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IBM® TS7700 Series
TS7700 zTape Air-Gap User's Guide
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Introduction

TS7700 zTape Air-Gap was first introduced as an RPQ for release 8.51.2.12 and later as feature code 5995 for release 8.53.x.x. It provides a low cost alternative customer rack mount solution to replace C06/C07 IBM controllers. It offers z Mainframe customers a cost effective solution using LTO8 tape drives within a TS4300 an air-gap tape drive for exporting tapes for backup and restore. TS7700 zTape Air-Gap is also referred to as, Simple Tape Attach (STA).

Description

The STA feature may only be added to a TS7700 disk-only solution and provides new methods for writing and reading to physical (LTO) tape media residing in a TS4300 library. This is an alternative solution to the TS7700 Tape Attach feature and copy export and fits within a single rack. This feature is designed for limited and specific use cases and uses new LIBRARY REQUEST commands (STAxxxx) to initiate and to track status. Similar to copy export, the logical volumes that are backed up using the new STA method are also copied to physical tape media enabling the logical volumes that were backed up to continue to be accessible in the TS7700. This new feature may be useful for clients that are mainly using physical tape media today with the IBM 3592 Model C06 and C07 tape control units and still have a need for physical media. That need could be for backup (off-site) and/or for data interchange purposes

The physical tape media created by the new STA method's backup capability is only useful by the new method's restore capability and the physical tape media used for restoring must have been generated using the new STA backup method.

Media encryption may be used but would be configured by the TS4300 library and the LTO drives, external to the TS7700.

This feature installs additional software on the TS7700.

There is no corresponding host software that is needed for this solution; however, as indicated below, this solution can take full advantage of existing tape management system software (for example, z/OS DFSMSrmm and its stacked volume support). If DFSMSrmm is being used, refer to the following (optional) enhancements shipped with APAR OA63639. Check with your tape management system vendor for equivalent-type support.

Tape Drives

This feature requires IBM LTO drives installed in the TS4300. All solutions which utilize this feature and share media must use the same drive model. There can be one or two tape drives installed. The second tape drive is used for redundancy only.

Library

This feature requires the IBM TS4300 tape library. A logical library is configured on the physical library with the drives, storage, and Import/Export elements. Cartridge policies should be configured for the physical tape volumes to be used.

TS7700 Attachment to Tape drives and Library

The LTO tape drives residing in the TS4300 are attached to the TS7700 using one FCP HBA port on the TS7700 per drive. The drives installed in the library are configured as a control path for communication to the library.

Methods Supported

The use cases supported by this feature are backup, restore, and import of new data into the TS7700 disk cache. All existing functions in the TS7700 remain as they are today.

User Interface

The user initiates the new STA methods from the z/OS host using the LIBRARY REQUEST command or from the TS7700 Management Interface using the same LIBRARY REQUEST command. For IBM Z (VM, VSE and TPF), the STA methods must be initiated through the TS7700 Management Interface.

This requires a pre-requisite TS7700 code change.

Library Request Commands

Backup

Backup (STABACK) will write logical volumes in the TS7700 disk cache to LTO physical media, stacking the logical volumes. When initiated, this command can be used to backup one or more logical volumes, or it can also be used to backup the logical volumes in a specified storage group. Volumes assigned to a scratch category or the private category X'FFFF' are not backed up.

After backing up logical volumes, regardless of the selection method used, they are moved to the TS7700 reserved private category X'FFFF'. Volumes in this private category X'FFFF' can still be read by the z/OS host.

This is an asynchronous task which is started, status is returned, and the user receives notification when it completes. The user can also issue LIBRARY REQUEST commands to check on status (STASTAT). When the backup is complete, the physical volume will be automatically ejected.

```
LI REQ syntax:
LI REQ,<LIBNAME>,STABACK,<PVOL>,<(ALL|VOL|STG)>,<VALUE>
```

The response from this command will indicate if the BACKUP task was started or if there is a condition preventing the request from starting. The <LIBNAME> referenced in the command would be the distributed library (or cluster) that has the STA feature installed.

Basic wildcarding using (*) and (%) may be used in the **<PVOL>** field or in the **<VALUE>** field when the 3rd keyword is **<VOL>.** You may use asterisks (*) and percent signs (%) to qualify the specified volsers. An asterisk replaces any number of follow-on characters, and a percent sign replaces one character. Asterisks and percent signs may be used together.

All logical volumes selected must fit on the single physical volume or a failure will occur. Physical volume spanning for a single backup is not supported. The physical volume is always written from BOT, all existing data on the physical volume will be overwritten by this new backup.

The list of logical volumes that are backed up to the physical volume can be obtained by issuing a STASTAT TASK request after the STABACK completes. This must be done before the next STABACK or STAREST command as this data is only maintained for the last STABACK or STAREST command issued.

Examples:

```
# Backup all logical volumes that start with ABC on JC1234
LI REQ,BARR16A,STABACK,JC1234,VOL,ABC*

# Backup all volumes whose first character is A and third C
LI REQ,BARR16A,STABACK,JC1234,VOL,A%C*
```



```
# Backup all logical volumes
LI REQ,BARR16A,STABACK,JC1234,ALL

# Backup all logical volumes in storage group BACKUPS on physical
# volume that starts with JC
LI REQBARR16A,STABACK,JC*,STG,BACKUPS
```

Restore

Restore (STAREST) all logical volumes to the TS7700 disk cache from the physical volume <PVOL> specified. There is no method to restore a subset of the logical volumes on a physical volume.

This is an asynchronous task which is started, status is returned, and the user is notified when it completes. When the restore is complete, the physical volume will be unloaded and demounted (returned to a storage cell in the library.) If a logical volume being restored already exists in the cache and is the same date and timestamp or older than the volume to be restored, then the volume in the TS7700 will be overlaid with the data on this backup volume and placed in the insert category. If the volume in the TS7700 exists and is newer than the volume to be restored, the restore command will fail. Volumes which have been updated since the backup occurred must be scratched and expired or ejected from the TS7700 before the restore will work. If the logical volume does not exist in the TS7700 it will be added to the inventory and placed in the insert category.

The list of logical volumes that are restored from the physical volume can be obtained by issuing a STASTAT TASK request after the STAREST completes. This must be done before the next STABACK or STAREST command as this data is only maintained for the last STABACK or STAREST command issued.

```
LI REQ syntax:
LI REQ,<LIBNAME>,STAREST,<PVOL>
```

The response from this command will indicate if the RESTORE task was started or if there is a condition preventing the request from starting.

Example:

```
# Restore all logical volumes on physical volume JC1234
LI REQ,BARR16A,STAREST,JC1234
```

Import

The import method is the same as the restore (STAREST) method above. The logical volumes being imported must have been backed up by a TS7700 with this feature using the backup (STABACK) method.

For this use case, one host uses STABACK to backup one or more logical volumes to a physical volume. This physical volume is then shipped to another TS7700 with this feature who would then restore from this physical volume all the logical volumes on that physical volume.

See Restore for details.

Status

Status (STASTAT) returns the status of the current or prior backup/restore, or the status of the library and drives.

```
LI REQ syntax:
LI REQ,<LIBNAME>,STASTAT[,TASK[,<n>]]
```

If there is a current backup/restore task running, then the response from this command will return status of the current task.

If there is no backup/restore task running and the optional keyword TASK is added, then the response from this command will be the status of the prior task which completed.

If there is no backup/restore task running and the optional keyword TASK is not specified, then the response from this command will be the status of the library.

