

Planning for the Unplanned

Oracle E-Business Suite Disaster Recovery Solution with VMware®
Site Recovery Manager and EMC CLARiiON storage



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Introduction

This document outlines how, in a multi-tier Oracle E-Business environment that resides on EMC CLARiiON storage, VMware® Site Recovery Manager can help you:

- Accelerate recovery for the virtual environment through automation.
- Ensure reliable recovery by enabling non-disruptive testing.
- Simplify recovery by eliminating complex manual recovery steps and centralizing management of recovery plans.

Today's datacenter is a product of change. Technological progress and business growth have added to the complexity of IT infrastructure with new operating system (OS), storage, database, and network technologies. As complexity has increased, datacenter uptime has also grown increasingly important for corporations. Even in the event of a site failure or system failure caused by hardware malfunction, corporations must continue to safeguard critical business data such as customer information, and rapidly restore system functionality to ensure continuing services. Interruptions or outages affecting important services pose serious threats to the entire business, in some cases resulting not just in lost income, but causing serious damage to the confidence of customers and associated companies.

At the same time, data is one of the most critical assets for any company. Corporate data such as payroll or employee information, client records, research results, financial records, or historical information can require significant cost and effort to reconstruct or regenerate once lost, if reconstruction is even possible. In some cases such data loss may even impair a company's ability to continue operating. In short, even brief outages can have significant consequences in today's always-on enterprise.

To further complicate matters, more and more mission critical business applications are now logically combined into distributed, multi-tier (also called n-tier) client/server platforms. An example of an n-tier application is Oracle E-Business suite. Companies that have deployed Oracle E-Business suite depend heavily on the information, processes and availability of the environment, even in the case of a disaster. However, the complexity and distributed nature of applications make traditional disaster recovery solutions expensive and complex to implement and maintain. Smaller businesses, with limited budgets and staff, are typically turned off by the costs, stringent requirements and complexities and hence are left with few options for protecting their applications and their business.

VMware virtualization technology helps overcome these challenges related to high availability. This paper introduces a short, simple approach to disaster recovery that uses VMware Site Recovery Manager and EMC CLARiiON storage technology to provide an effective availability solution for the mission critical E-Business suite environment.

The scope of the architecture documented here includes:

1. Fresh installation of Oracle E-Business Suite 12 along with Oracle 10g Database on Oracle Enterprise Linux 4.5 and EMC CLARiiON CX4 storage.
2. Storage array replication of LUNs (via MirrorView/Synchronous (MirrorView/S)) between two separate CLARiiON storage systems simulating a primary and secondary site.
3. Setup of Protection group and recovery plan consisting of E-Business Suite environment using VMware Site Recovery Manager.
4. Performance of non-disruptive test execution of recovery plan.
5. Execution of a disaster recovery plan using Site Recovery Manager. This test included recovering EBusiness Suite environment at a secondary site while the primary site was subjected to load created by the General Ledger report generation.

Components

The key components deployed in this solution are summarized below.

VMware Site Recovery Manager

VMware Site Recovery Manager is a pioneering disaster recovery management and automation solution for VMware® Infrastructure. Site Recovery Manager accelerates recovery by automating the recovery process and simplifying the management of disaster recovery plans. It makes disaster recovery an integrated element of managing your VMware virtual infrastructure. The solution ensures reliable recovery by eliminating complex manual recovery steps and enabling non-disruptive testing of recovery plans. Site Recovery Manager integrates tightly with VMware Infrastructure, VMware® VirtualCenter and storage replication software from leading storage vendors to make failover and recovery rapid, reliable, affordable and manageable. It enables organizations to take the risk and worry out of disaster recovery, as well as expand protection to all of their important systems and applications.

Figure 1 illustrates the technical architecture of Site Recovery Manager with storage array replication across two sites.

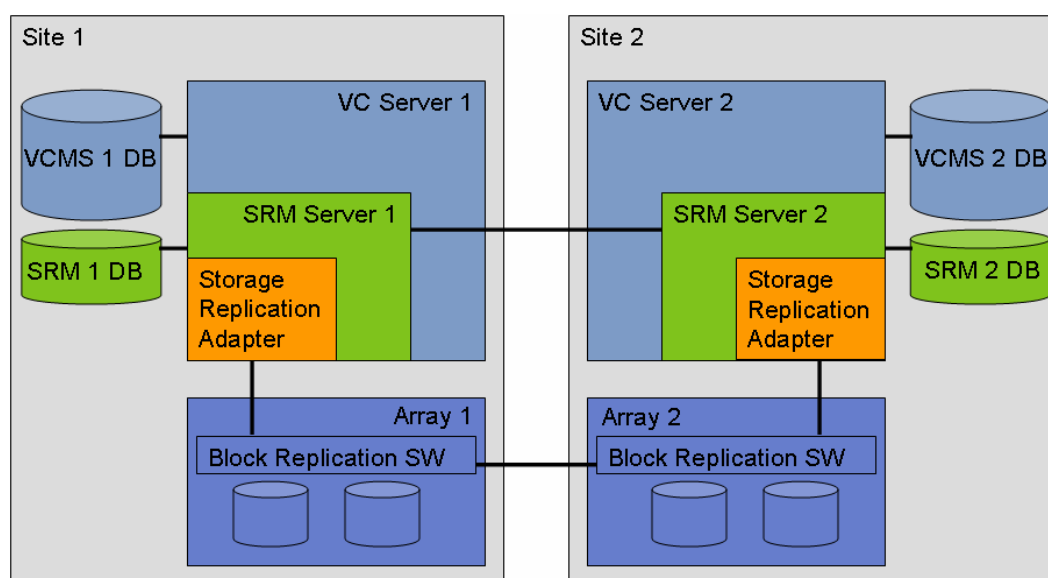


Figure 1: Site Recovery Manager Architecture

Site Recovery Manager is designed as a plug-in to VirtualCenter so that disaster recovery tasks can be executed from the same centralized interface that is used to manage other virtual machine administrative tasks such as creation, migration, deletion, and so forth. However, Site Recovery Manager is not a built-in component of VirtualCenter. It is a separate server process with its own separate database. The server processes for Site Recovery Manager and VirtualCenter can co-exist on the same server or reside on different servers. Similarly, both Site Recovery Manager and VirtualCenter data repositories can be created in a single database or separate databases.

Site Recovery Manager does not actually perform the replication for disaster recovery but facilitates the setup, test, and recovery workflows. Site Recovery Manager relies on block-based replication (fiber or iSCSI) from VMware storage partners for replication. In this case, EMC CLARiiON

MirrorView/Synchronous was used. The communication between the Site Recovery Manager and storage replication software is managed by storage replication adapters that are developed, qualified, and supported by the storage vendor. They exist on the Site Recovery Manager server and once installed are invisible for the duration of their use. Additional details about Site Recovery Manager setup and configuration are covered in Appendix A.

EMC CLARiiON Storage and Data Replication

EMC disaster recovery solutions include a variety of products that provide flexibility to address a broad range of recovery point objectives to meet the needs of all customers. These solutions allow customers to replicate data efficiently over long distances, providing protection from both site and regional disasters. The products and features used in this solution along with VMware Site Recovery Manager are:

EMC CLARiiON Storage CX-4 Series

Enterprises use EMC CLARiiON systems as their mid-range storage for its price-performance benefits while maintaining enterprise-class scalability, reliability, and availability for their mission-critical applications. The CLARiiON CX4 series storage platform, launched in Q3 2008, is EMC's state-of-the-art midrange family of storage systems. The CX4 features a 64-bit enhanced FLARE driver for increased scaling and operational capability and a new UltraFlex™ I/O module design that allows additional connection ports to be added to expand connection paths from servers to the CLARiiON. The flexibility in this design incorporates the ability to upgrade to new higher-bandwidth connection technologies, such as 10 Gigabit Ethernet or 8 Gb FC, as they become available. As shown in Figure 2, the CLARiiON CX-4 offers combined iSCSI and Fibre channel connectivity (available in all storage models within the CX4 family). This empowers storage administrators to optimize predictable performance based on application service levels.

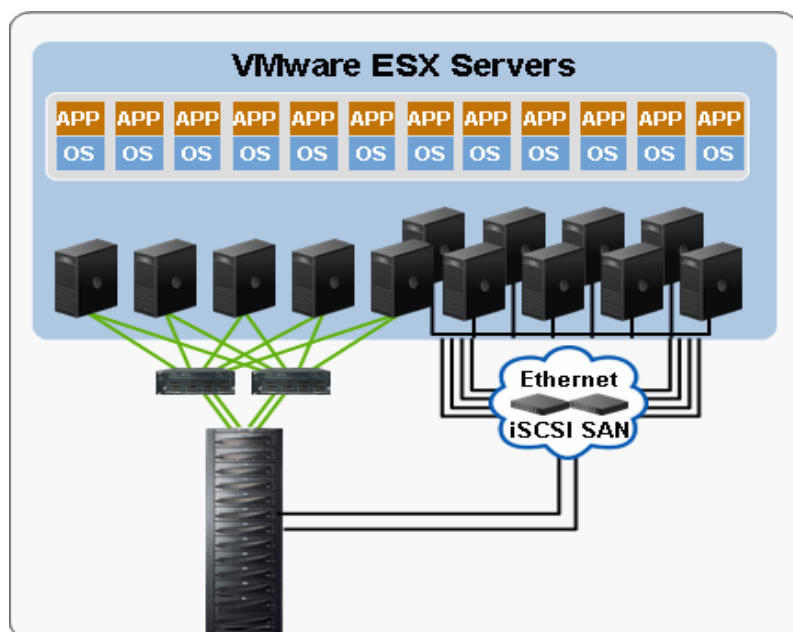


Figure 2: EMC CLARiiON CX-4 storage and VMware

Unmatched scalability is delivered with this platform with up to 960 drives and 4,096 LUNs with the CX4-960 model for accommodating a multitude of drive types ranging from extremely high performance drives to extremely dense drives. The result is not only good scaling in total capacity, but

also storage tiering to allow for the most cost-effective manner of storing and managing Oracle database solutions. For additional information on the CLARiiON CX4 UltraScale series, refer to the EMC website.

For the VMware Site Recovery Manager and Oracle E-Business Suite use case discussed in this paper, two CX4-480 storage arrays with MirrorView/S are used. Note that the methodologies discussed here are valid for all models in the CLARiiON family that support MirrorView/Synchronous, including the CX, CX3, and the latest CLARiiON CX4 series storage

EMC MirrorView

EMC MirrorView is storage system-based disaster recovery software that provides end-to-end data protection by replicating the contents of a primary volume to a secondary volume residing on a different CLARiiON storage system. It provides end-to-end protection because, in addition to performing replication, it protects the secondary volume from tampering or corruption by making the volume only available for server access when initiated through MirrorView. MirrorView offers consistency groups, a unique consistency technology that replicates write-order dependent volumes. Using this technology, MirrorView maintains write ordering across the secondary volumes in the event of an interruption to one, some or all of the write-dependent secondary volumes. For the solution considered here, we used MirrorView/Synchronous mode.

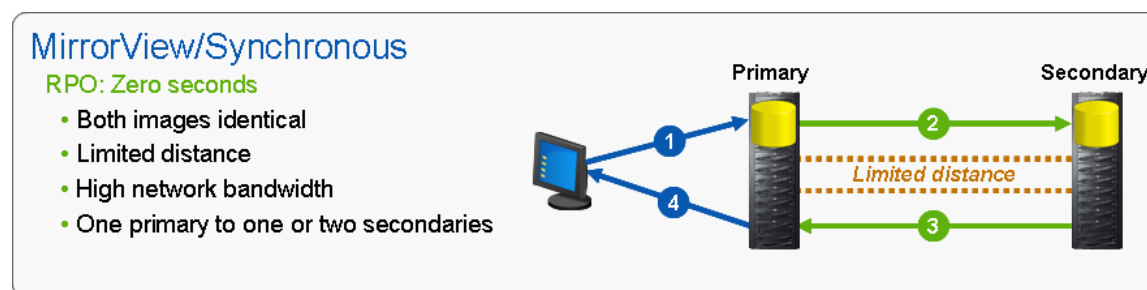


Figure 3: EMC MirrorView/Synchronous software

As shown in Figure 3, all I/O from the local host is first written to the local storage processor memory and is then sent over the mirroring links to the remote CLARiiON unit. Once the remote CLARiiON unit reports that the data has reached its storage processor memory successfully, the I/O is acknowledged to the local host. Synchronous mode guarantees that the remote image is a complete duplication of the source image.

Oracle E-Business Suite

Oracle Applications architecture is a framework for multi-tiered distributed computing. In the Oracle Applications model, services are distributed among multiple levels or tiers. A service is a process or a group of processes that exercise some business logic and provide a particular functionality. A tier is a grouping of services that can potentially span across physical machines. In other words, a tier is a logical grouping of services that is not limited by physical nodes or machines. Thus, each tier can consist of one or more nodes and each node can accommodate more than one tier. For example, a single machine can contain database, application and desktop tiers. Similarly, a database can reside on one of many application servers or on a separate machine by itself.

The next section describes Oracle Applications architecture and its major components.

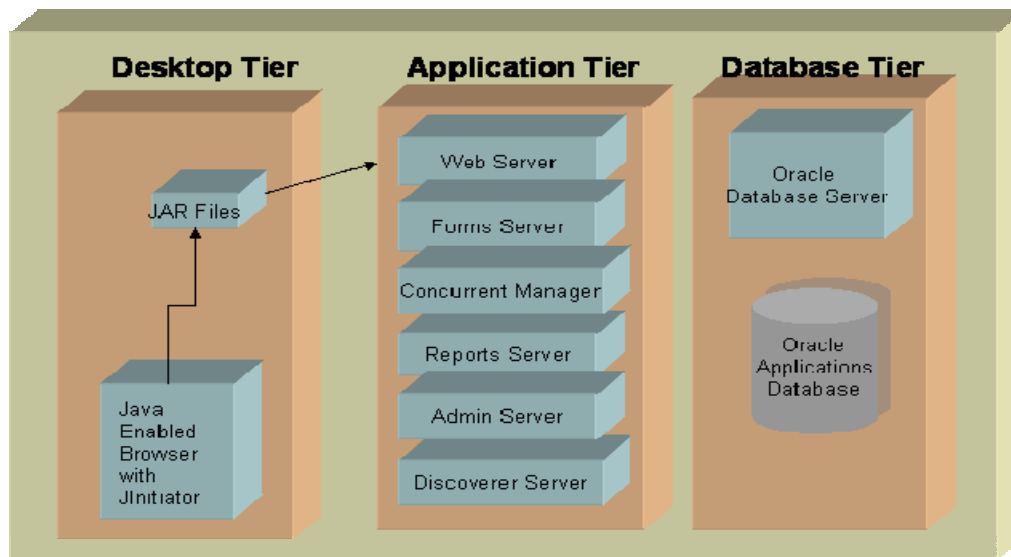


Figure 4: Oracle E-Business Suite

The Desktop Tier

The Desktop Tier primarily refers to the client web browser. The interface is provided through HTML for self-service applications and a Java applet for forms. The desktop client is installed on demand upon first use and is stored locally for future use. The forms client applet is packaged as JAR files and mainly represents the presentation layer of Oracle forms. The JAR files are also downloaded on the desktop during first use. The forms client must run within a Java Virtual Machine (JVM) and is supplied by Oracle JInitiator.

