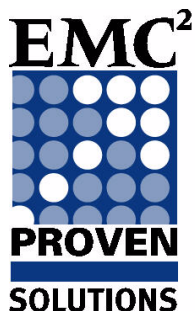


EMC Solutions for Enterprises
EMC Symmetrix DMX-4
EMC Disaster Recovery for Oracle E-Business Suite
Enabled by EMC Replication Manager and SRDF

Reference Architecture



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Published March 2009

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Part number: H6050

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About this Solution

Purpose

The purpose of this solution is to provide customers with a comprehensive solution for disaster recovery and provide the ability to optimize hardware for the testing and development process for Oracle Applications. This document provides best practices for remotely replicating the entire Oracle E-Business Suite Release 12 stack using EMC[®] replication technology. The EMC technology includes EMC Replication Manager, TimeFinder[®] replication, and EMC SRDF[®]. EMC SRDF is used to validate disaster recovery scenarios. Replication Manager and TimeFinder are used to replicate clones of the Oracle E-Business Suite Release 12 environment for rapid deployment and testing purposes.

These DR and replication best practices, explained here and detailed in the follow-on integration guide, will reduce the cost and mitigate risk in the client's enterprise Oracle environments while meeting improved customer service level requirements. EMC has developed fully validated, and documented, proven solution architectures for Oracle applications and databases.

The business challenge

Today's IT departments are being challenged by the business to solve several pain points in keeping business critical environments available 24x7. Protecting mission-critical applications has become a requirement for all enterprise-level businesses. Customers also require a DR solution that is flexible enough to address a broad range of RPOs ranging from zero data loss to one hour to one day. The ability to replicate across a variety of distances is also critical to protecting these environments.

This solution illustrates how businesses can:

- Ensure disaster recovery is rapid, reliable, manageable, and guarantees a consistent replica of business-critical data in the event of any possible failure or disaster.
- Minimize production downtime by ensuring production applications are kept online.
- Guarantee zero data loss and rapid restart.
- Automate cloning process by keeping manual operations (copying data, software, config files, etc.) to a minimum.
- Eliminate the impact on network performance of application cloning.
- Clone an Oracle Release 12 E-Business environment while maintaining SLAs.
- Create identical environments that can be used for test and development purposes, both locally and remotely.
- Efficiently use both infrastructure and people to support the business.
- Reduce business risk - restore data quickly and accurately with built-in hardware redundancy and RAID protection.

Due to the typically mission-critical nature and high performance and availability requirements of Oracle applications and database technologies, it is essential that robust, reliable, and tested disaster recovery processes are in place. To meet these IT business challenges, enterprise customers need proven solution architectures that encompass the best of what Oracle, EMC, and other third-party software can offer.

The technology solution

The solution addresses the business need for high-speed data replication and disaster recovery using EMC Replication Manager, TimeFinder replication, and SRDF with Oracle Release 12 E-Business Suite cloning procedures. The environment consists of a multi-tier Oracle Release 12 E-Business Suite with a back-end two-node Oracle 10g RAC cluster.

The solution includes information on:

- Enterprise disaster recovery - provide a robust, scalable, and proven disaster recovery solution while integrating application consistency at multiple levels both within and outside the Oracle R12 Applications infrastructure.
- Improving IT efficiency and responsiveness - allow key Oracle resources to focus on critical tasks and projects while dramatically improving their SLA times for business request response using EMC Replication Manager with EMC TimeFinder.
- Creation of a high performing storage design for an Oracle Release 12 E-Business Suite application infrastructure running on a Symmetrix[®] DMX-4.
- Use of the disaster recovery location for development and test environments.
- High-speed replication - minimize impact to production while maintaining consistency throughout with the use of Replication Manager and TimeFinder.
 - Three times faster R12 cloning than the standard Oracle recommended R12 cloning solutions.
- Approved Oracle/EMC cloning methodology - using the best product cloning features from both EMC and Oracle.
- Patching and upgrading - delivering new versions of applications components, and providing a mechanism for creating rolling environments to minimize downtime. EMC TimeFinder/Clone technologies can be leveraged to allow "instant rollback," minimizing contingency rollback times for maintenance windows and change control processes, and supporting faster response to security patch issues while minimizing risk.

Environment profile

This document provides a specification for the customer environment (storage configurations, design, software, and hardware, etc.) that constitutes a two-tier Oracle Release 12 E-Business Suite deployed on the DMX-4 utilizing EMC Replication Manager and SRDF to safeguard and replicate data, both locally and remotely.

