

# Oracle Secure Backup and Quantum Provide Maximum Scalability and Performance

*An Oracle White Paper*  
*October 2006*

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## EXECUTIVE OVERVIEW

We are all witnessing exponential growth of data on production servers and data at rest on secondary storage. As the amount of data grows, the backup and recovery infrastructure must effectively scale to meet current and future requirements. In addition, recent changes in government compliance regulations have changed the landscape of data protection and long-term retention of backup data. Deploying a backup and recovery solution that meets the evolving data protection requirements is one of the most important corporate challenges.

Tape backup is the cornerstone of most enterprise data protection strategies because of its proven reliability, portability and suitability for long-term storage. An effective tape backup solution is a combination of tape backup software and tape hardware providing scalability, performance and reliability within budget.

In a joint performance benchmarking effort between Quantum, leader in Backup, Recovery and Archive solutions, and Oracle, we demonstrate how a complete tape backup solution using Oracle Secure Backup and Quantum i2000 successfully scales as the environment grows.

With the Quantum and Oracle Secure Backup solution, your backup infrastructure can be architected to meet backup time requirements (windows) based on the formula of amount of data and available hardware throughput. As backup windows shrink, or the amount of data increases, you can directly increase performance by adding more hardware to meet your requirements.

Our goal in this joint testing effort was to demonstrate how our customers could leverage our technology and commodity servers to deploy a scalable, affordable tape backup solution.

## INTRODUCTION

In the Quantum test lab, our engineers were tasked with protecting 350Gb of actual customer data to tape. Their goal was to maximize backup performance leveraging as much hardware throughput as possible. After tracking results of their base environment, the amount of hardware was doubled to determine if our tape backup solution scaled to meet hardware capabilities.

**A successful tape backup infrastructure is the marriage of reliable tape backup software and tape devices. The Oracle Secure Backup and Quantum solution delivers a proven tape backup strategy providing maximum scalability, performance and value.**

While benchmarking backup speed, our overall goal was to insure maximum restoration performance. Therefore, our engineers did not utilize multiplexing since it degrades restore performance.

Our benchmark testing focused on tape backup performance for the Oracle Database leveraging Oracle Real Application Clusters (RAC), Oracle Secure Backup, and Recovery Manager (RMAN). While RAC and RMAN are specific to the Oracle Database, Oracle Secure Backup protects heterogeneous file systems and the Oracle Database to tape. This would apply to file system data or Oracle database data.

Our testing proved that a backup solution using Oracle Secure Backup and the Quantum i2000 tape library delivers scalability, performance and affordability. In our test environment, Oracle Secure Backup leveraged over 97% of available disk throughput achieving sustainable backup speeds of 700 MB/s (2.5 TB/hr) out of a 720 MB/s maximum available throughput with minimal CPU usage (<30%).

### **WHY OUR SOLUTION WORKS**

Oracle Secure Backup delivers high performance, secure tape data protection for the Oracle Database and file systems in heterogeneous, distributed environments. Oracle Secure Backup leverages SSL for inter-domain communication and two-way server authentication better protecting your backup domain from unauthorized users. Ideally suited for Oracle customers, Oracle Secure Backup protects UNIX, Linux, Windows and Network Attached Storage (NAS) file systems and is tightly integrated with Recovery Manager (RMAN) for the Oracle database providing centralized tape backup management for the entire Oracle environment.

With support for over 200 tape devices from legacy equipment to the latest high-performance tape drives, Oracle Secure Backup can be deployed with existing tape hardware. For this performance benchmarking, we chose to use the Quantum i2000 tape library because its proven reliability, value and modular design make it extremely scalable from small companies to large data centers.

The performance results described in this paper concentrate on local, not networked, backup performance. In actual customer environments, performance of networked backups may be throttled only by network limitations. As your backup domain increases, Oracle Secure Backup dynamically shares tape drives in SAN environments to maximize resource utilization. Oracle Secure Backup and Quantum i2000 provide maximum value to Oracle customers.

Priced at \$3000 per physical tape drive, Oracle Secure Backup is the most affordable enterprise tape backup solution for the Oracle database and file systems. By reducing tape backup software costs, budget dollars can be diverted to enhance the backup infrastructure for a complete affordable solution.

