Oracle RMAN Accelerated with Sun Storage 16Gb FC PCIe Universal HBA, QLogic

Sun Storage 16Gb FC HBA Reduces Oracle Recovery Manager Backup Time up to 76%

The Sun Storage 16Gb FC HBAs boast industry-leading native Fibre Channel performance—achieving dual-port, line-rate, 16-gigabit Fibre Channel throughput—at extremely low CPU utilization with full hardware offloads. With this level of performance it is a natural adapter choice for servers performing high bandwidth tasks with applications such as Oracle Recovery Manager (RMAN).

- Sun Storage 16Gb FC HBA reduced backup time by 76% compared to the Sun StorageTek 8Gb FC HBA.

- Sun Storage 16Gb FC HBA reduced a 3TB backup time by 2 hours and 21 minutes.

- Backing up more data in less time alleviates shrinking backup window pressure to prepare for future growth.

- Fully utilize RMAN by writing critical data out to safe, secondary storage at a rate of 1100 MB/s.

- Improve application performance.

- Exposure to data loss in case of a disaster during backup dramatically reduced.

OVERVIEW

RMAN is defined in the Oracle documentation as *"… an Oracle Database client that performs backup and recovery tasks on your databases and automates administration of your backup strategies. It greatly simplifies backing up, restoring, and recovering database files."*

RMAN is an essential application to the disaster recovery plans for organizations running Oracle. Today data is always on, always available, and is forever. This expectation is only possible because of regular backups that keep the backed up information in the desired recovery window.

RMAN backups have the need for speed. Even a "small" incremental backup can take too much time or too much performance away from the live applications running at the same time. It is critical that backups be accelerated as much as possible to increase real-time performance for the users and shorten the amount of time the enterprise is exposed to data loss due to unforeseen disasters before the latest backup completes.

PHYSICAL CONFIGURATION

This RMAN test profiled two HBAs: a Sun StorageTek 8Gb FC HBA and a Sun Storage 16Gb FC Universal HBA. The Server, Switch, Storage, and Database configurations are detailed below:

Server:

- Intel-based x86 Server, 16 CPUs, 32GB memory
- Sun StorageTek 8Gb FC PCIe HBA - SG-XPCIE2FC-QF8-Z (dual channel)
- The experiment was conducted using the Sun Storage Dual 16Gb FC PCIe Universal HBA, QLogic - 7101674; however, any of the following 16Gb FC Oracle HBAs from QLogic could also apply:
  - 7101673 Sun Storage Dual 16Gb FC PCIe Universal HBA, QLogic (for factory installation)
  - 7101674 Sun Storage Dual 16Gb FC PCIe Universal HBA, QLogic
  - 7101682 Sun Storage Dual 16Gb FC ExpressModule Universal HBA, QLogic

Switch:

Two 16Gb switches
The switches were zoned to keep the HBAs from each device in the same zone. To change the measurement from a baseline 8Gb HBA to 16Gb HBA, we simply moved the cables from one HBA to the other.

Storage:

- Two DataCore (16TB storage each)
- Sun StorageTek 8Gb FC HBA and Sun Storage 16Gb FC HBA

Database:

- The database was built at a size of 3.1TB with 70 tables with 100 million rows in each table.

RMAN CONFIGURATION

The RMAN backup was configured to use the disk channel to back up to an ext4 file system on the second Datacore array using the following command:

```
CONFIGURE CHANNEL DEVICE TYPE DISK FORMAT   '/u02/bkup/full_%u_%s_%p';
```

The experiments included changing one of the default settings related to how many tasks RMAN uses to perform a backup. As the test findings report, we found a dramatic increase in performance by configuring RMAN to use more than a single task to perform a backup. This setting is referred to as the "RMAN Parallelism Setting."

To configure RMAN parallelism to a value of "8", we used the following command:

```
CONFIGURE DEVICE TYPE DISK PARALLELISM 8 BACKUP TYPE TO BACKUPSET;
```

The above command distributed the files (table spaces) to the disk channels. If the file is large (a big file table space), we recommend breaking the file into fixed sizes set in the backup command to balance the load across the parallel tasks.

For example, the following backup command breaks a large table space (over 3TB) into 256GB sections:
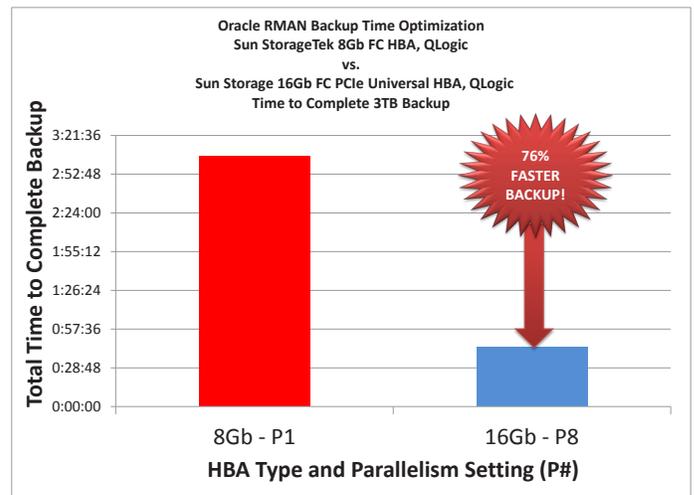
```
BACKUP AS BACKUPSET DATABASE SECTION SIZE 256G;
```

FINDINGS

Our initial tests with the Sun StorageTek 8Gb FC HBA (SG-XPCIE2FC-QF8-Z) with RMAN in default settings did not push the maximum bandwidth capabilities of the adapter. The RMAN application by default will execute with only one task to perform a backup. With these settings, we measured 300 MB/s of sequential write throughput. The 8Gb HBA is capable of more than double that sequential write performance. At this bandwidth, the backup time was measured at 3 hours and 6 minutes for a 3.1 TB data set.

In today's hyper-threaded world, where everything is done in parallel such as with multiple CPUs in a server, each with multiple cores, multiple servers, multiple disks per volume group, multiple arrays, and multiple ports per adapter, we asked *"Why should we single thread the application?"* We next increased the parallelism setting in RMAN to 8. With this setting, 8 parallel tasks are performing the backup. At 8 tasks the measured throughput jumped to nearly 800 MB/s or 780.17 MB/s to be exact. This equated to a total backup time of only 1 hour and 8 minutes. With a simple RMAN "tweak" you can push the Sun StorageTek 8Gb FC HBA to maximum bandwidth.

However, RMAN can do even more. With this simple RMAN configuration the 8Gb Adapter is the bottleneck. Our final experiment was using the Sun Storage 16Gb FC HBA, also with a parallelism of 8 in RMAN. Now with the doors blown off we measured 1,161 MB/s. The total backup time was reduced to only 44 minutes.

Oracle RMAN Backup Time Optimization
Sun StorageTek 8Gb FC HBA, QLogic
vs.
Sun Storage 16Gb FC PCIe Universal HBA, QLogic
Time to Complete 3TB Backup

76% FASTER BACKUP!

CONCLUSION

The Sun Storage 16Gb FC PCIe Universal HBA can make a dramatic impact on your organization's disaster recovery plan. A fast, reliable backup solution is critical and the Sun Storage 16Gb FC HBA is an excellent choice for your SAN. We found that backup time was reduced by over 2 hours and 21 minutes for a 76% faster backup. Learn more about the Sun Storage 16Gb FC PCIe Universal HBA at http://www.qlogic.com/Go/oracle/ds_16Gb.html.

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