# Oracle® Fusion Middleware

## Disaster Recovery Guide

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# Preface

This preface contains the following sections:

- Audience
- Documentation Accessibility
- Related Documents
- Conventions

## Audience

This document is intended for administrators, developers, and others whose role is to deploy and manage the Oracle Fusion Middleware Disaster Recovery solution using storage replication technology.

## Documentation Accessibility

For information about Oracle's commitment to accessibility, visit the Oracle Accessibility Program website at `http://www.oracle.com/us/corporate/accessibility/index.html`.

**Access to Oracle Support**

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## Related Documents

For more information, see the following documents in the Oracle Fusion Middleware documentation set:

- *Oracle Fusion Middleware High Availability Guide*
- *Oracle Fusion Middleware Enterprise Deployment Guide for Oracle SOA Suite*
- *Oracle Fusion Middleware Enterprise Deployment Guide for Oracle WebCenter Portal*
- *Oracle Fusion Middleware Enterprise Deployment Guide for Oracle WebCenter Content*
- *Oracle Fusion Middleware Enterprise Deployment Guide for Oracle Business Intelligence*

- *Oracle Fusion Middleware Enterprise Deployment Guide for Oracle Identity and Access Management*

## Conventions

The following text conventions are used in this document:

| Convention | Meaning |
|---|---|
| **boldface** | Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary. |
| *italic* | Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values. |
| `monospace` | Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter. |

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# Introduction to Oracle Fusion Middleware Disaster Recovery

Oracle Fusion Middleware Disaster Recovery is a disaster recovery solution that provides protection to Oracle Fusion Middleware components in different Oracle product suites.

This chapter includes the following sections:

- Overview of Oracle Fusion Middleware Disaster Recovery
  Learn about the problems Oracle Fusion Middleware Disaster Recovery solves and get familiar with the terminology.
- Setting Up Disaster Recovery for Oracle Fusion Middleware Components
  Learn how to set up your Disaster Recovery for an Oracle Fusion Middleware enterprise deployment.

## 1.1 Overview of Oracle Fusion Middleware Disaster Recovery

Learn about the problems Oracle Fusion Middleware Disaster Recovery solves and get familiar with the terminology.

This overview includes the following sections:

- Problem Description and Common Solutions
  Learn how to deploy an Oracle Fusion Middleware Disaster Recovery solution for enterprise deployments on Linux and UNIX operating systems, that make use of the storage replication and Oracle Data Guard technologies.
- Terminology
  Learn about Disaster Recovery terminology.

### 1.1.1 Problem Description and Common Solutions

Learn how to deploy an Oracle Fusion Middleware Disaster Recovery solution for enterprise deployments on Linux and UNIX operating systems, that make use of the storage replication and Oracle Data Guard technologies.

Providing Oracle Maximum Availability Architecture is one of the key requirements for any Oracle Fusion Middleware enterprise deployment. Oracle Fusion Middleware includes an extensive set of high availability features, such as process death detection and restart, server clustering, server migration, cluster integration, GridLink, load balancing, failover, backup and recovery, rolling upgrades, and rolling configuration changes, which protect an enterprise deployment from unplanned downtime and minimize planned downtime.

In addition, enterprise deployments need protection from unforeseen disasters and natural calamities. One protection solution involves setting up a standby site at a geographically different location than the production site. The standby site may have equal or fewer services and resources compared to the production site. Application data, metadata, configuration data, and security data are replicated periodically to the standby site. The standby site is normally in a passive mode; it is started when the production site is not available. This deployment model is sometimes referred to as an active-passive model. This model is usually adopted when the two sites are connected over a WAN and network latency does not allow clustering across the two sites.

A core strategy for and a key feature of Oracle Fusion Middleware is hot-pluggability. Built for the heterogeneous enterprise, Oracle Fusion Middleware consists of modular component software that runs on a range of popular platforms and inter-operates with other technologies and business applications. For instance, Oracle Fusion Middleware products such as ADF, Oracle BPEL Process Manager, Oracle Enterprise Service Bus, Oracle Web Services Manager, Adapters, Oracle Access Manager, Oracle Identity Governance, Rules, Oracle TopLink, and Oracle Business Intelligence Publisher can run on non-Oracle containers such as IBM Websphere and JBoss, in addition to running on the Oracle WebLogic Server container.

The Oracle Fusion Middleware Disaster Recovery solution uses storage replication technology for disaster protection of Oracle Fusion Middleware middle tier components. It supports hot-pluggable deployments, and it is compatible with third-party vendor recommended solutions.

Disaster protection for Oracle databases that are included in your Oracle Fusion Middleware is provided through Oracle Data Guard.

## 1.1.2 Terminology

Learn about Disaster Recovery terminology.

Disaster Recovery uses the following terms:

- **Asymmetric Topology**

  An Oracle Fusion Middleware Disaster Recovery configuration that is different across tiers on the production site and standby site. For example, an asymmetric topology can include a standby site with fewer hosts and instances than the production site. Creating an Asymmetric Standby Site describes how to create asymmetric topologies.

- **Disaster**

  A sudden, unplanned catastrophic event that causes unacceptable damage or loss. A disaster is an event that compromises an organization's ability to provide critical functions, processes, or services for some unacceptable period of time and causes the organization to invoke its recovery plans.

- **Disaster Recovery**

  The ability to safeguard against natural or unplanned outages at a production site by having a recovery strategy for applications and data to a geographically separate standby site.

- **Alias Host Name**

  This guide differentiates between the terms alias host name and physical host name.

  The alias host name is an alternate way to access the system besides its real network name. Typically, it resolves to the same IP address as the network name of the system. This can be defined in the name resolution system such as DNS, or locally in the local hosts file on each system. Multiple alias host names can be defined for a given system.

See also the **Physical Host Name** definition later in this section.

- **Physical Host Name**

  The physical host name is the host name of the system as returned by the `gethostname()` call or the `hostname` command. Typically, the physical host name is also the network name used by clients to access the system. In this case, an IP address is associated with this name in the DNS (or the given name resolution mechanism in use) and this IP is enabled on one of the network interfaces to the system.

  A given system typically has one physical host name. It can also have one or more additional network names, that correspond to the IP addresses enabled on its network interfaces, which are used by clients to access it over the network. Further, each network name can be aliased with one or more alias host names.

  See also the **Alias Host Name** definition earlier in this section.

- **Virtual Host Name**

  Virtual host name is a network addressable host name that maps to one or more physical systems through a load balancer or a hardware cluster. For load balancers, the name *virtual server name* is used interchangeably with *virtual host name* in this book. A load balancer can hold a virtual host name on behalf of a set of servers, and clients communicate indirectly with the systems by using the virtual host name. A virtual host name in a hardware cluster is a network host name assigned to a cluster virtual IP. Because the cluster virtual IP is not permanently attached to any particular node of a cluster, the virtual host name is not permanently attached to any particular node either.

  > **Note:**
  >
  > Whenever the term *virtual host name* is used in this document, it is assumed to be associated with a virtual IP address. In cases where just the IP address is needed or used, it is explicitly stated.

- **Virtual IP**

  Generally, a virtual IP can be assigned to a hardware cluster or load balancer. To present a single system view of a cluster to network clients, a virtual IP serves as an entry point IP address to the group of servers which are members of the cluster. A virtual IP can be assigned to a server load balancer or a hardware cluster.

  A hardware cluster uses a cluster virtual IP to present to the outside world the entry point into the cluster (it can also be set up on a standalone system). The hardware cluster's software manages the movement of this IP address between the two physical nodes of the cluster, while clients connect to this IP address without the need to know which physical node this IP address is currently active on. In a typical two-node hardware cluster configuration, each system has its own physical IP address and physical host name, while there could be several cluster IP addresses. These cluster IP addresses float or migrate between the two nodes. The node with current ownership of a cluster IP address is active for that address.

A load balancer also uses a virtual IP as the entry point to a set of servers. These servers tend to be active at the same time. This virtual IP address is not assigned to any individual server but to the load balancer that acts as a proxy between servers and their clients.

- **Production Site Setup**

  To create the production site by using the procedure described in this manual, you must plan and create physical host names and alias host names, create mount points and symbolic links (if applicable) on the hosts to the Oracle home directories on the shared storage where the Oracle Fusion Middleware instances are installed, install the binary files and instances, and deploy the applications. Note that symbolic links are required only in cases where the storage system does not guarantee consistent replication across multiple volumes. See Storage Replication for more details about symbolic links.

- **Site Failover**

  The process of making the current standby site the new production site after the production site becomes unexpectedly unavailable. For example, due to a disaster at the production site. This book also uses the term *failover* to refer to a site failover.

- **Site Switchback**

  The process of reverting the current production site and the current standby site to their original roles. Switchbacks are planned operations done after the switchover operation has been completed. A switchback restores the original roles of each site: the current standby site becomes the production site and the current production site becomes the standby site. This book also uses the term *switchback* to refer to a site switchback.

- **Site Switchover**

  The process of reversing the roles of the production site and standby site. Switchovers are planned operations done for periodic validation or to perform planned maintenance on the current production site. During a switchover, the current standby site becomes the new production site, and the current production site becomes the new standby site. This book also uses the term *switchover* to refer to a site switchover.

- **Site Synchronization**

  The process of applying changes made to the production site at the standby site. For example, when a new application is deployed at the production site, you should perform a synchronization so that the same application is also deployed at the standby site.

- **Standby Site Setup**

  The process of creating the standby site. To create the standby site by using the procedure described in this manual, you must plan and create physical host names and alias host names, and create mount points and symbolic links (if applicable) to the Oracle home directories on the standby shared storage. Note that symbolic links are required only in cases where the storage system does not guarantee consistent replication across multiple volumes. See Storage Replication for more details about symbolic links.

- **Symmetric Topology**

  An Oracle Fusion Middleware Disaster Recovery configuration that is completely identical across tiers on the production site and standby site. In a symmetric topology, the production site and standby site have the identical number of hosts, load balancers, instances, and applications. The same ports are used for both sites. The systems are configured identically and the applications access the same data. This guide describes how to set up a symmetric Oracle Fusion Middleware Disaster Recovery topology for an enterprise configuration.