In some cases there may be more detail to return in the response than will fit in the allocated space for a LI REQ response. In this case the user may specify the optional <n> parameter which selects which page of output to return. If <n> is not passed, page 1 will always be returned. If <n> is greater than the number of pages, the last page will be returned. Each page has an indicator of the page number and how many pages are available.

The list of logical volumes that were backed up or restored to/from the physical volume can be obtained by issuing a STASTAT TASK request after the preceding STABACK or STAREST command completes. This must be done before the next STABACK or STAREST command as this data is only maintained for the last STABACK or STAREST command issued. The user must maintain this list of lvols associated with the PVOL as it can not be obtained via a query command, only upon the STAREST, which will list the lvols as they are restored.

Examples:

```
# Give status of last backup/restore task
LI REQ,BARR16A,STASTAT,TASK

# Give status of library or current running task
LI REQ,BARR16A,STASTAT
```

Cancel

Cancel (STACANC) will request the current backup/restore method to be cancelled. This is an asynchronous operation. The backup/restore will be notified of the cancel request and it will complete as soon as the current non-interruptible step is complete.

The steps that may take more time are the mount, backup or restore, demount, and eject. After each of these steps the task will check to see if a cancel was requested and if so, it will terminate at that point. The last steps after the eject are not interruptible and generally complete very

quickly. These steps move the backed up volumes to the private reserved category FFFF or for the restore volume to the insert category FF00.

If a cancel is issued before the eject occurs for a backup it may be reissued because the logical volumes have not been moved to FFFF.

```
LI REQ syntax:
LI REQ,<LIBNAME>,STACANC
```

The response from this command will be the status of the backup/restore running, which is being cancelled. (This is the same output as would be received by a STASTAT,TASK request.)

Host Messages Presented

There are three types of messages presented to the host over the FICON channel by this Simple Tape Attach (STA) function.

1. Existing TS7700 copy export message E0006 (often used by the tape management system to track a stacked volume that is being exported)
2. Existing TS7700 message E0030 (used to indicate when a stacked volume is returned to the library)
3. New OP094[0-3] operator messages. These messages are displayed as part of existing z/OS host message CBR3750I.

Export Message E0006

At the successful completion of an STABACK request, operator message E0006 will be raised to the host to trigger host software automation to recognize that logical volumes have been exported to a physical volume.

```
E0006 STACKED VOLUME <PVOL> FROM <DIST_LIB_ID> IN EXPORT
Resulting in z/OS host message CBR3750I (for example):
CBR3750I MESSAGE FROM LIBRARY BARR16A: E0006 STACKED VOLUME WMT002 FROM
BA16A IN EJECT. SEVERITY IMPACT: INFORMATION.
```

Stacked Volume Returned Message E0030

When a volume is imported into the TS4300 Library, operator message E0030 will be raised to the host. This is for informational purposes and could be used by host automation.

```
E0030 STACKED VOLUME <PVOL> RETURNED TO THE LIBRARY <DIST_LIB_ID>
```

Operator Messages OP094n

When the Simple Tape Attach (STA) function is invoked for either a STABACK or a STAREST, request which execute asynchronously, the host may poll for the progress and completion of this task using the STASTAT command. In addition to the polling, the host will be notified when the operation completes. These messages are defined as:

```
940 STABACK <pvol> <STG|VOL> <string> <task_id> Success
941 STABACK <pvol> <STG|VOL> <string> <task_id> Failed <error_word>
942 STAREST <pvol> <task_id>) Success
943 STAREST <pvol> (task_id) Failed (error_word)
```

These messages are displayed as part of existing z/OS host message CBR3750I (for example):

```
CBR3750I MESSAGE FROM LIBRARY BARR16A: OP0940 STABACK WMT002
```

Codes returned:

```
STABACK:
Success rc=0
Failure rc=6_PVOL_not_in_library
```

```
Failure rc=4_zero_LVOLS_match
Failure rc=3_PVOL_mount
Failure rc=3_PVOL_write
Failure rc=3_PVOL_demount
Failure rc=7_PVOL_eject_IO_station_full
Failure rc=3_PVOL_eject

STAREST:
Success rc=0
Failure rc=6_PVOL_not_in_library
Failure rc=3_PVOL_mount
Failure rc=3_PVOL_read
Failure rc=3_PVOL_demount

RC=2 is a logic error and requires development support.
RC=3 implies a hardware error.
RC>3 implies a user error that the operator may resolve.
```

Service, Install, Support

Install

The process for installing TS7700 FC 5995

1. The TS7700 is installed, configured, and brought online.
2. The LTO tape drives and TS4300 library are installed, configured, and brought online.
3. Note: Rack mount TS7700 allows for the TS4300 library to be installed in the same rack as the TS7700.
4. Physical LTO tape volumes are inserted into the TS4300 library.
5. Cable the LTO drive(s) to the TS7700 using designated fcp hba ports on the TS7700. The ports used are the same ports which are used by the TS7700 Tape Attach Feature.
6. (For 8.51.2.12 RPQ 8B3761) Install the feature software via vtd_exec.373. The software installation process verifies the hardware configuration. This feature software must be reinstalled each time the TS7700 code is installed. (For 8.53.x.x FC5995) Configure the tape devices and library from the SMIT STA Utility menu.

Uninstall

The Process for uninstalling TS7700 FC 5995

1. Remove the cable(s) to the drives(s) at the TS7700 designated fcp hba ports.
2. For 8.51.2.12 RPQ 8B3761) Remove the feature software via vtd_exec.373. (For 8.53.x.x, remove FC5995)

Call Home

In the event of a hardware error, the new feature will call home. The health is not monitored automatically, only upon a backup/restore command from the host.

Service Query

Service can be done via remote connecting into the TS7700 and looking at the feature software logs and status indicators. The only hardware in the TS7700 that is unique to this feature are the designated fcp hba ports. There are concurrent replacement methods already in the TS7700 for these ports.

Service from the TS7700 can identify when there is a tape or library hardware problem. Service of the LTO drives and the TS4300 library are managed under their service agreements and are outside of the scope of this feature.

DFSMSrmm Stacked Volume Support

When using DFSMSrmm, the recommendation is to take advantage of RMM's existing stacked volume support to track the movement of the LTO physical tape volumes. Though RMM will have no knowledge of the logical volumes that have been backed up using the Simple Tape Attach (STA) feature of the TS7700 (similar to the TS7700's copy export support), RMM can be setup to help manage the movement of the LTO physical volumes.

