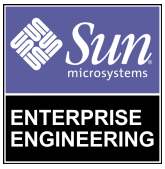
Online Backups Using the VxVM Snapshot Facility

By John S. Howard - Enterprise Engineering

Sun BluePrints™ OnLine - September 2000



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Sun Microsystems, Inc.
901 San Antonio Road
Palo Alto, CA 94303 USA
650 960-1300 fax 650 969-9131

Part No.: 806-6639-10
Revision 01, September 2000

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Online Backups Using the VxVM Snapshot Facility

Introduction

Complete and accurate backups are crucial to every datacenter. However, the uptime and availability requirements of a datacenter are often opposed to the typical backup needs of making disk volumes quiescent for the minutes or hours necessary to perform a backup.

By using the snapshot facility of the Veritas Volume Manager software we can effect an online backup of disk volumes. This online backup still requires the volume to be made quiescent. However, the snapshot facility requires the volume to be quiescent for only seconds or minutes rather than hours.

The Snapshot Procedure

The procedure overview for performing an online backup is as follows:

1. **Create and attach a mirror to be used for the snapshot.**

   As this step is attaching a mirror to an existing volume, a data synchronization to the snapshot mirror will be performed. Depending on the size of the volume and system load, this synchronization may be very consumptive of time and system resources, so it is recommended that this step be performed during off-peak system utilization. The snapshot mirror is a true mirror, for as long as the snapshot mirror is attached any changes or updates to the volume will automatically be made to the snapshot mirror as well.

2. **When you are ready to perform the online backup, the snapshot mirror is broken off and created as a volume.**

   This step is typically very brief and the volume should be made as quiescent as possible to minimize the possibility of data inconsistency on the snapshot volume.

3. **The consistency of the snapshot volume is verified.**

4. **The backup of the snapshot volume is performed and any clean up is done.**

   In the example that follows, version 8 of the Solaris™ Operating Environment and version 3.0.4 of the Veritas Volume Manager (VxVM) software are used. It is also assumed that VxVM has been correctly installed and `root`'s PATH has been correctly set. We will be demonstrating the snapshot procedure on the `u01` volume of the `drepdg` diskgroup. The `u01` volume is a 6GB RAID1+0 volume containing a ufs filesystem that is mounted on `/u01`. In addition, we will be adding disk `c5t1d0` to the `drepdg` diskgroup to be used to hold the snapshot volume.

   The detailed procedure is as follows:

1. **Initialize the snapshot disk and add it to the `drepdg` diskgroup with the name of `snapdisk`.**

2. **Create and attach the snapshot mirror on `snapdisk`:**

```
racerx# vxdisksetup -i c5t1d0
racerx# vxdg -g drepdg adddisk snapdis k=c5t1d0
racerx# vxassist -g drepdg snapstart u01 \alloc="snapdisk"
```

   When the `vxassist snapstart` is completed (when the mirror synchronization is complete), the snapshot mirror will be put in a `SNAPDONE` state. For example:

```
racerx# vxprint -ht -g drepdg u01-03
PL NAME         VOLUME       KSTATE   STATE    LENGTH   LAYOUT    NCOL/
WID MODE
SD NAME        PLEX        DISK     DISKOFFS LENGTH   [COL/]OFF DEVICE
MODE
SV NAME        PLEX        VOLNAME  NVOLLAYR LENGTH   [COL/]OFF AM/NM
MODE

pl u01-03      u01         ENABLED  SNAPDONE 12585752 CONCAT    -       WO
sd snapdisk-02  u01-03     snapdisk  12585752 12585752 0       c5t1d0
ENA
```

The time to synchronize the snapshot mirror to the volume is dependant on the size of the volume, system load, and system resources such as number of CPUs and amount of RAM. For the 6GB `u01` volume on a moderately loaded 4 CPU Ultra Enterprise™ 420 used in this example, the `snapstart` step took approximately 10 minutes.

3. **Make the u01 volume as quiescent as possible, then break the snapshot mirror off of the `u01` volume and create a temporary snapshot volume named `snapshotu01`:**

```
racerx# /usr/sbin/vxassist -g drepdg snapshot u01 snapshotu01
```

The time to break off the snapshot mirror and create it's associated temporary volume is typically very brief, but the length of time is dependant upon the size and number of IO operations pending to the volume (essentially, the size and number of updates that need to be flushed to the mirror before it is detached). For the 6GB `u01` volume we are using in our example, the snapshot step took an average of 0.6 seconds to complete.