- **Topology**

  The production site and standby site hardware and software components that comprise an Oracle Fusion Middleware Disaster Recovery solution.

- **Target**

  Targets are core Enterprise Manager entities, which represent the infrastructure and business components in an enterprise. These components need to be monitored and managed for efficient functioning of the business. For example, Oracle Fusion Middleware farm or Oracle Database.

- **System**

  A System is a set of targets (hosts, databases, application servers, and so on) that work together to host your applications. To monitor an application in Enterprise Manager, you would first create a System, that consists of the database, listener, application server, and hosts targets on which the application runs.

- **Site**

  Site is a set of different targets in a datacenter needed to run a group of applications. For example, a site could consist of Oracle Fusion Middleware instances, databases, storage, and so on. A datacenter may have more than one site defined by Oracle Site Guard and each of them managed independently for operations such as switchover and failover.

## 1.2 Setting Up Disaster Recovery for Oracle Fusion Middleware Components

Learn how to set up your Disaster Recovery for an Oracle Fusion Middleware enterprise deployment.

The following section describe the setup details:

- Oracle Fusion Middleware Disaster Recovery Architecture Overview
  Learn about the deployment architecture for Oracle Fusion Middleware components and the methods it supports to protect Oracle Fusion Middleware data and database content.
- Components Described in This Document
  Learn about the Oracle product suites that Oracle Fusion Middleware Disaster Recovery supports.

### 1.2.1 Oracle Fusion Middleware Disaster Recovery Architecture Overview

Learn about the deployment architecture for Oracle Fusion Middleware components and the methods it supports to protect Oracle Fusion Middleware data and database content.

The product binary files and configuration for Oracle Fusion Middleware components and applications get deployed in Oracle home directories on the middle tier. In addition, most of the products also have metadata or runtime data stored in a database repository. Therefore, the Oracle Fusion Middleware Disaster Recovery solution keeps middle tier file system data and middle tier data stored in databases at the production site synchronized with the standby site.

To protect Oracle Fusion Middleware data and database content, Oracle Fusion Middleware Disaster Recovery supports the following methods:

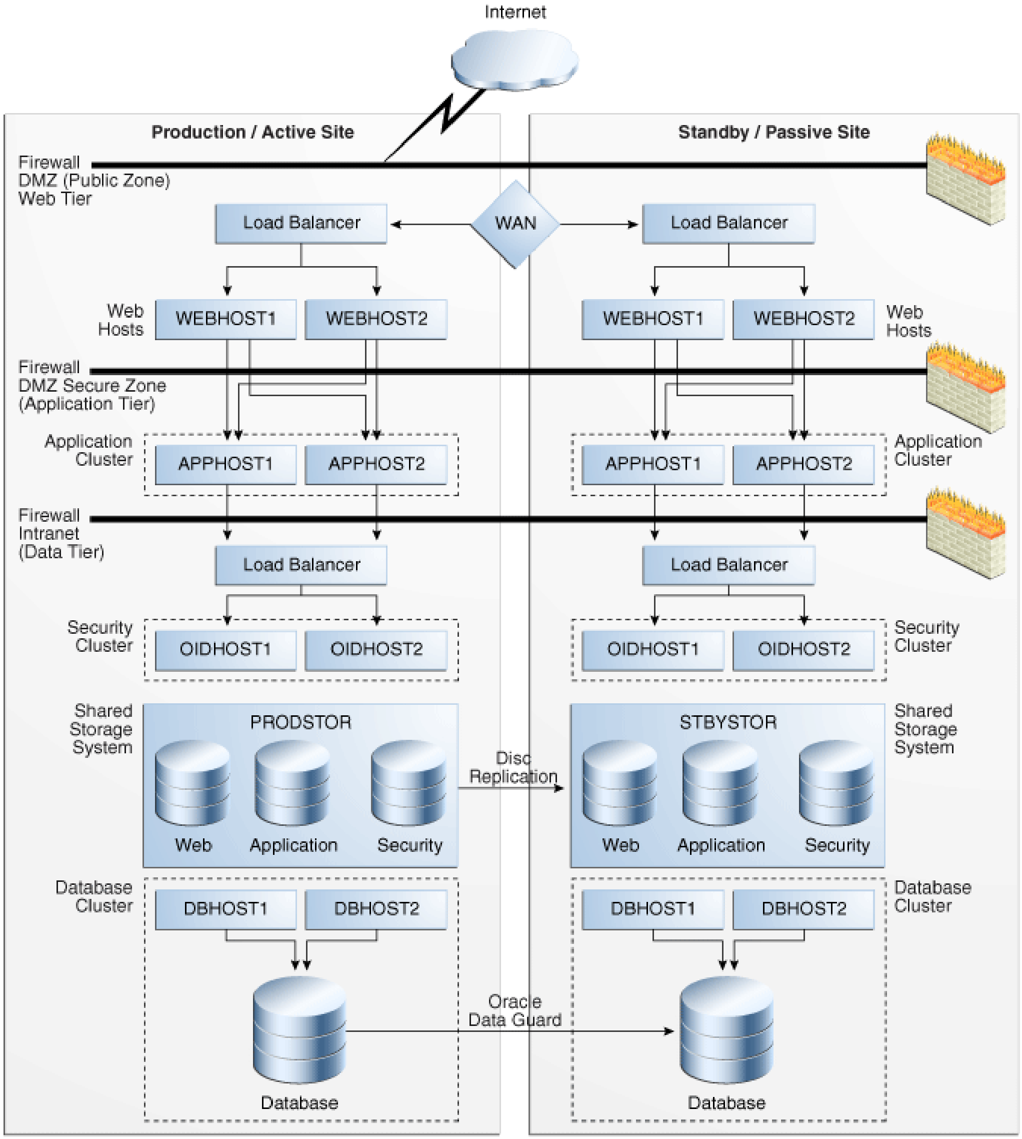
- Oracle Fusion Middleware product binary files, configuration files, and metadata files

  Use storage replication technologies.
- Database content

  Use Oracle Data Guard for Oracle databases (and vendor-recommended solutions for third party databases).

Figure 1-1 shows an overview of an Oracle Fusion Middleware Disaster Recovery topology.

**Figure 1-1 Production and Standby Sites for Oracle Fusion Middleware Disaster Recovery Topology**



Some of the key aspects of the solution in Figure 1-1 are:

- The solution has two sites. The current production site is running and active, while the second site is serving as a standby site and is in passive mode.
- Hosts on each site have mount points that are defined for accessing the shared storage system for the site.
- On both sites, the Oracle Fusion Middleware components are deployed on the site's shared storage system. This involves creating all the Oracle home directories, which include product binary files and configuration data for middleware components, in volumes on the production site's shared storage and then installing the components into the Oracle home directories on the shared storage. In Figure 1-1, a separate volume is created in the shared storage for each Oracle Fusion Middleware host cluster (note the Web, Application, and Security

volumes created for the Web Cluster, Application Cluster, and Security Cluster in each site's shared storage system).

- Mount points must be created on the shared storage for the production site. The Oracle Fusion Middleware software for the production site is installed into Oracle home directories by using the mount points on the production site shared storage. Symbolic links may also need to be set up on the production site hosts to the Oracle home directories on the shared storage at the production site. Note that symbolic links are required only in cases where the storage system does not guarantee consistent replication across multiple volumes. See Storage Replication for more details about symbolic links.
- Mount points must be created on the shared storage for the standby site. Symbolic links also need to be set up on the standby site hosts to the Oracle home directories on the shared storage at the standby site. Note that symbolic links are required only in cases where the storage system does not guarantee consistent replication across multiple volumes. See Storage Replication for more details about symbolic links. The mount points and symbolic links for the standby site hosts must be identical to those set up for the equivalent production site hosts.
- Storage replication technology is used to copy the middle tier file systems and other data from the production site's shared storage to the standby site's shared storage.
- After storage replication is enabled, application deployment, configuration, metadata, data, and product binary information is replicated from the production site to the standby site.
- It is not necessary to perform any Oracle software installations at the standby site hosts. When the production site storage is replicated at the standby site storage, the equivalent Oracle home directories and data are written to the standby site storage.
- Schedule incremental replications at a specified interval. The recommended interval is once a day for the production deployment, where the middle tier configuration does not change very often. In addition, you should force a manual synchronization whenever you make a change to the middle tier configuration at the production site. For example, if you deploy a new application at the production site. Some Oracle Fusion Middleware components generate data on the file system, which may require more frequent replication based on recovery point objectives. See Recommendations for Oracle Fusion Middleware Components for detailed Disaster Recovery recommendations for Oracle Fusion Middleware components.
- Before you force a manual synchronization, you should take a snapshot of the site to capture its current state. This ensures that the snapshot gets replicated to the standby site storage and can be used to roll back the standby site to a previous synchronization state, if needed. Recovery to the point of the previously successful replication (for which a snapshot was created) is possible when a replication fails.
- Oracle Data Guard is used to replicate all Oracle database repositories, including Oracle Fusion Middleware repositories and custom application databases. For information about using Oracle Data Guard to provide disaster protection for Oracle databases, see Database Considerations.
- If your Oracle Fusion Middleware Disaster Recovery topology includes any third-party databases, use the vendor-recommended solution for those databases.
- User requests are initially routed to the production site.

- When there is a failure or planned outage of the production site, perform the following steps to enable the standby site to assume the production role in the topology:
  1. Stop the replication from the production site to the standby site (when a failure occurs, replication may have already been stopped due to the failure).
  2. Perform a failover or switchover of the Oracle databases using Oracle Data Guard.
  3. Start the services and applications on the standby site.
  4. Use a global load balancer to reroute user requests to the standby site. At this point, the standby site has assumed the production role.

## 1.2.2 Components Described in This Document

Learn about the Oracle product suites that Oracle Fusion Middleware Disaster Recovery supports.