Hardware resources

Table 1 lists the hardware resources used in the EMC Disaster Recovery for Oracle E-Business Suite environment.

Table 1 Hardware resources

Equipment	Quantity	Configuration
Storage	2	EMC Symmetrix DMX-4 2500: <ul style="list-style-type: none"> • 128 GB MEM • 16 DAEs • 146 GB 15k • 300 GB 15k
SAN	2	SAN switch, 64 port
Oracle database servers		Four Dual-Core Intel Xeon 3.4 GHz CPUs
Production	2	16 GB RAM
DR	2	Two 146 GB 10k internal RAID disks Two dual-port NICs Two 4 Gb HBAs
Oracle infrastructure database servers		Four Dual-Core Intel Xeon 3.4 GHz CPUs
Infrastructure	1	32 GB RAM
DR infrastructure	1	Two 146 GB 10k internal RAID disks Two dual-port NICs Two 4 Gb HBAs
Oracle application servers		Quad-Core 2.66 GHz / 1333 MHz FSB
Production	1	16 GB RAM
DR	1	One 4 Gb HBA
Replication Manager server	1	Quad-Core 2.66 GHz / 1333 MHz FSB 8 GB RAM One 4 Gb HBA

Software resources

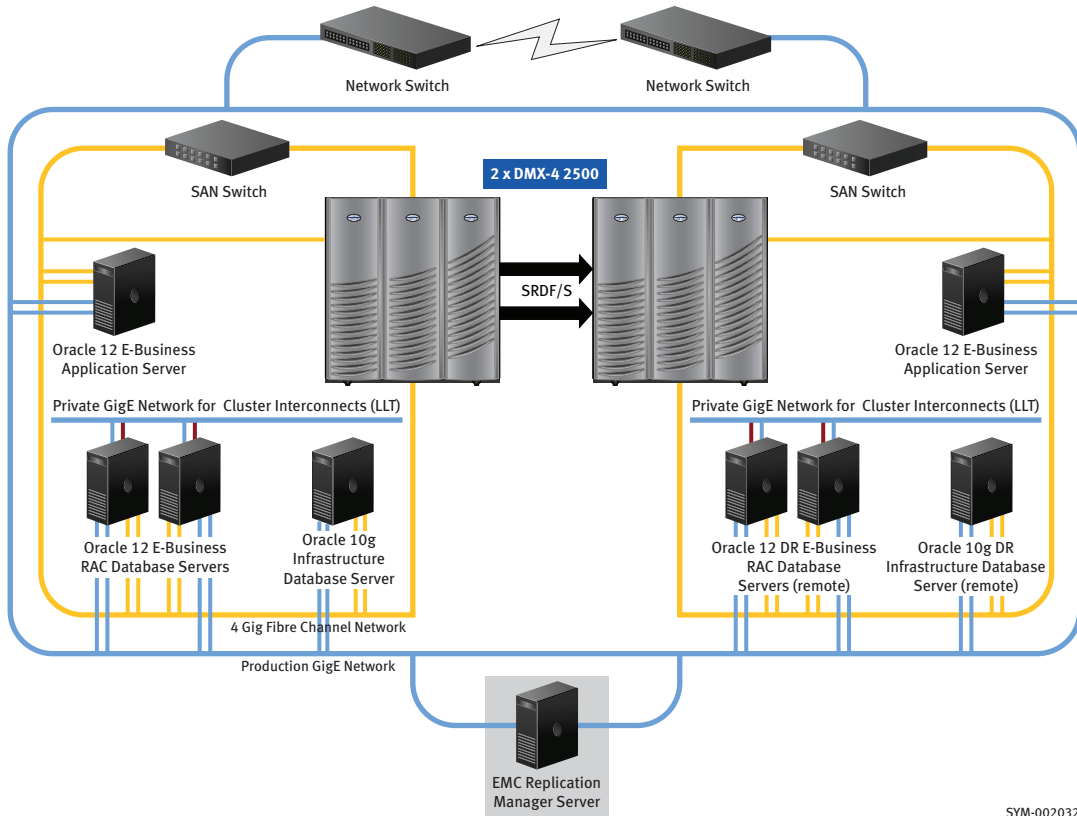
Table 2 lists the software resources used in the solution.