To use RMM's stacked volume support:

1. For RMM to take action automatically, the RMM CDS must be updated to begin using STACKED volume support with EDGUTIL. While DFRMM is down across the RMMplex, the following JCL can be run to enable the stacked volume support:

   ```
   //EDGUTIL  EXEC PGM=EDGUTIL,PARM='UPDATE'
   //SYSPRINT DD   SYSOUT=*
   //MASTER   DD   DISP=SHR,DSN=your.rmm.cds
   //SYSIN    DD   *
    CONTROL CDSID(cdsid) STACKEDVOLUME(YES)
   /*
   ```

   After this task is completed, stacking support in RMM can be checked by issuing TSO subcommand RMM LC ALL and looking for the Options field:

   ```
   Options:
      Stacked Volumes          = ENABLED    <----
      Extended Bin             = DISABLED
      Common Time              = DISABLED
      CDSID ENQ name           = ENABLED
   ```

   However, there are some cases where pre-existing information in the RMM CDS regarding containers may cause a condition where STACKED support shows up as MIXED. In this condition, RMM will not be able to run EDGHSKP functions. Note that enabling stacking support in RMM is a 'one way' exercise, ie, once you have enabled it you cannot disable it without forward recovering the CDS to a point prior to the enablement. As such, it is recommended that you review the information in the following link prior to running this step.

   https://www.ibm.com/docs/en/zos/2.5.0?topic=server-enabling-stacked-volume-support

2. With the RMM stacked volume support enabled, when the CBR3750I (E0006) message is issued, RMM automatically detects that a physical stacked volume has been put into EJECT status and defines the volume to the RMM CDS as TYPE STACKED with the OWNER of EXPORT.

```
Volume information:
Volume = JCC252   VOL1  =          Rack  =          Owner   = EXPORT
  Type = STACKED          Stacked count  = 0        Jobname =
```

3. A media name of LTO (or another name of your choosing) can be specified in the EDGRMMxx PARMLIB member using a VLPOOL statement for the LTO volser range, in this example we will use a stacked volsers that begins with JCC:

   VLPOOL PREFIX(JCC*) DESCRIPTION ('LTO volumes') EXPDTCHECK(N) - MEDIANAME(LTO) RACF(N) TYPE(S)

   This results in the media name being displayed as:

   ```
   Media name          = LTO
   ```

4. Any unique MEDIANAME can be chosen but it is important that MEDIANAME needs to be consistent between the VLPOOL statement and the EDGRMMxx LOCDEF statement set up as a location to move the physical tapes to after eject. For example using location name of OFFSITE :

   LOCDEF LOCATION(OFFSITE) TYPE(STORAGE) MEDIANAME(LTO) MANAGEMENTTYPE(NOBINS)

5. The following commands can be used to define a VRS policy to manage the movement of the LTO physical tape volumes offsite after eject and keep them there. As an example, for a client’s usage pattern where, based on the data being backed up daily, they keep the volume off site for 7 days and then allow it to return to the library. We use the STORENUMBER parameter to control the number of tapes allowed at the offsite location.

   RMM AS VOLUME(JCC*) STORENUMBER(7) LOCATION(OFFSITE)

   This VRS policy marks any volume that is ejected from the library as INTRANSIT. Once EDGHSKP VRSEL is run the REQUIRED location for the volume will be set to OFFSITE. Then once EDGHSKP DSTORE is run the DESTINATION location will be set to OFFSITE.

   Just as with any existing VRS movement policy in use, a CONFIRMMOVE needs to be done after the physical movement to a new location notify RMM that the tape has changed locations successfully. Confirming movement is discussed at the following link:

   https://www.ibm.com/docs/en/zos/2.5.0?topic=management-confirming-global-volume-movement

What this looks likes from an RMM perspective is reflected in the following displays of the volume near the end of the report. After initial creation of the volume record in RMM by the interception of the CBR3750I (E0006) message from the library the location information shows INTRANSIT=Y but no REQUIRED location set.

```
Movement tracking date = 08/30/2021       Intransit = Y
In container           =                  Move mode = AUTO

Location:    Current      Destination  Old          Required     Home
Name       = BARR16A                                           BARR16A
Type       = AUTO                                              AUTO
```

After VRSEL runs, the REQUIRED location is set to the location specified in the previously defined VRS policy, OFFSITE, and INTRANSIT=Y is still set.

```
Movement tracking date = 08/30/2021       Intransit = Y
In container           =                  Move mode = AUTO

Location:    Current      Destination  Old          Required     Home
Name       = BARR16A                  BARR16A      OFFSITE      BARR16A
Type       = AUTO                     AUTO         STORE        AUTO
```

After DSTORE is run on the same day or later (they can be done in same step if desired), the DESTINATION is now also set to OFFSITE:

```
Movement tracking date = 08/31/2021       Intransit = Y
In container           =                  Move mode = AUTO

Location:    Current      Destination  Old          Required     Home
Name       = BARR16A      OFFSITE      BARR16A      OFFSITE      BARR16A
Type       = AUTO         STORE        AUTO         STORE        AUTO
```

After the tape is physically moved to the offsite location, the TSO subcommand RMM CV volser CMOVE is issued or the RMM Panels are used to confirm the move. The display then updates the CURRENT field to OFFSITE and turns off the INTRANSIT flag:

```
Movement tracking date = 08/31/2021       Intransit = N
In container           =                  Move mode = AUTO

Location:    Current      Destination  Old          Required     Home
Name       = OFFSITE                  BARR16A      OFFSITE      BARR16A
Type       = STORE                    AUTO         STORE        AUTO
```

Once the STORENUMBER value is satisfied from the VRS policy, ie, the number of tapes in the offsite location meets or exceeds the STORENUMBER, the VRS releases the oldest volume in the location to be returned to the home library. The next run of VRSEL will mark the volume as eligible for movement by turning on the INTRANSIT flag, then DSTORE will initiate the movement back to the home location where the library resides, BARR16A. In this way a continuous flow of older backups cycle through the offsite location and then return to the library to be reused.

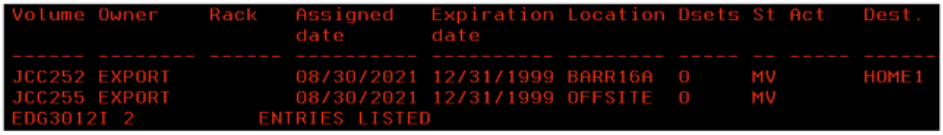
After the volume returns to the library location, it should then be deleted before it is used again in the backup process with RMM DV volser FORCE. This command removes it

entirely from the RMM CDS and when it gets used again in this process it will get automatically redefined. There is no need to confirm the final movement before deleting the volume.

Alternatively, if it is desired to instead keep the volume in the RMM CDS for inventory tracking purposes, there is an RMM APAR to now allow this. APAR OA63639 allows a CONFIRMMOVE command to be issues for volumes moving back into the distributed library from which they were ejected. However, it is important that if this method is chosen an additional step of issuing RMM CV volser MANAUALMOVE is also done to keep the volume VRS policy from prematurely moving returned volumes offsite before they are used again as a target for the backup procedure.

At any time in the process, the following RMM command can be issued to determine how many stacked volumes are in use and where they are located.

RMM SV VOLUME(*) OWNER(*) LIM(*) TYPE(STACKED)



```
Volume Owner    Rack   Assigned   Expiration Location Dsets St Act   Dest.
                       date       date
------ -------- ------ ---------- ---------- -------- ----- -- ----- ------
JCC252 EXPORT         08/30/2021 12/31/1999 BARR16A  0     MV       HOME1
JCC255 EXPORT         08/30/2021 12/31/1999 OFFSITE  0     MV
EDG3012I 2          ENTRIES LISTED
```

Detailed use case examples and useful JCL:

In this example, the libname is BARR16, the storagegroup we are writing to on that library is AIRGAP, the stacked volser range we are working with is DVxxxx and the location we are moving the tapes to is named VAULT. Our VRS policy is designed to keep two tapes in VAULT and when a third tape is written it will automatically move the oldest tape in VAULT back to the library for future processing.

