

# STORAGE CONSOLIDATION FOR DATABASE ENVIRONMENTS

## A NetApp Value Proposition

3311 | Vasu Subbiah, Network Appliance Inc. | 1/2004

WHITE PAPER

Network Appliance technology and expertise solve a wide range of data storage challenges for organizations, adding business value and enabling them to create and sustain a competitive advantage.

### Abstract

The storage infrastructure used by Oracle® databases in most enterprises have grown increasingly complex as the amount of stored data and the number of individual database applications have grown. Most large enterprises have a combination of DAS, SAN, and NAS storage to meet the needs of various databases and applications. To reduce this complexity, enterprises are increasingly relying on NetApp storage solutions to help consolidate storage for their database environments. Many companies can streamline operations even further by consolidating Oracle databases and storage at the same time.

NetApp offers a full suite of hardware and software solutions and a unified storage architecture that allows a single storage platform to meet the storage needs of existing applications whether they require direct-attached, SAN, or NAS storage. At the same time, NetApp solutions offer unparalleled availability, performance, scalability, and ease-of-use for lower total cost of ownership and improved return on investment. A variety of accompanying software solutions are designed to meet the critical needs that most database users have for data protection, rapid data recovery, and disaster recovery.

Through a close partnership with Oracle and a joint Center of Excellence, NetApp and Oracle offer a full suite of services designed to help companies tackle their most difficult data management problems, including advanced capacity planning, high availability, and disaster recovery.

### Storage Consolidation—Introduction

Information is a dynamic force within the enterprise. Information drives transactions, facilitates customer interactions, and ultimately creates competitive advantage. The rapid acceleration in the amount of data being collected and generated at most companies requires a strategic approach to storage infrastructure. How information is stored, managed, protected, and distributed directly impacts a company's success in lowering costs and accelerating revenues.

Over a decade ago, Network Appliance revolutionized information storage by pioneering storage appliances: flexible, scalable systems focused on storing and serving information. NetApp delivers unified storage solutions—capable of supporting storage area networks (SANs) and network attached storage (NAS) with a single platform. This unique approach has established NetApp as a market-leading innovator in advanced storage systems and storage consolidation.

Managing storage has become a primary concern in Oracle database environments. Many enterprises have significant investments in multiple storage architectures—DAS, SAN, and/or NAS—to meet the storage needs of multiple corporate, departmental, and remote-office databases. The result is often an inefficient, expensive, and underutilized storage environment. A critical IT management challenge is to maximize the usage of existing storage to improve efficiency and return on investment (ROI). IT departments can substantially reduce total cost of ownership (TCO) and improve storage utilization for Oracle database storage by consolidating disparate storage onto NetApp storage appliances. NetApp and Oracle have a track record of working together to meet the storage needs of some of today's largest and fastest growing enterprises.

### Key Reasons for Companies to Consolidate Storage

In the past, enterprises paid very little attention to data growth, focusing instead on database applications and servers to run them. This led to the creation of islands of storage to serve each individual database application, often resulting in underutilization and/or overprovisioning of storage resources for each application. In today's enterprise, management demands not only better access to information but an increased ROI from deployed resources.

Enterprises are undertaking storage consolidation with NetApp storage solutions for the following reasons:

**Increased productivity.** The proven reliability and availability of NetApp storage appliances helps ensure user productivity. Administrators can perform management tasks simply and quickly, reducing the cost of storage management.

**Reduced management overhead.** NetApp management software automates common data management tasks, mitigating the risk of data loss. Database administrators can spend less time on low-level storage tasks and more time adding value for end-users.

**Improved storage utilization.** Serving multiple databases from a single NetApp storage pool increases utilization and decreases overprovisioning. Complexity is reduced, administration is simplified, and capacity can be expanded as necessary at the lowest incremental cost.

**Greater reliability.** NetApp storage solutions provide a complete data management, distribution, and retention strategy for Oracle data. This means your business operations benefit from rapid restores and frequent near-instantaneous, nondisruptive backups, which lower overhead without degrading performance.

**Superior data protection.** NetApp solutions simplify backup and reduce recovery time, ensuring that Oracle data is always protected and can be recovered rapidly should a disaster occur.

