

Database Storage Consolidation

The Next Logical Step To Improved Storage Utilization

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Database Storage Consolidation

Companies can save 20% or more through consolidation.
Giga Research, 2004

EXECUTIVE OVERVIEW

One thing all analysts agree on is that consolidation can significantly save IT cost for your company. Companies can save up to 50% depending on their application environments.

Distributed database deployment is a result of incremental deployment of new applications on different servers over time. This has resulted in costly business challenges such as higher administration costs, excess system capacity per server, islands of databases, difficulty in sharing data and expensive downtimes.

Consolidation improves resource utilization from typically 30% per server in a distributed environment to in excess of 80 % in a consolidated environment. Clustering technologies like Oracle Real Application clusters not only facilitate consolidation, but also significantly increase availability, which is a critical requirement in IT organizations today.

Storage consolidation has been an integral part of this evolution towards database consolidation. Monolithic and direct attached storage (DAS) is giving way to more efficient and flexible architectures introduced by fiber channel and storage area network (SAN) switch technologies. Database consolidation is more feasible and dynamic because of new hardware and software virtualization layers that allow architecture simplification and automation.

The introduction of the Automatic Storage Management (ASM) feature in Oracle Database 10g provides another positive step in consolidation. ASM further facilitates database consolidation not only from a server perspective, but also allows a consolidation with a shared pool of storage for both clustered and non-clustered environments. ASM enables the storage Grid within the Oracle Grid architecture and provides dynamic provisioning of storage, as well as simplified and automated storage administration.

Companies have realized great benefits by re-architecting to consolidate. These benefits are centralized management that lowers the administrator overhead, higher utilization of resources, greater control over data security, better scalability and improved performance.

External storage capacity growth will increase at a compound annual growth rate (CAGR) of approximately 50% through 2007. At this rate, storage capacity requirements will be more than 5 times the 2003 capacity.
IDC Report, 2003

89% of customers surveyed in 2003 either plan to consolidate or have consolidation projects underway.
*Gartner Research
J. Phelps*

DATABASE CONSOLIDATION BUSINESS REQUIREMENTS

As the adoption of relational databases grew rapidly, the one to one relation between database, server and storage resulted in unprecedented server and storage sprawl in data centers. The direct consequence of this distributed computing model was significant increase in cost, complexity, management overhead, and total cost of ownership.

The move to drive down cost and simplify the management of IT systems has led to several types of consolidations. Many companies have focused on server, database, and storage consolidation. Each of these provided new ways to increase the usage of IT resources while lowering the cost of managing the systems.

There is great demand for cost effective consolidated storage solutions driven by tremendous growth in storage volume and complexity. Islands of direct attached storage (DAS) were superseded by Storage Area Network (SAN) fibre channel switch technologies enabling more economical centralized storage management, resource sharing, agility to provision storage, and better storage utilization.

In addition, server consolidation remains one of the top IT priorities in 2005 and beyond. The business drivers motivating server consolidation are rampant server sprawl, improved TCO, centralized system management, improving service levels, and reducing complexity while providing higher availability.

Server cluster technologies were the next step in sophistication necessitated by availability and disaster recovery business requirements. Cluster parallel computing became the foundation for low cost horizontal cluster architecture ideal for consolidation. Oracle has been instrumental in leveraging cluster technologies to provide the fullest potential in server, storage and database consolidation with Oracle Database 10g Real Application Clusters and the grid platform.

DATABASE STORAGE CONSOLIDATION

Automatic Storage Management

Automatic Storage Management (ASM) feature in Oracle Database 10g Release 2 extends the ASM features and provides greater flexibility, enhanced manageability, improved data migration and empowers the next logical step in database storage consolidation into a clustered pool of storage.

Automatic Storage Management is an integrated cluster aware volume manager and a file system designed and optimized for managing Oracle database files. ASM is the realization of the Oracle Stripe And Mirror Everything (SAME) storage management methodology researched and established as best practices for Oracle database environments over many years. ASM provides the virtualization of the storage resources that allows a group of disks to be managed as a single object called a disk group. ASM provides even and automatic I/O distribution for database files across all the available disks or LUNs in a pool of storage. It optimizes performance and reduces the management overhead for provisioning

and managing database files for varying business requirements. ASM reduces the storage management complexity by automating best practices and eliminating tedious tasks for storage, system and database administrators providing easier database management environments.