1) Enable stacked volume support in DSMSrmm

We can see in our lab this is already active by issuing TSO subcommand RMM LC ALL and looking for the Options field:

Options:

```
Stacked Volumes          = ENABLED    <----
Extended Bin             = DISABLED
Common Time              = DISABLED
CDSID ENQ name           = ENABLED
```

2) Create VLPOOL and LOCDEF definitions in EDGRMMxx:

```
VLPOOL PREFIX(DV*) DESCRIPTION('LTO VOLUMES')  -
       EXPDTCHECK(N) MEDIANAME(LTO) RACF(N) TYPE(S)

LOCDEF LOCATION(VAULT) TYPE(STORAGE) MEDIANAME(LTO) -
 MANAGEMENTTYPE(NOBINS)
```

3) Define volume movement VRS policy for our stacked volume range:

```
RMM AS VOLUME(DV*) STORENUMBER(2) LOCATION(VAULT)
```

4) Select volumes in the library that are available to create a backup on:

```
LI REQ,BARR16,STASTAT
CBR1020I PROCESSING LIBRARY COMMAND: REQ,BARR16,STASTAT.
CBR1280I LIBRARY BARR16 REQUEST. 345
KEYWORDS: STASTAT
------------------------------------------------------
DV0058
DV0059
DV0045
```

5) Execute backup

```
LI REQ,BARR16,STABACK,DV0045,STG,AIRGAP
CBR1020I PROCESSING LIBRARY COMMAND: REQ,BARR16,STABACK,DV0045,STG,
AIRGAP.
CBR1280I LIBRARY BARR16 REQUEST. 348
KEYWORDS: STABACK,DV0045,STG,AIRGAP
------------------------------------------------------------------
Running STABACK task=14811460
CBR3750I MESSAGE FROM LIBRARY BARR16A: OP0940 LI REQ issued: STABACK 349
DV0045 STG AIRGAP Task id: 14811460 Status: Success rc=0. SEVERITY
```

```
IMPACT: INFORMATION.
CBR3750I MESSAGE FROM LIBRARY BARR16A: E0006 STACKED VOLUME DV0045 FROM
BA16A IN EJECT. SEVERITY IMPACT: INFORMATION.
```

RMM will now have volume DV0045 listed in its inventory:

```
Volume = DV0045   VOL1  =          Rack  =           Owner   = EXPORT
  Type = STACKED          Stacked count  = 0         Jobname =

Expiration date = 12/31/1999             Original =
Expiration time =           Datasets Kept By Catlg: 0
         set by = EXPORT
Retention date  =           Set retained  = NO
Retention method= VRSEL
         set by = EXPORT_DEF
      retain by =
Data set name =
Volume status:   EDM = N   Hold = N   File 1 Data set seq = 0
Status = MASTER    Availability =                  Label = SL

Description    = CREATED BY EXPORT
Number of data sets = 0       Data set recording= ON
Volume usage(KB)= 0           Use count         = 0
Physical(KB)    = 0           Compression       = 0.00
Capacity(MB)    = 300000      Percent full      = 0
Date last read  =             Date last written = 10/26/2022
Drive last used =             Write mount count = 0
Volume sequence = 1           Media name        = LTO
```

```
Store information:

Movement tracking date = 10/26/2022       Intransit = Y

In container           =                  Move mode = AUTO


Location:    Current    Destination   Old    Required     Home

Name       = BARR16A                                     BARR16A

Type       = AUTO                                        AUTO
```

Notice that this volume shows TYPE = STACKED and is kept permanently by expiration date(RMM will never expired a stacked volume). The set by fields and OWNER show EXPORT and EXPORT_DEF along with the description we coded in the VLPOOL statement. Media name is shown as LTO as specified in LOCDEF and VLPOOL which is just used to indicate the tape belongs to a LTO library.

The key to this volume moving is that it was created upon interception of the E0006 message. It gets created as INTRANSIT = Y and Move mode = AUTO, which sets it up to be processed by the VRS volume rule we defined that will now move it to the offsite location when we run EDGHSKP VRSEL/DSTORE

6) running EDGHSKP VRSEL/DSTORE to initiate movement

DSTORE function can be added to existing EDGHSKP job where you are running VRSEL or run in its own job or job step:

```
//EDGHSKP  EXEC PGM=EDGHSKP,PARM='VRSEL,DSTORE'
```

Prior to running EDGHSKP notice that we run the RMM search volume command to see all the volumes of this type you can see there is only the one volume and it is currently in the library

```
RMM SV VOLUME(*) TYPE(STACKED) OWNER(*) LIM(*)


Volume Owner    Rack   Assigned   Expiration Location Dsets St Act   Dest.
                      date       date
------ -------- ------ ---------- ---------- -------- ----- -- ----- --------
```

```
DV0045 EXPORT          10/26/2022 12/31/1999 BARR16A  0     M

EDG3011I 1 ENTRY LISTED
```

Running VRSEL and DSTORE assigns a never expire retention date and puts the volume to Availability = Vital Record and it sets the volume required and destination fields to the offsite location:

```
Volume = DV0045   VOL1  =          Rack  =           Owner   = EXPORT

  Type = STACKED          Stacked count  = 0         Jobname =


Expiration date = 12/31/1999             Original =

Expiration time =            Datasets Kept By Catlg: 0

         set by = EXPORT

Retention date  = CYCL/99999 Set retained  = NO

Retention method= VRSEL

         set by = EXPORT_DEF

      retain by =

Data set name =

Volume status:   EDM = N   Hold = N   File 1 Data set seq = 0

Status = MASTER    Availability = Vital Record      Label = SL


Movement tracking date = 10/26/2022       Intransit = Y

In container           =                  Move mode = AUTO


Location:    Current      Destination  Old          Required     Home

Name       = BARR16A      VAULT                     VAULT        BARR16A

Type       = AUTO         STORE                     STORE        AUTO
```

Because the volume is still under Move mode = Auto, the volume VRS we defined can still move this volume as required to maintain the limit of backups to be kept in location VAULT to 2(as defined by our STORENUMBER value).

Now, if we run the search volume command, we see the following:

```
Volume Owner    Rack   Assigned   Expiration Location Dsets St Act   Dest.
                       date       date
------ -------- ------ ---------- ---------- -------- ----- -- ----- --------
DV0045 EXPORT          10/26/2022 12/31/1999 BARR16A  0     MV       VAULT
EDG3011I 1 ENTRY LISTED
```

Notice the the current location is still the library, but the Destination field is VAULT, indicating that this volume is moving to our offsite location.

7) Confirming volume movement

RMM has no way to know the volume has arrived at its destination and therefore requires a confirmation that the move was successful. We will confirm the move of the volume with the following command:

```
RMM CV DV0045 CMOVE



Movement tracking date = 10/26/2022       Intransit = N
In container           =                  Move mode = AUTO

Location:    Current      Destination  Old          Required     Home
Name       = VAULT                    BARR16A      VAULT        BARR16A
Type       = STORE                    AUTO         STORE        AUTO
```

Notice the Current location is set to VAULT to match the Required location. The destination field is cleared and Intransit is set to N. This indicates no movement is needed for this volume at this time. The RMM searchvolume command output confirms this fact:

```
Volume Owner    Rack   Assigned   Expiration Location Dsets St Act   Dest.
                       date       date
------ -------- ------ ---------- ---------- -------- ----- -- ----- --------
DV0045 EXPORT          10/26/2022 12/31/1999 VAULT    0     MV
EDG3011I 1 ENTRY LISTED
```

8) Taking the next backup

When the storage group we are backing up has new data, a new backup can be taken. First, let's issue the command the check what volumes are available in the library:

```
LI REQ,BARR16A,STASTAT
CBR1020I PROCESSING LIBRARY COMMAND: REQ,BARR16A,STASTAT.
CBR1280I LIBRARY BARR16A REQUEST. 523
KEYWORDS: STASTAT
------------------------------------------------------------------------
DV0058
DV0059
DV0045 Exported
```

Although this step is not needed, and % can be used instead of volser to use any volume available in the libary, this step has the added value of showing that DV0045 has been exported, which indicates it is outside the libary either at the offsite location or waiting to be re-inserted to the libary.

