Part Two: Disaster Recovery Testing With the IBM TS7700

By Lloyd Christensen

Introduction

Last month I discussed my client's implementation of the IBM 3485 library with the latest IBM 3592 with encryption enabled. In this article I am going to discuss their first disaster recovery test in which they used encrypted tapes from a production environment and the IBM TS7700 Virtual Tape Server. Although I will focus on its use in a disaster recovery test, I will include some comments on TS7700 (and TS3500 library) operations and performance.

The recovery site for this production environment is located in another production data center. The equipment used for disaster recovery testing is separate from the site's production workload. The environment used for the D/R test includes: two IBM TS3500 tape libraries with eighteen (18) IBM 3592s defined to MVS; two TS7700 virtual tape servers in a Peer-to-Peer environment; and sixteen (16) IBM 3592s backing up the virtual tape server.

Scope and Configuration

The recovery test was the first with the new hardware platform. However, a full test including application recovery was planned. Among the considerations were:

1. A 'floor' system called 'DR01' exists at the recovery site that is always active. This system is used to restore DASD volumes enabling the recovering LPARs to be IPL'ed.
2. Encrypted IBM 3592 tapes, created at the production site, were shipped from the client's off-site tape storage vendor to the recovery site.
3. Encryption key management among all of the client's sites is performed by one group using IBM's ICSF and all sites use the same encryption keys. The recovery site also uses the same encryption keys.
4. All tape output from the recovery test is written to the IBM virtual tape server.
5. The IBM virtual tape environment includes two TS7700 VTSses in a Peer-to-Peer configuration.
6. A Peer-to-Peer configuration is referred to as a "GRID." One TS7700 is then "Cluster 0" while the other is "Cluster 1."
7. Allocations to tape are directed to a single DF/SMS Storage class and DF/SMS Storage Group.
8. Both IBM VTSses are in the same storage group.
9. Each VTS has 128 virtual tape drives defined. The Storage Group presents a total of 256 virtual tape drive addresses.

10. All virtual volumes, regardless of which "cluster" is used at creation, are replicated to the other cluster.
11. Replication is done immediately at end-of-volume (rewind time). IBM allows choosing when replication is done. In our case, replication is done at EOV; when the last write to the tape is done, that content of the volume is replicated to the second cluster before the operating system is told that the write is complete. An alternative is to inform the operating system that the write is complete and put the replication of the virtual volume into a queue for later processing.
12. When replication is to be done is specified via the Library Manager using the Copy Consistency Point keyword. In our case the Consistency Point is set to "RUN." The alternative is to set it to "DEFERRED."

DF/SMS Involvement

In our production environment, only "vault" data is directed to DF/SMS managed libraries. All other data is routed to Sun/STK (native 9840, 9490, and virtual tape). DF/SMS ACS routines for the recovery site were updated to direct all scratch mount requests to virtual tape via the DATACLAS, STORCLAS, and STORGRP routines. Existing DATACLAS, STORCLAS, and STORGRP routines for directing "vault" data to the encryption-enabled drives remained.

With the TS7700, there are three libraries being defined to DF/SMS. Each TS7700 must have two libraries defined: one for the "distributed" library plus one "composite" library even if there is not a Peer-to-Peer configuration.

TS7700 Library Management

Library management within the IBM virtual tape servers is done using a web interface called the TS7700 Management Interface. An I/P address is needed for each TS7700 plus one for the "Grid." Using the TS7700 Management Interface, the customer can: monitor the status and performance of the TS7700, manage the logical (virtual) volumes, configure and manage the TS7700 and grid, **and manage user access to the TS7700**. The customer can also access the Information Center and the (separate) 3953 Library Manager web interface.

I put the "**and manage user access to the TS7700**" in bold because this was not well understood at our site. Access to the TS7700 Management Interface allows some functions, mostly browsing, with no id/password required. However, other functions require a logon-id and password. It is possible to further restrict some functions, like adding

ranges of virtual volumes, to specific logon-ids. We did a rushed, and not well thought out, job of this and only one person had the logon-id/password required to define ranges of virtual volumes. Naturally this person was on a very well-deserved vacation, cruising in the Mediterranean, during the disaster recovery test.

TS3500 Cartridge Insert Process

The TS3500 has its own Library Manager. Included in the Library Manager are the Advanced Library Management System, Cartridge Assignment Policy, and Insert Notification. The Cartridge Assignment Policy associates a tape volume with a logical library. The Cartridge Assignment Policy should be set before tapes are entered into the library. **Take the time to get this right before you enter tapes.**

Okay, we didn't adequately define the CAP policy up front. There is a second chance to get it right. At the local library operator panel the operator gets 60 seconds to assign a library. After 60 seconds the tape is entered as "Unassigned." There wasn't anyone in front of the local operator panel.

So now we had tapes that were "Unassigned" in the TS3500 library manager. Using the TotalStorage Tape Library Specialist (another web interface), we could get them assigned properly by following these steps:

1. Get logged into the Tape Library Specialist
2. Select the correct logical library using the TS3500's web interface
3. Use the 3593 Library Manager's base-frame operator station or the web specialist to initiate an inventory upload.

TS7700 Performance Statistics

Prior generations of IBM's virtual tape systems wrote hourly statistics to SMF using Type 94 records. IBM is not doing that with the TS7700. What they've said is that there is too much data available to put it into an SMF record.

There are two types of statistics available: Point-In-Time and Historical Statistics. The Point-in-Time statistics are for a 15-second interval but are not kept beyond the current interval. You use the Bulk Volume Information Retrieval (BVIR) facility to get this data.

You also use the BVIR facility to get historical data. Historical data is collected at 15-minute intervals and kept for 90 days within the TS7700 data base. There are some canned reports available in the VEHSTATS program in IBMTOOLS to process the data retrieved by the BVIR facility.

There is useful stuff in these reports but not much in terms of documentation for what the reports are telling you. In a conversation with someone from IBM I did learn that we had our settings wrong for the Copy Consistency Point. What we had was all virtual volumes written to one of the clusters being replicated to the other cluster, but nothing written to the second cluster was being replicated to the first. We would not have known that had I not shared a report with IBM as part of trying to understand what the VEHSTATS and other reports were telling me.

Conclusion

Our first disaster recovery test of a production environment that had recently implemented the IBM 3584 and encryption-enabled 3592 drives worked. The recovery site had a pair of IBM TS3500 libraries along with two TS7700 virtual tape engines in a Peer-to-Peer config-

uration. All tapes created at the recovery site, other than those written with the expectation that they would be sent to an off-site storage facility, were directed to IBM virtual tape. That is a change from the production environment in which most tape data is routed to Sun/STK libraries and VSM.

There were lessons learned. The primary objective of the test was to verify that we could do the recovery using encrypted tapes from the production environment. It was also an opportunity to test the IBM virtual tape environment. Frankly, this test was rushed and occurred one week after the production environments began using the encrypted tape and some of the configuration of the IBM TS7700 was not as well thought out as it should have been. With much effort and lots of late-night phone calls, it did work, though. 🕓

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