Table 2 Software resources

Title	Version	Comment
Red Hat	4.5 (64-bit)	OS for database server
Microsoft Windows	2003 SP2	32-bit
Oracle Database/Cluster/ASM	10.2.0.3	Database server software
Oracle E-Business Suite	12.0.4	Oracle suite of integrated business applications
Enginuity™	5773.130	Symmetrix storage array OS microcode
EMC Replication Manager	5.1 SP1	Automate SAN disk-based replication procedures
EMC PowerPath®	5.1	HBA load balancing and redundancy
EMC ControlCenter®	6.1	<ul style="list-style-type: none"> • SAN Manager™ • DMX masking • Infrastructure alert management • Symmetrix Management Console (SMC) • Performance Manager (WLA)
Solutions Enabler	6.4.2	Symmetrix Command Line Interface host-based utility

Physical architecture

Figure 1 illustrates the overall physical architecture of the solution.



SYM-002032

Figure 1 Physical architecture

Solution details

The EMC Disaster Recovery for Oracle E-Business Suite solution was developed to show how EMC can add value for Oracle E-Business Suite disaster recovery using the following solutions components:

EMC Symmetrix DMX™ — The Symmetrix DMX-4 system extends EMC's leadership in the high-end enterprise and storage market. The DMX-4 delivers immediate support for the latest generation of disk drive technologies, Flash drives for superior performance, 4 Gb/s Fibre Channel for high performance, and SATA II for high capacity.

The DMX-4 is based on Enginuity 5773, which provides investment protection that delivers performance gains along with information-centric security advancements via integration with RSA enVision®. With the DMX-4 and Enginuity all replication and security activities are easy to manage with the Symmetrix Management Console (SMC).

EMC Replication Manager — EMC Replication Manager manages EMC point-in-time replication technologies through a centralized management console. Replication Manager coordinates the entire data replication process—from discovery and configuration to the management of multiple application consistent disk-based replicas. Auto-discover the replication environment and enable streamlined management by scheduling, recording, and cataloging replica information including auto-expiration.

With Replication Manager, the right data can be put in the right place at the right time—on-demand or based on schedules and policies that the customer defines. This application-centric product allows simplification of replica management with application consistency.

Replication Manager also supports replication of federated databases.

Note: Federated refers to an integrated repository of data from multiple, possibly heterogeneous, data sources that are spread across more than one production host.

EMC TimeFinder — The TimeFinder family of local replication allows users to non-disruptively create and manage point-in-time copies of data. This allows operational processes, such as backup, reporting, and application testing, to be performed independently of the source application to maximize service levels, without impacting performance or availability.

TimeFinder/Clone was used in this solution. It creates highly functional, high-performance, pointer-based, full-volume copies of Symmetrix DMX

volumes that can be used as point-in-time copies for data warehouse refreshes, backups, online restores, and even volume migrations.

EMC SRDF — Symmetrix Remote Data Facility. For this solution two separate Oracle databases were running on the source DMX-4 which were dependent on each other. By utilizing EMC SRDF Consistency Group (CG) a consistent restartable copy of both databases was ensured at the remote DMX-4 site. Oracle provides tools and procedural steps to avoid inconsistencies when splitting storage-based replicas; however, these procedures can be simplified and streamlined with the use of EMC consistency technology. All devices pertinent to both databases were placed in a specially configured EMC SRDF/CG consistency group.

The EMC SRDF Consistency Group (CG) protocol suspends remote mirroring for all devices defined in the consistency group in the event that any device I/O cannot communicate with its respective mirror. In this way, consistency groups ensure the integrity and consistency of the data at the remote site.

Note: For this solution SRDF/S was used but the consistency group feature is also available within SRDF/A.

SRDF significantly enhances disaster recovery operations by using fast and reliable replication technology to offload the Oracle backup operations to a remote site and later return the restored data to the local site. Further information and example commands are available in the *EMC Solutions Enabler Symmetrix SRDF Family CLI Product Guide*.

EMC ControlCenter — EMC ControlCenter (ECC) is designed to be the centralized control center for an entire distributed storage environment. It is a powerful, flexible, unified framework and suite of tools that provides end-to-end management of storage networks, storage devices, and other storage resources.

- Performance Manager (the historical reporting and performance analysis tool for ControlCenter) is used to monitor and analyze the performance of the storage array. Data is collected from the Symmetrix Collection Daemon (storstd) at a set time interval. Individual components within the DMX such as FA, disk, and cache utilization can then be tabulated and graphed. Tools are available within ECC to achieve this.

