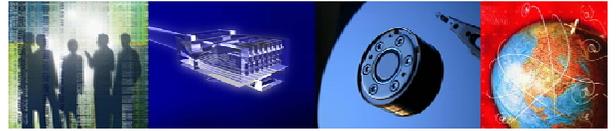




IT Knowledge • Business Results



White Paper

Double Up with Database Data Protection and Disaster Recovery with Oracle Data Guard

By Brian Babineau
Analyst
Enterprise Strategy Group
Information Protection

November, 2006

Table of Contents

Table of Contents	1
Executive Summary	1
Executive Summary	2
Introduction	2
Efficient and Effective Database Business Continuity	3
Integrating RPO and RTO Objectives into the Database Tier	4
Maximizing a Business Continuity Investment – Case Studies	5
BarnesandNoble.com	5
Burlington Coat Factory	6
D. Swarovski & Co.	7
Conclusion	8

All trademark names are property of their respective companies. Information contained in this publication has been obtained by sources The Enterprise Strategy Group (ESG) considers to be reliable but is not warranted by ESG. This publication may contain opinions of ESG, which are subject to change from time to time. This publication is copyrighted by The Enterprise Strategy Group, Inc. and is intended only for use by Subscribers or by persons who have purchased it directly from ESG. Any reproduction or redistribution of this publication, in whole or in part, whether in hard-copy format, electronically, or otherwise to persons not authorized to receive it, without the express consent of the Enterprise Strategy Group, Inc., is in violation of U.S. copyright law and will be subject to an action for civil damages and, if applicable, criminal prosecution. Should you have any questions, please contact ESG Client Relations at (508) 482-0188.

Executive Summary

Highly available IT architectures should incorporate disaster recovery solutions that ensure systems and information remains accessible in case unforeseen events impair data center operations. Some organizations associate the term 'disaster recovery' with proprietary storage solutions that mirror disk updates to remote storage subsystems. While 'remote-mirroring' affords a certain level of data protection, such configurations can be expensive and cause IT to overlook alternative disaster recovery solutions that can improve levels of data protection and availability.

One such solution is Data Guard, a feature of Oracle Database 10g for maintaining standby databases, which are automatically kept synchronized with the production database, enabling fast failover when a production outage occurs. This ensures that data remains online, even in the event of an unplanned outage. Data Guard also enables productive use of standby databases, effectively reducing the cost of disaster recovery solutions and making such an investment easy to justify.

This paper describes how customers can use Data Guard, details the inherent benefits and offers testimonials from customers who have reduced their risk of data loss and improved availability.

Introduction

It is impossible for anyone to question the importance of databases within today's corporate data centers. From large multinational conglomerates to family owned small businesses, organizations rely on databases to process, organize and store transactional data. While the size of these databases may vary, the relative importance of the data cannot be measured and organizations need to value their information appropriately and protect it accordingly. When databases are offline, or worse, when data is lost, irreparable damage - in the form of lost revenue, customer dissatisfaction and other undesired scenarios - may result.

Databases are subject to many of the same business disruption risks to which other IT systems are: natural disasters, planned outages, data corruption and human error, to name a few. Organizations have historically deployed tape backup solutions as a means to protect data from failures. However, this approach results in significant downtime due to the length of time it takes to restore a database from tape, not to mention the time it may take to acquire new systems and facilities if the original production system is lost in a disaster of some kind.

Storage replication (also referred to as remote-mirroring), where data is copied between storage systems that are geographically separate, overcomes some of tape backup's shortcomings. However, these solutions also have limitations. For example, it requires two identical storage systems as well as the necessary bandwidth and specialized network devices, such as protocol converters, to connect them. In fact, many organizations continue to use traditional tape backups because remote-mirroring is too expensive and restrictive.

For those who can afford it, remote-mirroring does provide a level of data protection. However, when it comes to implementing a solution that ensures the availability and protection of database information, organizations should consider the innovations made by the database vendors. Because of their intimate knowledge of the database, database vendors can offer significant added value that translates into both higher availability and better data protection. For example, Oracle has helped customers keep information online and accessible with Oracle Real Application Clusters (RAC), by avoiding downtime that would otherwise result from server failures. Likewise, many database administrators have begun to utilize Data Guard, a feature included with Oracle Database, to increase availability and provide an additional level of data protection should unforeseen events impact their production database.