The Application Tier

The Application tier hosts one or more servers that process the business logic and provides communication between the Desktop tier and database. The Application tier is also commonly known as the middle tier and has the following major components: Web Server, Forms Server, Concurrent Processing Server, Business Intelligence System, Reports Server, Admin Server and Discover Server. These components usually run as services on the Applications tier and may run on one or more nodes.

The Database Tier

The Database tier contains the RDBMS Oracle home, along with the Applications database that stores all the data maintained by Oracle Applications. It also contains Oracle Application processing code stored inside Application database to optimize performance. In essence, the Database tier stores the Oracle database files, Applications database and executables. The database does not directly communicate with desktop clients but rather works with the Application tier services, which mediates the communication between the desktop tier and database tier.

The Oracle Applications File System

Oracle Applications product files, technology stack files, environment files and common files are held in the file system on the application layer. Typically, the commonly used JAR files are stored on the Desktop tier and the database server holds only database file.

Solution Design and Setup

Architecture Diagram

Figure 5 highlights the infrastructure setup for this solution.

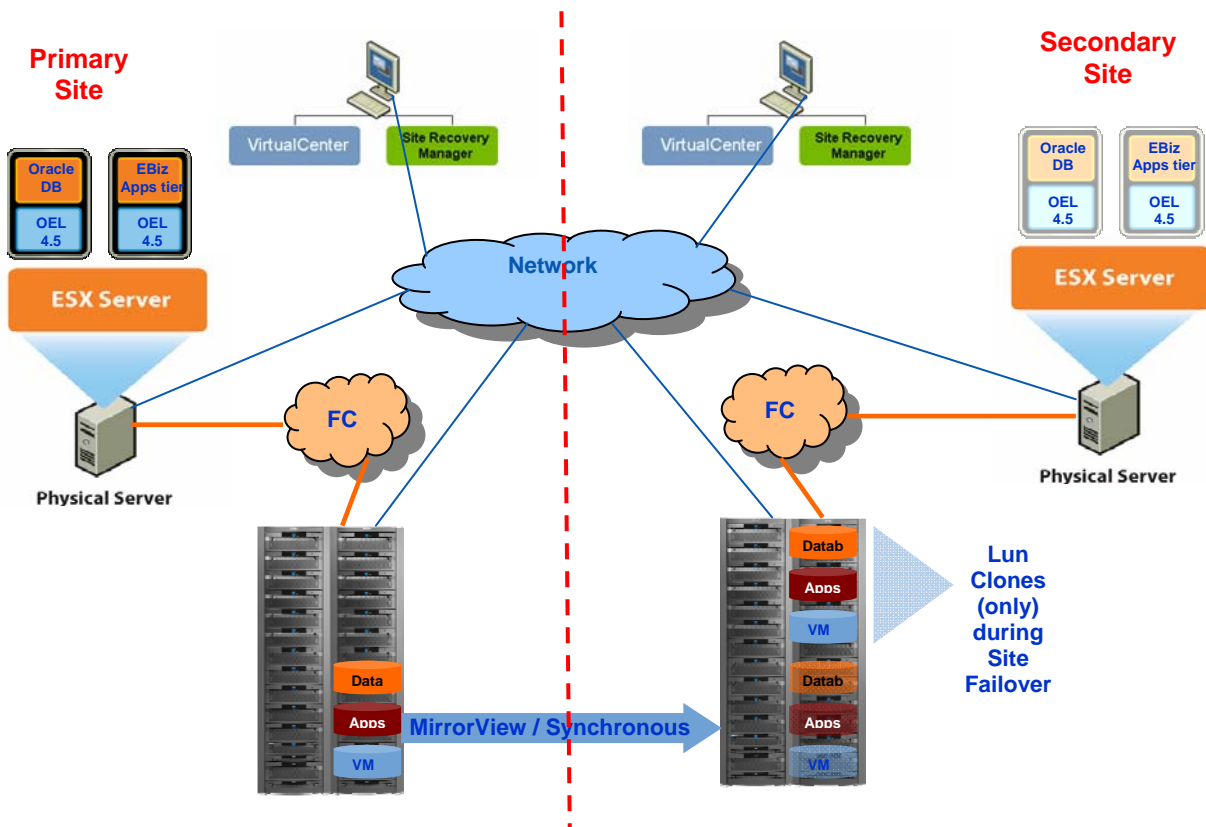


Figure 5: Site Recovery Manager setup with EMC CLARiiON CX-4 Storage

Hardware and software used

The following table lists the software and hardware used in the architecture.

VMware	
VMware Infrastructure 3	VirtualCenter Server 2.5 VMware® ESX 3.5
Site Recovery Manager	Site Recovery Manager 1.0
EMC	
Storage System	CLARiiON CX4-480
Features and Software	Mirrorview Synchronous
Storage Configuration	3 LUNs LUN 1: 256 GB, Vision database LUN 2: 200 GB, Apps Stack (or middle tier) LUN 3: 120 GB, OS LUN for 2 VMs (contains 2 virtual disks)

Oracle E-Business 12	
Oracle E-Business Suite 12	<p><u>Virtual Machine 1</u> Database Virtual machine (VM) name = "db-ebiz" 2 x vCPU 4 GB RAM Oracle Database 10g R2 Database SID = "VIS" Storage - 2 x volume (2 x LUNs): OS on 1 x VMFS LUN data on 1 x VMFS LUN</p> <p><u>Virtual Machine 2</u> Apps Tier virtual Machine (VM) name = "mt-ebiz" 2 x vCPU 4 GB RAM Storage - 2 x volume (2 x LUNs): OS on 1 x VMFS LUN Apps data on 1 x VMFS LUN</p>
DELL	
Blade Servers running ESX	DELL PowerEdge 2950 4 core (2.8 Ghz) 16 Gb RAM 4 Gbit QLogic HBA Card

Key points about the setup:

- The ESX host server at the primary site has two virtual machines. A database virtual machine hosts Oracle Vision database supplied with the Rapid install of Oracle EBusiness suite. The second virtual machine is configured as the middle tier (also known as the Apps Tier).
- Site Recovery Manager requires two VirtualCenter servers. One resides at the primary site and the second manages the standby site. For this solution, we used one ESX host machine to run the primary and secondary site VirtualCenter servers configured in virtual machines. However, it is a best practice to separate primary and secondary site VirtualCenter host servers for disaster recovery practices.
- EMC CLARiiON CX-4 Fiber Channel Storage Arrays are used for primary and secondary site storage. For data replication, EMC MirrorView Synchronous is configured to replicate all three LUNs from primary to secondary storage.
- The EMC Storage Replication Adapter(SRA) is installed on the primary and secondary VirtualCenter servers. The EMC SRA:
 - Automatically discovers the replicated LUNs on the primary side.
 - Facilitates a Site Recovery Manager test recovery workflow on the secondary site during failover. The clone of replicated LUNs (based on Snapshots) including the virtual machine clone is registered into the secondary site VirtualCenter server and gets started.
- The primary site containing all E-Business Suite virtual machines is logically combined into one Site Recovery Manager protection group called "EBusiness Protection Group." This protection group is created on the primary VirtualCenter server.
- At the recovery site VirtualCenter, a recovery plan called "EBusiness Recovery Plan" is created. This recovery plan protects the "EBusiness Protection group" that is created at the primary site.

Hardware Configuration

Configuration of the hardware for this exercise was carried out in the following order:

- Configure EMC storage arrays at the primary and secondary sites (each array per each site).
- Create three LUNs on the primary site storage and expose to primary site ESX host server. Create VMFS datastores on those LUNs as shown below:
 - LUN1: "db-ebiz" datastore for Vision database files.
 - LUN2: "mt-ebiz" datastore for Application Tier stack for Oracle E-Business suite.
 - LUN3: "VM_OS" datastore for 2 OS virtual disks (1 for each virtual machine)
- After creating and configuring the virtual machines with Operating systems and patches, install Oracle Business suite 12 with Vision database.
- Install VirtualCenter Server 2.5 on two Windows virtual machines. These will serve as primary and secondary site VirtualCenter Server instances.

Note: We used static IP addresses for this exercise. Use of DNS names is the best practice and highly recommended.
- Configure storage replication between primary and secondary site storage arrays by:
 - Configuring MirrorView to replicate three LUNs. (Database, Apps Tier, OS)
 - Creating a Consistency group containing these three LUNs. This unique feature ensures appropriate I/O ordering at the remote site in case of failover.
- Install Site Recovery Manager on the primary and secondary VirtualCenter Server instances.
- Configure Site Recovery Manager (covered in subsequent sections)
 - Configure primary/secondary connectivity, array managers and inventory preferences.
 - Create protection group on primary Site Recovery Manager instance.
 - Create recovery plan on secondary Site Recovery Manager instance.
 - Edit recovery plan and update virtual machine start order.

Software Install

Site Recovery Manager installation and configuration is simple, as shown below.

Primary site and Secondary site:

- Install Site Recovery Manager server into a separate database instance on the same guest OS running VirtualCenter Server.
- Install Site Recovery Manager Plug-in into VirtualCenter.
- Install EMC Storage Replication Adapter (SRA).

For more information about Site Recovery Manager install, please refer to Site Recovery Manager product manuals.

Site Recovery Manager Configuration

After installation, a Site Recovery Manager icon becomes visible on the VirtualCenter interface and is accessed via the VMware® Infrastructure (VI) Client. The screenshot of the primary VirtualCenter Server defines the configuration steps required after the initial installation.

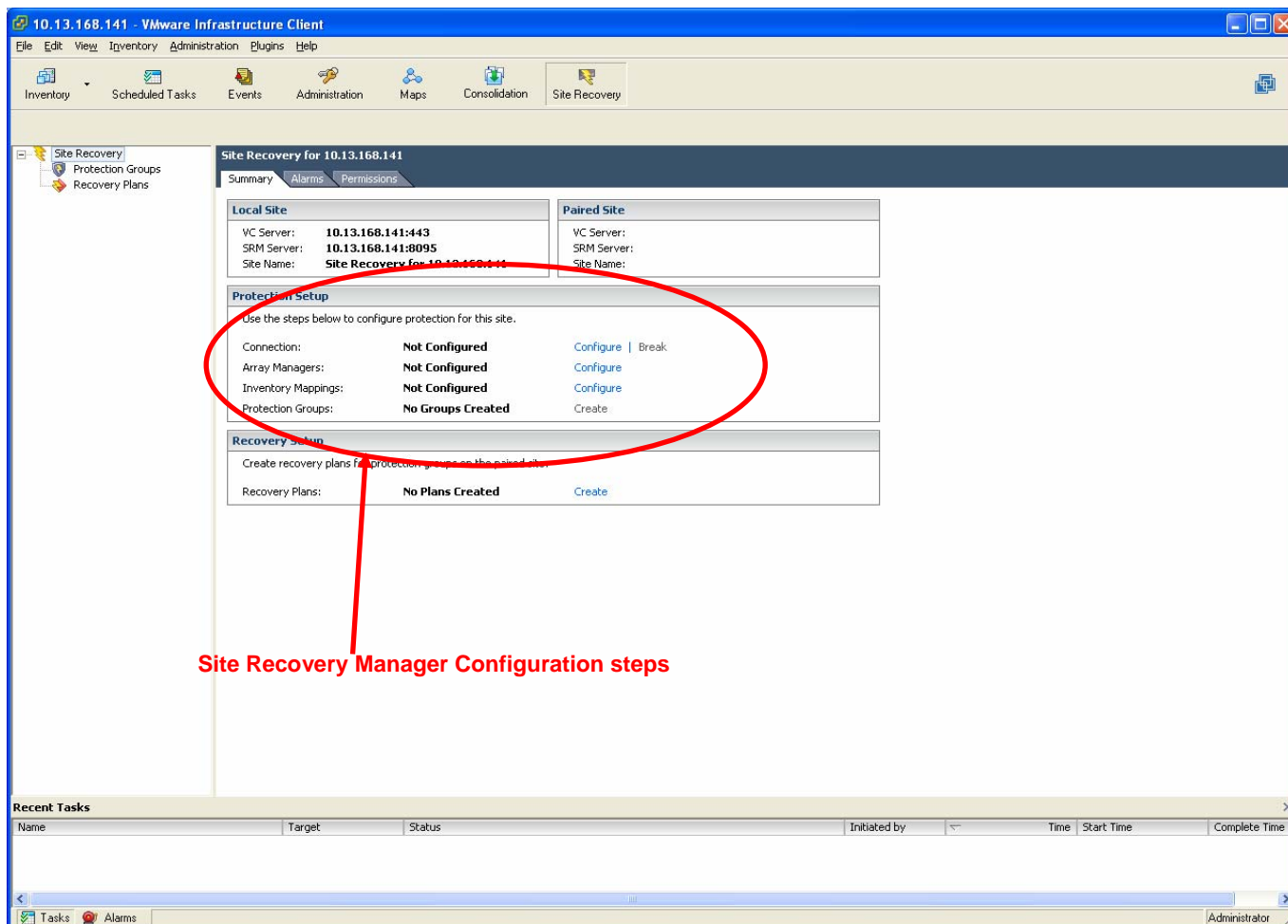


Figure 6: Primary Site Recovery Manager Server Screenshot immediately after Installation

As shown in Figure 6, execute the following configuration steps to establish connectivity between primary and secondary site:

Primary Site Recovery Manager Server:

- Configure connection between primary and secondary Site Recovery Manager Servers.
- Configure the array manager.
- Configure inventory preferences.
- Create protection group "EBusiness Protection Group" for the virtual machines at the primary site.

Secondary Site Recovery Manager Server:

- Create recovery plan "EBusiness Recovery Plan" consisting of "EBusiness Protection Group."
- Prioritize virtual machines start order to start database virtual machine ahead of the middle tier virtual machine.

Note: screenshots of these steps are included in Appendix A.

