the virtual devices online. See the appendix "Using the PARMLIB Feature" for further explanations about VTDRIVE member.

The Operator command used to vary devices online is as follows:

```
V xxxx-yyyy,online
```

where *xxxx* is the first address in the virtual device range and yyyy is the last.

**Possible Problems with Virtual Devices**

There are several problems that can occur when attempting to vary the Virtual Devices online. Two of the most common are:

1. If the virtual devices were not defined properly, you see the following message:

   ```
   IEE313I nnn     UNIT REF. INVALID
   ```

   To correct this situation, review your HCD definitions. If they are incorrect, then take the appropriate action. If they are correct, edit member VTDRIVE and review the virtual device definitions for possible errors.

   Another area to check is within IPCS. From option 6, type:

   ```
   SETD ACTIVE
   LISTUCB ucb
   ```

   where *ucb* is the device address you are investigating.

   In the UCBXPX at offset +0C, you find the SIDA and SCHNO fields. If the values in these fields are 0000s, then CA-Vtape successfully allocates this address. If these fields contain anything other than 0000s, then another range needs to be defined.

   This is a safety mechanism used by CA-Vtape to ensure that there are no physical devices associated with the UCB. This is a very important safety feature because after these devices are used by CA-Vtape, the UCB cannot be used by any other resource until after the next IPL.

2. If you attempt to vary the virtual devices online without the SVTS STC active, you see the following message:

   ```
   IEE025I UNIT nnn HAS NO LOGICAL PATHS
   ```

Step 15 **Add Scratch Tapes**

Virtual Volume Segments are the actual tape volumes defined and reserved within your Tape Management System for CA-Vtape to use.

Activation is done from the Operator's console. For example, you defined the segment 899000. To activate the first 1000 virtual volumes within this string, issue the following command:

```
SVTS ADD VVP=899000,1000
```

**Note:** The Tape Management System catalog must have virtual volumes defined before the volumes can successfully be mounted for use.

If you do not define enough virtual volumes, CA-Vtape displays the message shown in Figure A-14.

**FIGURE A-14 SDSF SYSLOG Scratch Shortage Message**

```
 Display  Filter  View  Print  Options  Help
 ------------------------------------------------------------------------------------------------------------------------
 SDSF SYSLOG   760.102 P390 P390 12/10/1998 LINE   4,489     COLUMNS   1 132
 COMMAND INPUT ===> _                                        SCROLL ===> CSR
N 4000000 P390     98344 16:45:50.39 JOB00862 00000090  $HASP373 ISPCNT1A STARTED - INIT    C - CLASS C - SYS P390
N 0000000 P390     98344 16:45:50.45 JOB00862 00000081  IEF403I ISPCNT1A - STARTED - TIME=16.45.50
N 2000000 P390     98344 16:45:50.84 JOB00862 00000090 *IEF233A M 0570,PRIVAT,SL,ISPCNT1A,IEBGENER,ISPCNT3.S3480.VTAPE.GEN2V5
W 8000000 P390     98344 16:46:11.80 STC00859 00000090 *07 SVTSV0424W 0570,Scratch shortage, Reply R(etry) or C(ancel)
N 0000000 P390     98344 16:47:00.15 TSU00852 00000290  IEA630I  OPERATOR ISPCNT3  NOW ACTIVE,   SYSTEM=P390    , LU=NMMAF001
NC0000000 P390     98344 16:47:00.57 ISPCNT3  00000290  SVTS ADD VVP=899000
NR0000000 P390     98344 16:47:03.10 TSU00852 00000090  SVTSX0100I Command Completed Successfully
NC0000000 P390     98344 16:47:38.35 ISPCNT3  00000290  R 07,R
NR8000000 P390     98344 16:47:38.42 ISPCNT3  00000090  IEE600I REPLY TO 07 IS;R
```

# Verifying the Installation

Step 1 **Test the Install**

To test that the install is functional, issue the display activity command as follows:

```
SVTS D A
```

This Operator command displays the virtual devices and any activity that is processing within CA-Vtape. For more information, see the section "SVTS DISPLAY Commands" in the chapter "Using CA-Vtape."

Figures A-15, A-16 and A-17 are sample output from the D A Command.

**Figure A-15 SDSF SYSLOG - CA-Vtape Active With One Virtual Device Online**

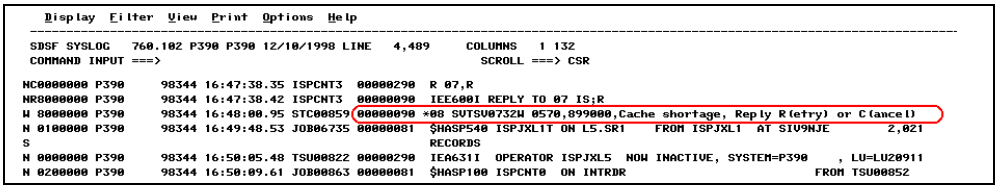
```
 Display  Filter  View  Print  Options  Help
 ------------------------------------------------------------------------------------------------------------------------
 SDSF SYSLOG   760.102 P390 P390 12/11/1998 LINE   5,309     COLUMNS   1 132
 COMMAND INPUT ===>                                          SCROLL ===> CSR
NC0000000 P390     98345 16:51:08.84 ISPDCM1  00000290  SVTS D A
MR0000000 P390     98345 16:51:08.86 TSU00894 00000090  SVTSX0580I Cache Size (MB)         / 600
DR                                600 00000090                Volser Cua  ----Status----  Ds    Type Jobname  #I/O  Last
DR                                600 00000090                 n/a  0570                        3480          00012
NR0000000 P390     98345 16:51:08.90 TSU00894 00000090  SVTSX0100I Command Completed Successfully
N 0000000 P390     98345 16:51:30.92 TSU00894 00000290  IEA631I  OPERATOR ISPDCM1  NOW INACTIVE, SYSTEM=P390    , LU=TC090S20
******************************** BOTTOM OF DATA ********************************************************************
```

In Figure A-15, CA-Vtape is active with one virtual device online.

Step 2 **Checking Cache**

If you have not defined enough cache, the message “Cache shortage” is displayed as shown in Figure A-16.

**Figure A-16 SDSF SYSLOG Cache Shortage Message**

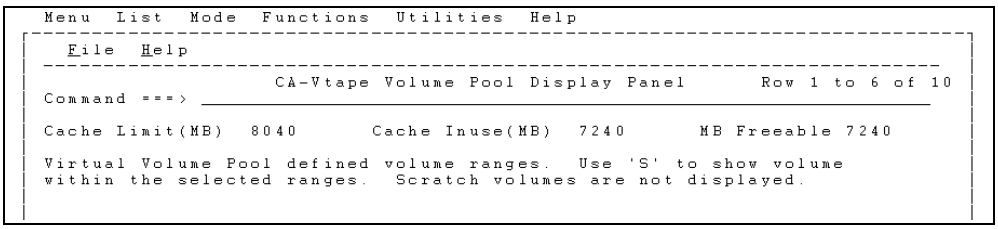



To resolve this situation, add more cache by submitting more of the “LDSADDx” members, or if you have submitted all of these members that the installation process created, see the section "Adding Cache After Installation" in this appendix for more information.

Step 3 **EXEC your.sams.SVTJCL(SVTSMON)**

When option 3 is chosen on the CA-Vtape Main Menu, the CA-Vtape Volume Pool Display Panel will appear, giving the Cache Limit amount as shown in Figure A-17.

**Figure A-17 CA-Vtape Volume Pool Display Panel**




Step 4 **Define Filters**

Data set name filters and/or data classes **must** be defined for those data sets you want CA-Vtape to manage. If you don’t include any filter or data class your jobs will continue using real tape drives.

We recommend activating the enhanced filter list mode by defining and customizing the default VTFILTR PARMLIB member as explained in the appendix “Using the PARMLIB FEATURE”. However if you are migrating from CA-Vtape 1.2 you can convert your basic filter list into the enhanced filter list **or** continue in basic filter list mode and selecting Option 4 and 5 from the CA-Vtape Main Menu to update your existing data set name filters and data classes.

# Adding Cache After Installation

To add additional cache after installation, modify the LDSJOBn member that was created by the GLOBAL Install. Change the DSN sequence number (the LDSnnnnn portion of the DSN, DD, and LDS_INITIALIZE statement) to a range higher than those currently allocated. This job deletes/defines and initializes the members.

**Caution:** Do not inadvertently delete DSNs in use. If you delete an unexternalized DSN, data loss occurs. The LDS job can be run with CA-Vtape up or down.

After the data sets have been prepared, the capacity is added by editing one of the LDSADDn jobs (the LDSnnnnn portion of the DSN, DD, and LDS_ADD statement) and submitting it while CA-Vtape is active.

# IVP Process

You are now ready to begin testing. A sample job resides in hlq.VxRnn.INSTALL(GENER). Review the JCL and change the DSN to one in your filter list or add an appropriate data class parameter. Verify that the UNIT parm matches the device you varied online. If the installation is correct, when you run the GENER job the data set will be allocated to a virtual drive.

## Externalization

By default, the cache threshold does not allow externalization to automatically take place. By using the BACKSTORE= command, you can activate externalization immediately. The command to do this is:

```
SVTS SET BACKSTORE=RELEASE,GROUP=xx,SUBGROUP=S/M/L
```

**Note:** Additional SVTS commands can be found in the section "SVTSUTIL Batch Commands" in chapter 4.

After you issue this command, CA-Vtape requests a physical mount from the physical devices assigned to the stacking group selected by the data set name and filtering criteria. The data set name used is the HLQ.VVE.Vxxxxxx.PRIMARYx where xxxxxx is the virtual volume serial number and x is the sequential number of physical volumes the virtual volume resides on.