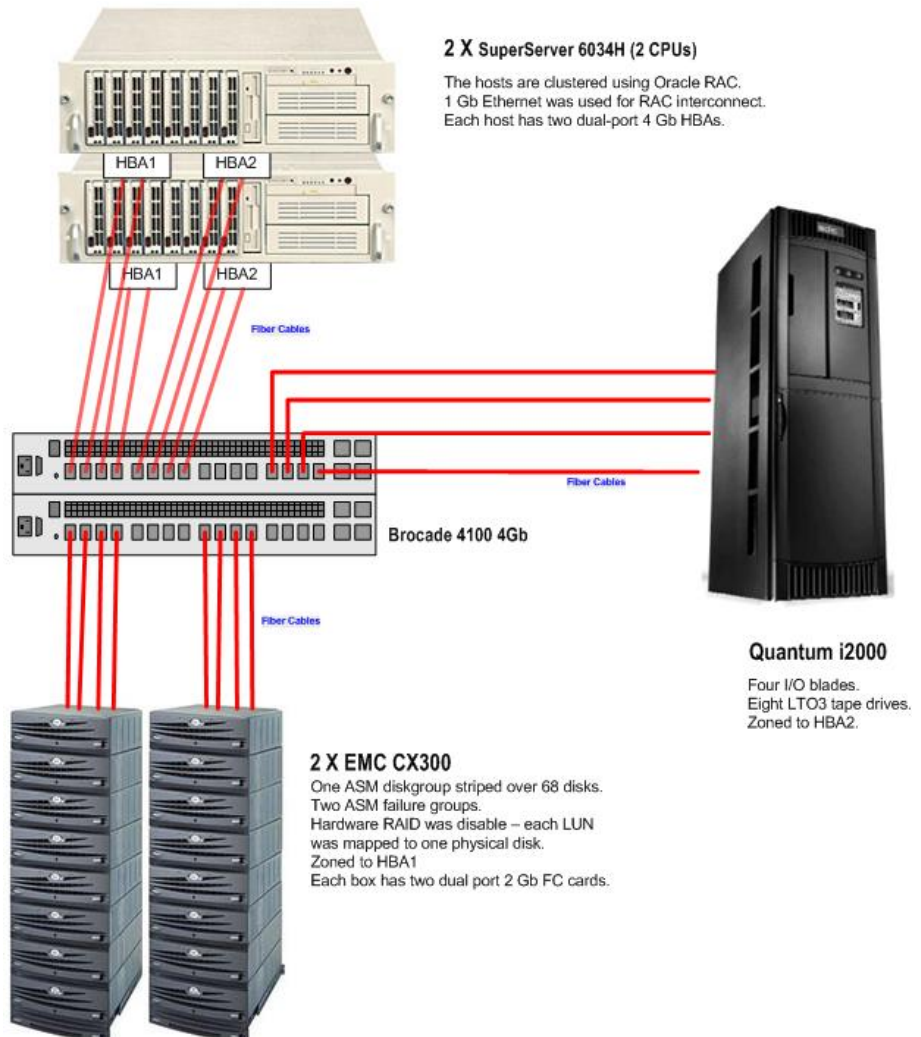
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## TEST ENVIRONMENT

The following table and figure describe hardware and software components used in the test:

Oracle Secure Backup and the Quantum i2000 provide maximum value to Oracle customers.

Server	RAC cluster of two SuperMicro servers.	
	Model	SuperMicro SuperServer 6034H (2 CPUs) - 6GB PC2-5300
	CPU	2X Intel® Xeon™ CPU 3.2GHz
	HBA	2X 4Gb Qlogic QLE2462 dual port
	OS	RedHat AS 4.0 U3
Oracle Database	10.2.0.2	
Oracle Secure Backup	10.1.0.2	
Database size	350Gb (actual customer data was used)	
Disk subsystem	Two disk arrays managed by Oracle ASM.	
	Model	EMC Cx300
	ASM	One disk group on top 68 LUNs. Two failure groups.
	RAID	HW RAID was disabled – each LUN was mapped to one physical disk.
	Disks	Maxtor MaxLine II, 320GB ATA/133, 5400 RPM .
Tape subsystem	Library	Quantum i2000
	Drives	8 IBM Ultrium LTO-3 fibre attached - 4 IO blades



The Quantum i2000 library is designed to scale easily from 100 to over 3,400 slots and from 1 to 96 tape drives. Quantum's innovative Capacity-On-Demand model allows users to activate more capacity with a simple software license key. In addition, the Intelligent management and proactive diagnostics software makes the Scalar i2000 one of the easiest, high availability solutions to operate in the marketplace.

Backup performance results are dependent on many factors with any one factor being a potential bottleneck. The primary hardware components effecting tape backup performance are the throughput capabilities of:

- Disk subsystem
- Processing power of server host
- Tape drive

To understand our hardware solution, our engineers determined the throughput capabilities of each component to determine the maximum speed that could be achieved in our test environment.

The Oracle ORION utility ([ORIO06]) was used to measure the throughput of the disk subsystem. This utility showed that maximum sequential read speed for a disk array was about 360 MB/s. The speed doubled to 720 MB/s when the second disk array was added to the ASM disk group.

A single HBA achieved a throughput of about 480 MB/s. Each node in the cluster was configured with two HBAs.

A single fibre attached LTO-3 tape drive is capable of achieving 120 MB/s write speeds for compressed data. We observed as much as 150 MB/s for highly compressible data. While the Quantum i2000 was populated with 4 LTO-3 drives, providing a potential backups speed of 480 MB/s (4 x 120 MB/s), the aggregate throughput was throttled to a maximum of 360 MB/s by the disk subsystem.