Planning and Testing

Disaster recovery testing is an interdisciplinary concept used to create and validate a practiced logistical plan for how an organization will recover and restore partially or completely interrupted critical function(s) within a predetermined time after a disaster or extended disruption. This logistical plan is commonly referred to as the Business Continuity Plan. An effective Business Continuity plan provides a smart balance of business needs vs. cost considering all the risk factors. It is beyond the scope of this document to detail all the aspects of building a master Business Continuity plan. However, it is possible to discuss the importance of frequent testing of the disaster recovery plan. The old saying goes that any disaster recovery plan is only as good as your last (successful) test. Indeed, most disaster recovery efforts fail as a result of one of two factors: the team either spends an inordinate amount of effort doing continual testing (not good), or -- worse -- neglects to test often, the result being an insurance policy that doesn't pay off when you really need it.

Disaster recovery testing is often difficult because it's usually very disruptive, expensive in terms of resources and extremely complex. By leveraging virtualization, VMware Site Recovery Manager addresses this problem while making planning and testing radically simpler to execute. Site Recovery Manager has the ability to create a 'virtual remote recovery image' - storage, virtual machines, even network connections -- and test this image as a walled-off virtual entity - perhaps even co-resident with production apps that might be running at the remote site. This ability to logically encapsulate and test a complete recovery scenario in a set of virtual machines is a huge simplification of the task and saves significant time and resources. Site Recovery Manager also eliminates the human error element to make disaster recovery testing easier, better, and possible far more frequently compared to physical environments. Along with a user-friendly user interface for managing disaster recovery tasks such as creating protection groups and recovery plans, Site Recovery Manager also accommodates frequent testing of the recovery plans in a non-disruptive manner. The recovery plan test for our solution is described below.

Recovery Plan Test Using Site Recovery Manager

The following sequence is executed to validate the recovery plan test:

- On the primary site, ensure that both virtual machines (database and middle tier) are running and you can log into the EBusiness Suite.
- Start Site Recovery Manager disaster recovery test on secondary site for recovery plan "EBusiness Recovery Plan." The recovery steps below show that the EBusiness recovery plan used in this test executes successfully in just few minutes.
- Once the Recovery Plan test completes, press "Continue" below to ensure proper cleanup.

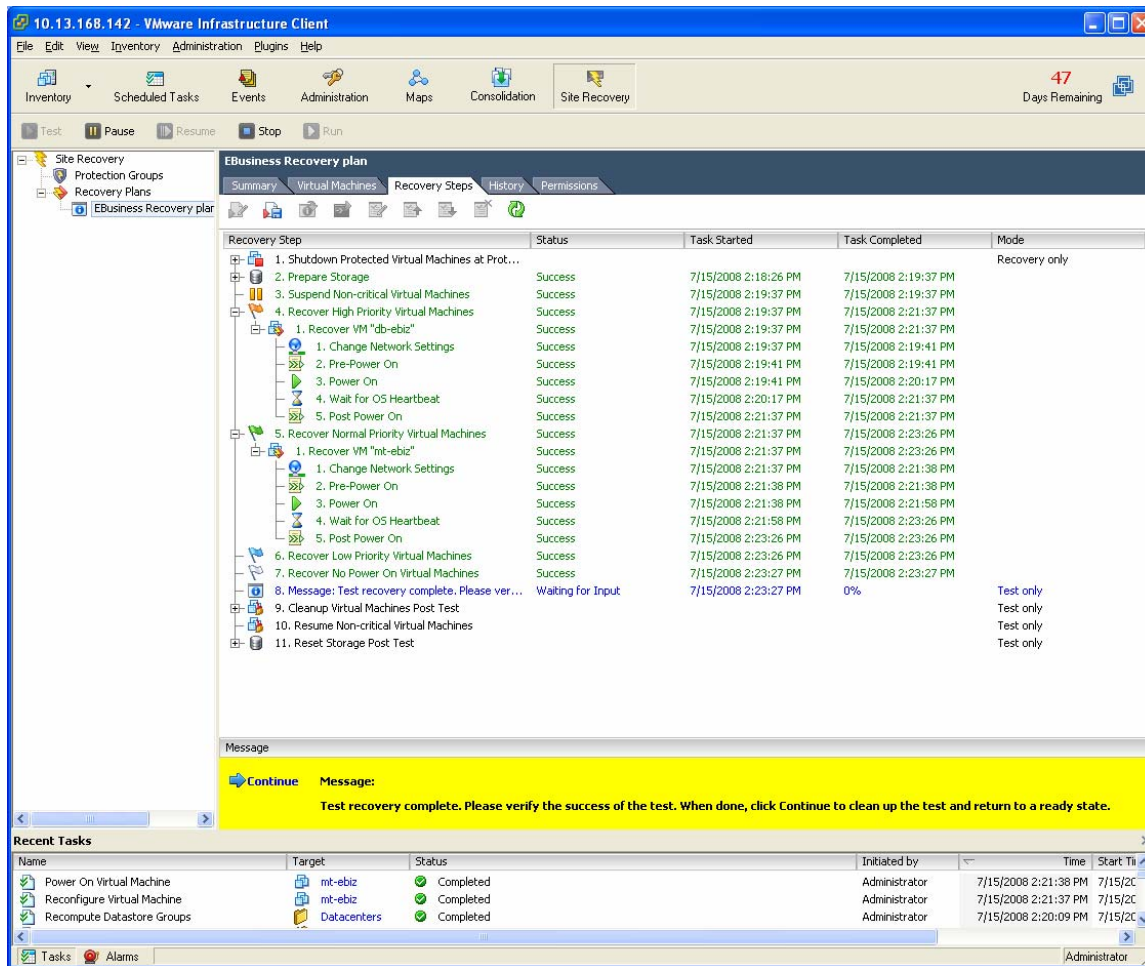


Figure 7: Recovery Plan test execution

As shown in Figure 7, Site Recovery Manager facilitates virtually non-disruptive testing of recovery plans.

The next section discusses the setup and flow for an actual site failover.

Site Failover (Disaster Recovery) Test

During a disaster, even a small corner case may cause significant issues in bringing up the remote site. Therefore, it is extremely important to test the failover while the database is under load conditions. In order to represent a realistic scenario, we submitted a long running (~ 3-5 min) batch job on the primary site. Once the job is submitted and starts execution, we initiated the site failover from Site Recovery Manager on the remote site. We used the following sequence to validate the site failover test:

- On the primary site, submit a concurrent manager batch job; this generates the necessary resource consumption for the virtual machine while incurring database I/O.

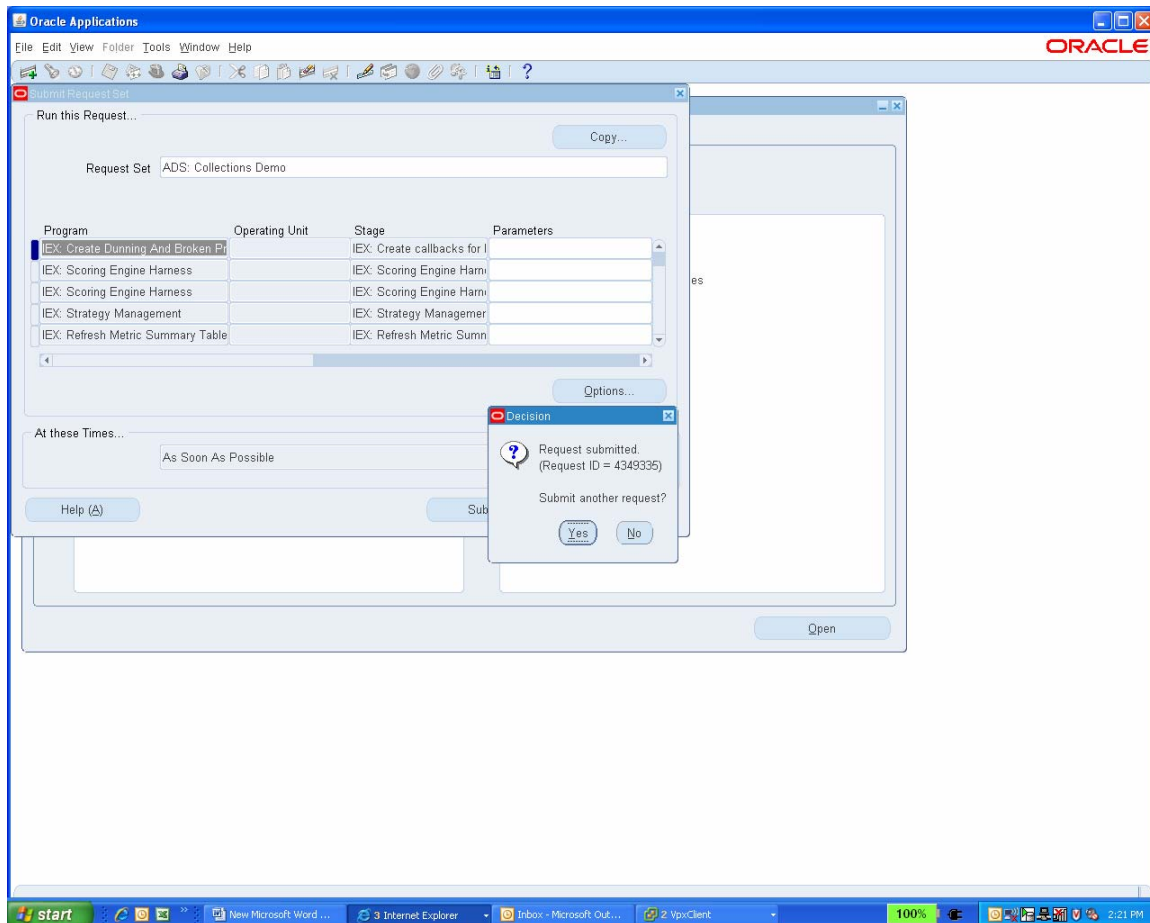


Figure 8: EBusiness Suite General Ledger Job submission

- Once the batch job starts executing, initiate site failover using the recovery plan on the secondary site.

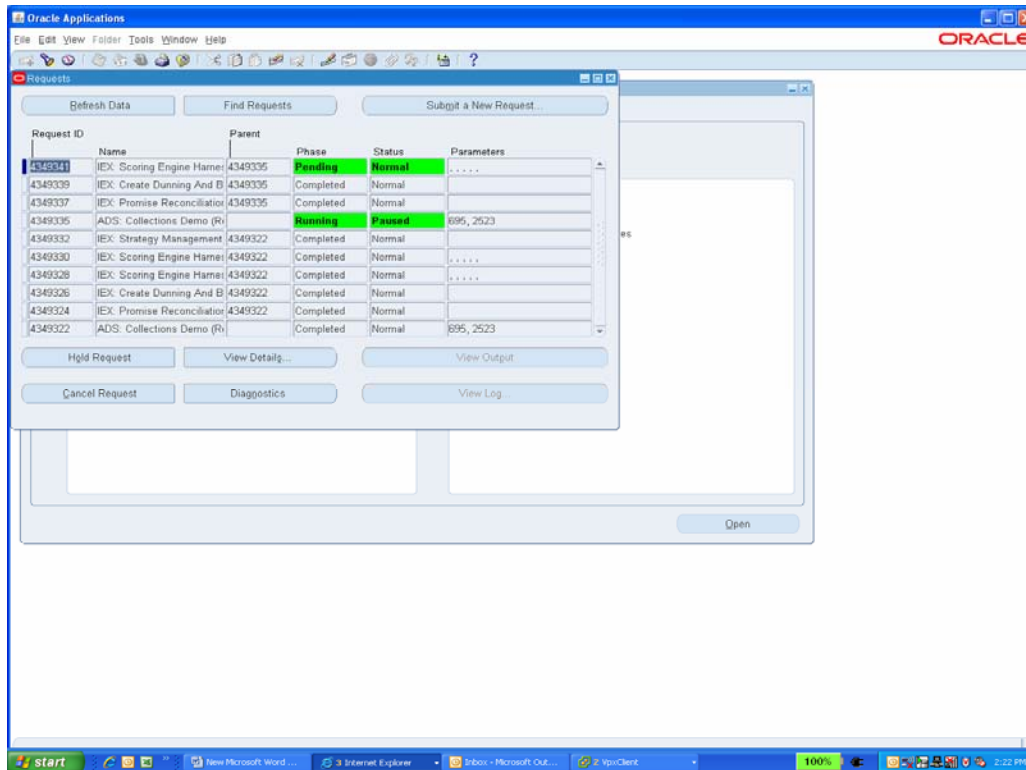


Figure 9: EBusiness Suite General Ledger Job status

- As the remote site recovery is initiated, "refresh" status on the primary site will show "network connection error" as shown in Figure 10.

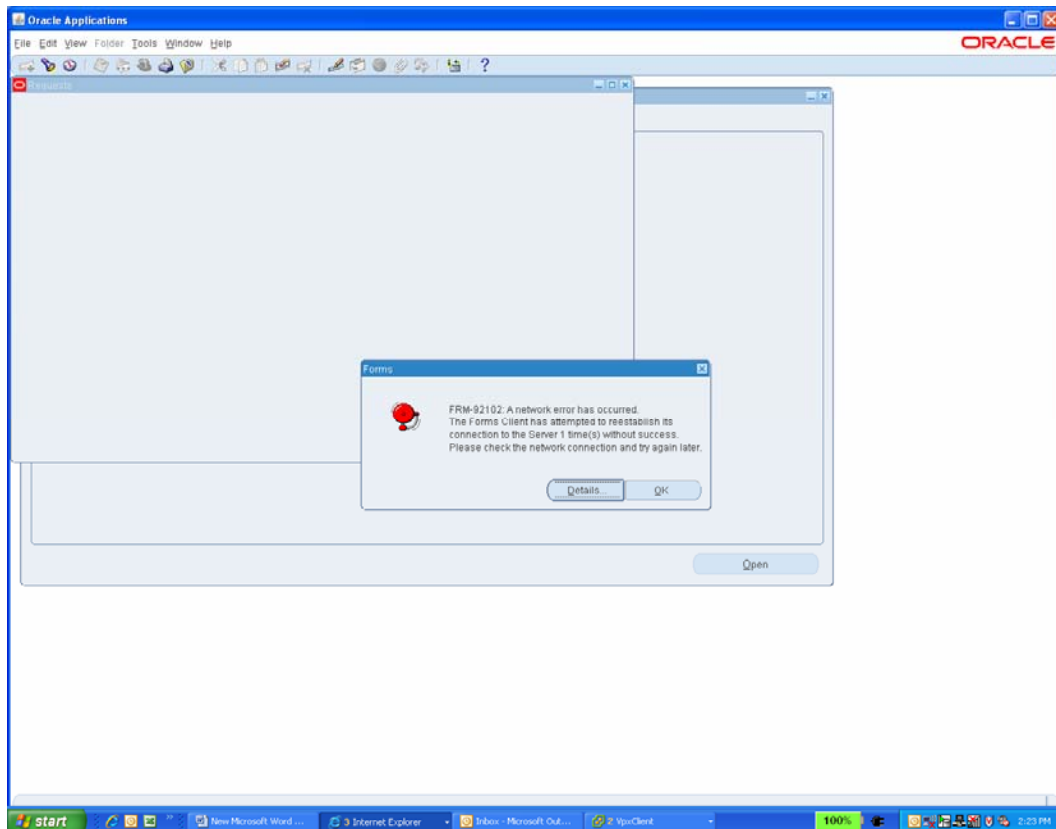


Figure 10: Failed Connection as Primary site goes down

- Once the site recovery is complete, log into EBusiness Suite at the recovery site and verify the status of previously submitted batch job. As expected, it has "incomplete" status and displays an error.