For more information about the BACKSTORE= command, see the section "SET BACKSTORE=" in the chapter “Using CA-Vtape.”

# DASD Pool Allocation Options

You can optionally use CA-Allocate or IBM's DFSMS Systems Managed Storage to manage the DASD buffer pool allocations for the virtual volume LDSs.

Either of the allocation packages mentioned above are the recommended means of managing the pool to which the virtual volume LDSs are allocated. It is also recommended that the pool be a separate storage group from other workloads with dedicated class definition. Automated Class Selection (ACS) routine changes need to be made to use SMS to manage the pool.

For information on using ACS routines, refer to the IBM *DFSMSdfp Storage Administration Reference*.

## Basic Class Components Used

**Dataclass -** usually a class that contains data sets with similar attributes. The class is defined under ISMF. Recommendation: define a specific dataclass for the virtual volume pool data sets and use the ACS routines to select the storage group. For example, you can use SVTSPOOL.

**Storage Class -** CA-Vtape makes no special use of storage class. This class is also defined using ISMF. Recommendation: define a unique storage class. Use SVTSSTOR as an example. No storage class functions (such as backups) are desired.

**Management Class -** CA-Vtape usually makes no special use of management class. The management class is also defined using ISMF. Recommendation: define a unique management class without any migration or backup criteria. For example, you can use SVTSMAN.

SVTS can use either 3380 or 3390 format volumes; however, each format should be in its own storage group. Examples might be SVTS3380 and SVTS3390. The ACS storage group routines can point to both storage groups.

**ACS routines -** To use an SMS implementation with dedicated classes for the CA-Vtape pool, use the ACS routine select statement to check for the right dataclass. The dataclass is specified after the installation of CA-Vtape if the SMS management step was completed.

The ACS routines for our example: For Management Class:

```
PROC MGMTCLAS
 SELECT
 WHEN (&DATACLAS = 'SVTSPOOL')
 DO
 SET &MGMTCLAS='SVTSMAN'
 EXIT
 END
```

For Storage Class:

```
PROC STORCLAS
 SELECT
 WHEN (&DATACLAS = 'SVTSPOOL')
 DO
 SET &STORCLAS='SVTSSTOR'
 EXIT
 END
```

For Storage Group:

```
PROC STORGRP
 SELECT
 WHEN (&DATACLAS = 'SVTSPOOL')
 DO
 SET &STORGRP = 'SVTS3380','SVTS3390'
 EXIT
 END
```

Refer to the IBM *DFSMSdfp Storage Administration Reference* for more information on Systems Managed Storage, ACS routines and classes.

## Using DFSMS to Manage Stacking

CA-Vtape allows the use of different data classes to select a respective CA-Vtape stacking group. This function provides control of CA-Vtape using the Automatic Class Selection (ACS) routines rather than using the data set filter tables of CA-Vtape. Define a data class for each stacking group you want to use.

The use of these dataclasses does not mean the data sets are SMS managed. The data sets merely have a dataclass assigned.

In a simple environment, an example dataclass can be “SVTSGR11” as the default for any normal workloads to be handled by CA-Vtape. An entry in the CA-Vtape Dataclass List Panel would be made to associate SVTSGR11 with group 11 data sets. Any data set assigned the SVTSGR11 dataclass by the ACS routine would automatically be assigned to group 11 for stacking.

A second location can be defined with a dataclass of “SVTSGR21” which is defined in the SVTS filter tables as group 21.

For Example: To send all 3480 workloads with a HLQ of “test” to CA-Vtape stacking group 11, modify the ACS routine to assign a dataclass of “SVTSGR11” to any HLQ of “test” and UNIT type of 3480. CA-Vtape handles allocations for this dataclass and automatically stacks the data in group 11.

There can be many dataclasses, with each one effectively selecting a particular stacking group. All of these dataclasses can be selecting the same storage group.

CA-Vtape will honor the stacking group assignments irrespective of the storage group.

**Note:** If more than one data set is written to a virtual volume, all subsequent data sets written to the virtual volume will assume the same output group as that of the first data set on the volume. This will occur for the second and subsequent data sets regardless of the output group implied by the data set filter list or dataclass filter list.

# Host Software Component (HSC) for STK Tape Devices

If CA-Vtape is being installed at a site that has STK tape hardware controlled by STK's Host Software Component (HSC), HSC will need to be modified. The modifications can be done by installing HSC exits or by modifying the HSC parameters directly.

Method 1 utilizes the SLSUX02 and SLSUX08 HSC exits. SLSUX02 controls scratch tape processing and is normally the only exit for Vtape processing.

A load module named VSLSUX02 is provided for this exit. Concatenate the Vtape loadlib containing this module with the HSC loadlib in the started task and consult the HSC manuals on how to activate the exit.

SLSUX02 is used to influence non-specific, scratch mounts. VSLSUX02 reads the CA-Vtape filter and data class lists and returns an appropriate return code to HSC to indicate whether CA-Vtape or HSC should satisfy the mount request.

If the SLSUX02 exit is already in use at the site, CA-Vtape provides a driver program to allow the existing exit module and the CA-Vtape exit module to coexist. The driver can be found in the CA-Vtape install library member named SLSUX02D and is installed as follows:

1. Rename the existing SLSUX02 source to USLSUX02 and reassemble it.
2. Assemble the SLSUX02D as SLSUX02.
3. Linkedit SLSUX02 with a SYSLIB concatenation of the client library containing the USLSUX02 load module and the CA-Vtape load library containing VSLSUX02.

Sample JCL is contained in member SLSUX02J in the CA-Vtape install library.

SLSUX08 is used to influence specific, non-scratch, mount requests. This exit uses a volser prefix to determine if the mount is for a virtual or real volume. The exit is normally only required when a real tape mount request can not be satisfied in the silo and no non-silo or floor tape devices exist.

Method 2 involves changing the following HSC parameters:

1. SLSSYSxx for the virtual scratch pool tape range.

   ```
   SCRPOOL  NAME(VTAPE) RANGE(V00001-V99999) LABEL(SL)
   ```

   **Note:** After changing SLSSYSxx a recycle of the HSC started task is required to activate the change.

2. TAPExx for the data sets to be intercepted by CA-Vtape.

   ```
   TAPEREQ  DSN(VTAPE.**) MED(LONG) REC(36) SUBPOOL(VTAPE)
   ```

3. VOLxx entry for the virtual tape range.

   ```
   VOLATTR SERIAL(V00001-V99999) MEDIA(LONG) RECTECH(36)
   ```

4. UNITxx entry for the virtual tape device range.

   ```
   UNITATTR ADDRESS(0F00-0F1F) MODEL(9490)
   ```

**Note:** The above information concerning HSC set up should be verified by reviewing the HSC manuals.

If the site already has a non-library or floor tape drive esoteric of CART, the addition of a new unit esoteric of CA-Vtape would cause the following change to NNLBDRV:

```
NNLBDRV=(CART,VTAPE)
```

# Tape Management Systems

CA-Vtape requires a range of virtual volumes to be defined under the tape management system. These volumes are used in a normal fashion with the addition of a synchronization process that is performed to inform CA-Vtape when the scratch status of its virtual volumes changes. The process is generally done in 3 steps:

- SVTS scratch listing.
- Tape management scratch listing.
- SVTSUTIL VVE_SCRATCH step.

CA-Vtape BACKSTORE is a normal user of tape volumes and will delete its own virtual volume LDSs as externalization and cache management require.

When all of the stacked CA-Vtape data sets are deleted from a backstore physical volume, the tape management system may scratch that volume. This is normally accomplished by using a CATALOG retention period for the virtual volume dsnames, HLQ.VVE.Vvolser.*. The backstore volumes require no interface to keep them in synch with tape management systems.

**Caution:** A product exit may be required to support stacked or multiple file tapes in your tape management product which scratches a stacked tape when the first data set (file 1) on the tape expires. A data loss situation will occur if the tape with file 1 expired, but files 2 through 'n' unexpired, is placed in scratch status and overwritten. This applies to both virtual and physical tapes. Contact your Tape Management System vendor to see if this situation applies to their product.

## Computer Associates' CA-1

The CA-Vtape virtual volume scratch list must be routinely synchronized with CA-1. The CA-1 TMSCLEAN job provides the CA-1 process to return volumes to scratch status. The job output listing those volumes being returned to scratch or a TMS query listing all virtual scratch volumes is passed to CA-Vtape. The SVTSUTIL program places any virtual volumes on that list into scratch status.

The sample job for CA1 synchronization is in HLQ.VnRnn.SVTJCL(CA1). Review this job for the vcat dsnames and volume ranges specified during install.

Review your Data Set Name Block (DSNB) counts to determine if enough exist to support a large increase due to data set stacking. The CA-Vtape Externalization and Backstore processes stack virtual volumes onto physical tapes. CA-1 consumes one DSNB for each virtual volume that is stacked on the physical tape. If 100 virtual volumes are stacked on the physical tape, 100 DSNBs will be consumed. DSNBs exist for the life of the physical tape, not the life of the virtual volume. As long as one of the virtual volumes on the physical tape remains unexpired, all 100 DSNB records will be maintained including the 99 expired ones. As CA-Vtape usage increases over time, more DSNB records will be used and maintained for expired virtual volumes. If all DSNB records are consumed, tape processing will stop until the Tape Management Catalog (TMC) is increased in size and the number of DSNB records is increased. Running Recycle to recover fragmented physical tape space will also recover expired DSNB records but a large increase in the number of DSNB records will still occur. A good rule of thumb is to have three DSNBs available for each virtual volume defined.