**Higher data availability.** NetApp storage appliances offer industry-leading availability from stand alone systems or clusters. Instantaneous backups, rapid restores, and ease of administration reduce downtime—planned and unplanned—ensuring that data is always available for access.

**Growth on demand, without disruption.** The NetApp appliance architecture is known for quick and easy expansion without interfering with business operations. You can add storage incrementally, when you need it, with no Oracle database or application downtime.

**Database portability.** Databases are growing across a variety of platforms. NetApp offers a unified storage platform that eliminates the headaches of heterogeneous storage systems while delivering high performance and better manageability.

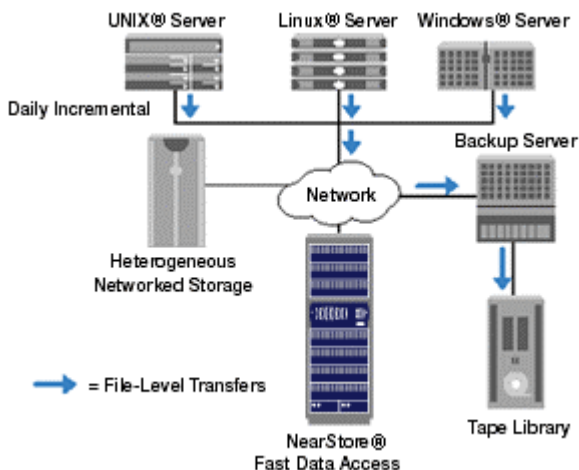
**Lower TCO.** The complexity of managing a heterogeneous—and possibly geographically dispersed—almost invariably leads to higher overall TCO. Consolidating storage on economical and easy-to-manage NetApp solutions can substantially lower the total ongoing cost of storage resources.

NetApp solutions can consolidate storage from several database servers using simple, powerful tools that help manage storage efficiently in a mixed networking environment, all while maintaining industry-leading 99.998% data availability.

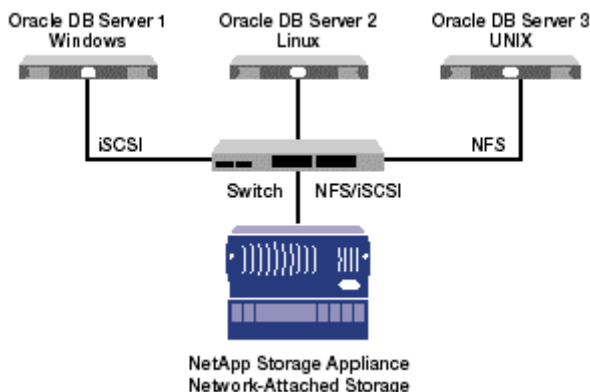
**Streamlining Operations by Consolidating Storage**

Storage consolidation is often viewed as the first step in streamlining enterprise database applications. A typical enterprise today has a variety of database applications, including ERP, customer support, CRM, SFA, etc. Storage for the databases that support these and other custom database applications can be consolidated by adopting any or all of the following methods:

**Back-end consolidation.** No changes are made to production storage systems. However, back-end functions such as backup and disaster recovery are offloaded to a NetApp solution, centralizing and streamlining these critical operations for improved data security and decreased operational costs.