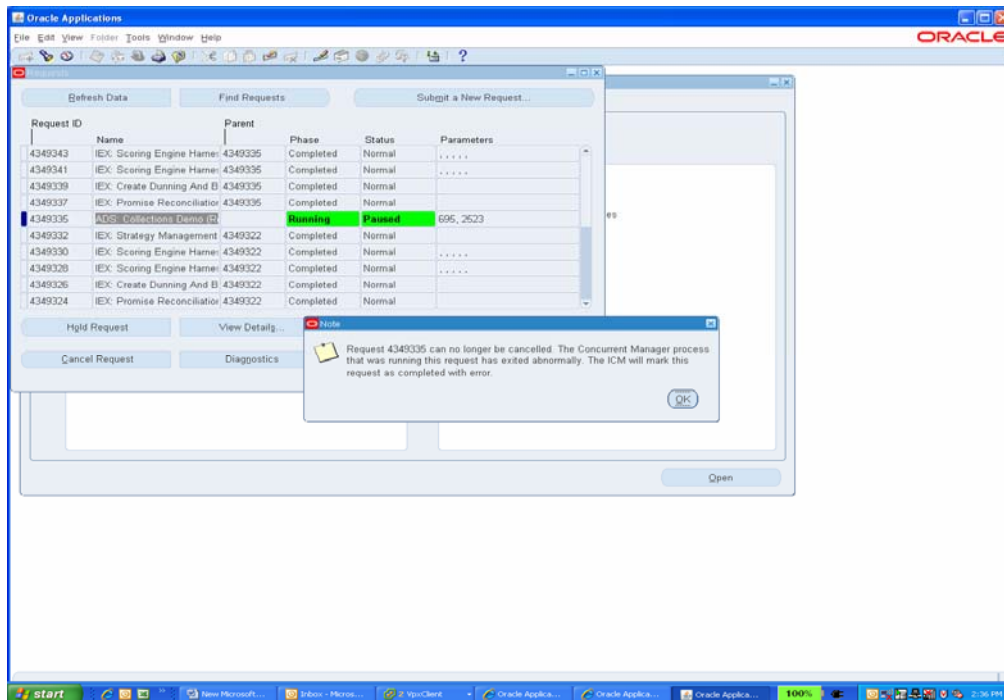


Figure 11: Failed Job that was submitted at Primary site

- To ensure everything is functional, resubmit the same job at the secondary site. As shown in Figure 12, it completes successfully.

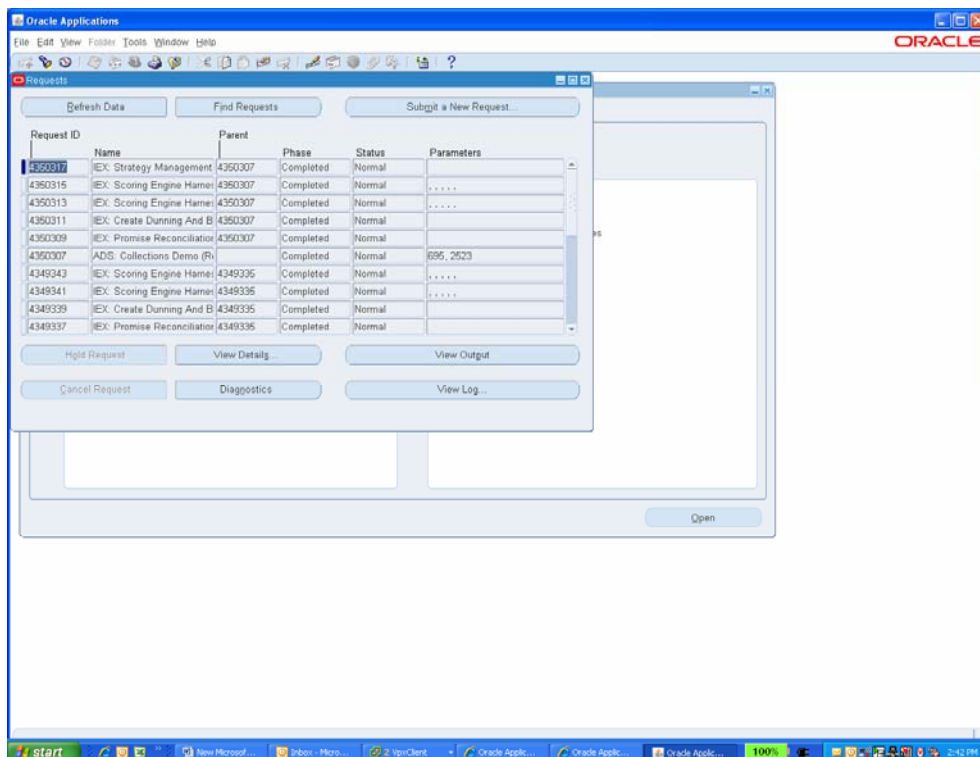


Figure 12: Successful Job completion at the remote site

Conclusion

In this document, we demonstrated how VMware Site Recovery Manager enables the design of a powerful yet simple disaster recovery solution. Built on the solid foundation of VMware virtualization, Site Recovery Manager easily and cost-effectively resolves typical disaster recovery challenges while providing excellent management flexibility. Using a multi-tier Oracle EBusiness environment residing on EMC CLARiiON storage, we highlighted how Site Recovery Manager lets you:

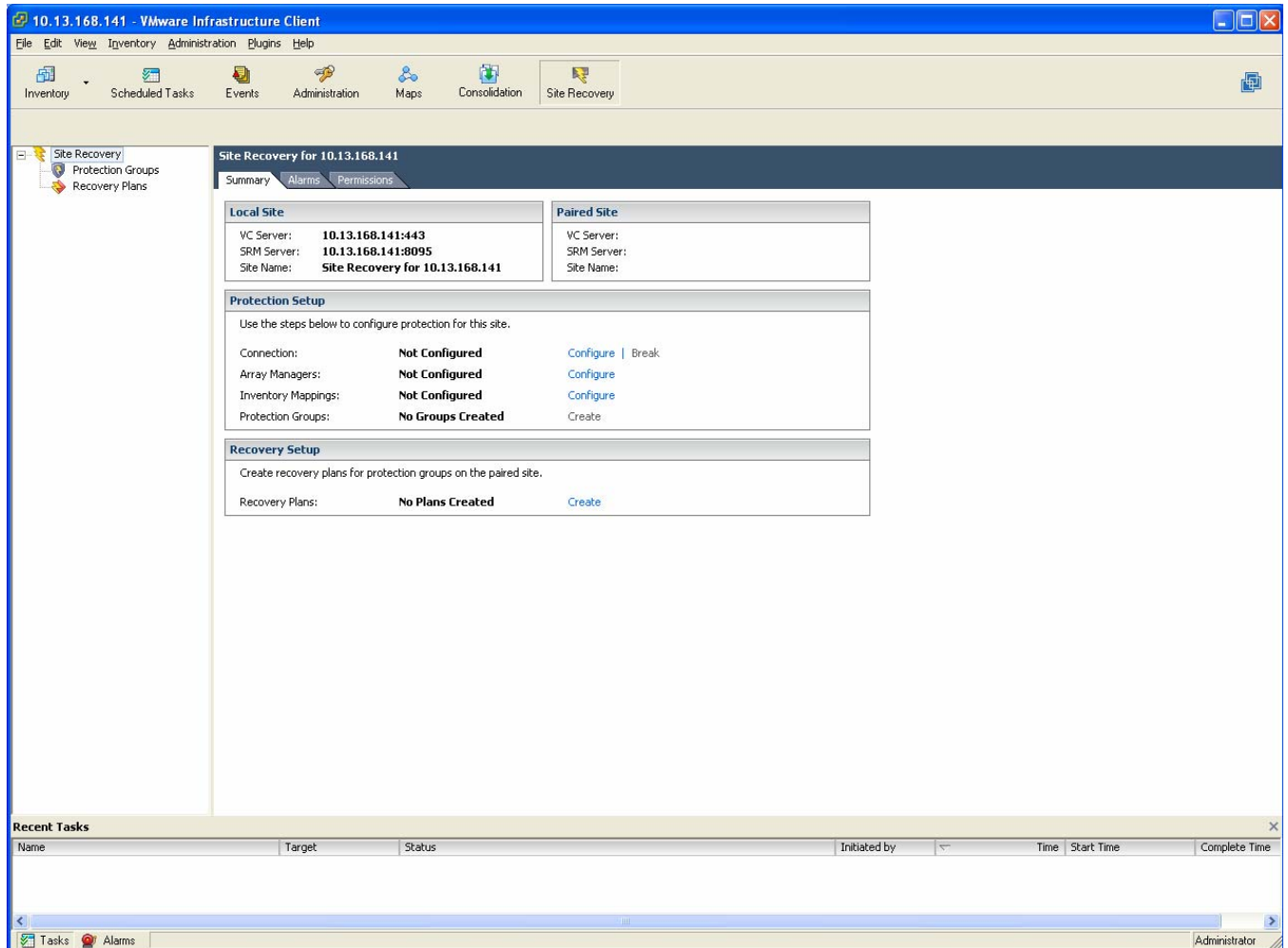
- Accelerate recovery for the virtual environment through automation.
- Ensure reliable recovery by enabling non-disruptive testing.
- Simplify recovery by eliminating complex manual recovery steps and centralizing management of recovery plans.

Traditional disaster recovery solutions are slow and prone to failures because they involve many manual and complex steps that are difficult to test, and require expensive duplication of the production datacenter infrastructure to ensure reliable recovery. VMware Site Recovery Manager is designed to simplify and automate the disaster recovery process so that customers can reliably recover from datacenter outages in hours rather than days. Working with VMware Infrastructure, VMware Site Recovery Manager can help eliminate the complexity and unreliability of manual recovery and eliminate the cost and complexity of maintaining duplicate but idle infrastructure at a recovery site.

Appendix

Appendix A: Screenshots

Site Recovery Manager Setup



Connect to remote site.

Connect to Remote Site

Remote Site Information
Connect to a remote VirtualCenter Server that will recover virtual machines from this site in the case of a disaster.

Remote Site Information
Authentication
Complete Connections

Enter the address and port for a remote VirtualCenter Server.

Address:
Example: vcserver.company.com

Port:

Help ≤ Back Next ≥ Cancel

Validate VirtualCenter Server Certificate

The following problems occurred during authentication:

Remote server certificate has error(s).

Show Certificate

Click OK to accept the certificate and continue connecting the sites, or click Cancel and change the connection information.

OK Cancel

Connect to Remote Site

VirtualCenter Server Authentication
Log in to remote VirtualCenter Server.

[Remote Site Information](#)
Authentication
Complete Connections

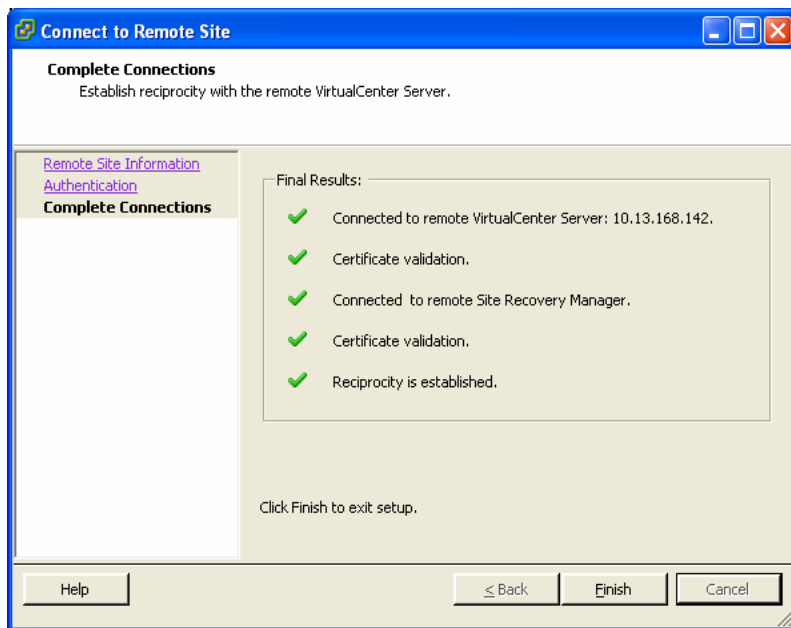
Provide administrator credentials for the remote VirtualCenter Server.