## Computer Associates' DYNAM/TLMS

The CA-Vtape virtual volume scratch list must be routinely synchronized with CA-Dynam/TLMS. The CA-Dynam/TLMS TLMS003 report provides the CA-Dynam/TLMS scratch volume status.

The job output listing scratch volumes is passed to CA-Vtape. A sample JCL is in 'HLQ.VnRnn.SVTJCL(TLMS)'. Review this job for the vcat dsnames and volume ranges specified during install.

For DYNAM/TLMS Release 5.5 and later, the CA-EARL PROC CATEARL is used to generate reports similar to the original reports native to DYNAM/TLMS. Report TLERPT03 is used for scratch volume reporting. To utilize the CA-EARL reporting, new sample JCL and REXX members have been created in SVTJCL(TLMSE) and SAMEXEC(TLMSSCE) respectively. Please read the notes in each member to implement and customize for your DYNAM/TLMS environment.

The SVTSUTIL program places any virtual volumes selected into scratch status.

**Caution:** CA-Dynam/TLMS exit VTAPXTRS is required to provide stacking or multiple file tape support for CA-Dynam/TLMS versions prior to 5.5. Without the VTAPXTRS exit for versions of CA-Dynam/TLMS prior to 5.5, the externalized physical tape will expire when the CA-Dynam/TLMS Control Data Set (normally file 1) for that tape expires without regard for the expiration dates of subsequent data sets on that physical tape. This could result in data loss.

If you are using CA-Dynam/TLMS 5.5 or higher, the exit is not required (and should be removed if you are upgrading CA-Dynam/TLMS from a release prior to 5.5). Stacked or multiple file tapes are supported by assigning retention types of:

**A** - All files must be uncataloged before a tape volume can be scratched

**B** - All files must be expired before a tape volume can be scratched

**C** - A combination of **A** and **B**.

The recommendation for CA-Vtape is to code a retention rule assigning type **A** retention to all tapes that contain data set names that start with your CA-Vtape high level qualifier or data set name prefix assigned during the GLOBAL customization process, see figure A-5 "CA-Vtape Install Panel." Refer to the current *CA-Dynam/TLMS User Guide* for details on this process.

## IBM's RMM

The CA-Vtape virtual volume scratch list must be routinely synchronized with RMM. The RMM command RMM SEARCHVOLUME ACTION(STATUS) VOLUME)vol-pattern) provides the RMM scratch volume status. The output listing scratch volumes is passed to CA-Vtape.

Sample JCL is in HLQ.VnRnn.SVTJCL(RMM). Review this job for the vcat dsnames and volume ranges specified during install.

The SVTSUTIL program places any virtual volumes selected into scratch status.

When virtual tapes are scratched by CA-Vtape all associated dsname information is lost. Users of RMM running in Protect Mode must allow reuse of the virtual volumes without any prior dsname checks. The rexx program in 'HLQ.VnRnn.SAMEXEC(RMMSCR)' detects Protect mode and issues DELVOL / ADDVOL for the virtual scratch volumes. Ensure the synchronization job has appropriate STRGADMIN authority for these actions.

RMM Physical tapes used by CA-Vtape should be catalog managed. Define a rule for these using RMM ADDVRS DSNAME('HLQ.VVE.V**') WHILECATALOG. To ensure only catalog control, no other expiration rules should apply.

## BMC's Control-T

The CA-Vtape virtual volume scratch list must be routinely synchronized with CTT control file status. The CTT scratch report provides the scratch volumes. The output listing of scratch volumes is passed to CA-Vtape. Sample JCL is in HLQ.VnRnn.SVTJCL(CTT). Review this job for the vcat dsnames and volume ranges specified during install. The CTT report can create long output records. Be sure the VVESYNC input volser listing has an LRECL of 255 bytes or less. Record format may be F or FB. The SVTSUTIL program places any virtual volumes selected into scratch status.

## Other Tape Management Systems

CA-Vtape virtual volume scratch list must be routinely synchronized, normally a daily process. A report from the Tape Management system to return volumes to scratch status is required. The output listing volumes being returned to scratch should model the TMSGRW step in HLQ.VnRnn.ini(ca1).

The only specific requirement is for the scratch volsers to appear one per line beginning in column one. Other information can help if these reports are saved for reference, but are ignored by the SVTSUTIL scratch process. The maximum supported LRECL (logical record length) for the scratch volser listing is 255 bytes.

Record format may be F or FB.

If your Tape Management System cannot produce a report listing the volsers in column one, contact CA-Vtape support for help. This usually requires a report step followed by a format step to extract the volsers of interest, the virtual volumes, and place them in column one.

Appendix

B

# Using the PARMLIB Feature

This appendix explains how to use the PARMLIB Feature which is a new feature added to CA-Vtape.

## PARMLIB Syntax Check Utility

At startup CA-Vtape reads and edits PARMLIB members used to defined runtime attributes that affect CA-Vtape processing. PARMLIB syntax errors may prevent CA-Vtape from being able to startup properly and can result in one or more error messages describing the condition along with a subsequent ABEND.

Since PARMLIB changes can be critical to the performance and operation of CA-Vtape it is important to review all such changes. To assist in making and testing your changes, the SVTPARMS utility can be run against your PARMLIB members. SVTPARMS invokes the CA-Vtape PARMLIB reader to check the syntax of various members and then produce a report of the various attribute values.

JCL for running SVTPARMS is created as part of the installation process and can be found in the SVTJCL data set.

Sample JCL for running SVTPARMS is shown below:

```
//*
//*****************************************************************
//* SYNTAX CHECK CA-VTAPE PARMLIB
//*****************************************************************
//*
//SVTPARMS PROC PARMDIR=VTPARMS
//SVTPARMS EXEC PGM=IRXJCL,
// PARM='SVTPARMS &&PARMDIR'
//STEPLIB DD DISP=SHR,DSN=&APF
//SYSEXEC DD DISP=SHR,DSN=&HLQ.REXX    YOUR VTAPE REXX LIBRARY
//SYSTSIN DD DUMMY,DCB=BLKSIZE=80
//SYSTSPRT DD SYSOUT=*
//SVTPARMS DD DISP=SHR,DSN=&DSN
//         DD DISP=SHR,DSN=&DSNPRE.SVTJCL
//         PEND
//*
//*****************************************************************
//*
//* // EXEC SVTPARMS,PARMDIR=MEMBER (,HEXDUMP  ,SYNTAX)
//*
//* WHERE PARMDIR=
//*
//* MEMBER
//*    IS THE NAME OF THE PDS MEMBER CONTAINING THE PARMLIB
//*    DIRECTORY.
//*
//* HEXDUMP
//*    PRODUCES A HEXIDECIMAL DUMP THE CONTROL BLOCKS.
//*
//*
//* SYNTAX
//*    FORCES THE PROGRAM TO COMPLETE THE SECTION SCAN INSTEAD
//*    OF STOPPING AFTER THE FIRST SYNTAX ERROR PER SECTION
//*
//* EXAMPLES:
//*
//*        EXEC SVTPARMS,PARMDIR='MEMBER'
//*        EXEC SVTPARMS,PARMDIR='MEMBER,HEXDUMP'
//*        EXEC SVTPARMS,PARMDIR='MEMBER,HEXDUMP,SYNTAX'
//*
//* +++ NOTES +++ PARMLIB SYNTAX ERRORS APPEAR AS WTOS
//*
//*****************************************************************
//*
//SVTPARMS EXEC SVTPARMS,PARMDIR=VTPARMS
//
```

Sample Report output for SVTPARMS is shown below:

```
PARMLIBDirectory read from VTPXE72 :
   Maps <sections> to PDS Members

      PARMLIBDirectory.............. VTPXE72
      StartupOptions................ VTPXE72
      DynamicOptions................ VTPXE72
      VirtualDeviceList............. VTPXE72
      GroupDefinitions.............. VTPXE72
      DatasetFilters................ VTPXE72



StartupOptions read from VTPXE72  errors, see wto messages, RC=(12)



DynamicOptions read from VTPXE72 :

      BypassRLLCompression.......... Y
      HardwareCompressionOption..... Y
```

# Summary of PARMLIB Features

The following is a brief summary of the changes and enhancements provided with the new PARMLIB feature of CA-Vtape.

- Parmlib support. New PDS members allow you to control additional aspects of CA-Vtape processing.
- Updated SVTS started task JCL procedure in support of PARMLIB.
- New operator commands allow you to change various PARMLIB options without stopping and restarting the subsystem.
- Dynamic group definitions. Group and subgroup attributes can now be changed dynamically through PARMLIB.
- Virtual device (drive) addresses are now assigned and can be modified through PARMLIB.
- Data set and data class filters can now be specified through PARMLIB.
- Virtual Volume compression. Using hardware compression instructions CA-Vtape now supports the ability to simulate IDRC, compressing virtual volumes and allowing you to store more data on DASD cache.
- ISPF panel changes to display compression information. Changes were made to the virtual volume as well as the group/subgroup display panels.
- Additional wild card characters and logic added to enhance data set filtering capabilities.

# Parmlib Support

This enhancement allows you to control processing attributes, options, and additional features of CA-Vtape using members in a partitioned data set.

## Parmlib Syntax

The parameter syntax used within PARMLIB members is similar to the syntax used for *.ini* files of various personal computer systems. Parmlib statements consist of:

**Blank lines** These are simply used for legibility and are completely ignored by CA-Vtape.

**; Comments** Comment lines always begin with a semi-colon. These statements are ignored by CA-Vtape and serve to document areas within PARMLIB.