We will choose DV0058 from the list as the volume to write our second backup to:

```
LI REQ,BARR16,STABACK,DV0058,STG,AIRGAP
```

Again, we will see the volume written too, ejected, and created in the RMM CDS marked as INTRANSIT = YES

```
CBR3750I MESSAGE FROM LIBRARY BARR16A: OP0940 LI REQ issued: STABACK 529
DV0058 STG AIRGAP Task id: 30474598 Status: Success rc=0. SEVERITY
IMPACT: INFORMATION.
CBR3750I MESSAGE FROM LIBRARY BARR16A: E0006 STACKED VOLUME DV0058 FROM
BA16A IN EJECT. SEVERITY IMPACT: INFORMATION.

Volume = DV0058   VOL1  =          Rack  =           Owner   = EXPORT
  Type = STACKED          Stacked count  = 0         Jobname =

Movement tracking date = 10/26/2022       Intransit = Y
In container           =                  Move mode = AUTO

Location:    Current      Destination  Old          Required     Home
Name       = BARR16A                                           BARR16A
Type       = AUTO                                              AUTO
```

And the results of the RMM SEARCHVOLUME command show both volumes:

```
Volume Owner    Rack   Assigned   Expiration Location Dsets St Act   Dest.
                      date       date
------ -------- ------ ---------- ---------- -------- ----- -- ----- --------
DV0045 EXPORT          10/26/2022 12/31/1999 VAULT    0     MV
DV0058 EXPORT          10/26/2022 12/31/1999 BARR16A  0     M
EDG3012I 2          ENTRIES LISTED
```

Now we have the original backup on DV0045 in VAULT and the new backup on DV0058 is in the I/O station and ready to be physically moved.

When we run VRSEL/DSTORE next the destination and required fields are set to VAULT

```
Volume = DV0058   VOL1  =          Rack  =           Owner   = EXPORT
  Type = STACKED          Stacked count  = 0         Jobname =

Movement tracking date = 10/26/2022       Intransit = Y
In container           =                  Move mode = AUTO

Location:    Current      Destination  Old          Required     Home
Name       = BARR16A      VAULT                     VAULT        BARR16A
Type       = AUTO         STORE                     STORE        AUTO
```

Then once the volume is physically moved to VAULT, we confirm the move:

```
RMM CV DV0058 CMOVE
```

The current field gets updated to VAULT, Intransit set to NO and now both volumes show as in VAULT:

```
Volume = DV0058   VOL1  =          Rack  =           Owner   = EXPORT
  Type = STACKED          Stacked count  = 0         Jobname =


Movement tracking date = 10/26/2022       Intransit = N
In container           =                  Move mode = AUTO

Location:    Current      Destination  Old          Required     Home
Name       = VAULT                    BARR16A      VAULT        BARR16A
Type       = STORE                    AUTO         STORE        AUTO

Volume Owner    Rack   Assigned   Expiration Location Dsets St Act   Dest.
```

```
                        date       date
------ -------- ------ ---------- ---------- -------- ----- -- ----- --------
DV0045 EXPORT          10/26/2022 12/31/1999 VAULT    0     MV
DV0058 EXPORT          10/26/2022 12/31/1999 VAULT    0     MV
EDG3012I 2          ENTRIES LISTED
```

9) Taking the third backup

At this point, once the storage group in the library has new data, a third backup can be taken. This backup, once it moves to the offsite location will push the oldest backup tape back to the library to be reinserted and reused. There is no longer a need to delete this volume entry from RMM after application of RMM APAR OA63639 and instead the volume movement back to the libary can be confirmed.

We display the status of the volumes in the library and see there are two exported volumes and one volume left we can backup to:

```
LI REQ,BARR16,STASTAT
CBR1020I PROCESSING LIBRARY COMMAND: REQ,BARR16,STASTAT.
CBR1280I LIBRARY BARR16 REQUEST. 623
KEYWORDS: STASTAT
------------------------------------------------------------------------
DV0059
DV0045 Exported
DV0058 Exported
```

Initiate backup:

```
LI REQ,BARR16,STABACK,DV0059,STG,AIRGAP
CBR1020I PROCESSING LIBRARY COMMAND: REQ,BARR16,STABACK,DV0059,STG,
AIRGAP.
CBR1280I LIBRARY BARR16 REQUEST. 626
KEYWORDS: STABACK,DV0059,STG,AIRGAP
```

```
------------------------------------------------------------------------
Running STABACK task=22479136
CBR3750I MESSAGE FROM LIBRARY BARR16A: OP0940 LI REQ issued: STABACK 62
DV0059 STG AIRGAP Task id: 22479136 Status: Success rc=0. SEVERITY
IMPACT: INFORMATION.
CBR3750I MESSAGE FROM LIBRARY BARR16A: E0006 STACKED VOLUME DV0059 FROM
BA16A IN EJECT. SEVERITY IMPACT: INFORMATION.
```

At this point all three volumes show as exported as they all contain backups.

```
LI REQ,BARR16,STASTAT
CBR1020I PROCESSING LIBRARY COMMAND: REQ,BARR16,STASTAT.
CBR1280I LIBRARY BARR16 REQUEST. 732
KEYWORDS: STASTAT
------------------------------------------------------------------------
DV0045 Exported
DV0058 Exported
DV0059 Exported

Volume Owner    Rack   Assigned   Expiration Location Dsets St Act   Dest.
                       date       date
------ -------- ------ ---------- ---------- -------- ----- -- ----- --------
DV0045 EXPORT          10/26/2022 12/31/1999 VAULT    0     MV
DV0058 EXPORT          10/26/2022 12/31/1999 VAULT    0     MV
DV0059 EXPORT          10/26/2022 12/31/1999 BARR16A  0     M
EDG3012I 3          ENTRIES LISTED
```

Now when VRSEL/DSTORE runs two of the volumes will move, the new backup to VAULT, and the oldest backup returned into BARR16A because we set a two volume limit in location via the STORENUMBER parm on the VRS. That will require both volumes to have their movement confirmed.

```
Volume Owner    Rack   Assigned   Expiration Location Dsets St Act   Dest.
                       date       date
------ -------- ------ ---------- ---------- -------- ----- -- ----- --------
DV0045 EXPORT          10/26/2022 12/31/1999 VAULT    0     MV       BARR16A
DV0058 EXPORT          10/26/2022 12/31/1999 VAULT    0     MV
DV0059 EXPORT          10/26/2022 12/31/1999 BARR16A  0     MV       VAULT
EDG3012I 3          ENTRIES LISTED
```

At this point you would return DV0045 to the library and physically reinsert it.

```
LI REQ,BARR16,STASTAT
CBR1020I PROCESSING LIBRARY COMMAND: REQ,BARR16,STASTAT.
CBR1280I LIBRARY BARR16 REQUEST. 732
KEYWORDS: STASTAT
------------------------------------------------------------------------
DV0045         <--- Exported flag is cleared now that the cartridge is
reinserted to the library
DV0058 Exported
DV0059 Exported
```

Issuing confirm commands for both volumes moving, however the volume just moved back into the library needs to also be put into manual move mode so that the volume VRS will not try to move it back out to VAULT until it is re-used

```
RMM CV DV0045 CMOVE
RMM CV DV0045 MANUALMOVE
RMM CV DV0059 CMOVE
```

