# BACKUP AND RESTORE FOR SUN ORACLE EXADATA AND SUN ORACLE DATABASE MACHINE

*Sun Oracle Exadata Storage Server and the Sun Oracle Database Machine are a joint offering from Oracle and Sun Microsystems. This joint backup and restore Proof of Concept used the Sun Oracle Database Machine and the Sun/StorageTek tape library solution. Tape backup rates ran at tape device speeds and achieved 7.8 TB/hr using 14 tape drives. An effective incremental backup rate of over 70 TB/hour was achieved.*

## Sun Oracle Exadata Storage Server

The Sun Oracle Exadata Storage Server (Exadata) is a storage product optimized for use with Oracle Database applications. It is the storage building block of the Sun Oracle Database Machine. Exadata delivers outstanding I/O and SQL processing performance for online transaction processing (OLTP), data warehousing (DW), and a consolidation of mixed workloads. Extreme performance is delivered for all types of database applications by leveraging a massively parallel grid architecture and Exadata Smart Flash Cache to dramatically accelerate Oracle Database processing and speed I/O operations. The Exadata storage products are a combination of software and hardware used to store and access Oracle databases. Exadata provides database-aware storage services—such as the ability to offload database processing from the database server to storage—and provides this while being transparent to SQL processing and database applications.

## Sun Oracle Database Machine

The Exadata Storage Servers are also packaged in a complete end-to-end database solution known as the Sun Oracle Database Machine. The Sun Oracle Database Machine is an easy-to-deploy, out-of-the-box solution for hosting the Oracle Database for all applications and delivers the highest levels of performance available. Database Machine and Exadata storage deliver breakthrough performance with linear I/O scalability. They are simple-to-use and manage, and deliver mission-critical availability and reliability to the enterprise.

## Backup and Restore Proof-of-Concept Hardware Configuration

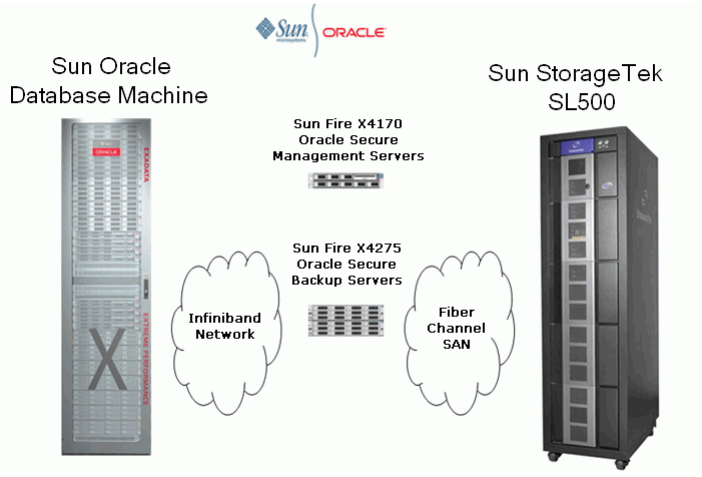


**Figure 1. Sun Oracle Hardware System Configuration**

| Hardware | At a Glance: |
|---|---|
| **Oracle Secure Backup Management Server** [1]<br>**Sun Fire X4170 Server** | Rack-optimized (1RU) x64 server<br>• One Intel® Xeon® Processor 5500 Series, Intel HyperThreading, 6Gb memory<br>• Four 2.5-inch 300 GB SAS hard disk drives |
| **Two Oracle Secure Backup Media Servers** [2]<br>**Sun Fire X4275 Storage Server** | Rack-optimized (2RU) x64 server<br>• Two Intel® Xeon® Processor 5500 Series, 12 Gb memory<br>• Four 3.5-inch SAS 300 GB hard disk drives<br>• Two dual port 8 GB PCIe 2.0 Fiber Channel adapters<br>• One dual port Infiniband QDR adapter |
| **Sun StorageTek SL500 Tape Library** [3] | Sun StorageTek SL500 Tape Library<br>• 14 HP LTO 4 tape drives<br>• 800 GB Native Tape Capacity<br>• 120 MB/s Native Throughput |
| **Sun Brocade 5100 Switch** [4] | Delivers full 8 Gb/sec performance |

[1] http://www.sun.com/servers/x64/x4170/index.xml
[2] http://www.sun.com/servers/x64/x4275/
[3] http://www.sun.com/storage/tape_storage/tape_libraries/sl500/
[4] http://www.sun.com/storage/storage_networking/switches_directors/brocade_5100/

## Backup and Restore Rates

The configuration in Figure 1 has the effective data transfer rates shown in the following table. During backup operations, sufficient CPU resources were available for production usage because fewer than two CPU cores were used for each participating backup server.

| Backup and Restore Proof of Concept | |
|---|---|
| **Full Database Backup to Disk** | |
| 1 instance, 1 RMAN channel | Achieved 727 MB/sec or 2.5 TB/hr |
| 2 instances, 4 RMAN channels | Achieved 1400 MB/sec or 4.8 TB/hr |
| **Full Database Restore from Disk** | |
| 1 instance, 1 RMAN channel | Achieved 1027 MB/sec or 3.5 TB/hr |
| 4 instances, 4 RMAN channels | Achieved 2326 MB/sec or 7.9 TB/hr |
| **Full Database Backup to Tape** | |
| 2 instances, 14 tape drives | Achieved 2291 MB/sec or 7.8 TB/hr |
| **Full Database Restore from Tape** | |
| 2 instances, 14 tape drives | Achieved 2105 MB/sec or 7.2 TB/hr |
| **Full Database Incremental to Tape (10% Change)** | |
| 2 instances, 14 tape drives | Achieved effective backup rates of >70 TB/hr |

You must use Recovery Manager (RMAN) to perform backup operations with Exadata. Any tape backup product that integrates with RMAN is automatically supported for use with Exadata Storage Server systems. Oracle Secure Backup, a centralized tape backup management solution, was used in the testing. Overall backup and restore runs much faster on Exadata compared to other environments. Our backup and restore rates to tape were limited by the aggregate tape transfer rates.

**Note:** A detailed joint best practice paper from Sun and Oracle will be available in the future on the Oracle Maximum Availability Architecture (MAA) OTN Web site. A detailed white paper about best practices for RMAN and Oracle Secure Backup with Exadata will also be available.