**<SectionName>** Section names can be identified clearly because they are enclosed within '<' braces or bracket pairs '>'. Sections are used to delimit a common set of related attributes. While the order of sections within a PARMLIB member is not important, sections cannot be imbedded or nested. Each new <SectionName> marks the end of the prior section.

**attribute=values** Assign a value to a particular CA-Vtape parameter. In this case, the left side of the equal sign denotes the name of a particular attribute while the right side denotes its assigned value.

**FIGURE B-1 Snippet From Sample Parmlib Member VTPARMS:**

```
;*****************************************************************
;                   <ParmlibDirectory>
; This section represents a directory index to other parmlib members
; each attribute=value associates a <section name> to a pds member.
;*****************************************************************

<ParmlibDirectory>             ; Directory of Parmlib Member
  StartupOptions   =VTPARMS    ; Options used at startup
  DynamicOptions   =VTPARMS    ; Options which can be dynamically changed
  GroupDefinitions =VTGROUP    ; GroupDefinitons
  VirtualDeviceList=VTDRIVE    ; DriveList member
```

Notable facts;

- Parmlib data sets are fixed or fixed blocked partitioned data sets containing 80 byte logical records:
  CB=(RECFM=FB,LRECL=80,BLKSIZE=6400,DSORG=PO)

- Multiple partitioned data sets may be concatenated to allow different security requirements for various processing attributes.
- Within PARMLIB members only columns 1 through 72 are used. Columns 73-80 may or may not contain sequence numbers and are ignored by CA-Vtape.
- There is no continuation character.
- Descriptive attribute names are used to associate and assign data values to various SVTS parameters. Quoted values can contain blanks or other special characters and must be enclosed within single ( ‘ ) or double ( “ ) quote marks.
- Attribute=values must appear together on a single record between columns 1 through 72

## Generated Sample Parmlib Members

The CA-Vtape customization process will create several sample PARMLIB members in the &HLQ.SVTJCL and &HLQ.&SYSID.SVTJCL libraries. These members can be used as is or tailored prior to use by SVTS. We recommend creating one or more new PARMLIB libraries where you can copy and customize the generated members.

The following sample members are created:

- VTPARMS
- VTDRIVE
- VTGROUP
- VTFILTR
- Updated SVTS proc
- New SVTSAS proc

# Existing Customers Converting To CA-Vtape 2.0

Existing Customers converting to CA-Vtape 2.0 should:

1. Run the Local and Global customization panels (INSTALL REXX in HLQ.SAMEXEC) to generate the sample members. There is no need to execute any of the generated JCL.
2. Copy the sample members to a separate PARMLIB library. Customize these members as needed.
3. Copy the updated SVTS proc and the new SVTSAS proc to the Proclib Data Set. Customize these procs as needed.
4. Start CA-Vtape 2.0.
5. Convert filters lists from Basic to Enhanced mode. For further explanations see the section “Migrating from Basic to Enhanced Mode” in this appendix.

## VTPARMS

VTPARMS provides a directory to the remaining members of PARMLIB. It also contains various system processing options. All of these attributes are considered global in scope. Therefore, this member is generated in the HLQ.SVTJCL data set.

The SVTS JCL procedure for CA-Vtape 2.0 contains a PARMDIR= keyword parameter. At startup, SVTS loads the PARMLIB member named by this parameter (the default is VTPARMS). This PARMDIR= named member must have a <ParmlibDirectory> section. This is used as a directory or index to the remaining members and sections used by CA-Vtape.

VTPARMS contains attributes=values shown in Table B-1 and <sections> shown in Table B-2.

TABLE B-1 <ParmlibDirectory>

| Attribute=value | Default Value | Required | Type | Description |
|---|---|---|---|---|
| StartupOptions= | VTPARMS | Y | A/N | Parmlib member containing the <StartupOptions> section. |
| DynamicOptions= | VTPARMS | Y | A/N | Parmlib member containing the <DynamicOptions> section. |
| GroupDefinition= | VTGROUP | Y | A/N | Parmlib member containing the <GroupDefinitions> section. |
| VirtualDriveList= | VTDRIVE | Y | A/N | Parmlib member containing the <VirtualDriveList> section. |
| DataSetFilters= | $BASIC | Y | A/N | The keyword $BASIC to use Basic mode filters or a PARMLIB member containing the <DatasetFilters> section implementing Enhanced mode filters. |

TABLE B-2 <StartupOptions>

| Attribute=value | Default Value | Required | Type | Description |
|---|---|---|---|---|
| BypassUCBChecking= | N | N | Y/N | Perform UCB validation prior to use. |
| MihTimeoutValue= | 15 | N | Num | Sets the Virtual Drive MIH timeout in seconds. |
| SubAddressSpace Name= | SVTSAS | N | A/N | Indicates the address space name to use for the externalizations and recalls. |

The StartupOptions are only loaded during CA-Vtape at initialization. Any changes to these values while CA-Vtape is up and running will not take affect until CA-Vtape is stopped and subsequently restarted.

TABLE B-3 <DynamicOptions>

| Attribute=value | Default Value | Required | Type | Description |
|---|---|---|---|---|
| BypassRLLCompression= | Y | N | Y/N | Bypass IBM's CSRCESRV services implementing RLL compression. |
| HardwareCompression Option= | N | N | A/N | When should hardware compression be attempted. N= never, Y=Always, JCL=based on TRTCH, GROUP= based on group definitions |
| MinimumCompression Rate= | 15 | N | Num | Minimum compression rate to achieve otherwise stop performing compression. |
| MinimumCompression CPU= | 100 | N | Num | Percentage of additional CPU overhead allowed for compression. Any value other than 100% will decrease compression's CPU overhead by reducing the amount of data the compression routines will process. |

While active, the CA-Vtape subsystem can dynamically reload the DynamicOptions attributes using the following operator command:

```
SVTS REFRESH=OPTION
```

**FIGURE B-2 Sample VTPARMS member:**

```
*****************************************************************
;                   <ParmlibDirectory>
; This section represents a directory index to other parmlib members
; each attribute=value associates a <section name> to a pds member.
;*****************************************************************

<ParmlibDirectory>              ; Directory of Parmlib Members
  StartupOptions      =VTPARMS  ; Options used at Initialization.
  DynamicOptions      =VTPARMS  ; Options which can be refreshed.
  VirtualDeviceList   =VTDRIVE  ; DriveList member
  GroupDefinitions    =VTGROUP  ; GroupDefinitons
  DataSetFilters      =$BASIC   ; Data set and data class filters
;
<StartupOptions>
;
; These parameters are loaded at SVTS initialization.  SVTS must
; must be recycled (stopped and restarted) in order to change the
; parameter StartupOption values used by CA-Vtape.
;
  BypassUCBChecking         =N  ; Y/N Extra UCB validation
  MihTimeoutValue           =15 ; MIH Timeout for SETIOS (seconds only)
  SubAddressSpaceName   =SVTSAS ; Recall/Externalization Address Space
;
<DynamicOptions>
;
; These options can be dynamically changed and refreshed without
; stopping and starting the SVTS address space.  Simply change the
; values using ISPF and the issue the SVTS REFRESH=OPTIONS operator
; command.
;
  HardwareCompressionOption =N  ; Y/N/JCL/GROUP Perform Compression
  BypassRLLCompresion       =Y  ; Y/N Skip CSRCESRV Compression Services
  MinimumCompressionRate    =15 ; Minimum Compression Rate
  MaximumCompressionCPU     =100; %Additional CPU For Compression
;
```

The <StartupOptions> and <DynamicOptions> sections do not necessarily need to appear in the VTPARMS member. However, the default <ParmlibDirectory> section, in the sample VTPARMS member, indicates that these sections also appear in the VTPARMS member (it references itself). This technique allows all PARMLIB attributes and sections to appear in a single or multiple data set members.

## VTDRIVE

VTDRIVE is a PARMLIB member containing device addresses used by CA-Vtape to define virtual tape drives. Virtual tape drives are considered local in scope. Therefore, the member is generated in the HLQ.&SYSID.SVTJCL data set.

VTDRIVE contains attributes=values and <sections> shown in Table B-4.

TABLE B-4 <VirtualDriveList>

| Attribute=value | Default Value | Required | Type | Description |
|---|---|---|---|---|
| Offline= | | N | Hex | Virtual device address. Add as many Offline= parameters as required. Virtual drives may also be designated in list or range form. These devices are **not** varied online by CA-Vtape. |
| Online= | | N | Hex | Virtual device address. Add as many Online= parameters as required. Virtual drives may also be designated in list or range form. These devices are automatically varied online by CA-Vtape during startup. |

**FIGURE B-3 Sample VTDRIVE member:**

```
;*********************************************************************
;
;                     <VirtualDeviceList>
;
;  This section defines virtual device addresses used by
;  CA-Vtape to represent virtual tape units or drives.
;
;  An example of how to code this section:
;
; <VirtualDeviceList>             ; <SectionName>
;   Offline=0F41                    ; single entry
;   Offline=0F10,0F11               ; list  of entries i.e. addr,addr
;   Offline=0F20:0F24               ; range of entries i.e. addr:addr
;   Offline=0F31-0F35,0F40          ; combination shows list and range
;
;*********************************************************************
<VirtualDeviceList>
  Offline=1805
  Offline=180F
  Offline=1800,1801,1802
  Online=1803-1806
```

The CA-Vtape subsystem cannot dynamically change device addresses. You must stop and re-start the subsystem to change these addresses.

## VTGROUP

The VTGROUP PARMLIB member contains group attribute definitions. These attributes specify characteristics like the group esoteric names used to externalize virtual volumes. These options are considered local in scope. Therefore, this member is generated in the &HLQ.&SYSID.SVTJCL data set.

VTGROUP contains the<sections> and attributes=values shown in Table B-5.