DV0045 stays defined to RMM, is resident in the BARR16A library, and eligible to be reused in the next backup cycle.

```
Volume Owner    Rack   Assigned   Expiration Location Dsets St Act   Dest.
                       date       date
------ -------- ------ ---------- ---------- -------- ----- -- ----- --------
DV0045 EXPORT          10/26/2022 12/31/1999 BARR16A  0     MV
DV0058 EXPORT          10/26/2022 12/31/1999 VAULT    0     MV
DV0059 EXPORT          10/26/2022 12/31/1999 VAULT    0     MV
EDG3012I 3          ENTRIES LISTED

Volume = DV0045   VOL1  =          Rack  =           Owner   = EXPORT
  Type = STACKED          Stacked count  = 0         Jobname =

Store information:
Movement tracking date = 10/26/2022       Intransit = N
In container           =                  Move mode = MANUAL

Location:    Current      Destination  Old          Required     Home
Name       = BARR16A                   VAULT        BARR16A      BARR16A
Type       = AUTO                      STORE        AUTO         AUTO
```

10) fourth backups and beyond

Once the volumes are returned to the library and put into MANUAL MOVE mode they are eligible to be reused. For example, if we start another backup we will reuse DV0045.

```
LI REQ,BARR16,STABACK,DV0045,STG,AIRGAP
CBR1020I PROCESSING LIBRARY COMMAND: REQ,BARR16,STABACK,DV0045,STG,
AIRGAP.
CBR1280I LIBRARY BARR16 REQUEST. 503
```

```
KEYWORDS: STABACK,DV0045,STG,AIRGAP

------------------------------------------------------------------------

Running STABACK task=29819568

CBR3750I MESSAGE FROM LIBRARY BARR16A: OP0940 LI REQ issued: STABACK 50

DV0045 STG AIRGAP Task id: 29819568 Status: Success rc=0. SEVERITY

IMPACT: INFORMATION.

CBR3750I MESSAGE FROM LIBRARY BARR16A: E0006 STACKED VOLUME DV0045 FROM

BA16A IN EJECT. SEVERITY IMPACT: INFORMATION.
```

Notice the effect in RMM is to turn on the INTRANSIT = YES flag and change from Move mode = MANUAL to Move mode = AUTO

```
Volume = DV0045   VOL1  =          Rack  =           Owner   = EXPORT

  Type = STACKED          Stacked count  = 0         Jobname =

  Worldwide ID =                                    WORM    = N

Creation:  Date = 10/26/2022  Time = 10:23:29  System ID = MVS7

Assign:    Date = 10/27/2022  Time = 10:06:18  System ID =


Movement tracking date = 10/27/2022       Intransit = Y

In container           =                  Move mode = AUTO


Location:    Current      Destination  Old          Required     Home

Name       = BARR16A                   BARR16A                  BARR16A

Type       = AUTO                      AUTO                     AUTO
```

Notice also that the Assign Date is different than the Creation Date because the volume entry in the CDS for DV0045 was reused.

Doing the RMM search volume the view looks like:

```
Volume Owner    Rack   Assigned   Expiration Location Dsets St Act   Dest.
                       date       date
------ -------- ------ ---------- ---------- -------- ----- -- ----- --------
DV0045 EXPORT          10/27/2022 12/31/1999 BARR16A  0     M
DV0058 EXPORT          10/26/2022 12/31/1999 VAULT    0     MV
DV0059 EXPORT          10/26/2022 12/31/1999 VAULT    0     MV
EDG3012I 3          ENTRIES LISTED
```

And then after VRSEL/DSTORE we will again see two moves, the new backup on DV0045 to VAULT and the oldest backup DV0058 back to the library:

```
Volume Owner    Rack   Assigned   Expiration Location Dsets St Act   Dest.
                       date       date
------ -------- ------ ---------- ---------- -------- ----- -- ----- --------
DV0045 EXPORT          10/27/2022 12/31/1999 BARR16A  0     MV    VAULT
DV0058 EXPORT          10/26/2022 12/31/1999 VAULT    0     MV    BARR16A
DV0059 EXPORT          10/26/2022 12/31/1999 VAULT    0     MV
EDG3012I 3          ENTRIES LISTED
```

Assuming DV0045 was moved to VAULT, we issue confirm move to DV0045:

```
RMM CV DV0045 CMOVE
```

```
Volume Owner    Rack   Assigned   Expiration Location Dsets St Act   Dest.
                       date       date
------ -------- ------ ---------- ---------- -------- ----- -- ----- --------
DV0045 EXPORT          10/27/2022 12/31/1999 VAULT    0     MV
DV0058 EXPORT          10/26/2022 12/31/1999 VAULT    0     MV    BARR16A
DV0059 EXPORT          10/26/2022 12/31/1999 VAULT    0     MV
EDG3012I 3          ENTRIES LISTED
```

And assuming DV0058 was put back in the library we issue confirm move to DV0058:

```
RMM CV DV0058 CMOVE

Movement tracking date = 10/27/2022       Intransit = N
In container           =                  Move mode = AUTO

Location:    Current      Destination  Old          Required     Home
Name       = BARR16A                  VAULT        BARR16A      BARR16A
Type       = AUTO                     STORE        AUTO         AUTO
```

And then because it has moved back into the library we turn off Auto Move mode:

```
RMM CV DV0058 MANUALMOVE

Movement tracking date = 10/27/2022       Intransit = N
In container           =                  Move mode = MANUAL

Location:    Current      Destination  Old          Required     Home
Name       = BARR16A                  VAULT                     BARR16A
Type       = AUTO                     STORE                     AUTO
```

After these commands the RMM search volume display shows DV0058 has moved back to the library and is ready for re-use while our latest two backups remain offsite

```
Volume Owner    Rack   Assigned   Expiration Location Dsets St Act   Dest.
                       date       date
------ -------- ------ ---------- ---------- -------- ----- -- ----- --------
DV0045 EXPORT         10/27/2022 12/31/1999 VAULT    0     MV
DV0058 EXPORT         10/26/2022 12/31/1999 BARR16A  0     MV
```

```
DV0059 EXPORT          10/26/2022 12/31/1999 VAULT    0     MV

EDG3012I 3          ENTRIES LISTED
```

The following are some useful JCL examples using RMMCLIST DD to help automate CHANGEVOLUME commands to confirm moves and switch to manual move mode.

DFSMSrmm provides a method to use the results of TSO subcommand RMM SEARCHVOLUME(SV) to generate statements to an output file. This can be very handy when put into a batch job that calls TSO to automatically generate the needed CHANGEVOLUME(CV) CONFIRM MOVE(CMOVE) and MANUALMOVE commands to track and move exported LTO volumes from the z/TAPE AIRGAP library. Our examples will be presented using the offsite location name of VAULT and the library name of BARR16A, which of course can be customized.

The SV command can be used to generate a list of volumes that need to move and write them to an output file

`RMM SV VOLUME(*) OWNER(EXPORT) LIM(*) DESTINATION(*)` will find all export volumes moving to any location

`RMM SV VOLUME(*) OWNER(EXPORT) LIM(*) DESTINATION(VAULT)` will find all export volumes moving to VAULT

`RMM SV VOLUME(*) OWNER(EXPORT) LIM(*) DESTINATION(BARR16A)` will find all export volumes moving to BARR16A

With these commands, you can build an output file that lists the volumes returned in the search and you can add command statements around the returned volsers.

