IBM Tape Manager for z/VM and DFSMSRMS z/VM in a TS7700 Tape Grid Environment

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IBM Advanced Technical Skills

Tracy Dean
Offering Manager, z/VM Management Software
tld1@us.ibm.com
&
Mike Sine
Consulting I/T Specialist, WSC
sine@us.ibm.com

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- Art Eisenhour

Introduction

This document describes configuration and testing that were done with Tape Manager for z/VM V1.3 on a z/VM V6.3 system running DFSMSRMS for z/VM. The system was connected to a TS7700 tape grid consisting of 3 libraries or clusters.

It is important to keep in mind:

1. This testing was done as a result of questions from a real customer who has a tape grid and wanted to understand how Tape Manager for z/VM would work in their environment and with their requirements for using one (local) library as the primary and only using the second (remote) library when the first was being serviced or was unavailable due to DR (real or testing.) The following setup is specific to these questions and reflects and environment similar to the customer's environment.

2. The authors are thankful for the team of folks below who allowed access to a z/VM system with TS7700 access and/or helped answer many questions in preparation for this configuration testing. Some were local to the z/VM system and hardware devices while the authors worked remotely. A huge thanks to:

    - Bill Norton for providing a 2nd level z/VM system (with IBM Operations Manager for z/VM, IBM Tape Manager for z/VM, and IBM Backup and Restore Manager for z/VM already installed).
    - Rex Newton for providing information on the TS7700 grid and explaining (again and again) what a grid vs cluster vs library was.
    - Alan Altmark for always having knowledge that amazes and helping the authors debug problems.

      All three gentlemen were also extremely helpful with impromptu questions and problems.

Setup

- One grid – We called it **GRID1** in Tape Manager for z/VM and RMS. (This is a name you can make up.)
- 3 tape libraries/clusters are described in this table. Although storage management provided all of this information, the only items that were really needed were the items in **green**. We changed the library names for easier readability and masked the IP addresses for this paper.

RED (Tape Attached) cluster=2 IP: 9.xx.xxx.35	YELLOW (disk-only) cluster=3 IP: 9.xx.xxx.129	BLUE (disk-only) cluster=4 IP: 9.xx.xxx.162
TS7700 Model: 3957-V07 Serial Number: 78-3957T Composite library sequence number: **BA074** Base Level: 8.33.0.18 Disk Model: 3956-CS8	TS7700 Model: 3957-VEB Serial Number: 78-2737P Composite library sequence number: **BA074** Base Level: 8.33.0.18 Disk Model: 3956-CS9	TS7700 Model: 3957-VEB Serial Number: 78-2755P Composite library sequence number: **BA074** Base Level: 8.33.0.18 Disk Model: 3956-CS8
Host: MVST3 VMT13	Host: MVST3 VMT13	Host: MVST3 VMT13
Addresses: **A3E0-A3EF**	Addresses: **E8E0-E8EF**	Addresses: **E4E0-E4EF**

Notice: The **composite library sequence number** is the **same** for all 3 libraries, since they are in a grid. You can issue QUERY TAPE DETAILS to determine its value. The benefits of one composite library sequence number are:

- Easier configuration
- All tape VOLSERS are considered to be in one tape library
- RMS will automatically find and use any tape device available and can mount any tape in the grid on any tape device in the grid

As a side note, each cluster is also assigned a distributed library sequence number (not shown) which must be unique per cluster and also different from the composite library sequence number. This distributed library sequence number is not used by z/VM:

- It's not defined in the I/O configuration, which only contains device numbers (aka RDEVs) and paths to the control unit (aka the FICON ports on the z Systems machine)
- When z/VM requests the grid or cluster information (for QUERY TAPE DETAILS, or for RMS), the control unit only provides the composite library sequence number.

- VOLSERS available were Z00100-Z00999 in category BBBB. These were already defined/inserted into the grid.

RMS configuration files located in SFS directory: **VMSYS:DFSMS.CONTROL**:

- **DGTVCNTL DATA** - in this file we commented out any existing entries for RM_AUTO_LIBRARY and added the following entry:
  RM_AUTO_LIBRARY GRID1 BA074 OPERATOR

  Note that although there are 3 libraries, as far as z/VM (and RMS) are concerned, there is only one composite library sequence number: BA074.

- **RMCONFIG DATA** - in this file we commented out any existing entries for tape device addresses and added the following entries:
  A3E0-A3EF * RED
  E8E0-E8EF * YELLOW
  E4E0-E4EF * BLUE

  Note: We didn't specify which library the devices are in – RMS will determine that. We also confirmed it using:
  Q TAPE DETAILS A3E0-A3EF
  etc.