Oracle Fusion Middleware Disaster Recovery supports components from various Oracle suites, including:

- Oracle WebLogic Server

  See Recommendations for Oracle WebLogic Server for Disaster Recovery recommendations for Oracle WebLogic Server components.
- Oracle SOA Suite components:
  - Oracle SOA Service Infrastructure
  - Oracle BPEL Process Manager
  - Oracle Mediator
  - Oracle Human Workflow
  - Oracle B2B
  - Oracle Web Services Manager
  - Oracle User Messaging Service
  - Oracle JCA Adapters
  - Oracle Business Activity Monitoring
  - Oracle Business Process Management

  See Recommendations for Oracle SOA Suite for Disaster Recovery recommendations for Oracle SOA Suite components.
- Oracle BI Suite components
  - Oracle Business Intelligence Enterprise Edition (EE)
  - Oracle Business Intelligence Publisher

  See Recommendations for Oracle Business Intelligence Suite for Disaster Recovery recommendations for Oracle BI Suite components.

# 2 Recommendations for Oracle Fusion Middleware Components

Learn about the disaster protection requirements for Oracle Fusion Middleware components in different Oracle product suites and recommendations for synchronizing those components.

Oracle Fusion Middleware Disaster Recovery uses storage replication to synchronize the middle tier content, and uses Oracle Data Guard to synchronize data in Oracle databases and custom application databases that are included in your topology.

> **Note:**
>
> Certain artifacts such as Oracle Inventory, the `beahomelist`, the `oratab` and the `oraInst.loc` files are common across all Oracle product deployments. These artifacts change very rarely and need not be part of the regular storage replication and synchronization activity. Oracle recommends that you place Oracle Inventory, the `beahomelist`, the `oratab`, and the `oraInst.loc` files on the local disk of your systems. These artifacts should be manually updated upon creation, as well as upon applying patch updates. If required by your environment, these artifacts can also be on shared storage.
> For information about managing Oracle Inventory, see Managing Oracle Inventory.

For related information, see the following documents:

- *Oracle Fusion Middleware High Availability Guide*
- *Oracle Fusion Middleware Enterprise Deployment Guide for Oracle SOA Suite*
- *Oracle Fusion Middleware Enterprise Deployment Guide for Oracle WebCenter Portal*
- *Oracle Fusion Middleware Enterprise Deployment Guide for Oracle Business Intelligence*
- *Oracle Fusion Middleware Administering Oracle Fusion Middleware*

This chapter includes the following sections:

- Recommendations for Oracle WebLogic Server
  Oracle WebLogic Server is a scalable, enterprise-ready Java Platform, Enterprise Edition (Java EE) application server.
- Recommendations for Oracle SOA Suite
  Oracle SOA Suite is an Oracle Fusion Middleware component that provides a complete set of service infrastructure components for designing, deploying, and managing SOA composite applications.

- Recommendations for Oracle Business Intelligence Suite
  Oracle Business Intelligence Suite (Oracle BI) is a portfolio of technology and applications that provides the industry's first integrated, end-to-end Enterprise Performance Management System, including Oracle Business Intelligence foundation and tools as well as financial performance management applications, operational Oracle Business Intelligence applications, and data warehousing.
- Recommendations for Oracle WebCenter Portal
  Oracle WebCenter Portal is an Oracle Fusion Middleware component that provides a personalized, secure, and efficient way of presenting and consuming information, collaborating with others, and interacting with applications in the context of business processes.
- Recommendations for Oracle WebCenter Content
  Oracle WebCenter Content is an integrated suite of products designed to manage enterprise content.

## 2.1 Recommendations for Oracle WebLogic Server

Oracle WebLogic Server is a scalable, enterprise-ready Java Platform, Enterprise Edition (Java EE) application server.

The Oracle WebLogic Server infrastructure supports the deployment of many types of distributed applications, and is an ideal foundation for building applications based on the Oracle Fusion Middleware product suite.

The following artifacts and considerations apply to all WebLogic Server components, along with the component-specific recommendations.

- **Artifacts on the File System**

  Oracle home: The Oracle home consists of a WebLogic home that has the WebLogic Server binary files.

  Domain home: The domain home contains the configuration data and the applications for the WebLogic domain.

- **Network Artifacts**

  Oracle recommends that you use a virtual alias (instead of physical host names) as the listen address for both Oracle WebLogic Administration server and the Managed Servers. As long as this alias can be resolved on both the production and standby sites, there is no need to update this value after a Disaster Recovery operation.

  If your environment requires whole server migration to be configured, then use the virtual host name as the listen address of the Managed Servers that are configured for whole server migration. To avoid manually updating the listen address after a Disaster Recovery operation, ensure that the host name can be resolved on both the primary and standby sites.

  Configure the load balancer virtual host, which is used for accessing the WebLogic Server applications, on both the production and standby sites.

The rest of this section describes Disaster Recovery recommendations for the following Oracle WebLogic Server components:

- Recommendations for Oracle WebLogic Server Java Message Service (JMS) and Transaction Logs (T-Logs)
  Learn about the Oracle WebLogic Server JMS and T-Log artifacts and what Oracle recommends for disaster recovery.
- Recommendations for Oracle Platform Security Services
  Learn about the Oracle Platform Security Services artifacts and what Oracle recommends for disaster recovery.

## 2.1.1 Recommendations for Oracle WebLogic Server Java Message Service (JMS) and Transaction Logs (T-Logs)

Learn about the Oracle WebLogic Server JMS and T-Log artifacts and what Oracle recommends for disaster recovery.

- **Artifacts on the File System:**

  File-based persistent stores: The file store location for the JMS and T-Log when you use a file-based persistent store.
- **Artifacts in the Database:**

  The schema that contains the JMS messages, when you use database-based persistent stores. The schema that contains Logging Last Resource (LLR) transaction log records for WebLogic applications that leverage the JDBC LLR option.

  When automatic whole server migration is configured, the required leasing table is in the database.
- **Special Considerations:**
  - Messages are lost if they were enqueued after the system restore point time but never processed. Message duplicates are generated for messages enqueued before the restore point time, but dequeued and acknowledged or committed (processed) after this time.
  - If the persistent store is a custom store that is dedicated to JMS use, then you can delete the entire store.
  - Restoring different parts of the system to different points in time can lead to inconsistent data. This can occur when the message store, transaction log, or application database are synchronized differently. For example, a message may reference a database row that does not exist, or the reverse. This may delete unprocessed messages in addition to duplicate messages.
  - If the store is not dedicated to JMS use, then use the Oracle WebLogic Server JMS message management administrative tooling. This tooling can perform import, export, move, and delete operations from the Administration Console, MBeans, and WebLogic Scripting Tools (WLST).
  - When applications use both queues and topics, ensure that you manipulate both the queue and topic subscriptions.
- **Synchronization Recommendations:**
  - If JMS data is critical, then synchronize transaction log data and JMS data in real time by using synchronous replication. Using synchronous replication may have performance implications.

  - If data consistency between tiers is important, then ensure that the database and application tiers are replicated at the same time. This helps ensure that the different tiers recover to the same exact point in time.
  - Use Oracle Data Guard to replicate the primary site and standby site when you use database-based persistent stores.
  - When you use a storage device that does not support block-level snapshot capabilities, shut down the JMS server to create a consistent backup. This ensures that the persistence store is not being written to while the copy operation is being performed. In a clustered environment, shut down one server at a time, back it up, and restart it. You also can create a script to perform these operations by using WLST.

- **Recovery Recommendations:**

  Recover the database schema that contains the persistent stores for the Administration Server and the Managed Servers in the WLS domain to the most recent point in time.

  Also, use the following recovery recommendations to avoid duplicate messages.

**Avoiding Duplicate Messages**

Perform the following procedure before recovery to filter messages in the JMS queue after persistent-store recovery, to avoid processing duplicate messages:

> **Note:**
>
> Do not drain and discard messages without being certain that the messages contain no data that must be preserved. The recovered messages may include unprocessed messages with important application data, in addition to duplicate messages that have already been processed.

1. Sign in to the Oracle WebLogic Server Administration Console.
2. Before recovery, configure JMS server to pause Production, Insertion, and Consumption operations at Startup. This ensures that no new messages are produced or inserted into the destination or consumed from the destination before you drain stale messages. To do this:
   a. Expand **Services**, then **Messaging**, and then **JMS Servers**.
   b. On the Summary of JMS Servers page, click the JMS server that you want to configure for message pausing.
   c. On the Configuration: General page, click **Advanced** to define the message pausing options. Select **Insertion Paused At Startup**, **Production Paused At Startup**, and **Consumption Paused At Startup**.
   d. Click **Save**.
   e. To activate these changes, in the Change Center of the Administration Console, click **Activate Changes**.

**Use the following procedure after recovery:**

1. After you recover the persistent store, start the Managed Servers.
2. Drain the stale messages from JMS destinations by following these steps:

a. Expand **Services**, then **Messaging**, and then **JMS Modules**.
b. Select a JMS module, and then select a destination.
c. Select **Monitoring**, and then click **Show Messages**.
d. Click **Delete All**.

Resume operations by following the instructions listed in step 2.

### 2.1.2 Recommendations for Oracle Platform Security Services

Learn about the Oracle Platform Security Services artifacts and what Oracle recommends for disaster recovery.

- **Artifacts in the Database:**

  Oracle Platform Security Services have database dependencies.

- **Synchronization Recommendations:**

  You must manually synchronize the application tier with the standby site after you make configuration changes and applying patches.

  You should configure Oracle Data Guard for the Oracle database metadata repositories.

  When the application tier synchronization is initiated on the storage, Oracle recommends that you synchronize the standby database. This synchronization occurs automatically because Oracle Data Guard is configured in Managed Recovery mode (the recommended configuration) for the database. If the standby database is not in Managed Recovery mode, then you should manually synchronize the standby database. See Synchronizing Databases Manually and Applying Redo Data to Physical Standby Databases.

- **Recovery Recommendations:**

  Recover the Administration Server and the Managed Servers in the WebLogic Server domain.

## 2.2 Recommendations for Oracle SOA Suite

Oracle SOA Suite is an Oracle Fusion Middleware component that provides a complete set of service infrastructure components for designing, deploying, and managing SOA composite applications.

Oracle SOA Suite enables services to be created, managed, and orchestrated into SOA composite applications that combine multiple technology components.