TABLE B-5 <GroupDefinitions>

| Attribute= value | Default Value | Required | Type | Description |
|---|---|---|---|---|
| GROUPnn =aGroup SectionName | None | Y | A/N | The attribute name must be a valid group name, that is, GROUP01, GROUP02, GROUP03, and so on. All 32 GROUPS must be assigned to a valid section name describing their attributes. The attribute value, "aGroupSectionName", must be a defined section within the current PARMLIB member. This referenced section contains the attribute=values assigned to a given group. See Table B-6 <GroupSection>. |

TABLE B-6 <GroupSection>

| Attribute= value | Default Value | Required | Type | Description |
|---|---|---|---|---|
| Description= | None | N | A/N | An optional attribute used for documentation purposes. It is displayed in the Subgroup and Externalization Queue ISPF panels. The maximum length for this attribute is 30 characters. |
| MB_Threshold= | 2000 | N | Num | Sets the number of MBs queued for externalization in a group and subgroup before starting additional subtasks. |
| ShortRetention Period= | 7 | N | Num | Sets upper limit retention period for data sets within the *short* subgroup. |

| Attribute= value | Default Value | Required | Type | Description |
|---|---|---|---|---|
| Medium Retention Period= | 21 | N | Num | Sets upper limit retention period for data sets within the *medium* subgroup. |
| Primary= | None | Y | A/N | Esoteric unit used to allocate physical cartridges for externalizing primary copies of virtual volumes. |
| Duplex= | None | N | A/N | Esoteric unit used to allocate physical cartridges for externalizing duplexed copies of virtual volumes. *If blank, or not specified, no duplex copy is produced.* |
| Export= | None | N | A/N | Esoteric unit used to allocate physical cartridges for externalizing export copies of virtual volumes. *If blank or not specified, no export copy is produced.* |
| Hardware Compression Option= | N | N | A/N | Based on <DynamicOptions>, this attribute specifies whether hardware compression (IDRC simulation) should be attempted for a given group. Valid options include: Y \| N \| JCL. These options correspond to: always compress, never compress, or based on JCL. |
| Minimum Compression Rate= | 15 | N | Num | Minimum compression rate to achieve otherwise stop performing compression. |
| Maximum Compression CPU= | 100 | N | Num | Percentage of additional CPU overhead allowed for compression. Any value other than 100% will decrease compression's CPU overhead by reducing the amount of data the compression routines will process. |

While active the CA-Vtape subsystem can dynamically reload the <GroupDefinitions> attributes using the following operator command:

```
SVTS REFRESH=GROUP
```

The REFRESH=GROUP command should be executed when there is no active work in the queues for the groups being changed. Groups with active work in their queues will not be refreshed and the previous attributes will continue in effect. When changes are needed for some other the groups, it is recommended to first hold externalization on those groups, wait for the related externalization subtasks to complete and then proceed with refreshing the groups.

**FIGURE B-4 Sample VTGROUP Member**

```
;*****************************************************************
;                   <GroupDefinitions>
; This section indexes <section names> containing group attributes
; to group numbers.
;*****************************************************************
<GroupDefinitions>              ; Index of SectionNames below

  Group01=Primary_Only
  Group02=Primary_Duplex
  Group03=Primary_Export
  Group04=Primary_Duplex_And_Export

  Group11=Primary_Only
  Group12=Primary_Duplex
  Group13=Primary_Export
  Group14=Primary_Duplex_And_Export

(This continues through group #74 )

  Group71=Primary_Only
  Group72=Primary_Duplex
  Group73=Primary_Export
  Group74=Primary_Duplex_And_Export

;*****************************************************************
; Primary_Only, default for Groups n1
;*****************************************************************
<Primary_Only>
  Description='Primary Only'
  MB_Threshold=2000
  ShortRetention=7
  MediumRetention=21
  Primary=3490
  HardwareCompressionOption   = N
  MinimumCompressionRate      = 15
  MaximumCompressionCPU       = 100
```

## VTFILTR

The VTFILTR PARMLIB member contains data set filter include and exclude definitions, as well as SMS data class include definitions. These definitions determine what data is to be processed by CA-Vtape, and what group definitions will be used. These options are considered local in scope. Therefore, this member is generated in the &HLQ.&SYSID.SVTJCL data set.

VTFILTR contains the following <sections> and attributes=values:

TABLE B-7 <DatasetFilters>

| Attribute= value | Default Value | Required | Type | Description |
|---|---|---|---|---|
| IncludeData Sets= | None | N | A/N | Identifies section name(s) which contain data set filter patterns to be used in selecting data sets for CA-Vtape processing. See Table B-6 GroupSection. |
| ExcludeData Sets= | None | N | A/N | Identifies section name(s) which contain data set filter patterns to be used in excluding data sets for CA-Vtape processing. See Table B-6 GroupSection. |
| IncludeData Class= | None | N | A/N | Identifies section name(s) which contain SMS data class names to be used in selecting data sets for CA-Vtape processing. See Table B-6 GroupSection. |

TABLE B-8 <Include DataClass>

| Attribute= value | Default Value | Required | Type | Description |
|---|---|---|---|---|
| GROUPnn=SMS dataclass | None | N | A/N | The attribute name, 'GROUPnn=', must be a valid group name, that is, GROUP01, GROUP02, GROUP03, and so on. The value, "SMSdataclass", must be the name of a valid SMS defined data class. This will cause data sets in data class "SMSdataclass" to be processed by CA-Vtape into group number 'nn'. |

TABLE B-9 <Include Datasets>

| Attribute= value | Default Value | Required | Type | Description |
|---|---|---|---|---|
| GROUPnn= dsnpattern | None | N | A/N | The attribute name, 'GROUPnn=', must be a valid group name, that is, GROUP01, GROUP02, GROUP03, and so on. The attribute value, 'dsnpattern' is a data set pattern consisting of alphanumeric characters and special pattern matching characters. This will cause data set names that match this pattern to be processed by CA-Vtape into group number 'nn'. |

TABLE B-10 <ExcludeDatasets>

| Attribute= value | Default Value | Required | Type | Description |
|---|---|---|---|---|
| GROUPnn='ds npattern' | None | N | A/N | The attribute name, 'GROUPnn=', must be a valid group name, that is, GROUP01, GROUP02, GROUP03, and so on. The attribute value, 'dsnpattern' is a data set pattern consisting of alphanumeric characters and special pattern matching characters. This will cause data set names that match this pattern to be excluded by CA-Vtape from group number 'nn'. |

**FIGURE B-5 Sample VTFILTR Member**

```
;*****************************************************************
; VTFILTR  - CA-Vtape data set and data class filters
;*****************************************************************
;
; Parmlib is a pds containing fixed or fixed blocked 80 byte
; records. The syntax of a individual parmlib members is
; similar to the format used for .ini files on PCs.  Individual
; pds members of parmlib can contain ;comments, <sections>,
; and keyword=value pairs for example:
; ;
; ; Comments always begin with a semi-colon.
; ;
; <section_name>   ; optional comments
; attribute=value  ; optional comments value stops at first blank
; attribute='text with blanks'
;
; <another section>
; moreattribute=morevalues
;
; ; Parmlib is not case sensitive.  You can enter <section names>,
; ; attributes and values in upper, lower, or mixed case.
;
;
;*****************************************************************
;
;                   <DatasetFilters>
;
; This section associates <section names> to include/exclude
; lists.  Here each attribute value names another section containing
; a list of data sets or data class names which are to either
; be included or excluded from Vtape processing.
;
;
;*****************************************************************
<DatasetFilters>
;
 IncludeDataClass=IncludeDataClass   ; Select  based on Data Class
 IncludeDatasets =IncludeDataSets    ; Select  based on Dataset Name
 ExcludeDatasets =ExcludeDataSets    ; Exclude based on Dataset Name
;
;ExcludeDatasets =ExcludeGROUP02     ; Note, you can specify more than one
;                                    ; section...
<IncludeDataClass>
;*****************************************************************
;
;                   <IncludeDataclass>
;
; This section defines filters used to select tape data sets for
; CA-Vtape processing based on SMS data class
;
;*****************************************************************
;
;
; The format of attribute=values for this <section> is:
;
;     GROUPnn=DataclassName
;
; Where nn is the CA-Vtape group number to be assigned
;       to those dataset having a matching dataclassname.
;
; Examples:
;
; GROUP01=VTAPE01
; GROUP02=PDSEDC
;
```

```
<IncludeDataSets>
;*********************************************************************
;
;                   <IncludeDatasets>
;
; This section defines filters used to select tape data sets for
; CA-Vtape processing based on matching data set name
;
;
;*********************************************************************
;
;
; The format of attribute=values for this <section> is:
;
;     Groupnn='pattern'
;
; Where nn is the CA-Vtape group number to be assigned
;       to those dataset having name matching this pattern.
;
; Special characters:
; '?' Matches any character in the filter name. For example, SYS?.
; SYS?.LINKLIB will match both SYS1.LINKLIB and SYS2.LINKLIB.
;
; '/' When this character is in the pattern, comparison to the input
; string terminates at the previous character. This functions as
; the asterisk '*' used to in the previous data set filter support.
; For example, SVTS.VTAPE21/ will match any data sets that begin
; with SVTS.VTAPE21. Both SVTS.VTAPE21.TEST and SVTS.VTAPE210.TEST
; will both match.
;
; '*' This characters is similar to the slash, except that it's effect
; is limited to a single data set level. For example, SVTS.* would
; match any two level data set name beginning with SVTS. SVTS.TEST
; would match, but SVTS.TEST.DATA would not.
;
; '!' This characters will match following characters to any location
; in a  data set name string. For example, '!GRP21' would match any
; data set name the had GRP21 in any position. SVTS.GRP21.DATA would
; match, as would SVTS.TEST.DATGRP21.
;
; Examples:
;
; GROUP02='LEELA02/'
; GROUP02='SVTS120.*.TESTING'
;
; Since patterns contain characters such as */. they must be
; enclosed in quotation marks.
;
```

```
<ExcludeDatasets>
;*****************************************************************
;
;                   <ExcludeDatasets>
;
; This section defines filters used to exclude tape data sets from
; CA-Vtape processing based on matching data set name
;
;
;*****************************************************************
;
;
; The format of attribute=values in this <section> is:
;
;     GROUPnn='pattern'
;
; Where nn is the CA-Vtape group number to be excluded from for
;       those dataset having a name matching this pattern.
;
; Examples:
;
; GROUP01='!LEELA02/'
; GROUP02='SVTS120.*.TEST/'
;
; Since patterns contain characters such as */. they must be
; enclosed in quotation marks.
;
```

# SVTS JCL Procedure

## Release 1.2 - SVTS JCL Procedure

Changes are required to the SVTS JCL procedure, used to start the CA-Vtape subsystem, in order to activate PARMLIB support.