VirtualCenter Server: 10.13.168.142

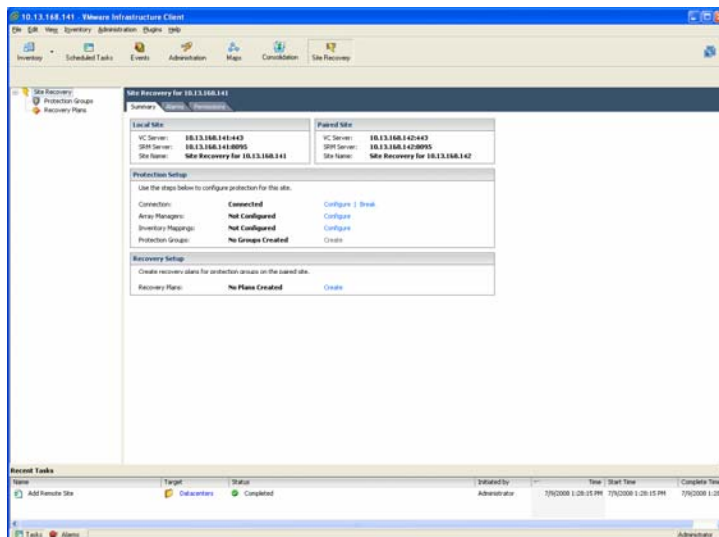
Username:

Password:

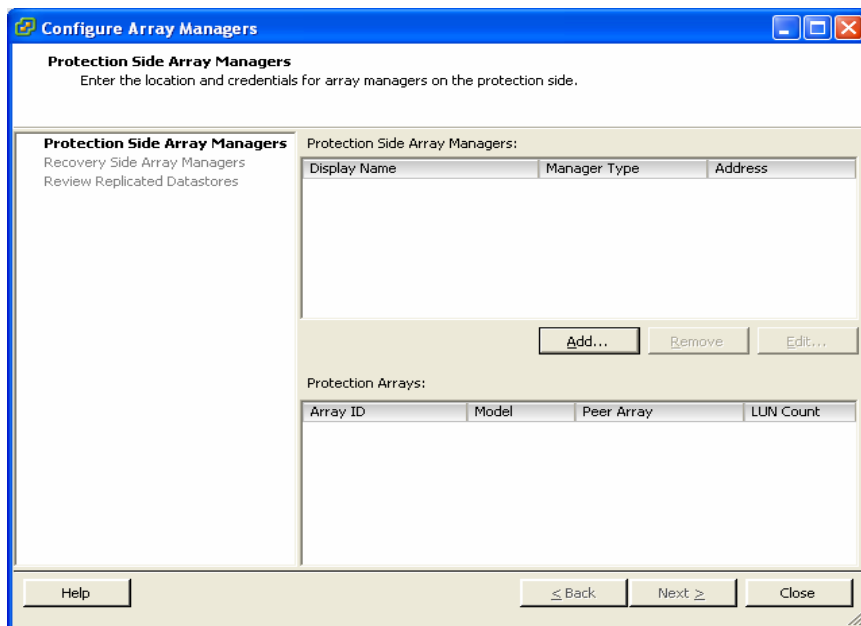
Help ≤ Back Next ≥ Cancel



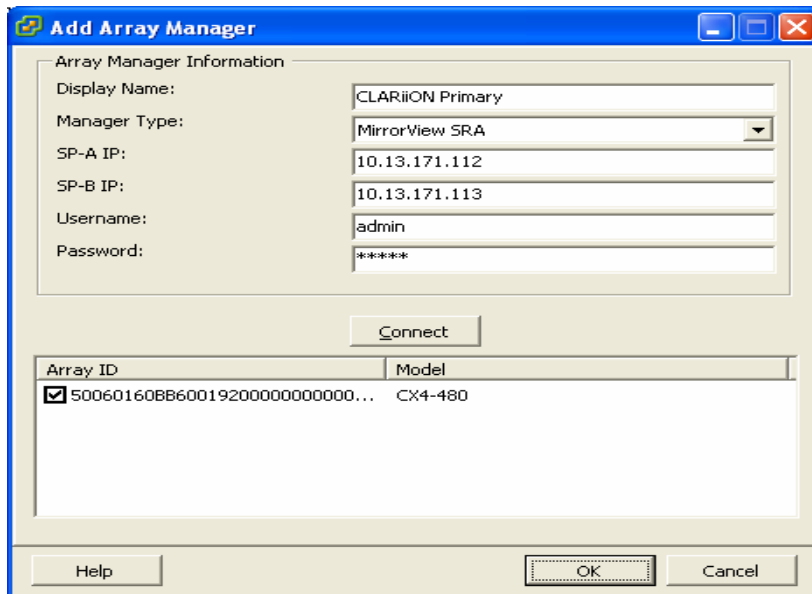
Once the remote site connection is successful, configure Storage Array Manager.



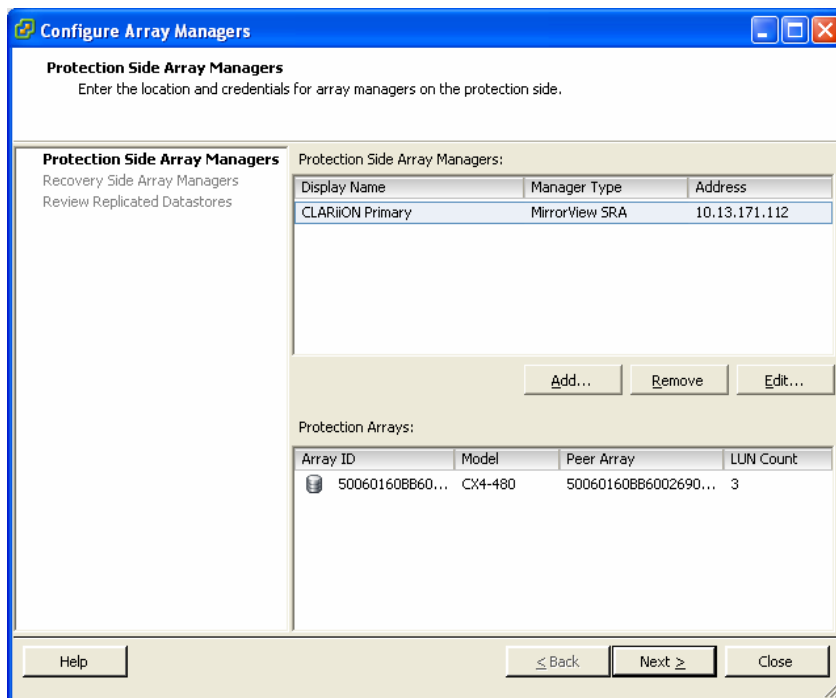
Configure Array Manager.



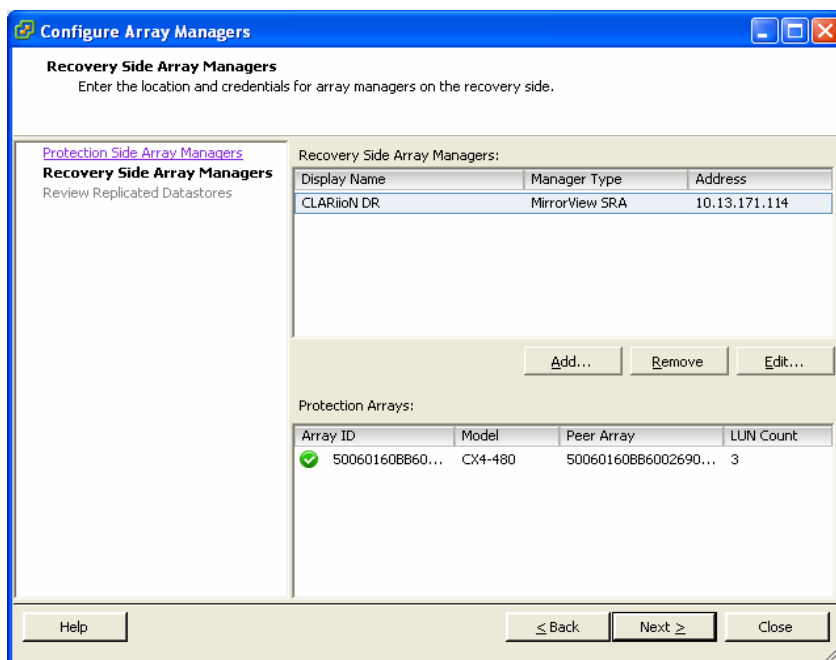
Add Primary Site Array details.



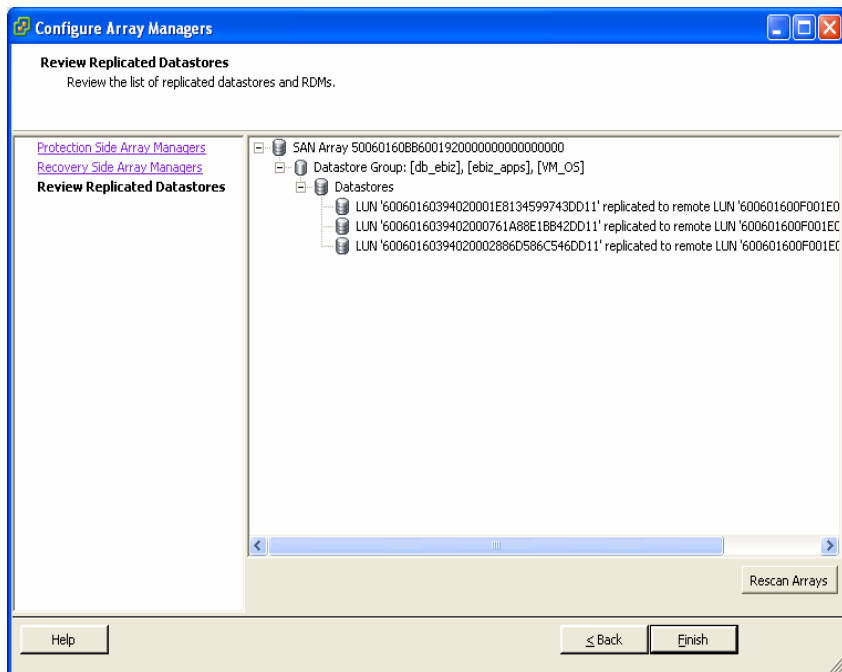
Primary site array discovery.



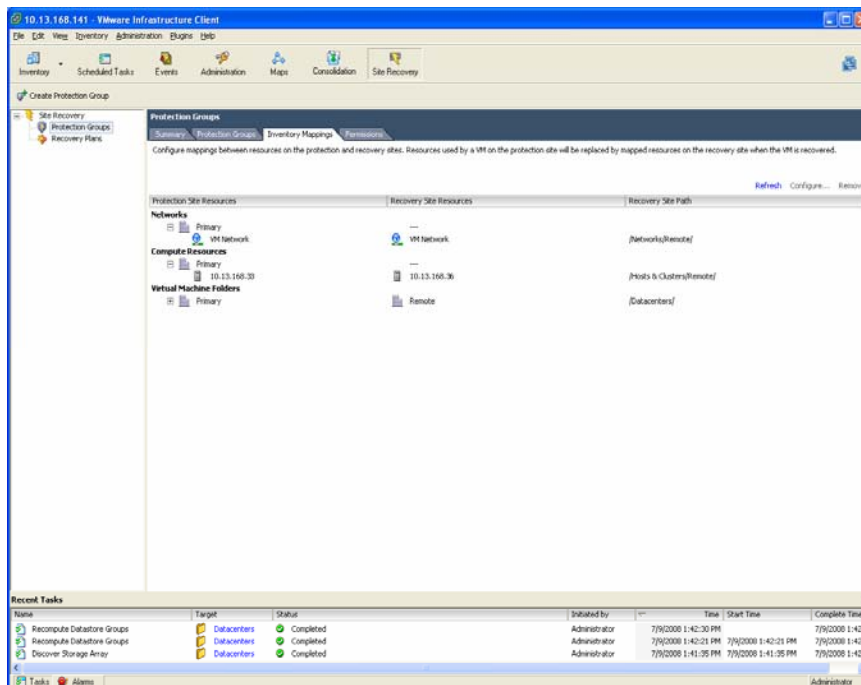
Remote (Recovery) site information. (Note: Remote site array details screenshot skipped.)



Discovered mirrored datastores at the remote site.



Configure Inventory mappings between Primary and Secondary site.



Create Protection Group

Create Protection Group at primary site.

Create Protection Group

Name and Description
Enter the name and description for this protection group.

Name
Datastore Group
Placeholder VMs

Protection Group Name:
EBusiness Protection Group

Description:
EBusiness Protection Group

Help ≤ Back Next ≥ Cancel

Group datastores and related virtual machines in the Protection group.

Create Protection Group

Select a Datastore Group
Select a datastore group for this protection group.

Name
Datastore Group
Placeholder VMs

Datastore groups:

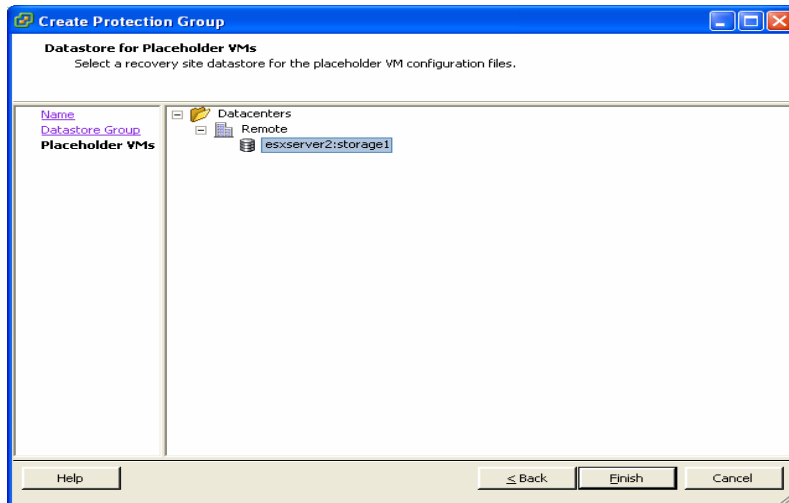
Datastore Group	Protection Group
[db_ebiz], [ebiz_apps], [VM_OS]	

VMs on the selected datastore group:

- db-ebiz
- mt-ebiz

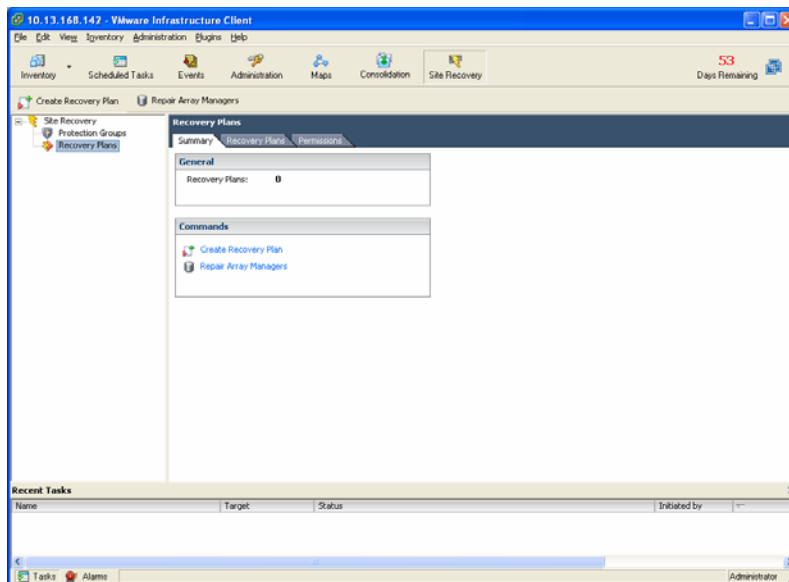
Help ≤ Back Next ≥ Cancel

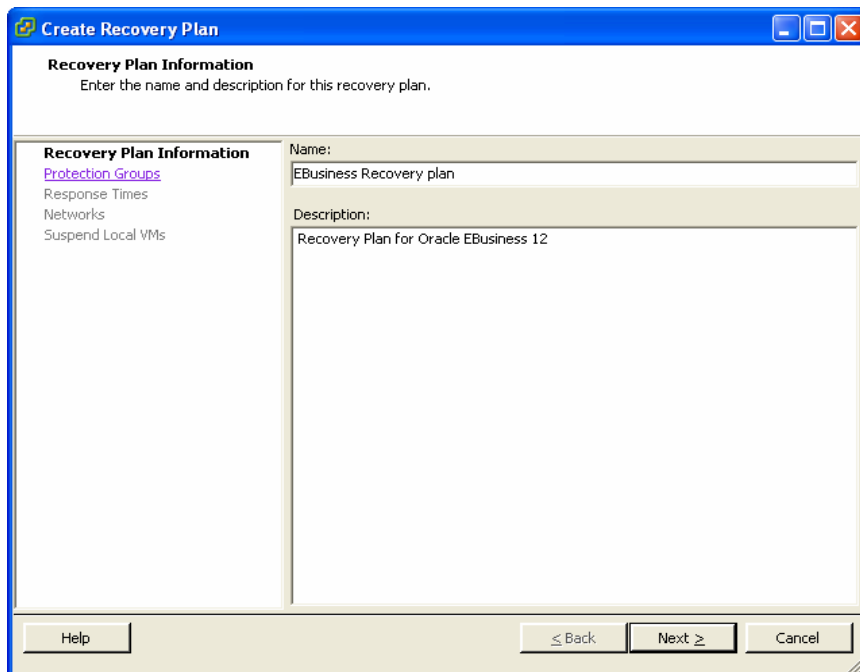
Identify placeholder for shadow virtual machines at remote site.