A SOA composite application consists of:

- Service components: Service components are the basic building blocks of SOA composite applications. Service components implement part of the overall business logic of the SOA composite application. Oracle BPEL Process Manager, Oracle Mediator, Oracle Human Workflow, and Business Rules are examples of service components.
- Binding components: Binding components connect SOA composite applications to external services, applications, and technologies. Binding components are organized into two groups:

- Services: Provide the outside world with an entry point to the SOA composite application. The WSDL file of the service advertises its capabilities to external applications. The service bindings define how a SOA composite service can be invoked. For example, through SOAP.
- References: Enable messages to be sent from the SOA composite application to external services. For example, the same functionality that partner links provide for BPEL processes, but at the higher SOA composite application level.

> **Note:**
>
> In older Oracle SOA Suite releases, such as 11*g*, the soa-infra and service-engine configuration files were stored in local or shared storage files as part of the domain configuration. Starting with Oracle SOA Suite 12*c* R1, those files reside in the metadata repository database. Thus, soa-infra and service-engine configuration changes are now immediately propagated across a cluster.
>
> The Disaster Recovery recommendations for Oracle SOA Suite assume that you are using Oracle SOA Suite 12*c* R2 (12.2.1) release.

Oracle SOA Suite artifacts are stored on the local or shared file system as well as in the metadata repositories. Composite artifacts are stored in the metadata repository, and binary files and domain-related configuration files are stored on a local or shared file system.

**Common Artifacts and Considerations for All Oracle SOA Suite Components**

The following artifacts and considerations apply to all the Oracle SOA Suite components, along with the component-specific considerations.

**Artifacts on the File System**

Oracle home: The Oracle home consists of a WebLogic home that has the WebLogic Server binary files and an Oracle home that contains the Oracle SOA Suite binary files.

Oracle Common Home: This is Oracle home that contains the binary and library files required for the Oracle Enterprise Manager Fusion Middleware Control and Java Required Files (JRF).

Domain home: The domain home contains the configuration data and SOA composites for the SOA domain.

**Network Artifacts**

Oracle recommends that you use virtual host name as the listen address for both the Oracle WebLogic Administration Server and Managed Server. As long as this host name can be resolved on both the production and standby sites, there is no need to update this value after a Disaster Recovery operation. See *Oracle Fusion Middleware Enterprise Deployment Guide for Oracle SOA Suite* for instructions for updating an IP address to a virtual host name.

The load balancer virtual hosts required for accessing the Oracle SOA Suite components should be configured on both the production and standby sites.

### Artifacts in the Database

Oracle SOA Suite schemas, Service Infrastructure and Service Engine configurations, and composite definitions are stored in the Oracle SOA Suite database and metadata repository.

### Synchronization Recommendations

The application tier must be manually synchronized with the standby site after you make changes in the domain-related configuration, deploy composites, and apply patches.

You should configure Oracle Data Guard for the Oracle SOA Suite database and metadata repository.

When the application tier synchronization is initiated on the storage, Oracle recommends that you synchronize the standby database. This synchronization occurs automatically because Oracle Data Guard is configured in Managed Recovery mode (the recommended configuration) for the database. If the standby database is not in Managed Recovery mode, then you should manually synchronize the standby database. See Synchronizing Databases Manually and Applying Redo Data to Physical Standby Databases.

### Recovery Recommendations

The database must be recovered to the most recent point in time to ensure that the latest composite definitions and in-flight instances are restored.

In-flight instances require matching the composite definition to continue processing. For this reason, the metadata repository (where composite definitions are stored) and Oracle SOA Suite database (where the process state is maintained) must be recovered to the same point in time.

In redeployed composites, a database recovery ensures consistency between the dehydrated in-flight processes and their corresponding definition because the process definition is stored in database repository where dehydrated instances are stored.

The following sections describe Disaster Recovery recommendations for Oracle SOA Suite components:

- Recommendations for Oracle SOA Service Infrastructure
  Oracle SOA Service Infrastructure is a Java EE application that provides the foundation services for running Oracle SOA Suite.
- Recommendations for Oracle BPEL Process Manager
  The Oracle BPEL Process engine is the service engine running in an Oracle SOA Service Infrastructure that allows the execution of BPEL processes.
- Recommendations for Oracle Mediator
  Oracle Mediator is a service engine within the Oracle SOA Service Infrastructure that provides the framework to mediate between providers and consumers of services and events.
- Recommendations for Oracle Human Workflow
  Oracle Human Workflow is a service engine running in the Oracle SOA Service Infrastructure that allows the execution of interactive human-driven processes and the human interaction support such as approvals, rejects, and reassign actions.

- Recommendations for Oracle B2B
  Oracle B2B connects SOA composite applications to external services, applications, and technologies, and offers a multi-protocol gateway that supports industry-recognized business-to-business (B2B) standards.
- Recommendations for Oracle Web Services Manager
  Oracle Web Services Manager (Oracle WSM) provides a policy framework to manage and secure web services consistently across your organization. Oracle Web Services Manager consists of the Policy Manager and the Agent.
- Recommendations for Oracle User Messaging Service
  Oracle User Messaging Service enables two-way communication between users and deployed applications and it supports a variety of channels, such as email, IM, SMS, and text-to-voice messages.
- Recommendations for Oracle Java EE Connector Architecture (JCA) Adapters
  Oracle JCA Adapters are JCA binding components that allow the Service Infrastructure to communicate by using different protocols.
- Recommendations for Oracle Business Activity Monitoring
  Oracle Business Activity Monitoring (Oracle BAM) provides the tools for monitoring business services and processes in the enterprise and allows quick correlation of market indicators to the actual and changing business processes.
- Recommendations for Oracle Business Process Management
  The Oracle Business Process Management ( Oracle BPM) Suite provides an integrated environment for developing, administering, and using business applications centered around business processes.

## 2.2.1 Recommendations for Oracle SOA Service Infrastructure

Oracle SOA Service Infrastructure is a Java EE application that provides the foundation services for running Oracle SOA Suite.

This Java EE application is a runtime engine that is automatically deployed when Oracle SOA Suite is installed. You deploy composites (the basic artifacts in a Service Component Architecture) to the Oracle SOA Infrastructure and it provides the required services for the composites to run. Oracle SOA Infrastructure provides deployment, wiring, and thread management services for the composites. These services sustain the lifecycle and runtime operations of the composite.

This section describes various Oracle SOA Service Infrastructure artifacts and provides recommendations for disaster recovery.

**Artifacts in the Database**

Composite definition and configuration files are stored in the MDS repository. The composite instance state persistence is stored in the Oracle SOA Service Infrastructure database.

**Synchronization Recommendations**

The application tier must be manually synchronized with the standby site after you make changes in the domain-related configuration, deploy composites, and apply patches.

You should configure Oracle Data Guard for the Oracle SOA Suite database and metadata repository.

When the application tier synchronization is initiated on the storage, Oracle recommends that you synchronize the standby database. This synchronization occurs automatically because Oracle Data Guard is configured in Managed Recovery mode (the recommended configuration) for the database. If the standby database is not in Managed Recovery mode, then you should manually synchronize the standby database.

**Recovery Recommendations**

The database must be recovered to the most recent point in time to ensure that the latest composite definitions and in-flight instances are restored.

## 2.2.2 Recommendations for Oracle BPEL Process Manager

The Oracle BPEL Process engine is the service engine running in an Oracle SOA Service Infrastructure that allows the execution of BPEL processes.

A BPEL process provides the standard for assembling a set of discrete services into an end-to-end process flow, and developing synchronous and asynchronous services into end-to-end BPEL process flows. It provides process orchestration and storage of long-running, asynchronous processes.

This section describes the various Oracle BPEL Process Manager artifacts and provides recommendations for disaster recovery.

**Artifacts in the Database**

Process definition and configuration files are stored in the MDS repository. The BPEL process state persistence is stored in the Oracle SOA Suite database.

**Synchronization Recommendations**

The application tier must be manually synchronized with the standby site after you make domain-related configuration changes and apply patches.

You should configure Oracle Data Guard for the Oracle SOA Suite database and metadata repository.

When the application tier synchronization is initiated on the storage, Oracle recommends that you synchronize the standby database. This synchronization occurs automatically because Oracle Data Guard is configured in Managed Recovery mode (the recommended configuration) for the database. If the standby database is not in Managed Recovery mode, then you should manually synchronize the standby database.

**Recovery Recommendations**

The database must be recovered to the most recent point in time to ensure that the latest process definitions and in-flight instances are restored. Idempotent Oracle BPEL Process Manager processes are recommended, because no cleanup is required after you perform a Disaster Recovery operation. If non-idempotent Oracle BPEL Process Manager processes are used, then processes must be cleaned up from the dehydration store after you perform Disaster Recovery operation, especially when a process is in flight.

## 2.2.3 Recommendations for Oracle Mediator

Oracle Mediator is a service engine within the Oracle SOA Service Infrastructure that provides the framework to mediate between providers and consumers of services and events.

Oracle Mediator runs in place with the SOA Service Infrastructure Java EE application.

This section describes various Oracle Mediator artifacts and provides recommendations for disaster recovery.

**Artifacts in the Database**

The Mediator service engine stores messages in the database for asynchronous routing for parallel routing rules. The Mediator component instance state and audit details are also stored in the database.

The metadata repository stores the Mediator component definition as part of the composite definition.

> **Note:**
>
> Sequential routing rules do not persist their messages into the database as part of the execution.

**Synchronization Recommendations**

The application tier must be manually synchronized with the standby site after you make changes in the domain-related configuration and apply patches.

You should configure Oracle Data Guard for the Oracle SOA Suite database and metadata repository.

When the application tier synchronization is initiated on the storage, Oracle recommends that you synchronize the standby database . This synchronization occurs automatically because Oracle Data Guard is configured in Managed Recovery mode (the recommended configuration) for the database. If the standby database is not in Managed Recovery mode, then you should manually synchronize the standby database.

**Recovery Recommendations**

The database must be recovered to the most recent point in time, along with the Administration Server and the Managed Server running the SOA application.

## 2.2.4 Recommendations for Oracle Human Workflow

Oracle Human Workflow is a service engine running in the Oracle SOA Service Infrastructure that allows the execution of interactive human-driven processes and the human interaction support such as approvals, rejects, and reassign actions.

The Human Workflow service consists of several services that handle various aspects of human interaction with a business process.