**FIGURE B-6 Sample Current SVTS JCL Procedure**

```
//SVTS      PROC SYSID=&SYSNAME
//IEFPROC   EXEC PGM=SVTSINI,
//          REGION=5M,
//          DPRTY=(15,15),
//          TIME=1440,
//          PARM='&SYSID,[NOCHECK]'
//STEPLIB   DD   DISP=SHR,DSN=&APF
//VCAT      DD   DISP=SHR,DSN=&HLQ..&SYSID..VCAT
//GLOBAL    DD   DISP=SHR,DSN=&VCGLOB
//BSDS1     DD   DISP=SHR,DSN=&BSDS
```

This existing syntax uses positional parameters and continues to work in CA-Vtape 2.0. This allows you to use your existing procedure unchanged. However, the new features and or functions provided by PARMLIB in CA-Vtape 2.0 are only activated when using a new SVTS JCL procedure syntax.

### Release 1.2 - Parameters

SYSID= This is an alphanumeric parameter providing system unique identifier for this instance of SVTS. The default value is `&SYSNAME.`

SYSID= is passed to the SVTSINI program through the PARM= parameter of the EXEC JCL statement. However, the program accepts two positional parameters. The second parameter (NOCHECK) is optional and is only used in special circumstances to allow SVTS to install virtual drives without extensive channel patch editing.

### Release 1.2 - Starting SVTS

The operator command for starting SVTS is as follows:

```
S SVTS,SYSID=sysid
```

## Release 2.0 - SVTS JCL Procedure

Parmlib support introduces changes to the SVTS started task that allows it to pass keyword parameters to the SVTSINI program. The use of keyword parameters can reduce errors and simplify the work necessary to add additional parameters in the future.

**FIGURE B-7 Sample new SVTS JCL Procedure:**

```
//SVTS      PROC SYSID=&SYSNAME,PARMDIR=VTPARMS
//IEFPROC   EXEC PGM=SVTSINI,
//          REGION=5M,
//          DPRTY=(15,15),
//          TIME=1440,
//          PARM='SYSID=&SYSID,PARMDIR=&PARMDIR'
//STEPLIB   DD   DISP=SHR,DSN=&APF
//VCAT      DD   DISP=SHR,DSN=&HLQ..&SYSID..VCAT
//GLOBAL    DD   DISP=SHR,DSN=&VCGLOB
//BSDS1     DD   DISP=SHR,DSN=&BSDS
//SVTPARMS  DD   DISP=SHR,DSN=&HLQ..&SYSID..SVTJCL
//          DD   DISP=SHR,DSN=&HLQ..SVTJC
```

These options are considered local in scope. Therefore, this member is generated in the &HLQ.&SYSID.SVTJCL data set.

### New Parameters

SYSID= This is an alphanumeric parameter providing system unique identifier for this instance of SVTS. The default value is &SYSNAME.

PARMDIR= This is an alphanumeric parameter naming the PARMLIB directory member.

At startup, SVTS loads this member to locate the <ParmlibDirectory> section. This section serves as a directory to the remaining members and sections loaded by CA-Vtape.

The default value is VTPARMS.

### Dropped Parameters

UCBCHECK was dropped from the new started task procedure. This option has become a PARMLIB option. See BypassUCBChecking= keyword in the section "SystemOptions" in this appendix.

### The SVTPARMS DD Statement

The new SVTS started task also includes a SVTPARMS data definition (DD) JCL statement. This DD statement names the PARMLIB data set(s). Parmlib members can be used to implement various CA-Vtape features or attributes. The DD statement is:

```
//SVTPARMS dd disp=shr,dsn='Parmlib Data sets'
```

### Starting the SVTS Procedure

The operator command for starting the new SVTS is as follows:

```
S SVTS,SYSID=systemid,PARMDIR=ParmlibDirectoryMemeber
```

## Operator Commands

Several new operator commands were added to support dynamic changes of PARMLIB members without stopping and restarting the CA-Vtape subsystem.

## SVTS REFRESH=OPTIONS

This command schedules the SVTS address space to reload the <DynamicOptions> section of PARMLIB.

```
SVTS REFRESH=OPTIONS
SVTSX0100I Command Scheduled in SVTS
IEE252I MEMBER  VTINDEX FOUND IN SVTS120.WK991030.CNTL
IEE252I MEMBER  VTINDEX FOUND IN SVTS120.WK991030.CNTL
SVTSS2500I SystemOptions refresh complete
```

## SVTS REFRESH=GROUP

This command schedules the SVTS address space to reload the <GroupDefinitions> section of PARMLIB.

```
SVTS REFRESH=GROUP
SVTSX0100I Command Scheduled in SVTS
IEE252I MEMBER VTPARMS FOUND IN QAPROD.VTAPE.SMP120.PARMLIB
IEE252I MEMBER VTGROUP FOUND IN QAPROD.VTAPE.SMP120.PARMLIB
SVTSS2400I GroupDefinitions refresh complete
```

## SVTS REFRESH=FILTERS

This command schedules the SVTS address space to reload the <DataSetFilters> section of PARMLIB.

```
SVTS REFRESH=FILTERS
SVTSX0100I Command Scheduled in SVTS
IEE252I MEMBER VTPARMS FOUND IN QAPROD.VTAPE.SMP120.PARMLIB
IEE252I MEMBER FILTERS FOUND IN QAPROD.VTAPE.SMP120.PARMLIB
SVTSR3500I <IncludeDataSets> entries in Enhanced Filter List     14
SVTSR3501I <IncludeDataSets> entries in Enhanced Filter List      2
SVTSS2600I DataSetFilterLst refresh complete
```

# Virtual Volume Compression

A new feature of CA-Vtape 2.0 is Virtual Volume Compression. It provides the ability to compress data written onto virtual volumes. Compressed volumes occupy less DASD and physical cartridge tape space. This results in better cache and cartridge utilization. Increased virtual cartridge capacity also allows a CA-Vtape subsystem to manage more user data. Compressed data requires fewer I/Os to read or write at the expense of some additional CPU overhead needed to perform the actual compression or expansion of that data.

**Note:** The additional CPU overhead required as well as the compression rate achieved is truly a function of the data. Your compression rate and CPU overhead will depend on your data. While it was common during our development testing to see 2 to 1 compression rates, this may not be representative of the amount of compression you will be able to achieve.

The CA-Vtape compression routines use a combination of techniques including run length limited (RLL) and the hardware compression facility as described in the publication IBM *Enterprise Systems Architecture/390 Data Compression, SA22-7208*. The compression facility provides LZ compression capabilities through hardware and/or software instructions. The logic added to CA-Vtape constantly performs dynamic analysis as data is written onto a virtual tape to select an efficient compression technique.

Virtual Volume Compression requires that you enable PARMLIB support. It is activated and controlled through attributes defined in the <DynamicOptions> section of VTPARMS. There are three PARMLIB attributes which control how and when compression is activated.

## <DynamicOptions> HardwareCompressionOption=

This alphanumeric attribute determines when compression is attempted. There are four valid option values which can be assigned to this attribute:

**N** Never attempt compression. No data is compressed.

**Y** Always compress. All virtual volumes are compressed.

**JCL** Compression based on JCL. If TRTCH=COMP is specified on the DD JCL statement, compression is applied. If TRTCH=NOCOMP is specified on the DD JCL statement, compression is not applied. If not specified this DD JCL parameter is defaulted to the value defined for the installation by your systems programmer.

**GROUP** Perform compression based on group definition. Instead of globally applying compression options to all virtual volumes in your environment, you can selectively compress specific groups. If this parameter is set to GROUP, CA-Vtape will interrogate the group definition section to determine when and how virtual volumes are compressed. See <GroupDefinitions>, HardwareCompressionOption=, MinimumCompressionRate=, and MaximumCompressionRate=.

## <DynamicOptions> MinimumCompressionRate=

This numeric attribute sets a lower limit percentage value at which compression is temporarily deactivated. See the section "HardwareCompressionOption=" in this appendix for more information about activating compression.

CA-Vtape calculates the virtual volume's rate of compression by tracking:

1. Number of 4MB segments written to the channel (that is, 4MB segments written by the application). The first segment contains control information. The minimum tracked value is 8MB.
2. Number of 4MB segments written to the virtual device (that is, 4MB segments written to DASD cache). The control information segment is not compressed and therefore the minimum value is 8MB.

Only application's written data segments are included in the rate of compression and is then being simply calculated as the ratio of these two values expressed as:

R=INT((A-B)*100)/A-4)

This always results in a value between 0 and 99.