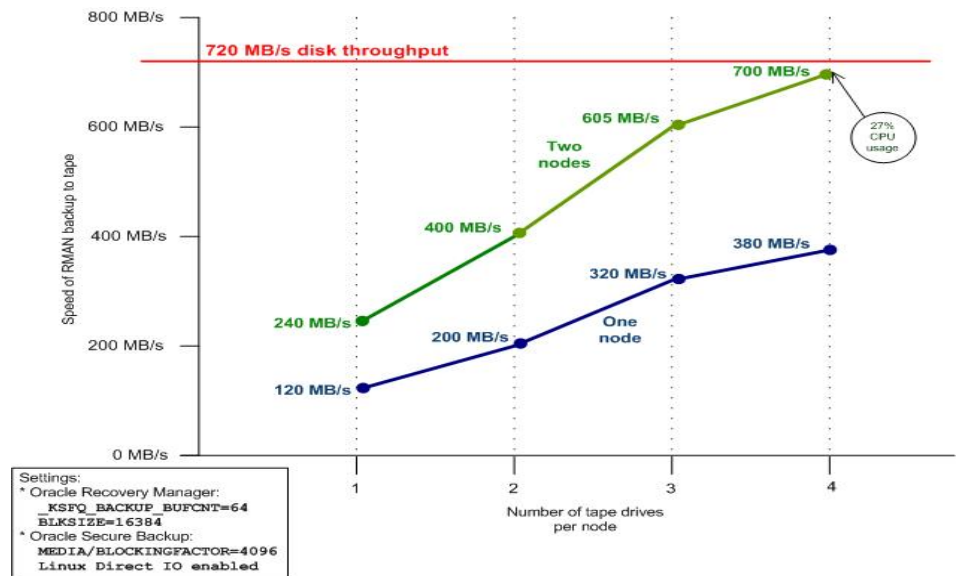
## **RESULTS AND FINDINGS**

Oracle Secure Backup performs backup operations as fast as the hardware will allow. As your environment grows or backup windows shrink, you can directly improve backup performance by adding more hardware to your backup infrastructure. With Oracle Secure Backup, you will achieve linear performance gains as additional RAC nodes and tape drives are added.

The chart below demonstrates how Oracle Secure Backup delivers speeds of 700 MB/s leveraging over 97% of available disk throughput to 8 LTO-3 tape drives. The blue line shows near-linear improvement in backup speed utilizing one node

of the RAC as the number of tape drives is increased from 1 to 4. By adding a second node and four additional tape drives, backup performance continues to increase in direct relation to the additional hardware capabilities as shown on the green line of the chart:

Oracle Secure Backup can leverage over 97% of available disk throughput.



No of tapes		Time for full backup of 350 GB database
Node 1	Node 2	
1	0	50 minutes
2	0	30 minutes
3	0	19 minutes
4	0	16 minutes
1	1	26 minutes
2	2	16 minutes
3	3	11 minutes
4	4	8 minutes

Oracle Secure Backup was able to backup 350 GB database in less than 10 minutes.

Oracle Secure Backup will backup data as fast as the underlying hardware will permit. Our tests achieved a sustainable backup rate in excess of 2.5 TB/hour. Furthermore, our testing demonstrated, hardware can be added to the environment in predictable manner. The throughput of a single node is maximized using 4 tape drives. When the second tapes was deployed, performance nearly doubled by adding 4 additional tapes drives, with the limiting factor being the disk subsystem.

## CONCLUSION

Oracle Secure Backup, combined with Quantum's i2000, is ideally suited for Oracle customers since it protects the entire Oracle environment of heterogeneous file system data and the Oracle database to tape.

As your environment grows, you can easily scale this solution to meet your changing backup and restoration requirements. Key benefits include:

- Oracle Secure Backup leverages over 97% of available disk throughput when writing data to tape and provides sustainable backup rates in excess of 2.5 TB per hour.
- Oracle Secure Backup's innovative, single-component-per-drive licensing model (\$3000 per physical tape drive) simplifies enterprise tape backup software licensing.
- Oracle Secure Backup provides unparalleled and predictable scalability protecting data from unlimited servers and Oracle databases.
- Oracle Secure Backup dynamically shares tape drives within the Quantum i2000 while managing any resource contention and thereby maximizes resource utilization in SAN environments.
- Quantum's i2000 intelligent management layer reduces administrative overhead and increases availability.
- Quantum's i2000 tape library maximizes investment protection by providing scalable backup performance and capacity – from 1 to 96 drives and 100 to >3,400 slots.
- Quantum i2000's standard rack footprint is ideal for data centers with limited space.

As a result of these benefits, Oracle Secure Backup and Quantum's i2000 provide a proven, centralized tape backup solution delivering unsurpassed performance, reliability and value.

## REFERENCES

[SDT06] Senad Dizdar, *["Tuning Oracle Recovery Manager and Oracle Secure Backup"](#)*, October 2006

[ORIO06] *"Oracle I/O Numbers Calibration Tool"*  
<http://www.oracle.com/technology/software/tech/orion/index.html>



**Quantum and Oracle Secure Backup Solution Provides Maximum Scalability and Performance**  
October 2006

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