This section describes the various Oracle Human Workflow artifacts and provides recommendations for disaster recovery.

**Artifacts in the Database**

Human workflow instance data and other worklist data such as vacation rules, group rules, flex field mappings, and view definitions are stored in the database.

The metadata repository is used to store shared human workflow service definitions and schemas that are used by SOA composites.

**Synchronization Recommendations**

The application tier must be manually synchronized with the standby site after you make changes in the domain configuration and apply patches.

You should configure Oracle Data Guard for the Oracle SOA Suite database and metadata repository.

When the application tier synchronization is initiated on the storage, Oracle recommends that you synchronize the standby database . This synchronization occurs automatically because Oracle Data Guard is configured in Managed Recovery mode (the recommended configuration) for the database. If the standby database is not in Managed Recovery mode, then you should manually synchronize the standby database.

**Recovery Recommendations**

The database must be recovered to the most recent point in time, along with the Managed Server running the SOA application. The Oracle Human Workflow engine uses Oracle User Messaging Service to send and receive notifications. See Recommendations for Oracle User Messaging Service for details about Oracle User Messaging Service.

## 2.2.5 Recommendations for Oracle B2B

Oracle B2B connects SOA composite applications to external services, applications, and technologies, and offers a multi-protocol gateway that supports industry-recognized business-to-business (B2B) standards.

Oracle B2B extends Oracle SOA Suite with business protocol standards, such as electronic data interchange (EDI), ebXML, HL7, and RosettaNet. Oracle B2B is implemented as a binding component within the SOA Service Infrastructure.

This section describes the various Oracle B2B artifacts and provides recommendations for disaster recovery.

**Artifacts on the File System**

JMS Store: The volume that contains the file-based JMS persistent store. Table 2-1 shows the JMS queues that Oracle B2B uses internally.

**Table 2-1 JMS Queues Used by Oracle B2B**

| JMS Artifact Name | Type | JNDI Name |
|---|---|---|
| `dist_B2BEventQueue_auto` | Distributed queue | `jms/b2b/B2BEventQueue` |
| `dist_B2B_IN_QUEUE_auto` | Distributed queue | `jms/b2b/B2B_IN_QUEUE` |

**Table 2-1 (Cont.) JMS Queues Used by Oracle B2B**

| JMS Artifact Name | Type | JNDI Name |
|---|---|---|
| `dist_B2B_OUT_QUEUE_auto` | Distributed queue | `jms/b2b/B2B_OUT_QUEUE` |
| `dist_B2BBroadcastTopic_auto` | Distributed topic | `jms/b2b/B2BBroadcastTopic` |

**Artifacts in the Database**

Oracle B2B message and message state persistence are stored in the Oracle SOA Suite database along with the partners, documents, and channels definitions. The metadata repository is used for storing Oracle B2B metadata.

**Special Considerations**

If these adapters are used, the external FTP servers and email servers should be available on the standby site .

**Synchronization Recommendations**

For information about Oracle B2B JMS queue synchronization and recovery, see Recommendations for Oracle WebLogic Server Java Message Service (JMS) and Transaction Logs (T-Logs).

The application tier must be manually synchronized with the standby site after you make changes in the domain-related configuration and apply patches.

You should configure Oracle Data Guard for the Oracle SOA Suite database and metadata repository.

When the application tier synchronization is initiated on the storage, Oracle recommends that you synchronize the standby database. This synchronization occurs automatically because Oracle Data Guard is configured in Managed Recovery mode (the recommended configuration) for the database. If the standby database is not in Managed Recovery mode, then you should manually synchronize the standby database.

**Recovery Recommendations**

The database must be recovered to the most recent point in time, along with the Managed Server running the SOA application. Oracle B2B stores state information within JMS queues and the SOA runtime database, so recovering the database and the Managed Server ensures that the application runs normally.

## 2.2.6 Recommendations for Oracle Web Services Manager

Oracle Web Services Manager (Oracle WSM) provides a policy framework to manage and secure web services consistently across your organization. Oracle Web Services Manager consists of the Policy Manager and the Agent.

Oracle WSM provides capabilities to build, enforce, execute, and monitor web services policies including security, Web Services Reliable Messaging, Message Transmission Optimization Mechanism, and addressing policies.

The Policy Manager reads and writes security and management policies, including predefined and custom policies from the MDS repository. The Policy Manager is a stateless Java EE application. It exposes its capabilities through stateless session beans. Although the Policy Manager does not cache any data, the underlying MDS infrastructure does.

The Agent is responsible for policy enforcement, execution, gathering of runtime statistics. The agent is available on all Oracle Fusion Middleware Managed Servers and is configured on the same server as the application it protects. The agent consists of two pieces: the Policy Access Point (PAP) and the Policy Interceptor.

This section describes various Oracle Web Services Manager artifacts and provides recommendations for disaster recovery.

**Artifacts in the Database**

The MDS repository is used for storing the policies.

**Synchronization Recommendations**

The application tier must be manually synchronized with the standby site after you make changes in the domain-related configuration and apply patches.

You should configure Oracle Data Guard for Oracle database metadata repositories.

When the application tier synchronization is initiated on the storage, Oracle recommends that you synchronize the standby database . This synchronization occurs automatically because Oracle Data Guard is configured in Managed Recovery mode (the recommended configuration) for the database. If the standby database is not in Managed Recovery mode, then manually synchronize the standby database.

**Recovery Recommendations**

The database must be recovered to the most recent point in time, along with the Managed Server running the SOA application. All policies are stored in the MDS repository, so recovering the database and the Managed Server ensures that the application runs normally.

## 2.2.7 Recommendations for Oracle User Messaging Service

Oracle User Messaging Service enables two-way communication between users and deployed applications and it supports a variety of channels, such as email, IM, SMS, and text-to-voice messages.

Oracle User Messaging Service is integrated with Oracle Fusion Middleware components such as Oracle BPEL Process Manager, Oracle Human Workflow, Oracle Business Activity Monitoring (BAM), and Oracle WebCenter Portal. It is typically deployed with Oracle User, along with Oracle SOA Service Infrastructure. Oracle User Messaging Service is made up of UMS Server, UMS Drivers, and UMS Client applications.

This section describes various Oracle User Messaging Service artifacts and provides recommendations for disaster recovery.

**Artifacts on the File System**

JMS Store: The volume that contains the file-based JMS persistent store. Table 2-2 shows the JMS resources that Oracle User Messaging Service uses.

**Table 2-2 JMS Resources Used by Oracle User Messaging Service**

| JMS Artifact Name | Type | JNDI Name |
|---|---|---|
| `OraSDPMAppDefRcvQ1_auto` | Distributed queue | `OraSDPM/Queues/OraSDPMAppDefRcvQ1` |
| `OraSDPMDriverDefSndQ1_auto` | Distributed queue | `OraSDPM/Queues/OraSDPMDriverDefSndQ1` |
| `OraSDPMEngineCmdQ_auto` | Distributed queue | `OraSDPM/Queues/OraSDPMEngineCmdQ` |
| `OraSDPMEngineRcvQ1_auto` | Distributed queue | `OraSDPM/Queues/OraSDPMEngineRcvQ1` |
| `OraSDPMEngineSndQ1_auto` | Distributed queue | `OraSDPM/Queues/OraSDPMEngineSndQ1` |
| `OraSDPMWSRcvQ1_auto` | Distributed queue | `OraSDPM/Queues/OraSDPMWSRcvQ1` |

#### Artifacts in the Database

Oracle User Messaging Service depends on an external database repository to maintain the message and configuration state.

#### Special Considerations

Oracle User Messaging Service uses JMS to deliver messages among messaging applications. By default, it is configured to use a file-based persistent JMS store; therefore, it depends on the storage device where those files are located.

#### Synchronization Recommendations

The application tier must be manually synchronized with the standby site after you make changes in the configuration, deploy additional Oracle User Messaging Service drivers, and apply patches.

You should configure Oracle Data Guard for Oracle database metadata repositories.

When the application tier synchronization is initiated on the storage, Oracle recommends that you synchronize the standby database. This synchronization occurs automatically because Oracle Data Guard is configured in Managed Recovery mode (the recommended configuration) for the database. If the standby database is not in Managed Recovery mode, then you should manually synchronize the standby database.

#### Recovery Recommendations

The database must be recovered to the most recent point in time, along with the Managed Server running the `usermessagingserver` application. Oracle User Messaging Service maintains the message and configuration state in an external database repository along with persisting messages in JMS queues, so recovering the database and the Managed Server ensures that the application functions without any issues. For recommendations on synchronizing JMS data, see Synchronization Recommendations in Recommendations for Oracle WebLogic Server Java Message Service (JMS) and Transaction Logs (T-Logs).

## 2.2.8 Recommendations for Oracle Java EE Connector Architecture (JCA) Adapters

Oracle JCA Adapters are JCA binding components that allow the Service Infrastructure to communicate by using different protocols.

Oracle JCA Adapters are deployed as a JCA resource (RAR) and are not part of the Oracle SOA Service Infrastructure.

The Oracle JCA Adapters include:

- Oracle Technology Adapters
- Legacy Adapters
- Packaged-Application Adapters
- Oracle Adapter for Oracle Applications

See the *Oracle Fusion Middleware Understanding Technology Adapters* for additional information about the types of Oracle JCA Adapters.

This section describes the various Oracle JCA Adapter artifacts and provides recommendations for disaster recovery.

**Artifacts on the File System**

Certain adapters use local or shared-storage files, for example:

- JMS adapters utilizing WebLogic JMS with file-based persistence store: The persistence store must be synchronized with the standby site to resume processing after failover.
- Inbound and outbound files from either File or FTP adapters: The relevant files must be synchronized with the standby site to resume processing after failover.

Adapter configuration is maintained in the `weblogic-ra.xml` deployment descriptor for the ear JCA resource (RAR). When the file is created, the location of each `weblogic-ra.xml` file is determined by the administrator, and must be replicated to the standby site.

**Artifacts in the Database**

Adapter artifacts are generated at design time as part of the composite project. These artifacts are stored with the rest of the composite definition in the metadata repository.

**Synchronization Recommendations**

The application tier must be manually synchronized with the standby site after you make changes in the domain-related configuration, that is adapter configuration changes, and apply patches.