Create Recovery Plan

Create Recovery plan at the remote site.





Create Recovery Plan

Recovery Plan Information
Enter the name and description for this recovery plan.

Recovery Plan Information

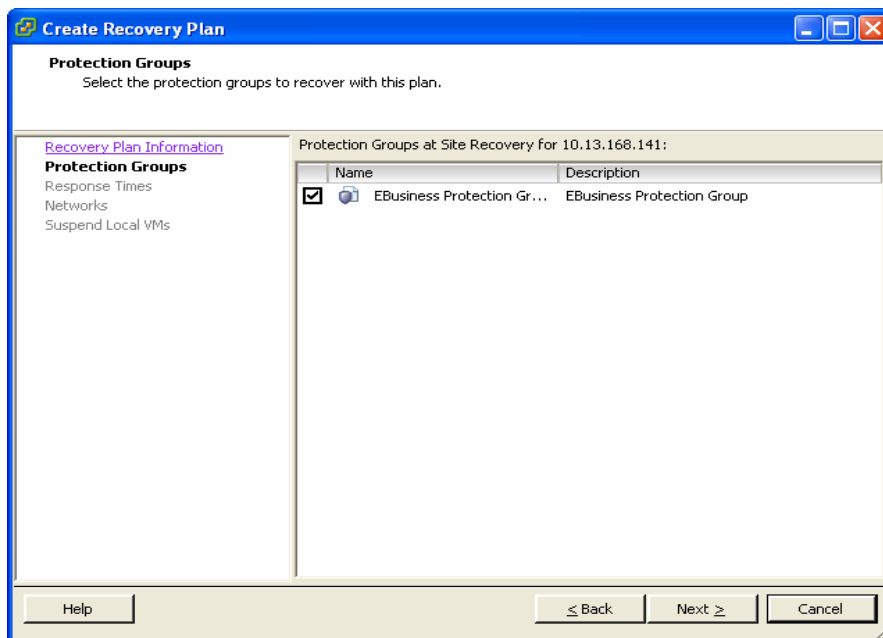
- [Protection Groups](#)
- Response Times
- Networks
- Suspend Local VMs

Name: EBusiness Recovery plan

Description: Recovery Plan for Oracle EBusiness 12

Help ≤ Back Next ≥ Cancel

Select protection group(s) for this recovery plan.



Create Recovery Plan

Protection Groups
Select the protection groups to recover with this plan.

[Recovery Plan Information](#)

Protection Groups

- Response Times
- Networks
- Suspend Local VMs

Protection Groups at Site Recovery for 10.13.168.141:

Name	Description
<input checked="" type="checkbox"/> EBusiness Protection Gr...	EBusiness Protection Group

Help ≤ Back Next ≥ Cancel

Response time for Virtual machine configuration (Default selected).

Create Recovery Plan

Response Times
Set the default response times for virtual machines in this plan.

[Recovery Plan Information](#)
[Protection Groups](#)
Response Times
[Networks](#)
[Suspend Local VMs](#)

VM Response Time
If a virtual machine has VMware Tools installed, then wait for heartbeat plus:

30 Seconds

Maximum time to wait for a response:

300 Seconds

Help ≤ Back Next ≥ Cancel

Network location for remote site (For disaster recovery tests only).

Create Recovery Plan

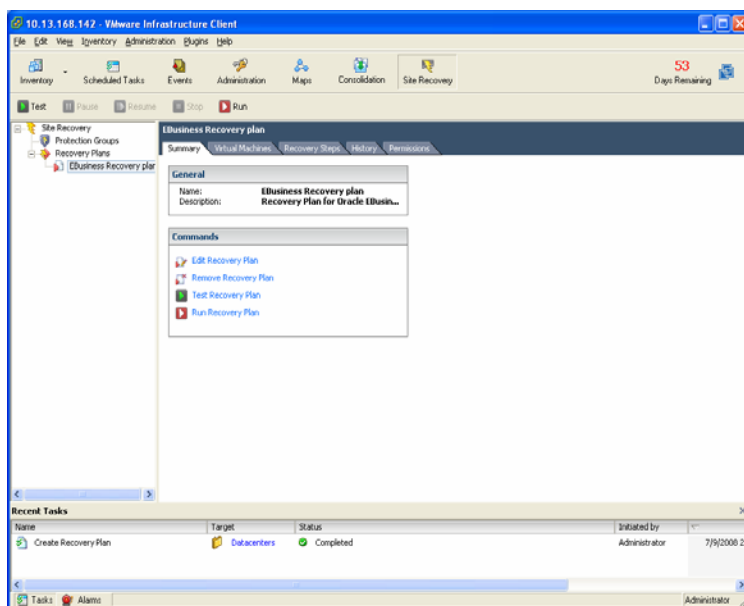
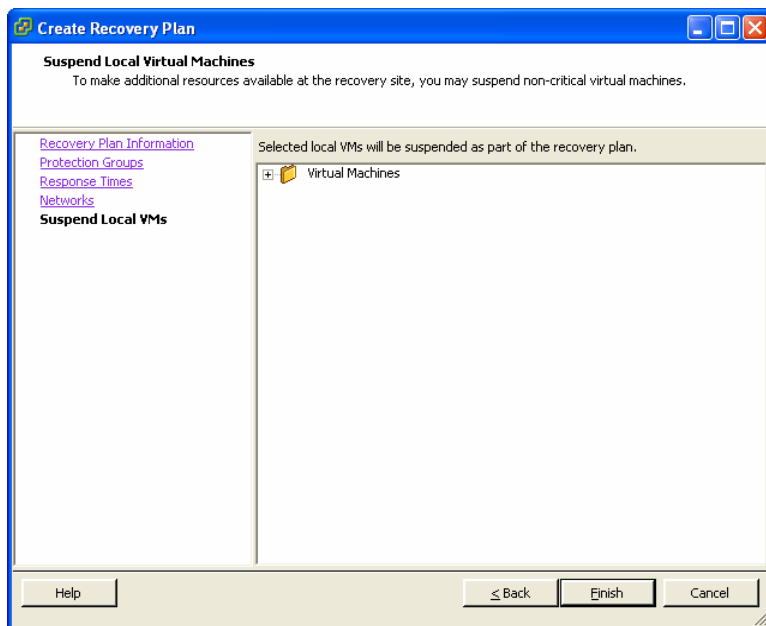
Configure Test Networks
Set the networks to use while running tests of this plan.

[Recovery Plan Information](#)
[Protection Groups](#)
[Response Times](#)
Networks
[Suspend Local VMs](#)

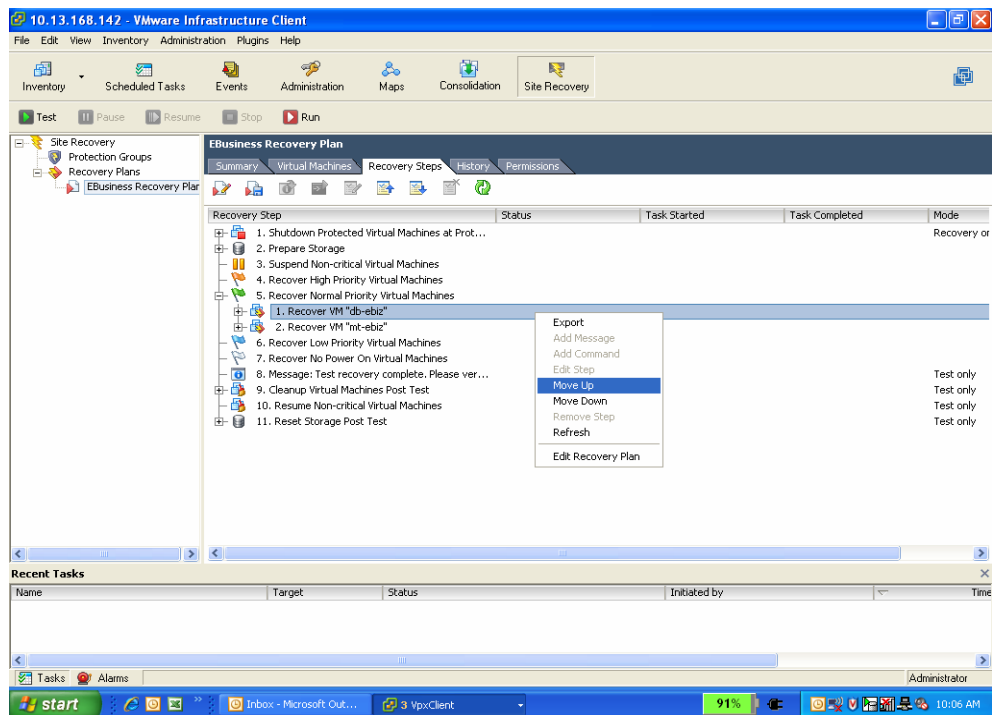
For each network used by virtual machines in this plan, select a network to use while running tests.
Select "Auto" if you want the system to automatically create a new isolated network environment during each test (Recommended).

Datacenter	Recovery Network	Test Network
Remote	VM Network	Auto

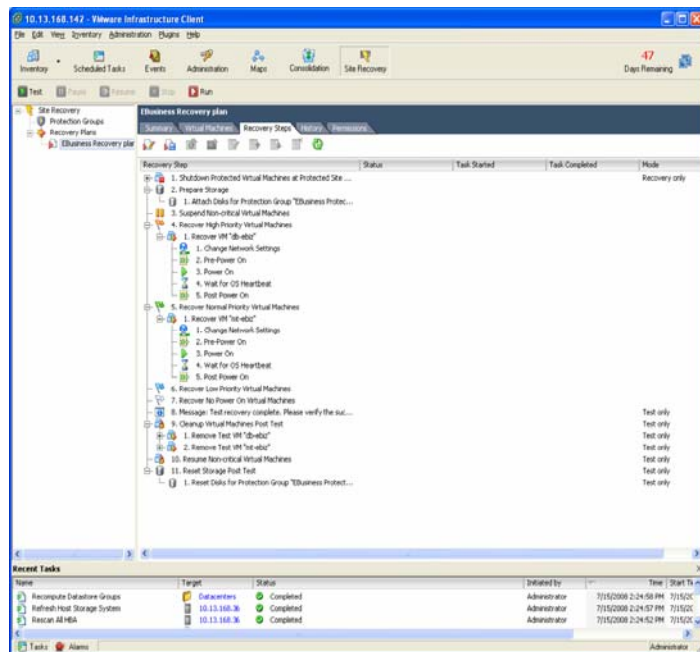
Help ≤ Back Next ≥ Cancel



Once recovery plan is created, prioritize virtual machine start order.



Summary of Recovery steps.



Test Recovery Plan

The screenshot displays the VMware Infrastructure Client interface for the EBusiness Recovery plan. The main window shows a list of recovery steps and their status. A yellow message box at the bottom indicates that the test recovery is complete and prompts the user to verify the success of the test and click Continue to clean up the test and return to a ready state.

Recovery Step	Status	Task Started	Task Completed	Mode
1. Shutdown Protected Virtual Machines at Prot...	Success	7/15/2008 2:18:26 PM	7/15/2008 2:19:37 PM	Recovery only
2. Prepare Storage	Success	7/15/2008 2:19:37 PM	7/15/2008 2:19:37 PM	
3. Suspend Non-critical Virtual Machines	Success	7/15/2008 2:19:37 PM	7/15/2008 2:21:37 PM	
4. Recover High Priority Virtual Machines	Success	7/15/2008 2:19:37 PM	7/15/2008 2:21:37 PM	
1. Recover VM "db-ebiz"	Success	7/15/2008 2:19:37 PM	7/15/2008 2:21:37 PM	
1. Change Network Settings	Success	7/15/2008 2:19:37 PM	7/15/2008 2:19:41 PM	
2. Pre-Power On	Success	7/15/2008 2:19:41 PM	7/15/2008 2:19:41 PM	
3. Power On	Success	7/15/2008 2:19:41 PM	7/15/2008 2:20:17 PM	
4. Wait for OS Heartbeat	Success	7/15/2008 2:20:17 PM	7/15/2008 2:21:37 PM	
5. Post Power On	Success	7/15/2008 2:21:37 PM	7/15/2008 2:21:37 PM	
5. Recover Normal Priority Virtual Machines	Success	7/15/2008 2:21:37 PM	7/15/2008 2:23:26 PM	
1. Recover VM "mt-ebiz"	Success	7/15/2008 2:21:37 PM	7/15/2008 2:23:26 PM	
1. Change Network Settings	Success	7/15/2008 2:21:37 PM	7/15/2008 2:21:38 PM	
2. Pre-Power On	Success	7/15/2008 2:21:38 PM	7/15/2008 2:21:38 PM	
3. Power On	Success	7/15/2008 2:21:38 PM	7/15/2008 2:21:58 PM	
4. Wait for OS Heartbeat	Success	7/15/2008 2:21:58 PM	7/15/2008 2:23:26 PM	
5. Post Power On	Success	7/15/2008 2:23:26 PM	7/15/2008 2:23:26 PM	
6. Recover Low Priority Virtual Machines	Success	7/15/2008 2:23:26 PM	7/15/2008 2:23:26 PM	
7. Recover No Power On Virtual Machines	Success	7/15/2008 2:23:27 PM	7/15/2008 2:23:27 PM	
8. Message: Test recovery complete. Please ver...	Waiting for Input	7/15/2008 2:23:27 PM	0%	Test only
9. Cleanup Virtual Machines Post Test				Test only
10. Resume Non-critical Virtual Machines				Test only
11. Reset Storage Post Test				Test only

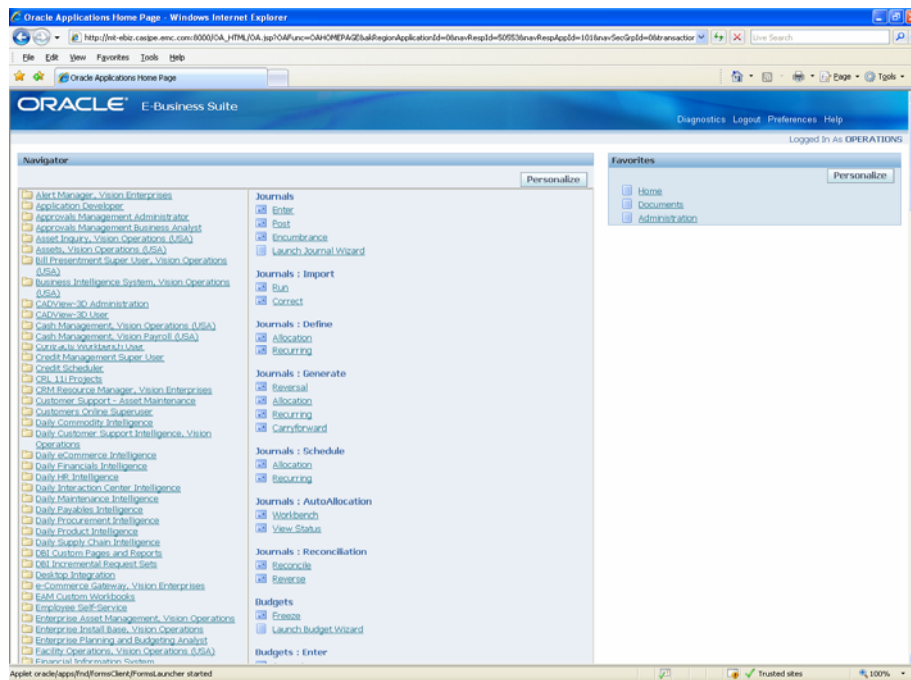
Message:
Test recovery complete. Please verify the success of the test. When done, click Continue to clean up the test and return to a ready state.