For this first example we will use a set of volumes in the following states:

```
Volume Owner    Rack   Assigned   Expiration Location Dsets St Act   Dest.
                       date       date
------ -------- ------ ---------- ---------- -------- ----- -- ----- --------
DV0045 EXPORT          10/27/2022 12/31/1999 VAULT    0     MV
DV0058 EXPORT          10/26/2022 12/31/1999 BARR16A  0     MV
```

```
DV0059 EXPORT          10/27/2022 12/31/1999 BARR16A  0     MV       VAULT
```

(1)To generate a list of all volumes moving offsite to VAULT and write them to a file:

```
//RMMSV  EXEC PGM=IKJEFT01,REGION=20M,
//            DYNAMNBR=20
//SYSTSPRT DD DUMMY
//RMMCLIST DD DSN=SCOTTMR.VAULT.LIST,
// DISP=(NEW,CATLG,DELETE),SPACE=(CYL,(2,2),RLSE),UNIT=SYSDA
//SYSTSIN  DD *
  RMM SV VOLUME(*) OWNER(EXPORT) LIM(*) -
  DESTINATION(VAULT) -
  CLIST()
```

The contents of that file is:

```
******************************** Top of Data ********************************
       DV0059
******************************** Bottom of Data *****************************
```

This file can be given to the librarian to indicate this tape can be found in the I/O station and should be physically moved. The DESTINATION can be changed BARR16A to generate a list of tapes that need to move from VAULT back to the library and reinserted.

(2) It may be more convenient to generate a list of volumes moving to VAULT, write a CONFIRM MOVE for those volumes to a file, and execute those commands all in the same job:

```
//RMMSV  EXEC PGM=IKJEFT01,REGION=20M,
//            DYNAMNBR=20
//SYSTSPRT DD DUMMY
//RMMCLIST DD DSN=SCOTTMR.SVCM.CMDS,
// DISP=(NEW,CATLG,DELETE),SPACE=(CYL,(2,2),RLSE),UNIT=SYSDA
//SYSTSIN  DD *
```

```
  RMM SV VOLUME(*) OWNER(EXPORT) LIM(*) -
  DESTINATION(VAULT) -
  CLIST(' RMM CV ',' CMOVE')
//RMMCM  EXEC PGM=IKJEFT01,REGION=20M,
//            DYNAMNBR=20
//SYSTSPRT DD SYSOUT=*
//SYSPRINT DD SYSOUT=*
//SYSTSIN  DD DISP=SHR,
//            DSN=SCOTTMR.SVCM.CMDS
```

The contents of the SCOTTMR.SVCM.CMDS file is:

```
******************************** Top of Data ********************************
        RMM CV DV0059 CMOVE
****************************** Bottom of Data ******************************
```

After this job was executed, the volumes now look like:

```
Volume Owner    Rack   Assigned   Expiration Location Dsets St Act   Dest.
                       date       date
------ -------- ------ ---------- ---------- -------- ----- -- ----- --------
DV0045 EXPORT         10/27/2022 12/31/1999 VAULT    0     MV
DV0058 EXPORT         10/26/2022 12/31/1999 BARR16A  0     MV
DV0059 EXPORT         10/27/2022 12/31/1999 VAULT    0     MV
```

(3) In the case where we have a volume returning to the library, there is another command that needs to be executed to keep the volume from moving during VRSEL/DSTORE until it is reused as a backup. This example job will list all volumes moving to BARR16A in a file with CMOVE and MANUALMOVE commands. In most cases, as in this example, anytime a volume is moving to the library, it is because another one was moving to the offsite location, so you would run both this job and the previous job to accomplish both moves and confirms.

We will start this example with the volumes in the following state:

```
Volume Owner    Rack   Assigned   Expiration Location Dsets St Act   Dest.
                       date       date
------ -------- ------ ---------- ---------- -------- ----- -- ----- --------
DV0045 EXPORT         10/27/2022 12/31/1999 BARR16A  0     MV       VAULT
DV0058 EXPORT         10/27/2022 12/31/1999 VAULT    0     MV
DV0059 EXPORT         10/27/2022 12/31/1999 VAULT    0     MV       BARR16A
```

```
//RMMSV  EXEC PGM=IKJEFT01,REGION=20M,
//            DYNAMNBR=20
//SYSTSPRT DD DUMMY
//RMMCLIST DD DSN=SCOTTMR.CVCM.CMDS1,
// DISP=(NEW,CATLG,DELETE),SPACE=(CYL,(2,2),RLSE),UNIT=SYSDA
//SYSTSIN  DD *
  RMM SV VOLUME(*) OWNER(EXPORT) LIM(*) -
  DESTINATION(BARR16A) -
  CLIST(' RMM CV ',' CMOVE')
//RMMSV2 EXEC PGM=IKJEFT01,REGION=20M,
//            DYNAMNBR=20
//SYSTSPRT DD DUMMY
//RMMCLIST DD DSN=SCOTTMR.CVMM.CMDS2,
// DISP=(NEW,CATLG,DELETE),SPACE=(CYL,(2,2),RLSE),UNIT=SYSDA
//SYSTSIN  DD *
  RMM SV VOLUME(*) OWNER(EXPORT) LIM(*) -
  DESTINATION(BARR16A) -
  CLIST(' RMM CV ',' MANUALMOVE')
//RMMCM1 EXEC PGM=IKJEFT01,REGION=20M,
//            DYNAMNBR=20
//SYSTSPRT DD SYSOUT=*
//SYSPRINT DD SYSOUT=*
```

```
//SYSTSIN  DD DISP=SHR,
//            DSN=SCOTTMR.CVCM.CMDS1
//RMMMM  EXEC PGM=IKJEFT01,REGION=20M,
//            DYNAMNBR=20
//SYSTSPRT DD SYSOUT=*
//SYSPRINT DD SYSOUT=*
//SYSTSIN  DD DISP=SHR,
//            DSN=SCOTTMR.CVMM.CMDS2
```

The two files contents:

```
******************************** Top of Data ********************************
        RMM CV DV0059 CMOVE
******************************** Bottom of Data *****************************

******************************** Top of Data ********************************
        RMM CV DV0059 MANUALMOVE
******************************** Bottom of Data *****************************
```

After these commands were executed by the batch job:

```
Volume Owner    Rack   Assigned   Expiration Location Dsets St Act   Dest.
                       date       date
------ -------- ------ ---------- ---------- -------- ----- -- ----- --------
DV0045 EXPORT          10/27/2022 12/31/1999 BARR16A  0     MV       VAULT
DV0058 EXPORT          10/27/2022 12/31/1999 VAULT    0     MV
DV0059 EXPORT          10/27/2022 12/31/1999 BARR16A  0     MV
```

Then after running the job described in 2) above:

```
Volume Owner    Rack   Assigned   Expiration Location Dsets St Act   Dest.
```

```
                        date       date
------ -------- ------ ---------- ---------- -------- ----- -- ----- --------
DV0045 EXPORT          10/27/2022 12/31/1999 VAULT    0     MV
DV0058 EXPORT          10/27/2022 12/31/1999 VAULT    0     MV
DV0059 EXPORT          10/27/2022 12/31/1999 BARR16A  0     MV
```

So best practice would be to run all four job steps following VRSEL/DSTORE step in EDGHSKP:

- pick list for movement to VAULT

- pick list for movement to BARR16A

- confirm move commands for VAULT moves

- confirm move and manualmove commands for BARR16A moves

System-Managed Tape

Since the Simple Tape Attach (STA) feature is part of the IBM TS7700 Virtualization Engine, when using this support with z/OS, it requires that SMStape be configured and used. If new to SMStape, please refer to the z/OS DFSMS Object Access Method Planning, Installation, and Storage Administration Guide for Tape Libraries.

https://www-01.ibm.com/servers/resourcelink/svc00100.nsf/pages/zOSV2R5sc236867/$file/idao300_v2r5.pdf

References

Also refer to the following z/OS DFSMS Academy SMStape Overview presentation and recording:

Presentation: https://ibm.ent.box.com/s/1on5fftvde4osu26hdh0c24rmzje7cae/file/742788455383

Recording: https://ibm.ent.box.com/s/4sspaf93r58o5ftn9f0t31po8aj1995z/file/742820740754

Redbook

The IBM TS7700 Virtualization Engine Redbook, also has a lot of guidance on using the SMStape support.

https://www.redbooks.ibm.com/abstracts/sg248464.html?Open

Scenarios

The scenarios documented below assume that the stacked volume support and any movement policies have been setup in DFSMSrmm (refer to the instructions above) and that the system-managed tape (SMStape) support is installed and configured.