EMC PowerPath — PowerPath works with the storage system to intelligently manage I/O paths, and support multiple paths to a logical device. In this solution PowerPath manages four I/O paths and provides:

- Automatic failover in the event of a hardware failure. PowerPath automatically detects path failure and redirects I/O to another path.
- Dynamic multipath load balancing. PowerPath distributes I/O requests to a logical device across all available paths, thus improving I/O performance and reducing management time and downtime by eliminating the need to configure paths statically across logical devices.

Oracle E-Business Suite Release 12 — An Oracle E-Business Suite Release 12 system utilizes components from many Oracle products. Oracle E-Business Suite is a complete set of business applications for managing and automating processes across an enterprise. Oracle E-Business Suite applications are either forms-based or HTML-based.

Oracle Database 10g RAC — Oracle Real Application Clusters (RAC) is an optional feature of Oracle Database 10g Enterprise Edition. Oracle RAC supports the transparent deployment of a single database across a cluster of servers, providing fault tolerance from hardware failures or planned outages. Oracle RAC supports mainstream business applications of all kinds.

Oracle Automatic Storage Management (ASM) — Oracle ASM is an integrated database filesystem and disk manager. With ASM, filesystem and volume management capabilities are built into the Oracle database kernel. This reduces the complexity of managing the storage for the database.

Validated solution benefits / key results

Some of the solution benefits and key results found during the testing were:

1. Lower deployment risk:
 - Creation of documented and validated procedures for Oracle RAC-to-RAC database remote replication techniques for an Oracle E-Business Suite applications and database infrastructure.
 - Creation of documented and validated best practices and guidelines for EMC customers on how to perform disaster recovery operations.
2. Increase operational efficiency:
 - Automation of Oracle E-Business Suite cloning using EMC Replication Manager/EMC TimeFinder replication.
 - Improve performance of cloning process – provide ability to clone the entire E-Business Suite environment quickly and efficiently.
3. Guaranteed application-level consistency:
 - Consistency groups are an essential part of disaster recovery so customers can ensure that all data is replicated between locations. This data includes database files as well as files stored outside of the database. This is extremely important in an Oracle E-Business Suite Release 12 environment where application and configuration files are stored on the file systems outside of the database. In order to guarantee consistency those files should be replicated also.
 - By utilizing EMC SRDF technology multiple databases can also be replicated remotely. Database consistency across one or more instances can be achieved using SRDF Consistency Groups (CG). This allows for fully restartable database copies on the remote site.
4. Maximize asset utilization, leverage disaster recovery infrastructure:
 - The EMC Disaster Recovery for Oracle E-Business Suite solution provides a complete end-to-end solution for many databases, the software tier, and data, by combining Oracle and EMC technologies.
 - Acceleration of development testing - use of development and test environments at the disaster recovery site.

Conclusion

The EMC disaster recovery solution provides customers with a recommended best practice architecture for Oracle E-Business Suite implementations. The solution utilizes EMC's replication technology suite to provide a comprehensive solution that enables customers to protect their entire application infrastructure. This reference architecture depicts a validated design using an EMC Symmetrix DMX-4 storage system for Oracle E-Business Suite Release 12 disaster recovery.

SRDF can guarantee consistency for Oracle E-Business Suite Release 12 databases and all other E-Business infrastructure components. Consistency groups can guarantee a complete recovery scenario, not only for the database but also for the application files and reports stored outside of the database. SRDF gives customers the ability to provide a zero data loss solution and can give rapid disaster restart capabilities at the remote DR site, while providing consistency across applications.

EMC Replication Manager/TimeFinder integration with Oracle E-Business Suite Release 12 cloning utilities provides the ability to accelerate testing and development lifecycles. This was achieved by creating identical test/development environments while ensuring there was no impact to production, and applications remained online.

A disaster recovery infrastructure can also be used effectively for test and development cycles. Leveraging the remote SRDF copy of the database to replicate for test and development can accelerate time to deployment and drastically lower cost. With this Oracle E-Business Suite solution, customers are provided with a robust disaster recovery solution as well as the ability to deploy applications to gain maximum efficiencies.

Since 1995, EMC and Oracle have invested to jointly engineer and integrate their technologies. The combination of Oracle and EMC software and best practices used in an integrated fashion can greatly reduce the cost of designing, implementing, and operating your IT infrastructure.

To learn more about this and other solutions contact an EMC representative or visit:

<http://www.emc.com/solutions/application-environment/oracle/index.htm>.