Efficient and Effective Database Business Continuity

Data Guard enables Oracle customers to implement and maintain a standby database, which is a synchronized copy of the production database to protect data and increase information availability should any event cause a production database to fail. Data Guard has no geographical limitations, allowing the standby database to be located a few feet away (in the same data center) or thousands of miles away (at a remote data center). If the production database becomes unavailable, customers can use Data Guard to fail over to the standby database. Data Guard allows customers to create multiple standby databases for a single production database, thereby increasing data protection, and mitigating the risk of costly downtime and data loss.

Customers implement Data Guard by taking an online backup of their production database and restoring the backup on another server to create a standby database, ideally located at a remote location. Once the standby database is created, Data Guard Transport Services automatically synchronize the standby by efficiently transmitting transactional data blocks to the standby database. The creation of the standby database, from the backup through synchronization, does not disrupt availability of the primary database. The standby database can be located anywhere because Data Guard uses standard TCP/IP protocol to transmit data between the primary and standby databases, eliminating the need for specialized networking devices.

Data Guard Apply Services comprise the processes that apply the data received from the production site to the standby database. As is the case with every Data Guard process, Apply Services are Oracle-aware, using its knowledge of the Oracle database to perform additional data validation before any data is applied to the standby database. This important step, only possible with Data Guard, provides an additional level of protection to ensure that hardware- or network-induced data corruption is not propagated to the standby database. Remote-mirroring solutions, because of their lack of knowledge about the database data structure, copy all data, including any corruptions caused by the storage or network hardware.

Data Guard Apply Services also offer a choice as to how data is applied to the standby database. Customers may implement a physical standby database that has the identical physical structure of the primary database, making it an exact replica of production. A physical standby database can be open in 'read only' mode, enabling customers to query data while it continues to receive data from the production database, ensuring that data remains protected at all times. It can also be used to offload the overhead of performing backups from the production databases to the standby database, thus freeing up critical server resources from the production database.

Alternatively, customers can choose to implement a logical standby database, which, as its name implies, creates a logical copy of the production database. A logical standby database converts data received from the production database into SQL statements and applies these SQL statements to the standby database to maintain synchronization. This enables a logical standby database to be open in read/write mode at all times, making it useful for supporting queries and reporting against an up-to-date copy of production. It is a "logical standby" because while the data is identical to production, the physical structure of the database can be different. This allows customers the flexibility to add local data or create additional indexes to optimize query performance.

Oracle Enterprise Manager Grid Control (EM), Oracle's data center management tool, provides the web interface to manage one or more Data Guard configurations. EM includes wizards that automate the creation of Data Guard configurations. Administrators can easily execute Data Guard switchovers (planned events) or failovers (the result of sudden, unplanned failures) that quickly promote a standby database to production. One significant benefit of this management capability is the ease with which Data Guard users can easily test their disaster recovery systems.

Integrating RPO and RTO Objectives into the Database Tier

Data Guard provides customers with significant flexibility and added value when deploying a business continuity solution for their enterprise data. As with any business continuity solution, customers should also evaluate Recovery Point Objective (RPO) and Recovery Time Objective (RTO) requirements for all aspects of a database infrastructure that supports the information that they are protecting. The RPO measures the amount of data that an organization can afford to lose if a disaster or other unplanned outage occurs. For example, an RPO of “2 hours” means that in the event of a failure, you can recover everything up to 2 hours before the failure. You deem that losing 2 hours of data is an acceptable risk for the cost associated with protecting that data. RTO is the amount of time it takes to restore access to IT systems, applications and associated data. Highly available architectures should minimize data loss and reduce the time it takes to bring applications back online. Data Guard is one of a number of integrated high availability features of Oracle Database 10g - all of which are designed to help customers achieve specific RPO and RTO. Two additional Oracle features of particular note are Oracle Real Application Clusters (RAC) and Flashback Database.

Many Oracle customers choose to implement Real Application Clusters (RAC) to cluster database servers, providing high availability should a server fail, as well as adding the option to scale server resources as necessary. Similar to Data Guard, RAC is application transparent, and enables customers to increase availability and scalability by having multiple servers share access to a single Oracle database. Additional servers can be added as performance requirements dictate and administrators can shift the allocation of resources within a cluster from one application to another, as the needs of the business dictate, without any disruption to existing servers. If a server fails, RAC can rebalance the workload across the remaining servers, preventing downtime, as a server no longer presents a single point of failure. Also similar to Data Guard, RAC enables customers to reduce their hardware costs by utilizing industry standard servers without compromising availability or scalability. Data Guard provides significant value with or without RAC, but it complements an RAC configuration by maintaining a standby database at a remote location for data protection and high availability should any event impact the availability of the production RAC database.

