Sun StorEdge™ Availability Suite Software Point-in-Time Copy Software – Maximizing Backup Performance

A Best Practice

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The Sun StorEdge™ Availability Suite Software point-in-time copy software is a snapshot facility that runs in the Solaris™ Operating Environment (Solaris OE). A point-in-time snapshot is an instantly available, time-fixed, replicated view of a momentarily quiesced storage volume. The use of snapshots for backup purposes helps to increase data availability by helping to reduce the backup window to just seconds. However, use of a snapshot can add I/O processing that impacts the performance of the backup procedure. This best practice discusses a method for maximizing backup performance using the export feature of the point-in-time copy software.

Point-in-Time Copy Snapshots

The point-in-time copy software creates a volume set in which an application volume is copied to a snapshot volume. The snapshot volume can then be used for backup purposes without accessing the application volume. The point-in-time copy software's export feature enables the snapshot to be removed from the volume set in which it was established for the duration of the backup procedure. When the snapshot is exported, the application server no longer maintains the snapshot volume, which improves backup performance. When the backup is complete, a fast resynchronization occurs during which the snapshot is updated with only the changes to the application volume, rather than a full volume copy.

The backup can be run on the application server, or the snapshot can be imported by a backup server to move backup processing off the application server. For a backup server to import the snapshot requires that the snapshot reside on a dual-ported storage device. Whether you are using a single server or a dual-server configuration, the major advantages of using the point-in-time copy software and its export functionality are as follows:

- Helps improve backup performance because the I/O overhead of reading from a snapshot is eliminated
- Helps improve application performance because the backups are performed on separate disk devices
- Helps increase application availability because the backup is done with a snapshot instead of waiting for the backup to be written to tape, which helps to reduce the backup window to seconds
- Helps protect investment, because existing backup software can still be utilized

Issues With Snapshots

Operational procedures, automated or otherwise, must be established to employ the point-in-time copy technology. Examples of operational issues that must be addressed are:

- When to do the backup snapshots
- How often to do the backup snapshots
- How to notify the backup software when the snapshot is available

In most cases, a point of data consistency must be reached before a point-in-time copy can be established so that the snapshot image is logically consistent.

Maximizing Backup Performance

This procedure explains how to make a point-in-time copy and how to export it for backup purposes. Before starting, make sure you are logged in as the root user. The following steps assume that the point-in-time copy software is installed on each server that has access to the point-in-time copy.

▼ To Maximize Backup Performance

1. **Determine the volumes required for your point-in-time copy volume sets.**

   The point-in-time copy software uses shadow volume sets to manage point-in-time copies. A shadow volume set consists of a master volume, a shadow volume, and a bitmap volume. The master volume is the volume accessed by the application. The shadow volume is the point-in-time copy of the master. Use raw volumes for bitmaps. The bitmap in the volume set is where changes to the master are tracked while the shadow is exported.

   The shadow volume set must be enabled as an independent shadow volume set so that a full physical copy of the master is performed.

   Define an additional bitmap volume to track changes to the shadow volume while the shadow is exported. If the exported shadow volume is a backup, no changes are written to the shadow. However, the bitmap is still required for consistency checking when joining the shadow volume with its associated volume set on the application server.

   To make the shadow and secondary bitmap volumes accessible to another server, place them in a separate disk group from the master and primary bitmap volumes. This enables the disks associated with the shadow volumes and their respective bitmap volumes to be deported in a single operation.

   Example volumes are as follows:

   - Master volume (belongs to the disk group `production`):

     `/dev/vx/rdsk/production/vol01`

   - Shadow volume (belongs to the disk group `backup`):

     `/dev/vx/rdsk/backup/vol01`

   - Bitmap volume associated with master (belongs to the disk group `production`):

     `/dev/vx/rdsk/production/vol01.bmp`

   - Bitmap volume associated with shadow during export (belongs to the disk group `backup`):

     `/dev/vx/rdsk/backup/vol01.bmp`

2. **Size the volumes.**

   An independent shadow volume requires the same amount of storage space as its master volume. The master volumes can be any RAID level supported by the Solaris OE and the volume manager software. Master, shadow, and bitmap volumes do not need to be the same RAID level.

   The bitmap volumes are sized according to the size of the master volume. For each 1 Gbyte of raw disk space of the master volume, 8 Kbyte are required for the bitmap, plus an additional 24 Kbyte for overhead. So an 8 Gbyte master volume requires a bitmap of
   (8 * 8 Kbyte) + 24 Kbyte) = 88 Kbyte.