You should configure Oracle Data Guard for the Oracle SOA Suite database and metadata repository.

When the application tier synchronization is initiated on the storage, Oracle recommends that you synchronize the standby database . This synchronization occurs automatically because Oracle Data Guard is configured in Managed Recovery mode (the recommended configuration) for the database. If the standby database is not in Managed Recovery mode, then manually synchronize the standby database.

**Recovery Recommendations**

The database must be recovered to the most recent point in time, along with the Managed Server running the JCA Adapters and the Administration Server.

## 2.2.9 Recommendations for Oracle Business Activity Monitoring

Oracle Business Activity Monitoring (Oracle BAM) provides the tools for monitoring business services and processes in the enterprise and allows quick correlation of market indicators to the actual and changing business processes.

Oracle BAM provides the necessary tools and runtime services to create dashboards that display real-time data inflow and define rules to send alerts under specified conditions.

This section describes various Oracle BAM artifacts and provides recommendations for disaster recovery.

**Artifacts in the Database**

Oracle BAM data and report metadata is stored in the Oracle BAM database that contains Oracle BAM schemas.

**Synchronization Recommendations**

The application tier must be manually synchronized with the standby site after you make domain-related configuration changes and apply patches.

You should configure Oracle Data Guard for the Oracle SOA Suite database that contains the Oracle BAM schemas and the metadata repository.

When the application tier synchronization is initiated on the storage, Oracle recommends that you synchronize the standby database . This synchronization occurs automatically because Oracle Data Guard is configured in Managed Recovery mode (the recommended configuration) for the database. If the standby database is not in Managed Recovery mode, then you should manually synchronize the standby database.

**Recovery Recommendations**

The database must be recovered to the most recent point in time, along with the Managed Server running Oracle BAM.

## 2.2.10 Recommendations for Oracle Business Process Management

The Oracle Business Process Management ( Oracle BPM) Suite provides an integrated environment for developing, administering, and using business applications centered around business processes.

Oracle BPM Suite provides a seamless integration of all stages of the application development life cycle from design-time and implementation to runtime and application management.

The Oracle BPM Suite is layered on the Oracle SOA Suite and shares many of the same product components, including:

- Oracle Business Rules
- Oracle Human Workflow

- Oracle adapter framework for integration
- SOA Composite Architecture

This section describes the various Oracle BPM artifacts and provides recommendations for disaster recovery.

**Artifacts on the File System**

BPM JMS Persistent Store (`BPMJMSFileStore_auto`): The file-based JMS persistent store. The persistence store must be synchronized with the standby site to resume processing after failover.

**Artifacts in the Database**

Process definition, deployed applications, and configuration files are stored in the Oracle Metadata Services (MDS) repository. Oracle BPM also uses a separate MDS partition to share projects and project templates between process analysts and process developers.

**Synchronization Recommendations**

The application tier must be manually synchronized with the standby site after you make changes in the domain-related configuration and apply patches.

You should configure Oracle Data Guard for the Oracle SOA Suite database and metadata repository.

When the application tier synchronization is initiated on the storage, the standby database is also updated to the same point in time. This is recommended if a snapshot Standby database is used.

**Recovery Recommendations**

The database must be recovered to the most recent point in time, along with the Managed Server running the SOA application.

## 2.3 Recommendations for Oracle Business Intelligence Suite

Oracle Business Intelligence Suite (Oracle BI) is a portfolio of technology and applications that provides the industry's first integrated, end-to-end Enterprise Performance Management System, including Oracle Business Intelligence foundation and tools as well as financial performance management applications, operational Oracle Business Intelligence applications, and data warehousing.

Oracle BI has the following components:

- Administration Server: runs in a dedicated Java virtual system and is used for administering the system. When you use two or more servers for High Availability, the Administration Server exists on both hosts but is only active on one host.
- Managed Server: runs in a dedicated Java virtual system and provides the runtime environment for the Java-based services and applications.
- Node Manager: provides management services for the Administration Server, Managed Servers, and the System Components.
- System Components: server processes that provide the core services to Oracle BI. Oracle BI components are as follows:

- BI Server
- BI Scheduler
- BI Java Host
- BI Preservation Server
- Cluster Controller

Other domain contents includes the configuration file, WebLogic Server Tool commands, security, and connection information that are required to run Oracle BI.

Oracle BI artifacts are stored on the local or shared file system as well as in the metadata repositories. Composite artifacts are stored in the metadata repository, and binary files and domain-related configuration files are stored on a local or shared file system.

For more information about Oracle BI Architecture, see *Oracle Fusion Middleware Enterprise Deployment Guide for Oracle Business Intelligence*.

This section contains the following recommendations:

- Common Recommendations for All Oracle Business Intelligence Suite Components
  Learn about what Oracle recommends for all Oracle Business Intelligence Suite (Oracle BI) components.
- Recommendations for Oracle Business Intelligence Enterprise Edition (EE)
  Oracle Business Intelligence Enterprise Edition (Oracle BI EE) brings business visibility and insight to a wide variety of users in an enterprise.
- Recommendations for Oracle Business Intelligence Publisher
  Oracle Business Intelligence Publisher (BI Publisher, formerly XML Publisher) allows you to create highly formatted reports that are suitable for printing Business Intelligent reports.

## 2.3.1 Common Recommendations for All Oracle Business Intelligence Suite Components

Learn about what Oracle recommends for all Oracle Business Intelligence Suite (Oracle BI) components.

The following artifacts and considerations apply to all Oracle BI components, in addition to the component specific considerations.

**Artifacts on the File System**

Oracle home—The Oracle home consists of a WebLogic home that has the WebLogic Server binary files and an Oracle home that contains the Oracle BI Suite binary files.

Domain home—The domain home contains the WebLogic Administration Server and WebLogic Managed Server configuration data, logs, and Oracle BI applications for the domain.

Singleton Data Directory (SDD)–A directory that contains the metadata and other cross-cluster files. There is exactly one SDD for each domain. The SDD path (by default, `DOMAIN_HOME/bidata`) is defined in the file `bi-environment.xml` which is located at the`DOMAIN_HOME/config/fmwconfig/bienv/core/bi-environment.xml` directory.

**Network Artifacts**

Oracle recommends that you use the virtual host name as the listen address for both the Oracle WebLogic Administration Server and the WebLogic Managed Server. As long as this host name can be resolved on both the production and standby sites, there is no need to update this value after a Disaster Recovery operation.

You should configure the load balancer virtual host, that is required for accessing the Oracle BI components, on both the production and standby sites.

**Artifacts in the Database**

The Oracle Business Intelligence schemas are located in the Oracle Business Intelligence database.

Schema-based metadata–This is nondesign-time metadata that is stored in database schemas, including schemas for the Scheduler, usage statistics, event polling, repository files, and the Oracle BI Presentation Catalog.

**Synchronization Recommendations**

The directory tier must be manually synchronized with the standby site after you change the domain configuration, or deploy composites, or apply patches.

You should configure Oracle Data Guard for the Oracle BI database and metadata repository.

Oracle recommends synchronizing the standby database, when the application tier synchronization is initiated on the storage. This synchronization occurs automatically because Oracle Data Guard is configured in Managed Recovery mode (the recommended configuration) for the database. If the standby database is not in Managed Recovery mode, then you should manually synchronize the standby database. See Applying Redo Data to Physical Standby Databases in *Oracle Data Guard Concepts and Administration*.

**Recovery Recommendations**

The database that contains the Oracle Business Intelligence schemas must be recovered to the most recent point in time, along with the Identity Management component in question.

## 2.3.2 Recommendations for Oracle Business Intelligence Enterprise Edition (EE)

Oracle Business Intelligence Enterprise Edition (Oracle BI EE) brings business visibility and insight to a wide variety of users in an enterprise.

Oracle BI EE is a comprehensive set of enterprise business intelligence tools and infrastructure, including a scalable and efficient query and analysis server, an ad-hoc query and analysis tool, interactive dashboards, proactive intelligence and alerts, real-time predictive intelligence, and an enterprise reporting engine.

The following are recommendations that are specific to Oracle BI EE.

**Artifacts in the Database**

`BIPLATFORM` schema is part of the Oracle BI EE database.

**Special Considerations**

You should configure load balancer virtual hosts for Oracle BI EE on both the production and the standby sites.

**Synchronization Recommendations**

Synchronize the application tier manually with the standby site after you change the configuration or apply patches.

When the application tier synchronization is initiated on the storage, Oracle recommends that you synchronize the standby database . This synchronization occurs automatically because Oracle Data Guard is configured in Managed Recovery mode (the recommended configuration) for the database. If the standby database is not in Managed Recovery mode, then you should manually synchronize the standby database.

**Recovery Recommendations**

Recover the Middleware home, the domain, and the Oracle instance that contains the Oracle BI EE components. On Windows, import Oracle BI EE Registry entries. Recover the database to the most recent point in time, if needed.

## 2.3.3 Recommendations for Oracle Business Intelligence Publisher

Oracle Business Intelligence Publisher (BI Publisher, formerly XML Publisher) allows you to create highly formatted reports that are suitable for printing Business Intelligent reports.

BI Publisher reports are built on top of BI Publisher data models. BI Publisher data model can consist of data sets from a wide range of sources, such as subject areas from the Oracle Business Intelligence Server or analyses, SQL queries against relational data bases, MDX queries against Subbase, LDAP, web services, Microsoft Excel, HTTP feeds, or XML files. BI Publisher supports a wide range of layout types, so you can create the full range of documents that your organization might need. Within Oracle Business Intelligence Enterprise Edition you can view, create, edit, and schedule BI Publisher reports and then include them in the dashboard pages.

The following are recommendations that are specific to BI Pubisher.

**Artifacts in the Database**

`BIPLATFORM` schema is a part of the Oracle Business Intelligence Publisher database.

**Special Considerations**

You should configure load balancer virtual hosts for Oracle Business Intelligence Publisher on both the production and standby sites.

**Synchronization Recommendations**

Synchronize the application tier manually with the standby site after you make changes in the configuration or apply patches.