Database Consolidation

“The clustered pool of storage managed by ASM presents new key opportunities for Vanderbilt to improve storage utilization and save money through storage database consolidation in single instance as well as RAC database environments”

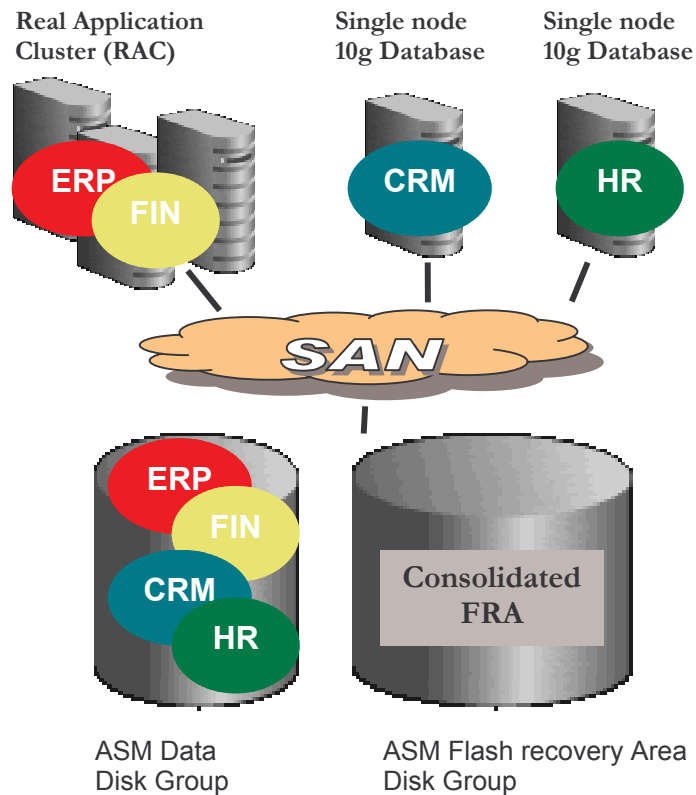
*Darryl Boone, MIS Director
Vanderbilt University*

Multiple single instance and RAC database servers can leverage ASM and Oracle Clusterware to economically consolidate multiple islands of databases into a single clustered pool of storage managed by ASM. This feature allows customers to optimize their storage utilization by eliminating wasted over-provisioned storage and save money by reducing their overall footprint of database storage.

ASM enables the DBA to manage a small number of disk groups instead of managing hundreds of independent data files and storage volumes or partitions. These disk groups can now be a shared resource to many databases on the same cluster server and managed as single shared resource pool for both Oracle Database 10g single instance and/or RAC environments.

ASM enables the next logical step in the consolidation evolution.

- Multiple single Oracle Database 10g instances leverage ASM and Oracle Clusterware to economically consolidate multiple islands of databases into a single clustered pool of storage
- Real Application Cluster databases leverage ASM to provide a consolidated database environment and share common disk groups



BENEFITS OF DATABASE STORAGE CONSOLIDATION

Higher Storage utilization

ASM empowers efficient utilization of shared storage resources to optimize storage utilization. Eliminating over-provisioned wasted capacity resulting in reduction of not only acquisition cost but also improved Total Cost of Ownership.

The conventional wisdom was to pre-allocate storage for different data types, such as data files for tablespaces, and allow headroom to grow. This was necessary since capacity changes such as increasing or decreasing the size of data files and the database in general was very tedious and error prone. This resulted in grossly under utilized storage and very costly for the data center.

ASM Disk Group consolidates storage elements and allows multiple databases from many RAC or single instance servers to be stored in one Disk Group that is shared among all. In addition, the ease by which storage can be added, removed or resized, a single sql command, makes it possible to provision storage exactly as you need it and meet your changing business requirements more predictably.

As illustrated in Figure 2 below, ASM allows you to achieve much higher storage utilization by evenly distributing data on all storage devices within an ASM Disk Group.

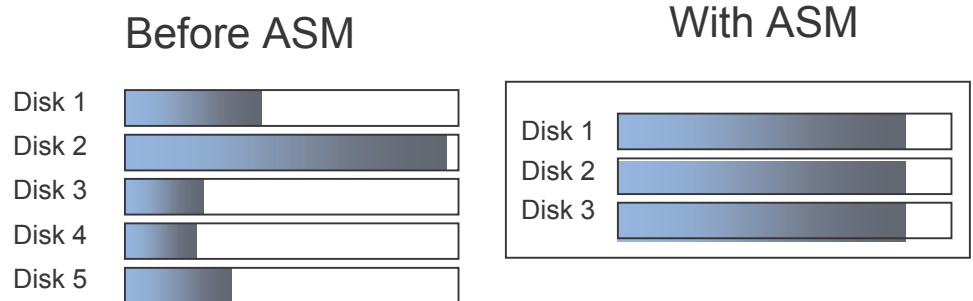


Figure 2. Uneven data distribution and wasted storage capacity

Even data distribution and high storage utilization

Fewer Storage elements to Manage

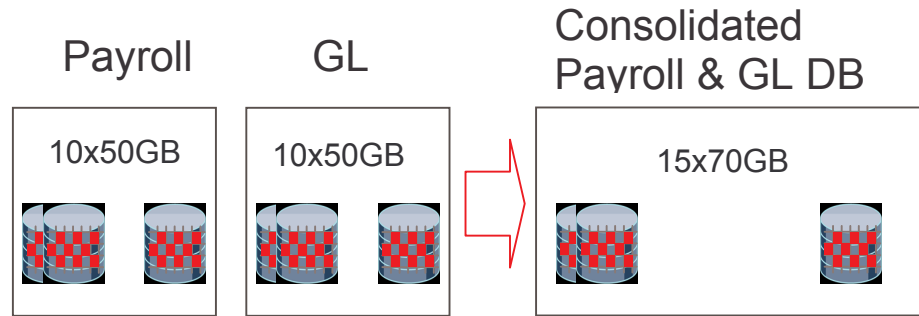
LUN management is growing more complex in today's SAN environments. The number of LUN and the size of each typically follows the number of volumes or partitions you need to create to create your database data structures. This requirement can easily be in hundreds or sometime thousands of LUNs which makes it impossible to manage effectively.