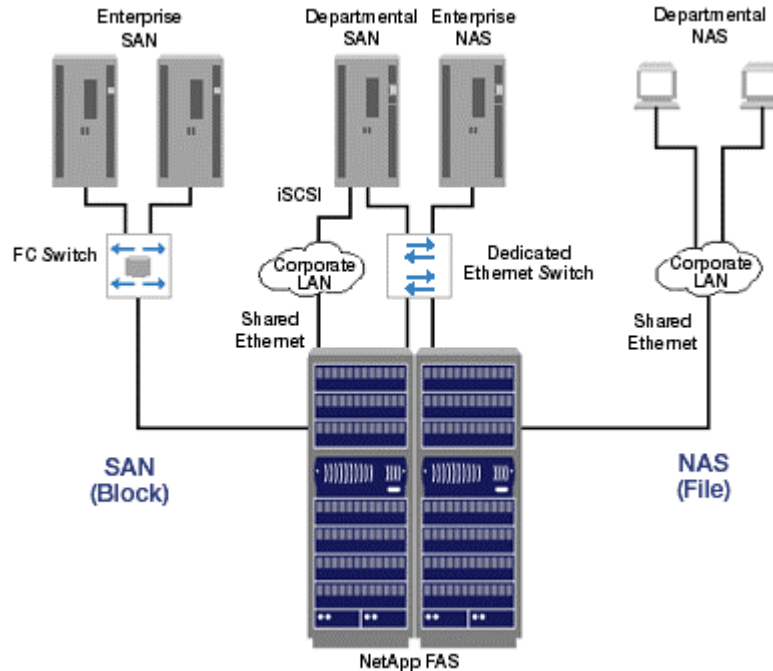


**One-to-one.** Storage for each individual application is consolidated into a single pool using NetApp storage. This simple approach is a first step toward more aggressive consolidation and provides the benefits of improved manageability, reliability, availability, and data protection for each application.



**Many-to-one.** Greater benefits can be achieved by consolidating the storage of multiple database applications on one centralized storage solution, dramatically simplifying management and data protection for an enterprise without sacrificing performance. Levels of data availability often improve

because of improved data management and the intrinsic reliability of NetApp storage. The NetApp unified storage architecture uniquely supports this configuration since a single system can simultaneously support the multiple protocols that may be required by different applications, including NFS, FCP, iSCSI, and DAFS.



### Database Consolidation

Undertaking database consolidation at the same time as storage consolidation can further simplify an enterprise's overall IT environment for greater efficiency and greater savings.

Today, many organizations have widely distributed IT resources. This network of systems is costly to maintain and often has low quality of service. Internet computing has made it possible to centralize IT resources while providing a high quality of service worldwide. By combining duplicate transactional systems, enterprises can reduce capital investments and ongoing expenses. Consolidating transactional systems enables organizations to:

- Standardize technology
- Improve quality of service
- Reduce complexity and improve manageability for IT staffs
- Better position IT assets for future change

Since the release of Oracle9i™, the Oracle database has been specifically designed for database consolidation. Consolidation can be achieved through:

**Physical instance consolidation.** Instead of having one database server per application, a single consolidated server supports multiple database instances to meet the needs of various applications. This significantly reduces administrative burden, reduces hardware expenses, and simplifies hardware and software upgrades. Instance consolidation can often be carried out with little or no change to configuration parameters.

**Application Rehosting.** Application rehosting takes physical instance consolidation one step further by collapsing multiple schemas into one shared database that can serve the needs of multiple applications. This further simplifies management, makes the most efficient use of hardware resources, improves data integrity, and simplifies backup and disaster recovery.

Combining database and storage consolidation can dramatically simplify the IT environment, enabling IT departments to reduce TCO and maximize ROI.

## NetApp Solutions

No matter what degree of storage and/or database consolidation you are undertaking, NetApp offers products and services that can address your requirements while delivering superior ROI. NetApp storage solutions can help you put in place disaster recovery plans and ensure business continuance while unifying and streamlining the storage infrastructure required for critical database systems.

Running the highly efficient Data ONTAP™ microkernel operating system, NetApp storage appliances are designed to consolidate critical database data from multiple platforms. A scalable suite of highly available, field-proven networked storage systems, NetApp systems are easy to install, configure, and manage, minimizing TCO while maximizing ROI.

Network Appliance provides the ideal storage platform to consolidate storage for enterprises with Oracle databases. The unified storage and multiple platform architecture of NetApp appliances ensures investment protection—a storage system can be easily scaled in capacity or reconfigured and repurposed as business needs evolve. NetApp appliances can be directly attached, accessed across enterprise network connections or storage area network connections, guaranteeing the utmost flexibility. A single appliance can store data from different server platforms, such as Windows, Solaris®, and Linux, flexibly allocating storage from a central pool to different database applications according to demand.