When the application tier synchronization is initiated on the storage, Oracle recommends that you synchronize the standby database. This synchronization occurs automatically because Oracle Data Guard is configured in Managed Recovery mode (the recommended configuration) for the database. If the standby database is not in Managed Recovery mode, then you should manually synchronize the standby database.

**Recovery Recommendations**

Recover the WebLogic Managed Server that contains the BI Publisher component.

## 2.4 Recommendations for Oracle WebCenter Portal

Oracle WebCenter Portal is an Oracle Fusion Middleware component that provides a personalized, secure, and efficient way of presenting and consuming information, collaborating with others, and interacting with applications in the context of business processes.

Oracle WebCenter Portal optimizes the connections between people, information, and applications; provides a context for users to navigate, discover, and access content relevant to your business needs.

Oracle WebCenter Portal includes the following servers, applications, and services:

- Portal Managed Servers:
  - Portal application and services
  - Analytics Collector service
- Collaboration Managed Servers:
  - Discussions application and services
- Portlet Managed Servers:
  - Portlet Producer services
  - Pagelet Producer service

This section contains the following recommendations:

- Common Recommendations for All Oracle WebCenter Portal Components
  Learn about what Oracle recommends for all Oracle WebCenter Portal components.
- Recommendations for Oracle WebCenter Portal Server
  Oracle WebCenter Portal offers a single, integrated, web-based environment for social networking, communication, collaboration, and personal productivity through a robust set of services and applications.
- Recommendations for Oracle WebCenter Analytics
  Oracle WebCenter Portal allows for a single active analytics collector registration. The Analytics Collector receives usage metrics from the Portal application. All connections to the Analytics Collector are stateless.
- Recommendations for Oracle WebCenter Discussion Server
  Oracle WebCenter Discussion Server provides the ability to integrate discussion forums and announcements into your applications.
- Recommendations for Oracle WebCenter Portlet and Pagelet Services
  Oracle WebCenter Portal supports deployment and execution of both standards-based portlets (WSRP 2.0), and traditional Oracle (Portlet Developer Kit) PDK-Java based portlets. Oracle WebCenter Portal provides several ready-to-use producers.

## 2.4.1 Common Recommendations for All Oracle WebCenter Portal Components

Learn about what Oracle recommends for all Oracle WebCenter Portal components.

The following artifacts and considerations apply to all Oracle WebCenter Portal components:

**Artifacts on the File System**

Oracle home—The Oracle home consists of a WebLogic home that has the Oracle WebLogic Server binary files.

Domain home—The domain home contains the configuration data and the applications for the WebLogic domain.

There are no shared files ystem persistence store requirements for any Oracle WebCenter Portal runtime components.

**Network Artifacts**

Oracle recommends that you use a virtual alias (instead of physical host names) as the listen address for both Oracle WebLogic Administration server and the Oracle Managed Servers. As long as this alias can be resolved on both the production and standby sites, there is no need to update this value after a Disaster Recovery operation.

Oracle WebCenter Portal does not require whole server migration or service migration to be configured. No special considerations are needed in this regard.

You should configure the load balancer virtual host, which is used to access the Oracle WebCenter Portal applications and services, on both the production and standby sites.

**Artifacts in the Database**

Oracle WebCenter Portal stores all data and metadata in database schemas created with the Repository Creation Utility. Application runtime configuration metadata is store through the Metadata Services Repository (MDS).

**Synchronization Recommendations**

Synchronize the application tier manually with the standby site after you make changes in the domain-related configuration, deploy applications or shared libraries, or apply patches.

You should configure Oracle Data Guard for the Oracle WebCenter Portal database and metadata repository.

Oracle recommends that you synchronize the standby database, when the application tier synchronization is initiated on the storage. This synchronization can occur automatically when Oracle Data Guard is configured in Managed Recovery mode (the recommended configuration) for the database. If the standby database is not in Managed Recovery mode, then you should manually synchronize the standby database. See Applying Redo Data to Physical Standby Databases in *Oracle Data Guard Concepts and Administration*, and Synchronizing Databases Manually.

**Recovery Recommendations**

You must be recover the database to the most recent point in time to ensure that the latest composite definitions and inflight instances are restored.

## 2.4.2 Recommendations for Oracle WebCenter Portal Server

Oracle WebCenter Portal offers a single, integrated, web-based environment for social networking, communication, collaboration, and personal productivity through a robust set of services and applications.

The following are recommendations that are specific to Oracle WebCenter Portal Server:

**Artifacts in the Database**

Portal application data is stored in the `WEBCENTER` database schema. Portal customized metadata is stored in the `MDS` database schema

**Synchronization Recommendations**

Synchronize the application tier manually with the standby site after you change the configuration, deploy applications, or apply patches.

You should be configure Oracle Data Guard for the Oracle database containing the `WEBCENTER` schema, and metadata repository.

When the application tier synchronization is initiated on the storage, Oracle recommends that you synchronize the standby database . This synchronization can occur automatically when Oracle Data Guard is configured in Managed Recovery mode (the recommended configuration) for the database. If the standby database is not in Managed Recovery mode, then you should manually synchronize the standby database. See Applying Redo Data to Physical Standby Databases in *Oracle Data Guard Concepts and Administration*, and Synchronizing Databases Manually.

**Recovery Recommendations**

You must be recover the database that contains the `WEBCENER` schema and `MDS` repository, to the most recent point in time, along with the Oracle WebCenter Portal domain.

## 2.4.3 Recommendations for Oracle WebCenter Analytics

Oracle WebCenter Portal allows for a single active analytics collector registration. The Analytics Collector receives usage metrics from the Portal application. All connections to the Analytics Collector are stateless.

Following an Enterprise Deployment Guide topology deployment, each portal server has one active local analytics collector service that is responsible for collecting metrics for all portal traffic on that portal server. The recommended configuration is to set the portal's common connection registration to `localhost`, and the default port of `31314`. Each portal server connects locally. Load-balancer configurations are not required and no configuration changes are needed for failover to the secondary site for analytics functionality.

The following are recommendations that are specific to Oracle WebCenter Analytics:

**Artifacts in the Database**

Analytics Collector data is stored in the Oracle WebCenter Portal's `ACTIVITIES` schema.

**Synchronization Recommendations**

Synchronize the application tier manually with the standby site after you make any changes in the configuration for the Analytics Collector MBeans, the Portal's Analytics service registration, or apply patches.

You should configure Oracle Data Guard for the Oracle database containing the Oracle WebCenter Portal schemas and the metadata repository.

When the application tier synchronization is initiated on the storage, Oracle recommends that you synchronize the standby database . This synchronization can occur automatically when Oracle Data Guard is configured in Managed Recovery mode (the recommended configuration) for the database. If the standby database is not in Managed Recovery mode, then you should manually synchronize the standby database. See Applying Redo Data to Physical Standby Databases in *Oracle Data Guard Concepts and Administration*, and Synchronizing Databases Manually.

**Recovery Recommendations**

You must recover the database that contains the `ACTIVITIES` schema to the most recent point in time, along with the Oracle WebCenter Portal domain.

## 2.4.4 Recommendations for Oracle WebCenter Discussion Server

Oracle WebCenter Discussion Server provides the ability to integrate discussion forums and announcements into your applications.

The following are recommendations that are specific to Oracle WebCenter Discussion Server:

**Artifacts in the Database**

The Discussions Server schema stores metadata and data and is part of the Oracle WebCenter Portal schemas.

**Synchronization Recommendations**

Synchronize the application tier manually with the standby site after you change the configuration, deploy applications, or apply patches.

You should configure Oracle Data Guard for the Oracle database that contains the Oracle Discussion Server schema and metadata repository.

When the application tier synchronization is initiated on the storage, Oracle recommends that you synchronize the standby database . This synchronization can occur automatically when Oracle Data Guard is configured in Managed Recovery mode (the recommended configuration) for the database. If the standby database is not in Managed Recovery mode, then you should manually synchronize the standby database. See Applying Redo Data to Physical Standby Databases in *Oracle Data Guard Concepts and Administration*, and Synchronizing Databases Manually.

**Recovery Recommendations**

You must recover the database that contains the Discussion Server schema to the most recent point in time along with the Oracle WebCenter Portal domain.

## 2.4.5 Recommendations for Oracle WebCenter Portlet and Pagelet Services

Oracle WebCenter Portal supports deployment and execution of both standards-based portlets (WSRP 2.0), and traditional Oracle (Portlet Developer Kit) PDK-Java based portlets. Oracle WebCenter Portal provides several ready-to-use producers.

The following are recommendations that are specific to Oracle WebCenter Portlet and Pagelet:

**Artifacts in the Database**

The `PORTLET` schema stores user customized data and is part of the Oracle WebCenter Portal schemas. The `MDS` repository stores portlet metadata and configuration information.

**Synchronization Recommendations**

Synchronize the application tier manually with the standby site after you change the configuration, deploy applications, or apply patches.

You should configure Oracle Data Guard for the Oracle database that contains the `PORTLET` schema and metadata repository.

When the application tier synchronization is initiated on the storage, Oracle recommends that you synchronize the standby database . This synchronization can occur automatically when Oracle Data Guard is configured in Managed Recovery mode (the recommended configuration) for the database. If the standby database is not in Managed Recovery mode, then you should manually synchronize the standby database. See Applying Redo Data to Physical Standby Databases in *Oracle Data Guard Concepts and Administration*, and Synchronizing Databases Manually.

**Recovery Recommendations**

You must recover the database that contains the `PORTLET` schema and `MDS` repository to the most recent point in time along with the Oracle WebCenter Portal domain.

# 2.5 Recommendations for Oracle WebCenter Content

Oracle WebCenter Content is an integrated suite of products designed to manage enterprise content.

Oracle WebCenter Content enables you to leverage industry-leading document management, web content management, digital asset management, and records management functionality to build your business applications. The ability to manage the enterprise content helps you reduce costs, share content across the enterprise, minimize risk, automate manual processes, and consolidate multiple web sites onto a single platform.

