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JPL's Move from StorageTek Redwood to 9940 drives/media

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Introduction

StorageTek has end-of-lifed the Redwood Tape drives so JPL needed to find a replacement tape drive system for our Cray SV1 DMF data. We chose the StorageTek 9940 tape drive as the replacement. It is supported on the Cray SV1 and has similar drive access, capacity and bandwidth. It has much better reliability (and cheaper maintenance) then the Redwood drives. No user changes would be necessary to access their DMF data.

We are in process of moving our DMF storage from STORAGETEK Redwoods to 9940 drives/media. We thought a site talk of our experience/tips might be of interest.

The Problem

JPL has long used DMF on its Crays and partnered with StorageTek for the hardware and media. With STORAGETEK's announcement of end-of-life we wanted to maintain our Cray DMF data and move to a newer tape technology. JPL has 7 terabytes of data on the Cray SV1. This data has both a primary and a backup copy of all data. We would like to move this data (again making two copies) during user production time with minimal user impact and maximum efficiency.

Hardware

Our existing hardware is three STORAGETEK Redwood drives in a Powderhorn silo. StorageTek recommended their newer tape drives, the 9940. The 9940 is supported by the Powderhorn silo. We consulted with Cray to see if they would support the new 9940 tape drives. Their support team tested and approved the 9940's with a SCSI connectivity (fibre channel is not supported). So JPL purchased three 9940 tape drives and new tape media.

For the transition from Redwood to 9940s we configured the hardware with two Redwood drives and two 9940 drives. This would allow us to copy data on one Redwood drive while writing to two 9940 drives, and leaves one Redwood drive for continued user access.

Configure/Test Tape Devices

JPL configured the new tape devices per Cray's specifications. In the TEXT_TAPECONFIG file we used the 'TYPE=VTAPE' parameter. We also defined a new group type of 9940. We then stopped and started the tape daemon and it saw the news drives. To use the new drives in testing, first we had to change our UDB limits adding user privilege on the second tape type.

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Also we labeled the tapes with the 'tplabel -g 9940' command. At this phase the TEXT_TAPECONFIG file kept our default group device as Redwood so all references to the new devices included the '-g 9940' parameter.

We moved on to testing tape read and write access using DUMP and RESTORE and TAR and UNTAR scripts. All testing was successful and we were ready to move on to trying DMF with our tape drives.

Configure/Test DMF

In order to test the new drives with DMF, we defined a 9940 device and two tape pools in the DMF_CONFIG file. Cray specified the new 9940 device should emulate a 3490. In the DMF_CONFIG file we set 'DEVICE_TYPE 3490'. During testing we created two new pools of tapes and made them third and fourth priority over our two user pools. We used the standard UDB parameter 'archmed' to allow the test users to read and write to these two new pools of tapes. We then created the empty pool databases with the DMVOLADM commands and added tapes to those pools.

After successful DMF testing, we changed our DMF configuration to write all new user production data to the new tape pools by making them priority one and two. Old user data was still available in read mode form the two Redwood pools.

Moving The Old Redwood Data to New 9940 Media

Cray recommended we used the DMMOVE command to move Redwood data to 9940 tapes. However, they counseled the DMMOVE command could bottleneck all tape drives. After consulting with Cray we determined to limit DMMOVE to one Redwood tape at a time. So JPL wrote scripts to locate the files on a per tape basis and use a DMSELECT input format for those files. We did this by dumping the databases with DMCATADM 'dump all' command and matched that to the DMSELECT '-m redwood' output. We then created one file per tape that contained a list of files contained on the tape. After starting the move process from Redwood to 9940 we found the moves were going too slowly - years to complete? We made a number of improvements to speed the process.

1. We added LDCACHE to the DMF database file systems. This greatly sped up the job on tapes that had thousands of files.

2. We gave priority to the move processes with the RENICE command.

3. To further speed up the move we changed from hard deleting the old Redwood data after successful move, to just leaving the Redwood data in the DMF databases. This greatly sped up the database access by cutting the number of database transactions in half.

4. We next cut back on regular DMF and DUMP CRON jobs to minimize system tape activity.

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Ongoing Problems

We have had a number of on-going problems including dirty tapes, dirty tape drives, hung channels and processes. Senior operations staff and system staff worked together to create interrupt procedures to allow tape drive cleaning and maintenance, kill and restart procedures to clear hung processes or channels as well as normal gigaring reset procedures.

Summary

This task has now gone into a production and monitoring mode and operations support is able to efficiently keep the tape drives busy. We expect our seven terabytes of data to be successfully copied by the time I'm giving this paper, down from one year to 200 days, to 35 days.

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