- We verified the RMS configuration through a successful mount request from MAINT:
  VMLINK DFSMS 1B5
  DFSMSRM MOUNT VOL Z00100

- Tape Manager configuration
  - Besides normal Tape Manager configuration information, the important options in Tape Manager's SYS CONFIG file were:
    - **Define_Media 3490 WARN 10**
    - **Library,**
      GRID1, /* Library name
      ONLINE, /* Initial status
      TMLM1 /* Service machine name
    - **LibTypPri A**
  - Notes:
    - **3490** is an identifier assigned by us - it can be any one to six character alpha-numeric name. It's used later for Tape Manager commands.
    - **GRID1** needs to match what we defined in RMS on the **RM_AUTO_LIBRARY** statement. It's also used later for Tape Manger commands.
  - TMLM1 had authorization to RMS commands as documented in the Tape Manager Admininstration Guide (SC18-9344.)
  - Using the following commands, we defined a tape pool, gave MAINT access to it, and added tapes to the system free pool:
    - **TAPCMD POOLDEF BKRADMIN BKRPOOL MEDIA 3490 RETNMAX 30 FREEPOOL SYS**
    - **TAPCMD POOLACC BKRADMIN BKRPOOL USER MAINT TAPE**
    - **TAPCMD TAPEADD VOL Z00100-Z00120 POOL SYS MEDIA 3490 ATL GRID1**
  - Using the following commands, we verified a tape could be mounted, then marked it free again:
    - **TAPCMD TAPEMNT SCR BKRADMIN BKRPOOL TEXT 'testing mount commands'**
    - **DET 181**
    - **TAPCMD TAPEMOD VOL Z00115 STATUS FREE**

Testing and Results

All testing was done with the configuration settings in Tape Manager and RMS described above. No changes to these configuration settings were needed for each scenario.

Initial verification testing was done with all devices online.

Once initial verification was complete, the more specific scenarios we were interested in were:

1. **Bring up RMS with only the devices from one library online.** We only want to use the "local" library for performance reasons. For this test, we used RED (devices A3E0-A3EF) and performed the following steps.
    - Varied offline tape devices E8E0-E8EF and E4E0-E4EF (i.e. those in the YELLOW and BLUE libraries)
    - Restarted RMSMASTR and viewed its console to confirm it only found A3E0-A3EF. In the customer's desired environment, this is how RMS would normally come up on the system – only knowing about the devices in the local/primary library.
    - Requested 17 scratch tape mounts in Tape Manager on different vdevs (for example vdevs 181 through 197)
      `TAPCMD TAPEMNT SCR BKRADMIN BKRPOOL VDEV nnn`
        - 16 completed successfully on A3E0-A3EF (since 16 real devices were available)
        - 1 timed out with these messages as a device was not available:
          ```
          EUMTAP0086E Device wait time for request 000048 exceeded the system
          limit.
          EUMTAP0074I Mount request 000048 failed - RC 32.
          ```
    - Detached all vdevs
    - **Summary** – this worked (as expected) – using only the devices in the local library.

2. **Simulate a "region switch"**.In this scenario, we wanted to stop using the primary library in the grid and use the secondary one instead. (Perhaps the primary library is going down for maintenance.) We performed the following steps:
    - Varied online tape devices E4E0-E4EF (those in the BLUE library)
    - Varied offline tape devices A3E0-A3EF (those in the RED library) to simulate DR or maintenance of the primary library.
    - Devices E8E0-E8EF (those in the YELLOW library) were still offline from test 1 above.
    - Requested 17 tape mounts in Tape Manager on different vdevs – some for scratch tapes and some for used tapes. (Used tapes were those volumes used in scenario 1 above.)
      `TAPCMD TAPEMNT SCR BKRADMIN BKRPOOL VDEV nnn`
      `TAPCMD TAPEMNT VOL <volser> VDEV nnn`

- 16 completed successfully on E4E0-E4EF (since 16 real devices were available)
- 1 timed out with these messages as a device was not available:

```
EUMTAP0086E Device wait time for request 000096 exceeded the system
limit.
EUMTAP0074I Mount request 000096 failed - RC 32.
```

- **Summary** – region switch can easily be done by just varying offline the devices in the primary library and varying online the devices in the secondary library. RMS and thus Tape Manager will find and use the correct devices. There was no need to reconfigure or restart Tape Manager nor RMS.

3. **Simulate a "library offline"**. In this scenario, all libraries in the grid are offline. For example, this could happen if we've taken a library offline for maintenance but did not vary online any of the devices in the other libraries. We performed the following steps:
   - Varied offline all devices in the grid:
     - A3E0-A3EF (those in the RED library)
     - E8E0-E8EF (those in the YELLOW library)
     - E4E0-E4EF (those in the BLUE library)
   - Requested a tape mount in Tape Manager for a tape used in a previous scenario: **`TAPCMD TAPEMNT VOL <volser>`**
   - The request timed out with these messages:

```
EUMTAP0086E Device wait time for request 000110 exceeded the system limit.
EUMTAP0074I Mount request 000110 failed - RC 32.
```

   - **Summary** – RMS (and thus Tape Manager) treats "all devices busy" and "no devices online" the same way. RMS will continue to look/wait for a device until Tape Manager reaches its time-out and cancels the request.

Closing

The configuration and testing successfully demonstrated that IBM Tape Manager for z/VM, DFSMSRMS for z/VM, and a TS7700 tape grid can be used in the manner in which the customer requested. The simulation of DR testing and maintenance windows showed the products functioning in the manner desired for this grid environment. It is the authors' hope that those with a similar environment will be able to use this example in order to configure IBM's Tape Manager for z/VM and DFSMSRMS for z/VM in a similar tape grid environment.