Recent Tasks

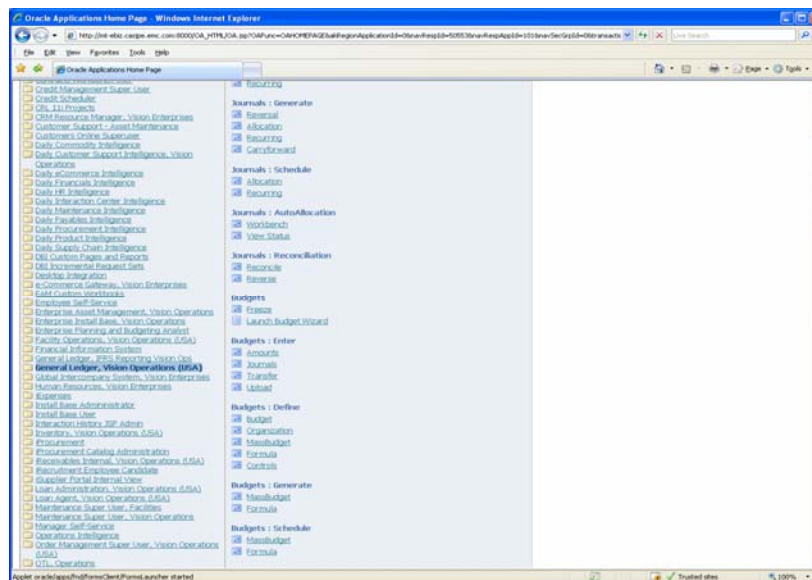
Name	Target	Status	Initiated by	Time	Start Ts
Power On Virtual Machine	mt-ebiz	Completed	Administrator	7/15/2008 2:21:38 PM	7/15/2C
Reconfigure Virtual Machine	mt-ebiz	Completed	Administrator	7/15/2008 2:21:37 PM	7/15/2C
Recompute Datastore Groups	Datacenters	Completed	Administrator	7/15/2008 2:20:09 PM	7/15/2C

Site Failover

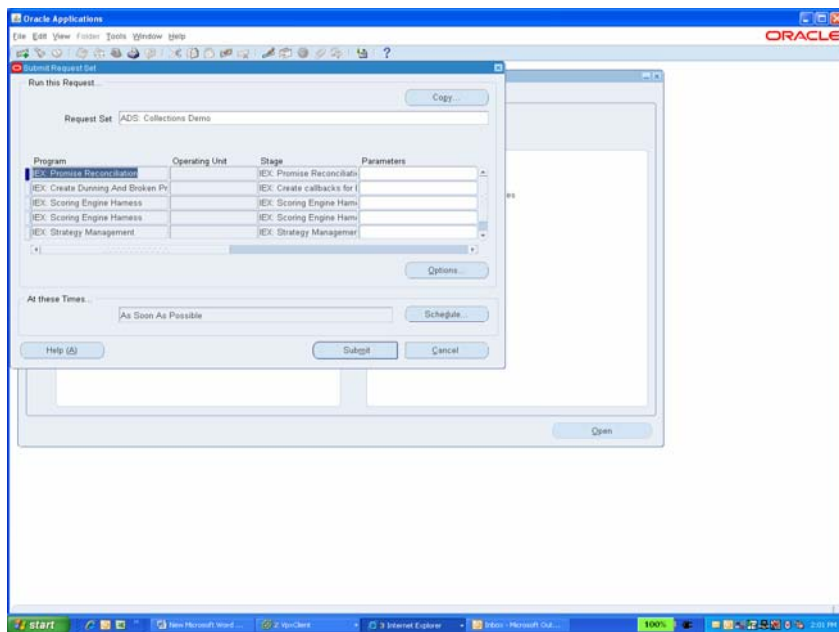
Login to Oracle EBusiness suite.



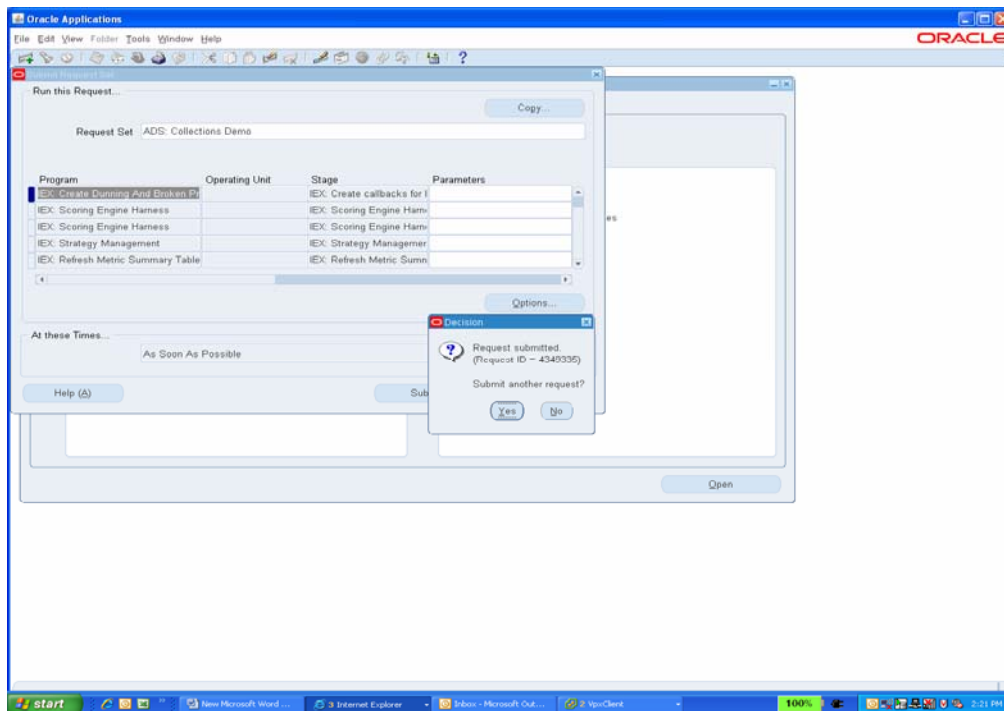
General Ledger, initiate report generation.



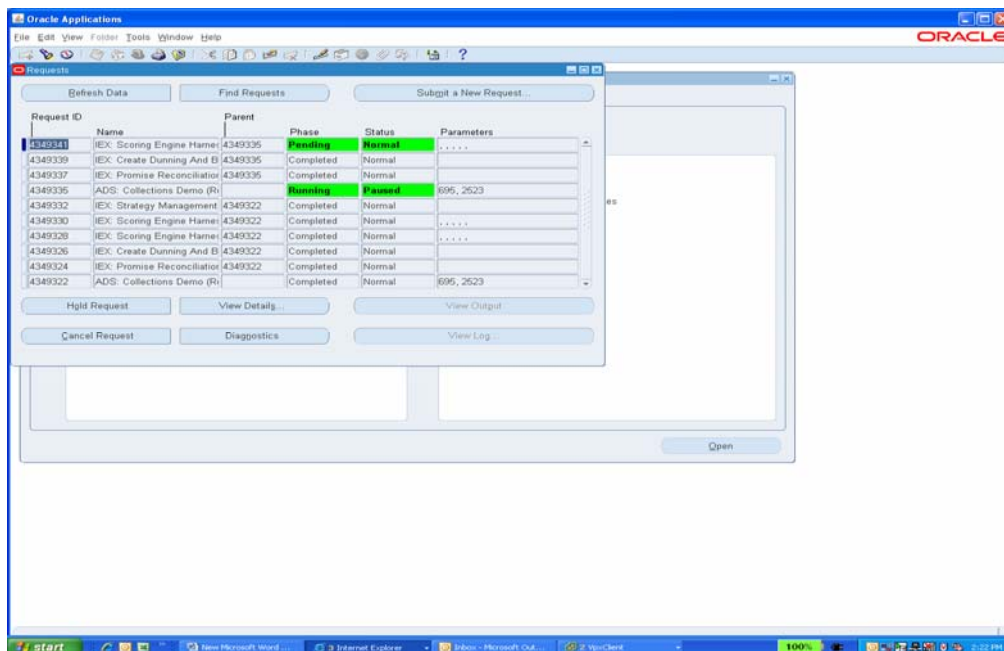
Submit job request to generate report.



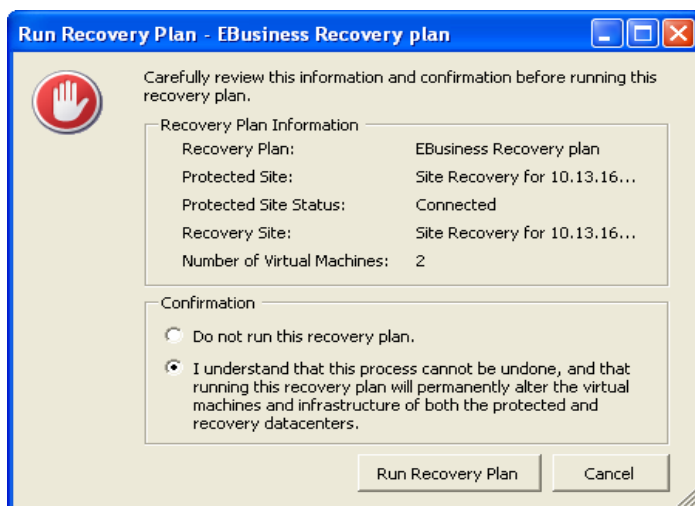
Job request is submitted.



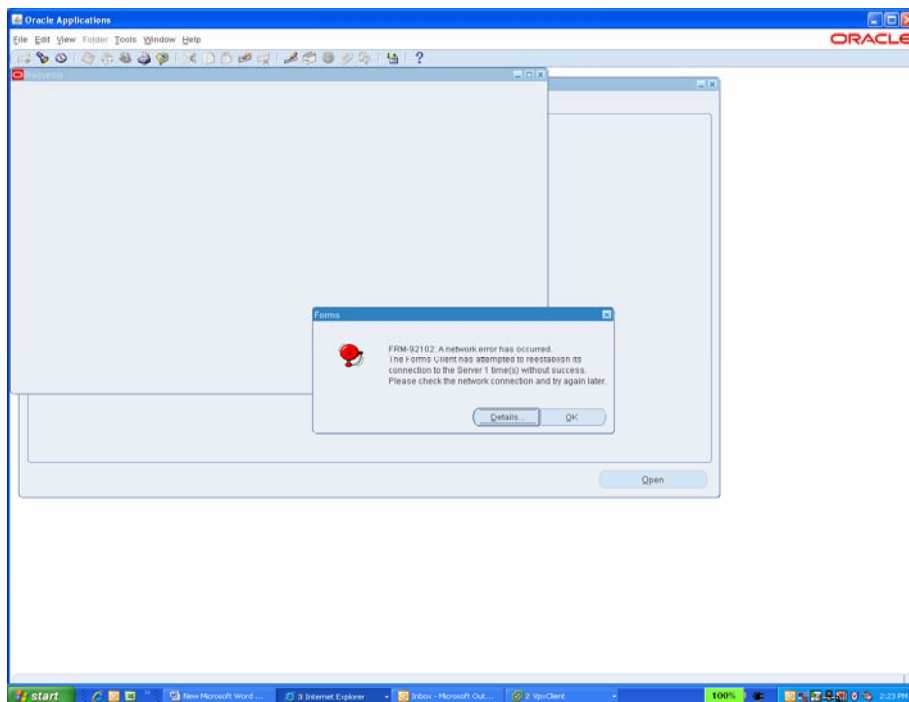
Report generation is progressing normally.



Initiate site failover using Recovery Plan at secondary site.



Connection Error at Primary site as the site goes down.