Oracle Flashback Database can also be used in conjunction with Data Guard and RAC to enable customers to quickly ‘rewind’ databases to a previous point-in-time in the event of human error or another form of logical corruption. When Flashback Database is enabled, Oracle records all data changes in a flashback log. Users determine their “retention period” by deciding how much disk space to allocate to these logs. A key advantage of using Flashback Database with Data Guard is the ability for a production database, after a failover, to quickly “rejoin” the Data Guard configuration as a standby database and automatically resynchronize itself with the new production system. This eliminates the time consuming task of recreating the original production database from a new backup of production, and very quickly returning the configuration to a protected state. Flashback Database also provides the foundation for integrated Continuous Data Protection (CDP) capabilities within Oracle Database 10g.

Maximizing a Business Continuity Investment – Case Studies

BarnesandNoble.com

During 2004, BarnesandNoble.com embarked on a project to re-architect its E-Commerce Shopping Database. David Willen, Chief Technology Officer of BarnesandNoble.com, and his team were tasked with building an application infrastructure that reflected their corporate business philosophy - a focus on the customer. According to Willen, the core BarnesandNoble.com E-Commerce Shopping (Customer Account and Order) Database is 400GB and typically supports between 300 and 500 concurrent users. BarnesandNoble.com's E-Commerce application generates hundreds of millions of dollars in annual revenue and by itself, was enough to warrant an investment in a business continuity solution. The potential for lost revenue was a significant factor in the project, however, as Willen explains. "The intangible component of the lost confidence of the customer - if the customer is on the Internet and goes there and cannot check out - drives us to keep the site online. Therefore, the new system's architecture had to be an extension of the company's customer focused philosophy."

With a focus on the BarnesandNoble.com customer in mind, the IT department turned to Oracle RAC and Data Guard because, as Willen states, "The new system had to be highly available which meant we needed a hot standby database so that it could be brought online in a very short time."

BarnesandNoble.com wanted a highly available architecture for its databases in the event of any outage that could bring down their primary data center. The company uses two east coast data centers - one houses their production database and the other hosts the remote standby database.

Because BarnesandNoble.com must be available for customers to shop 24 hours a day, 7 days a week, the project team felt that Oracle RAC and Data Guard would best meet their RPOs and RTOs. During the planning phase of the project, they established a business continuity Recovery Point Objective of five minutes and a Recovery Time Objective of forty-five minutes. After implementing the new, highly available configuration, BarnesandNoble.com tested the system and realized that they hit their RPO objectives and the RTO from system failure was actually between ten and twenty minutes, a fifty percent improvement over the original target. "This benefit is primarily due to the Data Guard solution," said Willen.

While many customers still look to storage system-based replication solutions, Data Guard can help exceed specific data protection and data recovery objectives, such as was the case at Barnes & Noble. When it came to selecting between a storage-based solution and Data Guard, Willen found the choice to be fairly easy. "We utilize EMC Symmetrix and we've got bandwidth, so we've got the ability to use solutions such as SRDF, but for this critical database system, we went with Data Guard. Data consistency and data integrity were the main drivers."

Data Guard has helped BarnesandNoble.com maintain its critical E-Commerce application, fulfilling the objective of the 2004 project - keeping customers happy with a website that is online all the time.

BarnesandNoble.com

Reasons for selecting Oracle Data Guard

- ✓ Needed a disaster recovery solution for E-commerce application
- ✓ Required data consistency and data integrity for database disaster recovery solution

Benefits

- ✓ Five minute RPO, Forty-Five minute RTO for E-commerce database application
- ✓ Web application supporting 24x7 customer access via the internet

Customer Quote

"We utilize EMC Symmetrix and we've got bandwidth, so we've got the ability to use solutions such as SRDF, but for this critical database system, we went with Data Guard. Data consistency and data integrity were the main drivers."