**Note:** A value calculated as 50% represents 2 to 1 compression.

When compression is active, CA-Vtape will always attempt to compress the first 6 to 7mb of data. If the compression rate falls below the MinimumCompressionRate CA-Vtape will stop compressing for the next 43 to 44 MB of data.

When the MinimumCompressionRate is a low value, a larger percentage of the virtual volume will be compressed. When the MinimumCompressionRate is a high value, a smaller percentage of the virtual volume will be compressed. Regardless of the value specified for the MinimumCompressionRate, when hardware compression is active, CA-Vtape will always attempt to compress 6 to 7 MB of data for every 50 MB written. By constantly tuning its compression algorithm, CA-Vtape insures that it is efficiently compressing data onto the virtual device. This results in some type of compression being applied to a minimum of 10% of a full tape while reducing CPU overhead associated with compression when it is clearly ineffective.

## <DynamicOptions> MaximumCompressionCPU=

Using compression reduces IO and dasd utilization at the cost of additional CPU. The compression routines in CA-Vtape rely heavily on the use of certain hardware instructions to perform compression. The CPU expense for using these instructions will vary based on the hardware of your environment. For some shops the additional CPU expense might not justify the use of compression.

MaximumCompressionCPU allows you to control this additional CPU expense. In simplest terms this attribute allows you to control the percentage of data that is exposed to compression.

Specifying a value of 100 would allow all data could be compressed. This would incur the highest additional CPU cost while producing the best compression rate.

Specifying a value of 50 would only allow 50% of the data to be exposed to compression call instructions. On average this would result in approximately 50% less compression but also at 50% less CPU cost.

Specifying a value of 0 would result in no compression since no data would be exposed to the compression call instruction.

A low MaximumCompressionCPU value may drop the actual compression rate below the MinimumCompressionRate forcing compression to be temporally deactivated.

# ISPF Panel Changes

Some ISPF panel changes were made to support the Virtual Volume Compression enhancement. The ISPF interface will use the new panels if the PARMLIB enhancement was activated.

## Group Display Panel

Compression attribute fields were added to the Group Display Panel, which includes the following fields:

**Max Drives** Maximum number of drives that CA-Vtape can use for externalization.

**Drives In Use** Number of drives currently in use.

**Group ID** Name of individual work queues.

**Work Que** Whether or not work is presently queued for externalization.

**Cmp Opt** HardwareCompressionOption attribute value. This indicates when virtual volume compression should be applied.

**Min Pct%** MinimumCompressionRate attribute value. Determines the minimal rate of compression desired.

**Max CPU%** MaximumCompressionCPU attribute value. Determines what percentage of additional CPU to apply toward compression. Where 0 means not to use additional CPU time for compression and hence no data is compressed. Or 100 is use additional CPU as needed and everything getting more that MinimumCompressionRate is compressed.

**Primary** Device type or esoteric to use when creating a primary tape.

**Duplex** Device type or esoteric to use when creating a duplex tape.

**Export** Device type or esoteric to use when creating an export tape.

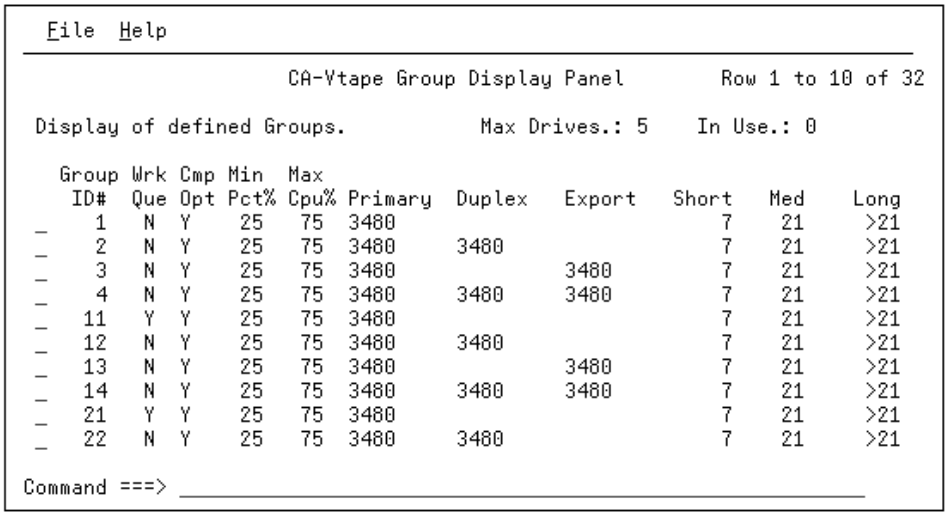
**Retention Periods** Backstore data is externalized and segregated onto physical cartridge tapes based on group id and retention period. The retention period is classified being:

**Short:**

**Medium:**

**Long:**

**FIGURE B-8 Sample of the Group Display Panel**




## Virtual Volume Display Panel

New columns have been added to the Virtual Volume Display to show the compression statistics, which now includes the following fields:

**Cache Limit** Maximum amount of DASD cache used for the virtual volumes.

**Cache In Use** Amount of DASD cache currently in use.

**Volid** Virtual volser number.

**Tape DSN** Data set name associated with the virtual volume. If the volume contains multiple DSNs, a plus sign is shown next to the Volid. To view these additional DSNs, select the entry by placing an "S" next to the entry.

**Cmp%** Rate of compression = int(((#mb-size)*100)/#mb-4)

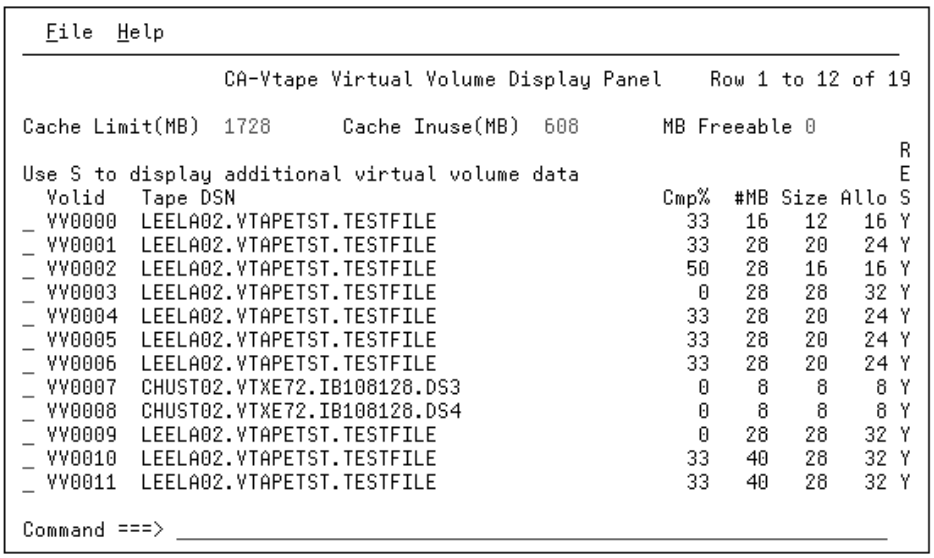
**#Mb** Estimated size of the virtual volume. Uncompressed size rounded to 4 MB. The first 4MB on each virtual volume contains CA-Vtape control data.

**Size** Compressed size of the virtual volume. Compressed size rounded to 4 MB, Also, it is the size required to store the virtual volume on a physical backstore tape. CA-Vtape allocates space to virtual volumes in 4 MB segments. The first segment always contains control information and is never compressed. Therefore, the smallest compressed virtual volume requires 2 segments or 8 mb.

**Allo** Size occupied by the virtual volume on DASD cache. Rounded to the size of an LDS cache data set. Each LDS cache data set is 1/10th the size of an uncompressed virtual cartridge tape. For 400mb virtual cartridges this value is a multiple of 40 MB while for 800 MB virtual cartridges this value is rounded to a multiple of 80 mb.

**Res** A flag which indicates if the virtual volume resides in DASD cache.

**FIGURE B-9 Sample of the Virtual Volume Display Panel**



# Enhanced Data Set Filters

CA-Vtape 2.0 supports two data set name/data class filter modes: Basic and Enhanced. In Basic mode only one wild card character is supported for data set names, the VTFILTR PARMLIB member is not implemented and the setup is accomplished following the explanations in the section Using the Data Set Filter List Display Panel in the chapter "Using the Interface" in this guide. This mode can be useful during the migration process from CA-Vtape 1.2.

The Enhanced mode provides more wild card characters, allowing customers more flexibility when defining their filter lists. Enhanced filtering is user specifiable, and will only be activated if the default value $BASIC is removed from the DataSetFilters attribute in the VTPARMS member and replaced with VTFILTR or any other valid member name. If this change is made while CA-Vtape is running the SVTS REFRESH=FILTERS command can be used to reload the enhanced filter lists.