Recovery Plan execution report

Here is the Recovery Plan execution report.

vmware Site Recovery Manager

EBusiness Recovery plan

Description

Recovery Plan for Oracle EBusiness 12

Start Time: 7/15/2008 3:18:32 PM

Finish Time: 7/15/2008 3:24:01 PM

Total Execution Time: 00:05:29

Mode: Recovery

Overall Result: Success

Recovery Step	Result	Execution Time
1. Shutdown Protected Virtual Machines at Protected Site "Site Recovery for 10.13.168.141"	Success	00:00:35
1.1. Shutdown Low Priority Protected Virtual Machines	Success	00:00:00
1.2. Shutdown Normal Priority Protected Virtual Machines	Success	00:00:35
1.2.1. Shutdown Primary Site VM "db-ebiz"	Success	00:00:35
1.2.1.1. Shutdown Guest OS for Remote VM "db-	Success	00:00:01

ebiz"		
1.2.1.2. Wait for Guest OS Shutdown	Success	00:00:34
1.2.1.3. Power off VM "db-ebiz"	Success	00:00:00
1.2.2. Shutdown Primary Site VM "mt-ebiz"	Success	00:00:35
1.2.2.1. Shutdown Guest OS for Remote VM "mt-ebiz"	Success	00:00:00
1.2.2.2. Wait for Guest OS Shutdown	Success	00:00:34
1.2.2.3. Power off VM "mt-ebiz"	Success	00:00:00
1.3. Shutdown High Priority Protected Virtual Machines	Success	00:00:00
2. Prepare Storage	Success	00:02:07
2.1. Attach Disks for Protection Group "EBusiness Protection Group"	Success	00:02:07
3. Suspend Non-critical Virtual Machines	Success	00:00:00
4. Recover High Priority Virtual Machines	Success	00:01:25
4.1. Recover VM "db-ebiz"	Success	00:01:25
4.1.1. Change Network Settings	Success	00:00:01
4.1.2. Pre-Power On	Success	00:00:00
4.1.3. Power On	Success	00:00:03
4.1.4. Wait for OS Heartbeat	Success	00:01:20
4.1.5. Post Power On	Success	00:00:00
5. Recover Normal Priority Virtual Machines	Success	00:01:19
5.1. Recover VM "mt-ebiz"	Success	00:01:19
5.1.1. Change Network Settings	Success	00:00:01
5.1.2. Pre-Power On	Success	00:00:00
5.1.3. Power On	Success	00:00:03
5.1.4. Wait for OS Heartbeat	Success	00:01:14
5.1.5. Post Power On	Success	00:00:00
6. Recover Low Priority Virtual Machines	Success	00:00:00
7. Recover No Power On Virtual Machines	Success	00:00:00
8. Message: Test recovery complete. Please verify the success of the test. When done, click Continue to clean up the test and return to a ready state.		
9. Cleanup Virtual Machines Post Test		
9.1. Remove Test VM "db-ebiz"		
9.1.1. PowerOff VM "db-ebiz"		
9.2. Remove Test VM "mt-ebiz"		

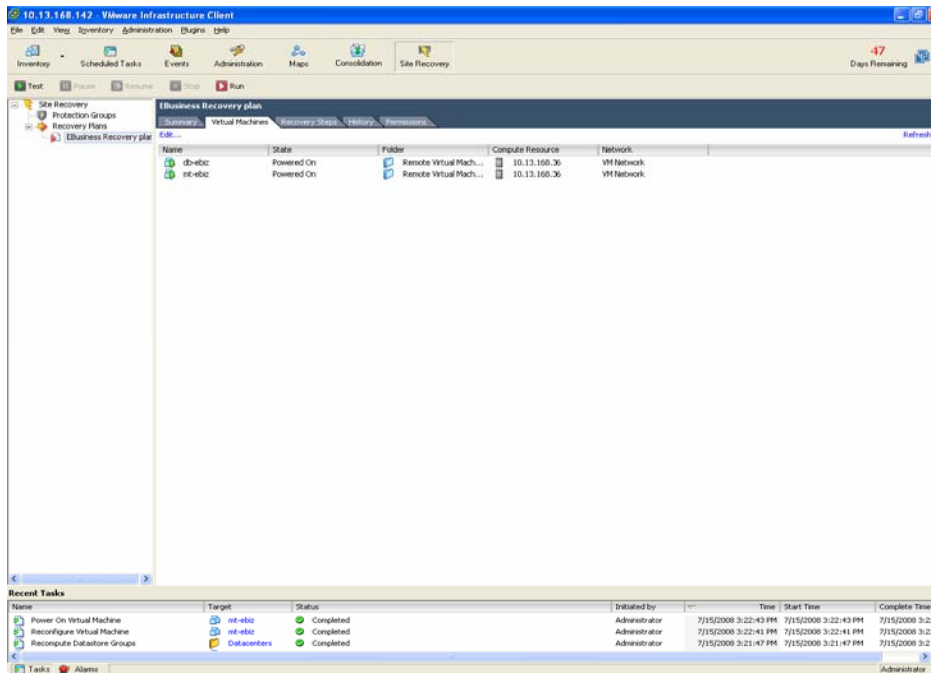
9.2.1. PowerOff VM "mt-ebiz"

10. Resume Non-critical Virtual Machines

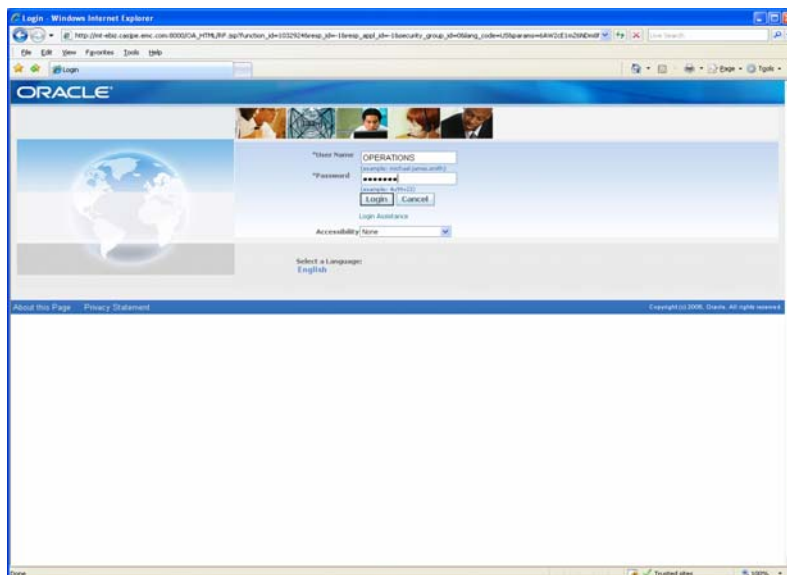
11. Reset Storage Post Test

11.1. Reset Disks for Protection Group "EBusiness Protection Group"

Remote Site ESX Server screen with two Virtual machines (running EBusiness suite).

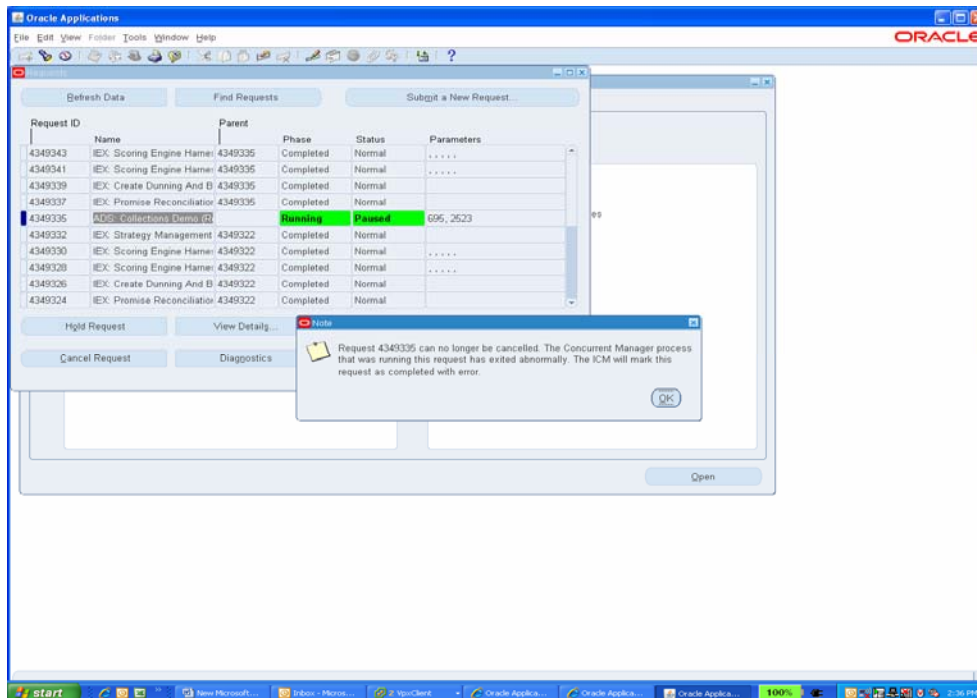


Login EBusiness suite at Remote site.

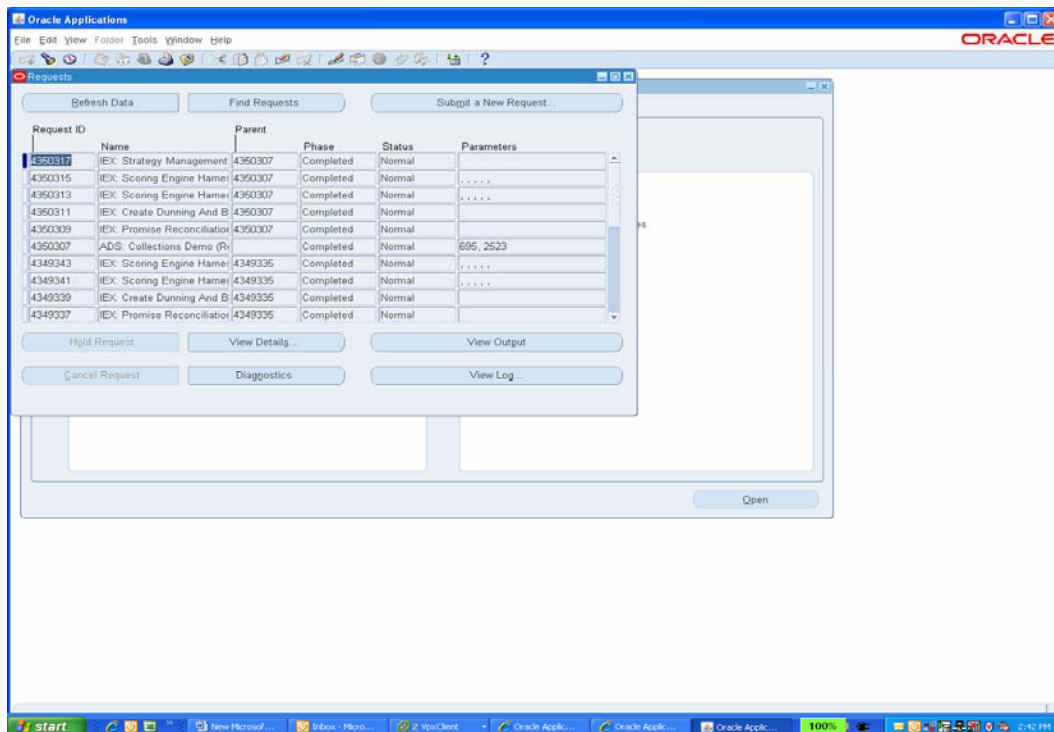


Query job status that was submitted prior to site failover.

Upon query, the previous request submitted at a Primary site shows up as “Paused” and error message is displayed.



Ensure that everything is running normal after site failover. Resubmitting request at the secondary site completes successfully.



Appendix B: Oracle Database and Middle Tier Auto Start Scripts

Database

```
#!/bin/bash
./Oradb/oracle/VIS/db/tech_st/10.2.0/VIS_db-ebiz.env
echo "starting up database"
sqlplus "/" as sysdba << !!
startup
!sleep 5
exit
!!
lsnrctl start
```

stopdb.sh

```
#!/bin/bash
./Oradb/oracle/VIS/db/tech_st/10.2.0/VIS_db-ebiz.env
echo "shutdown database"
sqlplus "/" as sysdba << !!
shutdown immediate;
exit
!!
lsnrctl stop
```

/etc/init.d/dbora

```
#!/bin/sh -x
#
case $1 in
'start')
    su - oracle -c ". /home/oracle/scripts/startdb.sh"
    ;;
'stop')
    su - oracle -c ". /home/oracle/scripts/stopdb.sh"
    ;;
*)
    echo "usage: $0 {start|stop}"
    exit
    ;;
esac
#
exit
```

Apps Tier

```
[oracle@mt-ebiz scripts]$ cat start_apps.sh
#!/bin/bash
. /OraApps/oracle/VIS/apps/apps_st/appl/VIS_mt-ebiz.env
echo "starting apps services"
. /OraApps/oracle/VIS/inst/apps/VIS_mt-ebiz/admin/scripts/adstrtal.sh APPS/APPS
ps -ef|grep LIBR
sleep 5
ps -ef|grep LIBR
ps -ef|grep LIBR |wc -l
```

```
[oracle@mt-ebiz scripts]$ cat stop_apps.sh
#!/bin/bash
. /OraApps/oracle/VIS/apps/apps_st/appl/APPSVIS_mt-ebiz.env
echo "starting apps services"
. /OraApps/oracle/VIS/inst/apps/VIS_mt-ebiz/admin/scripts/adstrtal.sh APPS/APPS
ps -ef|grep LIBR
sleep 5
ps -ef|grep LIBR
ps -ef|grep LIBR |wc -l
```

/etc/init.d/ebizora

```
[oracle@mt-ebiz scripts]$ cat /etc/init.d/ebizora
#!/bin/sh -x
#
case $1 in
'start')
    su - oracle -c ". /home/oracle/scripts/start_apps.sh"
    ;;
'stop')
    su - oracle -c ". /home/oracle/scripts/stop_apps.sh"
    ;;
*)
    echo "usage: $0 {start|stop}"
    exit
    ;;
esac
#
exit
```


Appendix C: References

VMware.com:

- VMware and Oracle database solutions page
<http://www.vmware.com/partners/alliances/technology/oracle.html>
- VMware virtualization products page
http://www.vmware.com/products/data_center.html
- VMware Site Recovery Manager
http://www.vmware.com/files/pdf/srm_datasheet.pdf
- VMware Site Recovery Manager administration guide
http://www.vmware.com/pdf/srm_10_admin.pdf
- VMware EBusiness Suite Deployment Guide
<http://www.vmware.com/files/pdf/customers/VMwareandOracleEBSDeploymentGuideFINAL.pdf>
- VMware Oracle Database deployment Guide
http://www.vmware.com/files/pdf/customers/07Q2_OracleDatabasesSoftwareSolutionsDeployment_wp_tiff_061207v2.pdf
- Simplify Database management with VMware Virtual Infrastructure 3 and CLARiiON Storage
<http://www.vmware.com/files/pdf/partners/vmw-drs-vmot-whitepaper.pdf>

EMC.com:

- EMC CLARiiON CX3 UltraScale Series datasheet
<http://www.emc.com/collateral/hardware/data-sheet/c1148-clariion-cx3-ds.pdf>
- EMC CLARiiON Integration with VMware ESX Server white paper
<http://www.emc.com/collateral/hardware/white-papers/h1416-emc-clariion-intgtn-vmware-wp.pdf>
- VMware ESX Server Using EMC CLARiiON Storage Systems Solutions Guide
<http://www.emc.com/collateral/software/solution-overview/h2197-vmware-esx-clariion-stor-syst-ldv.pdf>
- Maintaining End-to-End Service Levels for VMware Virtual Machines Using VMware DRS and EMC Navisphere QoS white paper
<http://www.emc.com/collateral/hardware/white-papers/h4089-maint-end-end-srv-c-vmware-virt-mach-vmware-drs-emc-navisphere-qos-wp.pdf>



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