With ASM, you can consolidate multiple databases into a single ASM Disk Group and afford to create fewer but larger LUNs and be able to meet your capacity requirements without the management overhead and complexity. The benefits are: only one Disk Group and fewer larger LUNs to manage.

“With Oracle 10g Automatic Storage Management, DBAs won’t have to worry about optimizing disk IO. ASM will manage the hot spots, relocate data from one point to another, and give that optimal bandwidth that end user or the application needs.”

Arvind Gidwani, Senior Manager

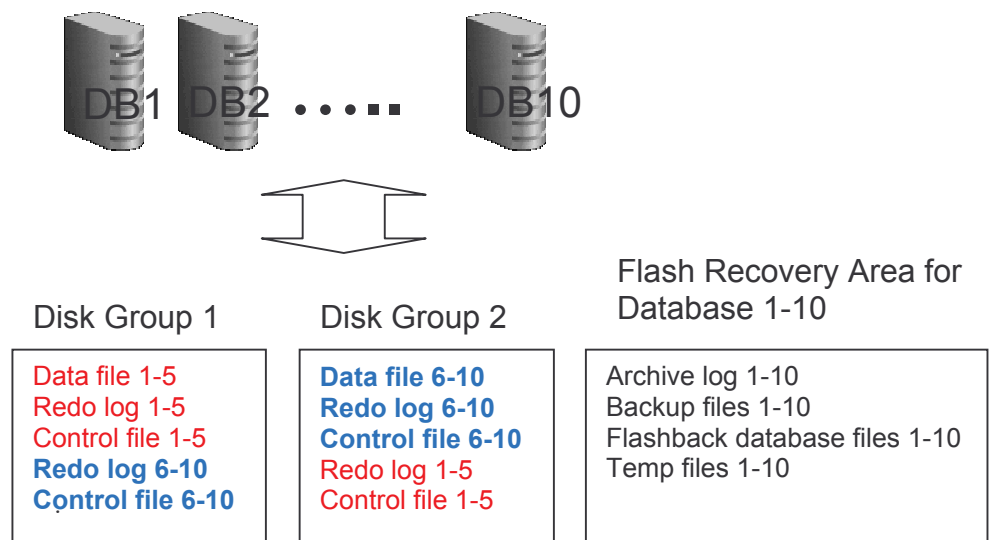
The other side benefit from database consolidation into ASM disk groups is that you end up with more disk drives in the disk group which translates into wider data distribution and higher IO bandwidth which means higher overall database performance.



Customer Example

An ASM customer decided to take advantage of the ASM database consolidation and simplify and streamline their database infrastructure and management. They have 10 single instance database servers with 10 databases (one on each). The customer decided to consolidate their databases into 3 disk groups. Disk group 1 stores the data files for databases 1-5 and control files, redo log files for database 6-10. Disk group 2 stores the data files for databases 6-10 and control files, redo log files for database 1-5. Disk group 3 consolidated the Flash Recover Area for all 10 databases.

The result was simplified management, higher storage utilization, fewer LUNs to manage and higher performance.



“On Average customers witnessed a 20% improvement in storage utilization.”

*Aggregate ROI Study
Mainstay Partners
December 2004*

CONCLUSION

Database storage consolidation provides various applications and systems to share the same storage pool, and taking advantage of centralized management, automation of best practices and standardized provisioning models:

- Improved resource utilization with better agility
- Improved manageability with automation
- More stable performance to meet SLA's

Oracle's Grid computing is the ideal platform for all types of consolidation. It fosters an environment where multiple single instance databases, as well as a few larger consolidated databases, can be deployed within the same infrastructure. Grid Computing has been the natural evolution of cluster technologies bringing elements such as modular and dynamic hardware and software components that can be provisioned on demand. Grid computing is about consolidation of components into pools of resources which can be centrally manage and automatically deployed into the Grid on demand.

ASM is the Oracle technology that enables pooling and simplification of management of the database storage requirements within the Storage Grid. RAC is the Oracle technology that enables this for the Database Grid.



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Author: Ara Shakian

Contributing :

Oracle Corporation

World Headquarters

500 Oracle Parkway

Redwood Shores, CA 94065

U.S.A.

Worldwide Inquiries:

Phone: +1.650.506.7000

Fax: +1.650.506.7200

www.oracle.com

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