Use STABACK to backup the logical volumes to storage group BACKUPS

1. Host backup jobs complete and the logical volumes written to are assigned to SG "BACKUPS" (for example, 10 volumes … SG "BACKUPS" can be another assigned SG name)
2. LIBRARY REQUEST,BARR16A,STABACK,JCC001,STG,BACKUPS issued to copy the 10 logical volumes in distributed library BARR16A to LTO physical volume JCC001.
3. The 10 logical volumes that are copied, remain in BARR16A as private and are fully accessible by the TS7700 (like copy export).
4. STABACK moves the logical volume that were copied to reserved private category xFFFF (they stay assigned to SG "BACKUPS").
5. STABACK automatically ejects physical volume JCC001 from the TS4300 library.
6. z/OS host message CBR3750I (E0006) is issued letting the client know that physical volume JCC001 was ejected from the TS4300 library. As with the TS7700 copy export support, the z/OS host has no direct knowledge of the logical volumes that were copied to JCC001.
7. If the RMM stacked volume support is enabled, RMM detects that the CBR3750I message with E0006 has been issued and automatically adds LTO stacked volume JCC001 to the RMM CDS. Any RMM movement policies that have been established will take effect (refer to the RMM sections above for examples).
8. z/OS host message CBR3750I (OP0940) is also issued letting the client know that the STABACK request had successfully completed.
9. Note there is no corresponding CBR3750I R0000 message issued for reclamation when the TS7700 detects that all the stacked volumes on the copy exported volume have returned to scratch. The TS7700 knowledge that tracks this information does not exist with the Simple Tape Attach (STA) support.
10. In case the E0006 message is missed (OAM is not up, RMM is not up, the attention gets lost, etc.), the RMM ADDVOLUME command can be used to add the LTO volume to the RMM CDS.

Stacked volume JCC001 needs all its logical volumes restored

1. STABACK retained no knowledge of JCC001 or the logical volumes that were copied to volume JCC001 (other than there is a status command STASTAT that can be issued for the last STABACK request).
2. The client determines that the logical volumes that are to be restored are on JCC001 and enters physical volume JCC001 into the TS4300 library.

3. LIBRARY REQUEST,BARR16A,STAREST,JCC001 is issued for physical volume JCC001. RMM when it creates the stacked volume record in the CDS will have a creation date/time to know when the backups were created on that volume. Other than that, RMM has no knowledge of the logical volumes that reside on JCC001. The client may want to keep a record of what logical volumes reside on which stacked volume perhaps using some type of automation using the LIBRARY REQUEST STASTAT command.
4. Logical volumes being restored from JCC001 are likely still in private status in the RMM CDS and in the TCDB.
5. STAREST copies the logical volumes residing on JCC001 into the disk cache of the TS7700 and puts the volumes into the insert category xFF00. If the logical volumes being copied back into the library were modified after the backup was taken, they are not copied over.
6. Logical volumes go through insert processing and because they are going back into the same library they are processed for reentry and will be placed into the host's private category as noted in the DEVSUPxx PARMLIB member.
7. z/OS host message CBR3750I (OP0942) is issued letting the client know that the STAREST request had completed.
8. JCC001 is then ejected from the TS4300 library
9. Stacked volume JCC001 can then be deleted (manually) from RMM or physically returned to the TS4300 and then CONFIRM MOVE'd and allowed to be reused for another backup request(if APAR OA63639 is applied).

Stacked volume JCC001 instead comes back after last RMM movement policy is reached

1. Logical volumes on JCC001 have all expired based on expiration/retention policies setup for the logical volumes. It's good practice to have the logical volumes expire before the movement policies bring the physical stacked volume back.
2. Client runs an RMM report to generate the stacked volume pick list that has the JCC001 volume coming back to HOME1.
3. Client brings the volume back to location HOME1, confirms the move in RMM and then manually deletes JCC001 from the RMM CDS. Alternatively if APAR OA63639 is applied the volume can be CONFIRM MOVE'd rather than DELETE VOLUME.
4. Client can then enter JCC001 back into the TS4300 library and can later use that physical volume for a subsequent STABACK request. When the volume is reentered, the Simple Tape Attach (STA) function has no knowledge of whether the LTO volume has active data on it or not. Everything is driven from the appropriate LIBRARY REQUEST STAxxxx commands.

Stacked volume JCC002 used for next set of backups

1. Next set of host backup jobs complete and the logical volumes written to are also assigned to SG "BACKUPS" (for example, 15 volumes … SG "BACKUPS" can be another assigned name)

2. LIBRARY REQUEST, BARR16A,STABACK,JCC002,STG,BACKUPS issued to copy the 15 logical volumes in distributed library BARR16A to LTO physical volume JCC002. Note that the previous 10 volumes also stay in SG BACKUPS; however, they were moved to private category xFFFF when STABACK last ran so are not copied this time.
3. Refer to the first scenario for the additional steps.

Stacked volume IMP001 being imported into the library

1. Using STABACK, stacked volume IMP001 is created in another TS7700 library that also has the Simple Tape Attach (STA) feature installed and is moved to its desired location.
2. Stacked volume IMP001 is entered into the TS4300 library where the import/restore will be done.
3. Prior to the STAREST command being issued, the client needs to predefine (using IDCAMS) the logical volumes that will be imported into the TCDB (as private). Client can then use the LIBRARY LMPOLICY command to assign the appropriate constructs/polices to that volume.
4. LIBRARY REQUEST,BARR16A, STAREST,IMP001 issued to import all the logical volumes from IMP001 into the library.
5. Logical volumes on IMP001 are copied into the disk cache of the TS7700 and placed into the insert category xFF00.

Stand-alone restore

This scenario is used when there is a disaster where the zSystems host, disk, and virtual tape solution is destroyed and must be restored from a prior physical tape which has the backup. This scenario starts after the zSystems host, disk, and TS7700 with FC 5995 has been installed. (Same process as initial install described above.)

This same process would apply for IPL'ing the zSystems host from a prior backup image.

1. Restore the logical volumes from the previous physical tape backup using the STAREST command to the TS7700 with FC 5995 disk cache using the scenario described above. NOTE: This may require using the TS7700 MI to execute the STAREST command as the host may not be functional for issuing it from the console.
2. Use existing TS7700 documentation and user guides for doing a Stand-Alone Restore from the TS7700 with the logical volumes restored from prior step.

NOTE: See IBM TS7700 section Stand-Alone Services.

https://www.redbooks.ibm.com/redbooks/pdfs/sg248464.pdf