Network Appliance™ storage solutions offer the availability, manageability, performance, and scalability to get the job done while keeping costs under control. A recent study by INPUT suggests that the TCO of Network Appliance storage is up to 75% lower than EMC for database applications.<sup>1</sup>

NetApp offers the following hardware product families to meet a broad range of enterprise storage requirements:

**Enterprise servers and workgroup filers.** NetApp offers a full line of enterprise servers and workgroup filers to meet a broad range of primary storage needs for production databases. These servers offer the benefits of the NetApp unified storage architecture and proven availability. Clustered solutions are available for even greater levels of availability and virtually uninterrupted access to data.

**NearStore solutions.** Primary storage is best suited to workloads that require constant, high-volume access to data, such as intensive database activity. Offline storage is used where data access is infrequently or never accessed, such as backup or long-term storage. Nearline storage is the ideal solution for workloads that require quicker random access compared with offline storage, but do not require the continuous, high-volume activity provided by primary storage.

NearStore systems offer cost-effective, fast-access storage for online backup and archiving. NearStore perfectly complements and dramatically improves existing tape backup processes by inserting economical and simple-to-use disk-based storage between application storage and tape libraries in a two-stage backup configuration. NearStore is also the perfect storage location for any infrequently or lightly used data that must be kept online.

**NetCache.** NetCache® appliances improve content delivery by storing content closer to end users, eliminating network and server bottlenecks that slow down or even terminate delivery. NetCache can improve access to database applications for remote sites, important suppliers, and other offsite users.

<sup>1</sup>For more information or to download a copy of this study please visit [www.netapp.com/tco](http://www.netapp.com/tco).

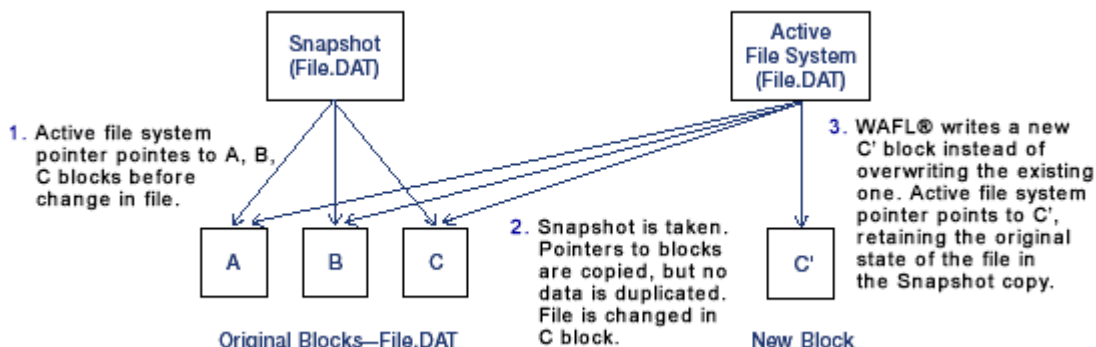
## Advanced Storage Software Capabilities to Ensure Data and Application Availability

Network Appliance and Oracle have had a long and successful partnership pairing Oracle database applications and Network Appliance storage. Oracle customers routinely select Network Appliance storage because of advanced storage management features that simplify storage operation, offload storage management functions from database servers, and improve data protection.

## Improving Database Backup

Every NetApp storage appliance has an innovative Snapshot™ capability that is closely integrated with the file system and RAID subsystems. A Snapshot copy is an online, read-only copy of the database. A Snapshot copy can be created in just a few seconds and uses no additional disk space until database changes are made. Only as blocks in the database are modified and written to new locations on disk does the Snapshot copy begin to

consume additional disk space. (As database blocks are modified, the original blocks are retained along with appropriate metadata structures.)