Sample VTPARMS member to run in Basic mode:

```
<ParmlibDirectory>              ; Directory of Parmlib Members
  StartupOptions      =VTPARMS  ; Options used at Initialization.
  DynamicOptions      =VTPARMS  ; Options which can be refreshed.
  VirtualDeviceList   =VTDRIVE  ; DriveList member
  GroupDefinitions    =VTGROUP  ; GroupDefinitons
  DataSetFilters      =$BASIC   ; Data set and data class filters
```

An informational message will be generated if SVTS REFRESH=FILTERS is executed while in Basic mode:

```
SVTS REFRESH=FILTERS
SVTSX0100I Command Scheduled in SVTS
IEE252I MEMBER VTPARMS FOUND IN QAPROD.VTAPE.SMP120.PARMLIB
SVTSS2601I Data set and Dataclass filters in $BASIC mode
SVTSS2600I DataSetFilterLst refresh complete
```

Sample SYSLOG messages issued when SVTS REFRESH=FILTERS is executed in Enhanced mode:

```
SVTS REFRESH=FILTERS
SVTSX0100I Command Scheduled in SVTS
IEE252I MEMBER VTPARMS FOUND IN QAPROD.VTAPE.SMP120.PARMLIB
IEE252I MEMBER FILTERS FOUND IN QAPROD.VTAPE.SMP120.PARMLIB
SVTSR3500I <IncludeDataSets> entries in enhanced Filter List   14
SVTSR3501I <IncludeDataClass> entries in enhanced Filter List    2
SVTSS2600I DataSetFilterLst refresh complete
```

When running in Enhanced mode, a warning message will be issued if a REFRESH=FILTERS is executed without include entries. In this case CA-Vtape is not able to create new data sets on virtual volumes. For example:

```
SVTS REFRESH=FILTERS
SVTSX0100I Command Scheduled in SVTS
IEE252I MEMBER VTPARMS FOUND IN QAPROD.VTAPE.SMP120.PARMLIB
IEE252I MEMBER FILTERS FOUND IN QAPROD.VTAPE.SMP120.PARMLIB
SVTSR3502I WARNING: Enhanced Filter List has no include entries
SVTSS2600I DataSetFilterLst refresh complete
```

The enhanced data set filter operates as follows:

Dataclass includes are processed first, that is, if present they will determine if a tape will be processed by CA-Vtape, and what group it will be placed in. There is no interaction between dataclass includes and data set excludes.

Data set include and excludes are processed in conjunction with each other. In other words, once a match is found on the include list, the exclude list will be checked. If an initial include and subsequent exclude both match a particular data set for the same group, include scan will be re-driven to determine if any following includes would match for another group. For example:

```
<DataSetFilters>
IncludeDataSets  = IncludeDSNames
ExcludeDataSets  = ExcludeDSNames
IncludeDataClass = IncludeDataClass

<IncludeDSNamess>
GROUP01='SYS?./'
GROUP02='SYS2./'

<ExcludeDSNamess>
GROUP01='SYS2./'
```

A SYS0, SYS1 or SYS3-SYS9 and SYSA-SYSZ would all be processed by CA-Vtape into group 1, but SYS2, which is excluded from group one would be placed into group 2.

CA-Vtape enhanced data set filtering recognizes the wildcard characters shown in Table B-11.

TABLE B-11 Wildcard Characters

| Wildcard Character | Description |
|---|---|
| ? | If this character is in the pattern, it matches any character within a character string. For example, SYS?.LINKLIB matches both SYS1.LINKLIB and SYS2.LINKLIB. |
| * | If this character is present in a data set name string, a single level node is not checked (for example, A.*.B.*.SOURCE). The asterisk can be placed after significant characters in a string node to indicate that any following characters in the node are acceptable (for example, A.B*.SOURCE).<br>**Note:** The definition of the * character in CA-Vtape differs from the IBM usage. In most cases where you would use a * character in IBM products you should use the / character (described below) in CA-Vtape. |
| / | When this character is in the pattern, comparison to the input string terminates at the previous character. These are called prefix entries. If the prefix matches the input string up to the slash, the comparison is satisfied. For example, SYS/ matches all data sets whose names begin with SYS, regardless of what follows. This usage is similar to the way in which IBM products use the * character. For example, in IBM products, the pattern DEPT751.* finds all data sets with a first-level index of DEPT751. To obtain the same result in CA-Vtape, use the pattern DEPT751./. |
| ! | When this character (English exclamation mark, X"5A") is encountered, the input is searched for a match on the characters that follow it. The pattern characters can occur anywhere in the input string. For example, the pattern !SYS1 matches any data set name that contains the SYS1 string anywhere in the name. The pattern !SYS1! matches any data set that ends in the string SYS1, regardless of what precedes that string. |

## Migrating From Basic To Enhanced Mode

For CA-Vtape 1.2 users to migrate from Basic mode to Enhanced mode you will need to run the conversion utility (member SVTDSCNV in the HLQ.&SYSID.SVTJCL data set). You will need to modify the sample to suit your environment.

```
//JOBCARD   JOB . . . . MSGLEVEL - 0.MSGCLASS=X.NOTIFY=
//*******************************************************************
//*  !!!!!!!!!!!!!!!!!!!!!!!!!!!! NOTE !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*
//*  !!!!!!!!!!!!!!!!!!!!!!!!!!!! NOTE !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!*
//* ONLY CUSTOMERS THAT HAVE EXISTING FILTER LISTS NEED RUN THIS JOB.      *
//* If this is a first time install you can ignore this member.           *
//*******************************************************************
//*******************************************************************
//* CA-VTAPE MUST BE RUNNING WHILE THIS UTILITY IS EXECUTED.              *
//* THIS UILITY INTERACTS WITH THE LOCAL VCAT ONLY AND GENERATES          *
//* A PRAMLIB MEMBER IF THE SVTSPARMS DD STATEMENT IS PRESENT             *
//* THIS UTILITY SHOULD RUN ON THE LPAR THAT OWNS THE LOCAL VCAT          *
//* BEING PROCESSED.                                                      *
//*                                                                       *
//* PARM-CONVERT                                                          *
//* THIS WILL CONVERT THE CURRENT (OLD) DATA SET FILTER LIST IN THE       *
//* LOCAL VCAT TO THE NEW FORMAT. THE DATA SET NAME SUPPLIED MUST         *
//* HAVE A MEMBER NAME SPECIFIED. OR THE PDS WILL BE DESTROYED. THE       *
//* OUTPUT MEMBER IS TO BE USED ASA THE NEW FILTER LIST PARMLIB           *
//* MEMBER.                                                               *
//*                                                                       *
//*******************************************************************
//STEP01   EXEC PGM=SVTDSCNV,PARM=CONVERT
//STEPLIB   DD  DISP=SHR.DSNQAPROD.VTAPE.SMP120.LOADLIB
//SYSUDUMP  DD  SYSOUT=*
//* YOU MUST SPECIFY A MEMBER NAME IN THE SVTSPARMS DATA SET NAME!!
//*SVTPARMS  DD DSN=???????.?????.PARMLIB(????????).DISP=SHR
//*SVTPARMS  DD DSN=???????.?????.PARMLIB(????????).
//*            SPACCE=(CYL.(1L1).RLSE).STORCLAS=???????.
//*            DISP=(NEW.CATLG.DELETE)
```

Once the conversion has completed you must activate the Enhanced filters by editing the VTPARMS PARMLIB member. Once in edit mode you should replace $BASIC in the DataSetFilters attribute under the section <ParmlibDirectory> in VTPARMS, with the generated member name, that is, VTFILTR, and issue a 'SVTS REFRESH=FILTERS' command to activate the new Enhanced filter list.

CA-Vtape supports switching from Enhanced mode back to Basic mode, however changes made to the filters in Enhanced mode will not be included in Basic mode.

# ISPF Panel Changes

To avoid confusion, enhanced filter mode deactivates SVTSMON main menu options 4 and 5. Once you are using enhanced filtering, browsing the PARMLIB member immediately after a refresh will be the only way to examine the filter list contents.

# Glossary

| | |
|---|---|
| **ACS** | Automated Class Selection |
| **BSDS** | Bootstrap Data Set |
| **BACKSTOR** | The process of moving virtual data (DASD cache) to 'tape' media. The Backstore may be virtual tape, physical tape or cartridge media.<br><br>Used as a synonym for the physical media where cache is moved. |
| **CDS** | Control Data Sets |
| **CHPID** | Channel Path ID. CA-Vtape requires a valid online CHPID so it can avoid path validation. CA-Vtape selects the 1st online CHPID from the SYSRES. We do this because the SYSRES may never be varied offline but individual paths can be varied offline. There is no way to be assured that the path we select will never be required to be varied offline but by selecting the 1st CHPID from SYSRES, we have reduced the exposure. |
| **DATA SPACE** | Facility that became available with the introduction of OS/390, allowing you to access information in memory which may be mapped to Linear Data Sets (LDS). Also referred to as DSP. |
| **DIV** | CA-Vtape uses Data In Virtual performance techniques provided by OS/390. |
| **DVE** | A 4MB segment used by CA-Vtape when partitioning the LDS. This helps in managing virtual storage consumption since externalization is based on filling a DVE. An overrun threshold maximizes the number of unexternalized DVE's so that each VTU has a maximum amount of virtual storage it may consume. |
| **Global VCAT** | A global volume catalog control file that records common shared information such as Volumes in a multi-system configuration. |
| **HCD** | Hardware Configuration and Definition |

| | |
|---|---|
| **HLQ** | High Level Qualifier |
| **IDRC** | Improved Data Recording Capability |
| **LDS** | Linear Data Sets are used by CA-Vtape and are 10% of the defined size of a virtual volume. |
| **Local VCAT** | A local volume catalog control file. |
| **OEMI** | Original Equipment Manufacturer Interface |
| **PGMDIR** | Program Directory library |
| **PTU** | A Physical Tape Unit control block. PTUs are attached to the address space only during externalization or internalization from physical tape. |
| **RIMLIB** | Related Installation Materials library |
| **SMF** | System Management Facilities |
| **SRM** | System Resource Manager |
| **VCAT** | A LDS data set containing control information specific to an MVS system image. Also known as a Local VCAT. |
| **VTU** | A Virtual Tape Unit control block. VTUs are attached when virtual drives are varied on-line through an OS/390 command. They are detached when varied off-line. |
| **VMA** | DF SMS Volume Mount Analyzer. |

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