The `vxassist` command creates the temporary volume as specified, in this example the temporary volume is named `snapshotu01`. The temporary volume is accessible and may be manipulated as any other VxVM volume. However, given that The temporary volume contains a point in time snapshot of our data, it is recommended to only use the snapshot volume as described in this article.

As with any other VxVM volume, access from the Solaris Operating Environment to the temporary volume is done through the `/dev` device tree. Given our example, a snapshot volume name of `snapshotu01` in the diskgroup `drepdg`, the raw device path to the temporary volume is `/dev/vx/rdsk/drepdg/snapshotu01`.

4. **Next, verify the consistency of the snapshot volume with the appropriate tool.**

Because the `u01` volume was a ufs filesystem, we will use `fsck` to verify the filesystem's consistency:

```
racerx# fsck /dev/vx/rdsk/drepdg/snapshotu01
** /dev/vx/rdsk/drepdg/snapshotu01
** Last Mounted on /u01
** Phase 1 - Check Blocks and Sizes
** Phase 2 - Check Pathnames
** Phase 3 - Check Connectivity
** Phase 4 - Check Reference Counts
** Phase 5 - Check Cyl groups
5 files, 4196385 used, 1996269 free (13 frags, 249532 blocks,  0.0%
fragmentation)
```

5. **Perform the backup.**

   Here `ufsdump` is used for the sake of example. The backup utility in use at your datacenter (i.e., Solaris Backup Utility or Veritas NetBackup) should be used to back the snapshot volume up to tape:

```
racerx# ufsdump 0uf /dev/rmt/0 /dev/vx/dsk/drepdg/snapshotu01
  DUMP: Writing 32 Kilobyte records
  DUMP: Date of this level 0 dump: Tue 01 Aug 2000 02:35:10 PM PDT
  DUMP: Date of last level 0 dump: the epoch
  DUMP: Dumping /dev/vx/rdsk/drepdg/snapshotu01 to /dev/null.
  DUMP: Mapping (Pass I) [regular files]
  DUMP: Mapping (Pass II) [directories]
  DUMP: Estimated 8405470 blocks (4104.23MB).
  DUMP: Dumping (Pass III) [directories]
  DUMP: Dumping (Pass IV) [regular files]
  DUMP: 8405438 blocks (4104.22MB) on 1 volume at 24469 KB/sec
  DUMP: DUMP IS DONE
  DUMP: Level 0 dump on Tue 01 Aug 2000 02:35:10 PM PDT
```

   If your backup utility has the capability of verifying the quality and consistency of the data written to tape, that verification should be performed now.

6. **Finally, destroy the temporary snapshot volume:**

```
racerx# /usr/sbin/vxedit -rf rm snapshotu01
```

   The `c5t1d0` disk may now be used to snapshot another volume in this diskgroup by starting over with the `vxassist snapstart` command. Alternatively, the `c5t1d0` disk may be removed from the `drepdg` diskgroup and added to another diskgroup to be used for snapshots within that diskgroup.

Comments

As with all backup procedures, this procedure should be thoroughly tested on a regular basis. In addition to scheduled testing of the backup procedures, scheduled testing of the restoration procedures is also essential.

Regular backups of the root "/" filesystem are often neglected or overlooked because of the inability to take the entire system down to get a clean, consistent backup of /. It is useful to note that this procedure may also be used to perform a backup of a VxVM encapsulated boot disk during off-peak system usage.

Conclusion

This article has presented a procedure to effect an online backup of a disk volume using the snapshot facility of Veritas' Volume Manager software.

Complete and accurate backups performed in a timely fashion are crucial to every datacenter. This article has presented a procedure utilizing the snapshot facility of the Veritas Volume Manager software which enables the System Administrator to perform timely, complete and accurate online backups with minimal impact to the user or applications.

Author's Bio: John S. Howard

John S. Howard is currently a Staff Engineer in the Enterprise Engineering group at Sun Microsystems in San Diego, California. He has worked as a software engineer and systems administrator for the past 19 years. Prior to Enterprise Engineering, John worked in Enterprise Services as an Area System Support Engineer for five years. As an ASSE, he was responsible for developing and performing Reliability, Accessibility, and Serviceability (RAS) studies of customer datacenters and the development of proactive Enterprise RAS Services. Prior to Sun, John held engineering positions at: The Chicago Board of Trade Clearing Corporation, Datalogics Inc, and Rand McNally. Throughout his career he has developed: pagination and publishing software, loose-leaf publishing systems, extensive SGML systems development, database publishing systems, text editors and WYSIWIG systems, and device drivers.