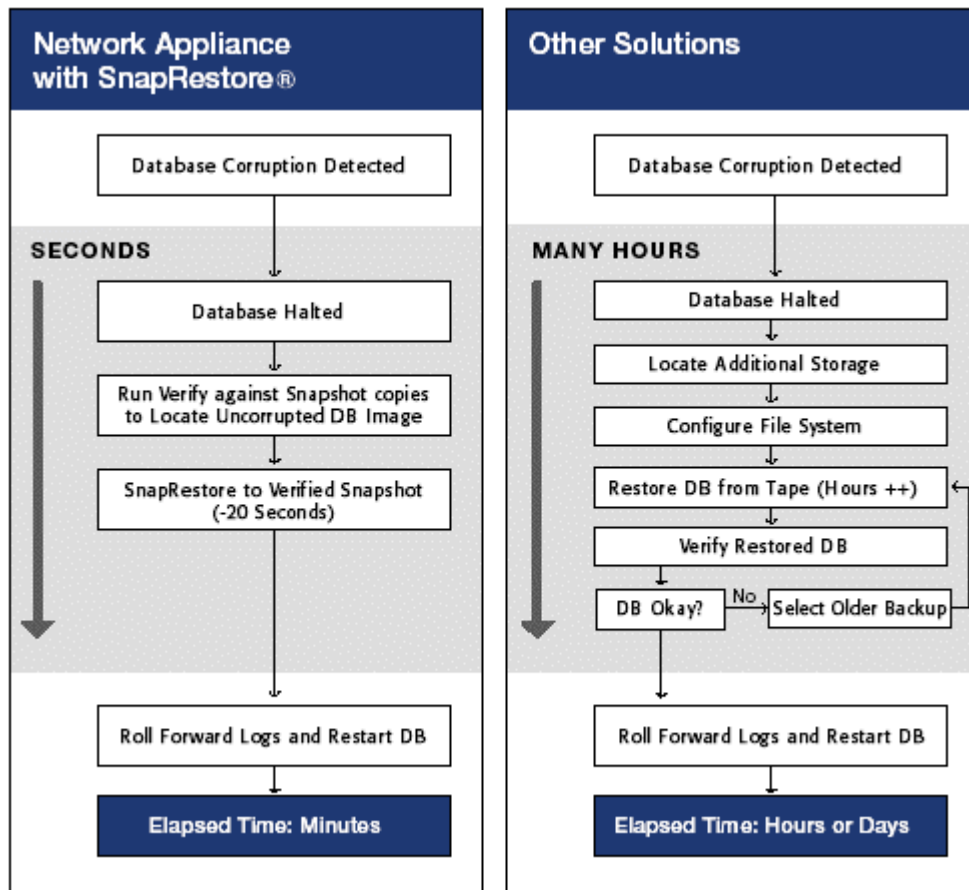


As disk blocks are written, the original disk blocks are retained by the Snapshot copy (along with appropriate metadata) instead of being freed. At any point in time the original state of the database file can be recovered from the Snapshot copy. Up to 255 Snapshot copy are available per volume. Incremental storage used by Snapshot copy is dramatically lower (typically 20%) than that for full duplication or the 100% overhead required on other systems.

Since a Snapshot copy is an automatically saved, consistent image of a database at a single point in time, it forms the basis for database backups. Once a Snapshot copy is taken, the storage appliance can back up the database to tape without disrupting ongoing database operations or placing any additional load on database servers. For even greater levels of data protection, data can be consolidated and protected using SnapVault™ together with a NetApp NearStore appliance, which provides an economical disk-based alternative to tape. SnapVault delivers increased backup performance (enabling more frequent backups) and extremely rapid data recovery. Reducing the backup window allows administrators to offer end users higher service levels without proportionate increases in storage costs.

**Rapid Database Recovery**

Although Oracle databases are highly reliable, no software is completely immune from software and hardware errors or user errors that can lead to data corruption. In such cases, the database must be recovered. Traditionally, database recovery is performed from backup tapes. Unfortunately, tape-based solutions often have prohibitively long recovery times that could make business communications inaccessible for an unacceptably long period of time.



SnapRestore is ideally suited to solve the database recovery problem and is another key benefit of Network Appliance storage. When SnapRestore is in use, the storage appliance is configured to create Snapshot copies of the database at regular intervals (usually every hour). If corruption occurs, the database administrator uses SnapRestore to revert the database to the most recent stable Snapshot copy. Database log files since the time of that Snapshot copy are replayed and the database is once again ready for normal operation. The entire process can be completed in minutes rather than the hours or days that may be required to do a full recovery from tape.

**Online Disaster Recovery Options**

Solutions such as Snapshot, SnapVault, and SnapRestore are ideal for ensuring data protection and data availability under normal circumstances and may also provide adequate levels of disaster recovery for some companies depending on their uptime goals:

Snapshot with tape backup can be used to create tapes for offsite vaulting, preserving critical business communications data in case of disaster.