Burlington Coat Factory

With over 400 stores in the United States, Burlington Coat Factory processes several million retail transactions per year. As the retailer has become a popular shopping destination for many Americans, Burlington Coat Factory's IT department has had to simplify its operations to control costs while increasing the availability of several mission critical applications. To reduce operating costs, Burlington Coat Factory has standardized on Oracle as their database management system platform. With Oracle databases supporting e-commerce, point-of-sale transactions, data warehousing and electronic data interchange applications, standardization was critical in controlling costs. Mike Balint, a Senior Database Administrator with Burlington Coat Factory, says about the decision to work closely with Oracle, "We believe in the company, we believe in their direction and we believe that they're trustworthy. They have come through for us in the past."

While controlling costs through standardization, Balint and his peers are also able to use Oracle Data Guard to increase application availability and data protection. When addressing increasing availability requirements, Burlington Coat focused on the ability to recover data quickly in the event of a corruption or site disaster impacting their production databases. By deploying a physical standby database at a second data center less than a mile from the primary location, Burlington Coat Factory has reduced the time it takes to recover from an unplanned outage. Balint and his administrators no longer have to go to tape to get a previous backup of data files and do a point-in-time recovery. "No matter what we did, recovery could take hours," stated Balint. "With a physical standby, the data is 100% current or as close as possible to current and we can recover immediately." Balint also notes that Data Guard has assisted in other database and storage system issues where recoveries impact application availability or business operations. "Data Guard helps us immensely in these crash recovery situations as outages are reduced to five minutes from four hours."

While Burlington Coat Factory relies heavily on its storage systems to support their Oracle databases, they elected not to go with remote-mirroring. One of the primary reasons was the ability to standardize on an availability solution included with their database. "Because of our familiarity with Oracle, Data Guard was a natural fit. We had enough Oracle expertise internally, we could utilize in-house DBA skills, and could train the appropriate people on one availability solution," explained Balint. "We did not have to buy a new grade of storage or a new component for our existing storage systems or train ourselves on a third party replication solution. Data Guard enables us to achieve a higher level of data protection and availability."

To date, Burlington Coat Factory has continued to standardize on other Oracle high availability features, including Data Guard, RAC, Flashback Database and RMAN (the backup and recovery solution for Oracle Databases). Because its revenue-generating applications (e-commerce) and internal applications (human resources) are vital to keeping Burlington Coat customers happy and employees productive, availability is top of mind in the IT department. It is very easy to see why Balint quickly

Burlington Coat Factory

Reasons for selecting Oracle Data Guard

- ✓ Sought to improve database recovery times due to system and storage media failures
- ✓ Minimize operating costs when working with a highly available database solution

Benefits

- ✓ No longer rely on tape to restore databases from crash recovery
- ✓ Database recovery times reduced to five minutes from four hours

Customer Quote

"Because of our familiarity with Oracle, Data Guard was a natural fit. We had enough Oracle expertise internally and could train the appropriate people on one availability solution. We did not have to buy a new grade of storage or a new component for our existing storage systems or train ourselves on a third party replication solution. Data Guard enables us to achieve a higher level of data protection and availability"

made the decision to go with Data Guard. “It is a risk management tool because it solves our primary issue: the ability to recover data in a short and predictable amount of time.”

D. Swarovski & Co.

As a leading supplier of cut crystal, Swarovski has extended its business operations across more than 120 countries. Based in Wattens, Austria, the company has been in business since 1895 and relies on SAP R/3 for many of its enterprise applications, including Enterprise Resource Management, Customer Relationship Management and Business Warehousing. Swarovski prides itself on producing quality cut crystal and its IT department extends that paradigm to its own processes. When undertaking their global SAP deployment, Swarovski’s Senior IT Management mandated that the system be designed to prevent any data loss and ensure that the applications could be brought online within an hour in the event of unplanned downtime. Harald Neuner, Swarovski’s IT Manager for the SAP installation, describes the mindset of the project that was instilled by senior management, “From the very beginning of the IT systems concept, we knew that we could not lose one transaction under any circumstance.”

The most critical application for Swarovski is its Enterprise Resource Management SAP module, which, at any time, needs to support one thousand four hundred users worldwide. To prevent data loss and reduce the time it took to bring this application online in the event of a disaster or data corruption, Neuner and his team turned to Oracle Data Guard. Swarovski created a physical standby database that is located in a second data center 400 meters from their primary facility. Data Guard synchronous transport services are utilized to protect against any chance of data loss. Maintaining integrity of information in the standby database was a primary reason that Swarovski opted for Data Guard over remote mirroring.