3. **Momentarily quiesce the application.**

   Flush to disk any data that is in the server's page cache. For `ufs`, do this with `lockfs`. Refer to your database software user manuals to determine the proper procedure for flushing data to disk.

4. **Enable the point-in-time volume sets.**

   For manageability, you may group volumes being exported together into an I/O group. You can create an I/O group called `Backup1` using the `iiadm -g` command, so that the volumes can be managed as a single set.

```
# iiadm -g Backup1 -e ind/dev/vx/rdsk/production/vol01 /dev/vx/rdsk/backup/vol01 \
dev/vx/rdsk/production/vol01.bmp
# iiadm -g Backup1 -e ind/dev/vx/rdsk/production/vol02 /dev/vx/rdsk/backup/vol02 \
dev/vx/rdsk/production/vol02.bmp
# iiadm -g Backup1 -e ind/dev/vx/rdsk/production/vol03 /dev/vx/rdsk/backup/vol03 \
dev/vx/rdsk/production/vol03.bmp
```

5. **Resume the application.**

   The application can be resumed while the copy to the independent shadow is in progress.

6. **For I/O grouping, create a single point-in-time copy for the group.**

   Although the volume sets have all been enabled and inserted into the I/O group `Backup1`, they were set at different points in time. To have a single point-in-time copy for the group, invoke an update operation for the group. The `-p` option for `iiadm` locks the volume so that no other `iiadm` command can be run until the update completes.

```
# iiadm -g Backup1 -p -u s
```

7. **When the independent copies are complete, export the shadow volumes.**

   For the creation of the initial point-in-time copy, this can take considerable time; subsequent updates are much quicker with fast resync capability.

   - For an I/O group, export the group.

```
# iiadm -g Backup1 -E
```

   - If there is no I/O group, export the shadow and bitmap volumes one pair at a time.

```
# iiadm -E /dev/vx/rdsk/backup/vol01
# iiadm -E /dev/vx/rdsk/backup/vol02
# iiadm -E /dev/vx/rdsk/backup/vol03
```

   - If the shadow and bitmap volumes are not being imported on another server, skip to Step 11.

8. **Deport the disk group that hosts the shadow volume and import it to the backup server.**

   For example:

```
# vxdg -g backup stopall
# vxdg -g backup deport
```

9. **Import the disk group on the backup server.**

```
# vxdg -g backup import
# vxdg -g backup startall
```

10. **Import the shadow volumes and bitmaps on the backup server.**

```
# iiadm -I /dev/vx/rdsk/backup/vol01 /dev/vx/rdsk/backup/vol01.bmp
# iiadm -I /dev/vx/rdsk/backup/vol02 /dev/vx/rdsk/backup/vol02.bmp
# iiadm -I /dev/vx/rdsk/backup/vol03 /dev/vx/rdsk/backup/vol03.bmp
```

11. **Perform the backup.**

    If the backup is performed on the application server, skip to Step 14.

12. **Disable the shadows and bitmaps from the point-in-time copy software on the backup server.**

```
# iiadm -d /dev/vx/rdsk/backup/vol01
# iiadm -d /dev/vx/rdsk/backup/vol02
# iiadm -d /dev/vx/rdsk/backup/vol03
```

13. **Reestablish the disk groups on the application server.**

- From the backup server, deport the disk groups.

```
# vxdg -g backup stopall
# vxdg -g backup deport
```

- At the application server, import the disk groups.

```
# vxdg -g backup import
# vxdg -g backup startall
```

14. **On the application server, join the shadows to their respective masters.**

The bitmap associated with the shadow is merged with the original bitmap volume to reconstruct the original volume set consisting of the master, shadow, and bitmap volumes.

```
# iiadm -J /dev/vx/rdsk/backup/vol01 /dev/vx/rdsk/backup/vol01.bmp
# iiadm -J /dev/vx/rdsk/backup/vol02 /dev/vx/rdsk/backup/vol02.bmp
# iiadm -J /dev/vx/rdsk/backup/vol03 /dev/vx/rdsk/backup/vol03.bmp
```

15. **Quiesce the application.**

16. **Perform a fast resynchronization to update the shadow with changes from the master.**

For an I/O group:

```
# iiadm -g Backup1 -u -p s
```

Or, for each shadow volume:

```
# iiadm -u -p s /dev/vx/rdsk/backup/vol01
# iiadm -u -p s /dev/vx/rdsk/backup/vol02
# iiadm -u -p s /dev/vx/rdsk/backup/vol03
```

17. **Resume the application.**

    The application can be resumed immediately after issuing the update commands.

18. **Repeat Step 7 through Step 17 to continually update and back up the shadow volumes.**

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