SnapVault to a NearStore system at a remote location can provide greater levels of security since critical data is preserved online for rapid restoration.

For companies with more stringent disaster recovery requirements Network Appliance offers SnapMirror® and MetroCluster:

SnapMirror software provides automated data replication to a remote site. Using SnapMirror, a NetApp storage appliance can replicate crucial data volumes to a second remote storage system, synchronizing the target file system with Snapshot copies created automatically on the source system. SnapMirror is asynchronous; the replication target is periodically synchronized with a stable Snapshot copy from the

source. If a disaster strikes the primary site, operation of critical applications can be resumed at the secondary site with only minor delays to bring the database to full currency.

For immediate disaster recovery, MetroCluster can be used. MetroCluster provides synchronous replication across a cluster, guaranteeing that data at a secondary site is always current. Operations can be immediately restarted at the secondary site should a disaster occur. MetroCluster can span metropolitan area distances, ensuring that the secondary site can be isolated from the primary site.

## Oracle and NetApp Center of Excellence

### The Challenge of Complexity

Companies today expect a lot from their information technology. They expect it to be up and running quickly. They expect it to support a constant stream of new technologies and business practices. And increasingly, they expect a positive, predictable return on their investments in technology.

As IT departments know, delivering all this is not easy—largely because of the complexity of integrating and managing IT infrastructures that encompass several layers of hardware and software. You have to work with multiple contacts at multiple vendors and manage a variety of relationships. And while that complexity continues to grow, you have to constantly do more with less to keep pace with growing demands and increasingly limited resources. It all requires a depth and breadth of skills that encompass a range of technologies—skills that many companies can no longer afford to keep in-house.

### A Focused, Collaborative Approach

To help you meet these challenges, Network Appliance and Oracle have joined forces to create the Oracle and NetApp Center of Excellence—a unique single source for a range of service offerings designed to help companies decrease the time and complexity of deployment of enterprise solutions. The jointly staffed Center of Excellence draws on the knowledge and experience of both companies and combines leading technology and leading technical expertise to provide a comprehensive range of solutions that address everything from high availability and integration to capacity and performance tuning.

### A Complete Portfolio of Services

The center offers a comprehensive portfolio of packaged services known as “accelerators”, which are designed to help companies quickly and effectively develop, deploy, and manage Oracle and NetApp infrastructure. The center’s lineup of accelerators includes:

**High-availability services centered** on Oracle9i Real Application Clusters and NetApp filers. These services help ensure the highest availability for enterprise solutions.

**Storage assessment, consolidation, data-migration, and configuration services** that help companies make the transition to Oracle enterprise applications with NetApp solutions smoothly and seamlessly

**Disaster recovery services** designed to enable mission-critical operations with Oracle Dataguard software integrated with NetApp SnapMirror tools and NearStore nearline storage solutions.

**Capacity and performance-tuning services** that tune and optimize Oracle and NetApp enterprise solutions and match them to real-world workloads in order to ensure the highest level of performance.

**Technical architecture and implementation services** that help companies streamline deployment and simplify the ongoing management of systems.

**A focal point for ongoing improvement** that helps ensure that customers have continued access to leading-edge services and solutions.

### The Bottom Line—Store More, Spend Less

Network Appliance offers highly available, scalable, and cost-effective storage consolidation solutions that incorporate the NetApp unified storage platform and the feature-rich functionality of data and resource management software to deliver storage with simplified backup and reduced recovery time as well as the ability to add storage without downtime.

Network Appliance storage solutions are proven to be interoperable across all platforms and backed by our service expertise. Plus, by freeing up valuable infrastructure and staff resources, Network Appliance storage consolidation



solutions improve enterprise productivity, performance, and profitability. The combination of NetApp storage appliances and Oracle database solutions has been proven successful in thousands of companies. Storage consolidation with NetApp offers Oracle users improved availability, simplified management, and exceptional scalability and performance, all at a reduced TCO relative to competing solutions. Further benefits can be achieved by consolidating database platforms and storage at the same time to reduce the overall management burden.

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