D. Swarovski & Co.

Reasons for selecting Oracle Data Guard

- ✓ Desired high available database architecture for SAP R/3 ERP application
- ✓ Configuration flexibility to minimize the risk of corrupted or lost data on standby database

Benefits

- ✓ Reduced recovery time of SAP R/3 ERP database application to less than 30 minutes from 12 hours
- ✓ Achieved goal of designing an infrastructure that will not lose any single transaction and applications can be up and running within one hour after a disruption

Customer Quote

“We are planning to use this technology for other critical databases in the future. We are familiar with how it works and we have documented our process, so it is natural for us to add Data Guard to other systems.”

In addition to having a standby database that can be brought up in minutes, Swarovski also uses the flexibility of Data Guard to reduce the risk of logical corruption or user error impacting their SAP applications. While Data Guard ships data immediately, Swarovski uses its delay feature in applying updates to their standby database. Swarovski’s planned delay of 4 hours gives Neuner’s team the time to undo accidentally deleted or corrupt transactions before they are applied to standby. “With the flexibility in Data Guard, we could architect this delay, and take our recovery time from 12 hours to less than 30 minutes without impacting application availability or increasing risk of data loss,” stated Neuner. This is possible because, while there is a 4-hour delay on apply, Data Guard still ships data to the standby database as quickly as it is generated. If Swarovski has to suddenly fail over to the standby, the delay is removed, and Data Guard performance is such that it takes just minutes to catch the standby database up to the last data received.

Swarovski plans to capitalize on Data Guard’s availability features across more of its SAP application portfolio. “We are planning to use this technology for other critical databases in the future,” says Neuner. “We are familiar with how it works and we have documented our process, so it is natural for us to add Data Guard to other systems.”

During its existence, Swarovski has not strayed from its commitment to quality and it does not appear that its IT operations will veer from its goal to prevent data loss. As it continues to expand its highly available architecture across SAP application modules, Swarovski's experience with Oracle Data Guard will be used to keep data available to its employees worldwide.

Conclusion

Business continuity solutions can be expensive and cumbersome to use, and provide little value to customers unless a catastrophic event causing system failure occurs. Many organizations still depend upon critical application recovery from tape as their sole business continuity solution, exposing their business to the risk of significant data loss and costly periods of downtime. Those organizations that depend on storage-based business continuity implementations often fail to consider all options available to protect their enterprise data. This oversight increases the risk that vital information assets can be lost if a data center or production database suddenly goes offline. Organizations that rely on databases to process transactions and organize information should consider all options to mitigate data loss and reduce any business disruption that can be caused by a planned or an unplanned outage.

Oracle Data Guard represents a cost-effective solution for protecting enterprise data, going beyond the limitations of tape-based backup and recovery and remote-mirroring solutions, with a native database capability that provides optimum data protection and availability. It is included as part of Oracle Database 10g and can be managed with Oracle Enterprise Manager Grid Control, a solution that many database administrators use regularly. Data Guard also enables customers to run queries, reports and backups using their standby database, increasing the return on investment in disaster recovery systems.

After speaking with Oracle customers, simple but definitive reasons that Oracle Database customers should consider Data Guard to increase the availability of their database management systems emerge. These are:

- *Efficient Network Utilization*
 - Data Guard is a database-aware disaster recovery solution that efficiently utilizes network resources by transmitting only the minimal changes necessary to keep standby database synchronized.
- *Comprehensive Data Protection*
 - Data Guard prevents data corruptions from propagating to standby databases.
- *Cost-Effective*
 - Data Guard is a storage agnostic solution, reducing hardware costs, and vendor lock-in.
- *Standby Utilization*
 - Data Guard's flexible configuration options enable customers to utilize their standby database and servers for backup, reporting, and other purposes.
- *Integrated Management*
 - Standby configurations, monitoring and maintenance, including failover and switchover, are easily managed by Oracle Enterprise Manager Grid Control.

The risk of an unplanned outage caused by a natural disaster, disruption to power, system failure or human error can cripple employee productivity if database-specific business continuity measures are not in place. With Data Guard, customers now have an option besides storage-based mirroring to ensure that database information will be protected regardless of what disrupts access to their production databases. To the extent that your organization views information as a business asset, Oracle Data Guard is a next-generation data protection solution that can mitigate the risk of data loss and downtime.