Oracle Enterprise Content Management includes the following components:

- Oracle WebCenter Content
- Oracle WebCenter Content: Inbound Refinery
- Oracle WebCenter Content: Enterprise Capture
- Oracle WebCenter Content: Content User Interface

This section contains the following recommendations:

- Common Recommendations for All Oracle WebCenter Content Components
  Learn about what Oracle recommends for all Oracle WebCenter Content components.
- Recommendations for Oracle WebCenter Content
  Oracle WebCenter Content provides a unified application for several different kinds of content management.
- Recommendations for Oracle WebCenter Content Inbound Refinery
  Oracle WebCenter Content Inbound Refinery is a conversion server that manages file conversions for electronic assets such as documents, digital images, and motion video.
- Recommendations for Oracle WebCenter Content Enterprise Capture
  Oracle WebCenter Enterprise Capture (Enterprise Capture) provides organizations with a single system to capture both paper and electronic documents.
- Recommendations for Oracle WebCenter Content: Content User Interface
  WebCenter Content User Interface is a user-friendly and a feature-rich user interface for managing Oracle WebCenter Contented based on Oracle Application Development Framework.

## 2.5.1 Common Recommendations for All Oracle WebCenter Content Components

Learn about what Oracle recommends for all Oracle WebCenter Content components.

The following artifacts and considerations apply to all Oracle WebCenter Content components:

**Artifacts on the File System**

MW_HOME—The Middleware home consists of a WebLogic home that has the WebLogic Server binaries and an Oracle home that contains the Oracle WebCenter Content binaries.

Oracle_Common_Home—The Oracle home that contains the binary and library files required for the Oracle Enterprise Manager Fusion Middleware Control and Java Required Files.

Domain Home—The domain home contains the Administration Server and Managed Server configuration data and Oracle WebCenter Content applications for the domain.

Oracle Instance—The Oracle instance contains the configuration data for non-J2EE Oracle WebCenter Content applications such as OPMN configuration and Enterprise Manager Agent configuration data.

WebCenter Content Shared Directories files— In a clustered implementation of WebCenter Content as per Enterprise Deployment guidelines shared directories are required for domain configuration as well as WebCenter Content shared directory files such as data, audit, and vault directories.

**Network Artifacts**

Oracle recommends that you use a virtual alias (instead of physical host names) as the listen address for both Oracle WebLogic Administration server and the Oracle Managed Servers. As long as this alias can be resolved on both the production and standby sites, there is no need to update this value after a Disaster Recovery operation.

You must configure the load balancer virtual host, which is used for accessing Oracle WebCenter Content Management components, on both the production and standby sites.

**Artifacts in the Database**

The Oracle WebCenter Content schemas are located in the Oracle WebCenter Content database.

**Synchronization Recommendations**

Synchronize the directory tier manually with the standby site after you make configuration changes, deploy applications, and apply patches.

You should configure Oracle Data Guard for the Oracle database metadata repository.

When the application tier synchronization is initiated on the storage, Oracle recommends that you synchronize the standby database. This synchronization can occur automatically when Oracle Data Guard is configured in Managed Recovery mode (the recommended configuration) for the database. If the standby database is not in Managed Recovery mode, then you should manually synchronize the standby database.

**Recovery Recommendations**

You must recover the database that contains the Oracle WebCenter Content schemas to the most recent point in time along with the Identity Management component in question.

## 2.5.2 Recommendations for Oracle WebCenter Content

Oracle WebCenter Content provides a unified application for several different kinds of content management.

Through user-friendly interfaces, roles-based authentication and security models, Oracle WebCenter Content empowers users throughout the enterprise to view, collaborate on or retire content. This ensures that all accessible, distributed, or published information is secure, accurate, and up-to-date.

The following are recommendations that are specific to Oracle WebCenter Content:

**Artifacts in the Database**

The `OCS` (Oracle Content Schema) schema is part of the Oracle WebCenter Content database.

**Artifacts in the File System**

WebCenter Content shared directories along with any Oracle Secure Files or the setup of file-based persistent stores need to be replicated across to the standby site for having them disaster protected.

**Special Considerations**

You should configure the load balancer virtual host, which is required for the Oracle WebCenter Content on both the production and standby sites.

**Synchronization Recommendations**

Synchronize the directory tier manually with the standby site after you change the configuration, deploy applications, or apply patches.

You should configure Oracle Data Guard for the Oracle database repositories.

When the application tier synchronization is initiated on the storage, Oracle recommends that you synchronize the standby database. This synchronization can occur automatically when Oracle Data Guard is configured in Managed Recovery mode (the recommended configuration) for the database. If the standby database is not in Managed Recovery mode, then you should manually synchronize the standby database.

For file-based persistent stores, you must synchronize the file-based persistent stores on the standby site.

**Recovery Recommendations**

You must recover Oracle WebCenter Content with the `OCS` and `MDS` schemas to the most recent point in time.

## 2.5.3 Recommendations for Oracle WebCenter Content Inbound Refinery

Oracle WebCenter Content Inbound Refinery is a conversion server that manages file conversions for electronic assets such as documents, digital images, and motion video.

Oracle WebCenter Content Inbound Refinery provides thumbnail functionality for documents and images, storyboarding for video, and the ability to extract and use EXIF data from digital images and XMP data from electronic files that are generated from programs such as Adobe Photoshop and Adobe Illustrator. You can use Oracle WebCenter Content Inbound Refinery to convert content items stored in Oracle Content Server.

The following are recommendations that are specific to Oracle WebCenter Content Inbound Refinery:

**Artifacts in the Database**

Oracle WebCenter Content Inbound Refinery does not have any database dependencies.

**Special Considerations**

You should configure the load balancer virtual host, which is required for Oracle WebCenter Content Inbound Refinery on both the production and the standby sites.

**Synchronization Recommendations**

Synchronize the directory tier manually with the standby site after you change the configuration or apply patches.

**Recovery Recommendations**

Recover the Oracle WebCenter Content Inbound Refinery instance.

### 2.5.4 Recommendations for Oracle WebCenter Content Enterprise Capture

Oracle WebCenter Enterprise Capture (Enterprise Capture) provides organizations with a single system to capture both paper and electronic documents.

Enterprise Capture supports both centralized and distributed image capture from a user-friendly web interface capable of using high-volume, production-level scanners. Support for the industry-standard TWAIN scanning interface enables Enterprise Capture to use a wide variety of industry-leading document imaging. Enterprise Capture provides organizations with a single system to capture both paper and electronic documents scanners to digitize paper content. Existing electronic document files can be easily captured by users or automatically captured through an importing process that can monitor an email server or network folder. Once captured, documents are organized and indexed by applying metadata through manual or automated processes that use bar code recognition technology. After documents are completed, they are committed into a content management system. Enterprise Capture is fully integrated with Oracle WebCenter Content to provide organizations with one system to capture, store, manage, and retrieve their mission critical business content.

The following are recommendations that are specific to Oracle WebCenter Content Enterprise Capture:

**Artifacts in the Database**

Resides in Oracle WebCenter Enterprise Capture schema.

**Artifacts in the File System**

There are no file system artifacts for Enterprise Capture unless its JMS servers are stored in file-based persistent stores. The recommendation is to configure JMS servers with database-based persistent stores so that Oracle Data Guard is leveraged to replicate the database schema across sites.

**Special Considerations**

You should configure the load balancer virtual host, which is required for Oracle WebCenter Content Inbound Refinery, on both the production and the standby sites.

**Synchronization Recommendations**

Synchronize the directory tier manually with the standby site after you change the configuration or apply patches.

**Recovery Recommendations**

You must recover Enterprise Capture with the Enterprise Capture schema to the most recent point in time along with the Managed Server running the Oracle WebCenter Content Capture application, and the associated instances.

### 2.5.5 Recommendations for Oracle WebCenter Content: Content User Interface

WebCenter Content User Interface is a user-friendly and a feature-rich user interface for managing Oracle WebCenter Contented based on Oracle Application Development Framework.

The following are recommendations that are specific to Oracle WebCenter Content User Interface:

**Artifacts in the Database**

The Metadata Services schemas (`MDS`) are part of the Oracle WebCenter Content User Interface.

**Special Considerations**

You must configure load balancer virtual hosts for Oracle WebCenter Content User Interface on both the production and standby sites.

**Synchronization Recommendations**

Synchronize the directory tier manually with the standby site after you change the configuration or apply patches.

When the application tier synchronization is initiated on the storage, Oracle recommends that the standby database be synchronized. This synchronization occurs automatically because Oracle Data Guard is configured in Managed Recovery mode (the recommended configuration) for the database. If the standby database is not in Managed Recovery mode, then you should manually synchronize the standby database.

**Recovery Recommendations**

Recover the Managed Servers running the Oracle WebCenter Content User Interface application, along with the Administration Server.

# 3 Design Considerations

Learn about the design considerations to keep in mind when you adapt an Oracle Fusion Middleware Disaster Recovery solution for your enterprise deployment

This chapter provides instructions about how to set up an Oracle Fusion Middleware Disaster Recovery production and standby sites for the Linux and UNIX operating systems. The procedures use the Oracle SOA Suite enterprise deployment (see Figure 3-1) in the examples to illustrate how to set up the Oracle Fusion Middleware Disaster Recovery solution for that enterprise deployment. After you understand how to set up Disaster Recovery for the Oracle SOA Suite enterprise topology, use that information to set up a Disaster Recovery for your other enterprise deployments as well.

> **Note:**
>
> - You can automate disaster recovery operations such as switchover and failover, by using Oracle Site Guard. For information about the product, see *Oracle Site Guard Administrator's Guide*.
> - For information about installing and configuring Oracle SOA Suite components in an enterprise deployment, see *Oracle Fusion Middleware Enterprise Deployment Guide for Oracle SOA Suite*.
> - See *Oracle Fusion Middleware Release Notes for Oracle Fusion Middleware Infrastructure* for updates about errors.

The Oracle Fusion Middleware Disaster Recovery symmetric topology that uses the Oracle SOA Suite enterprise deployment shown in Figure 3-1 at both the production site and the standby site. Figure 3-1 shows the deployment for only one site; the high level of detail shown for this deployment precludes showing the deployment for both sites in a single figure.

Figure 1-1 shows Oracle Fusion Middleware Disaster Recovery production and standby sites.

### Figure 3-1 Deployment Used at Production and Standby Sites for Oracle Fusion Middleware Disaster Recovery

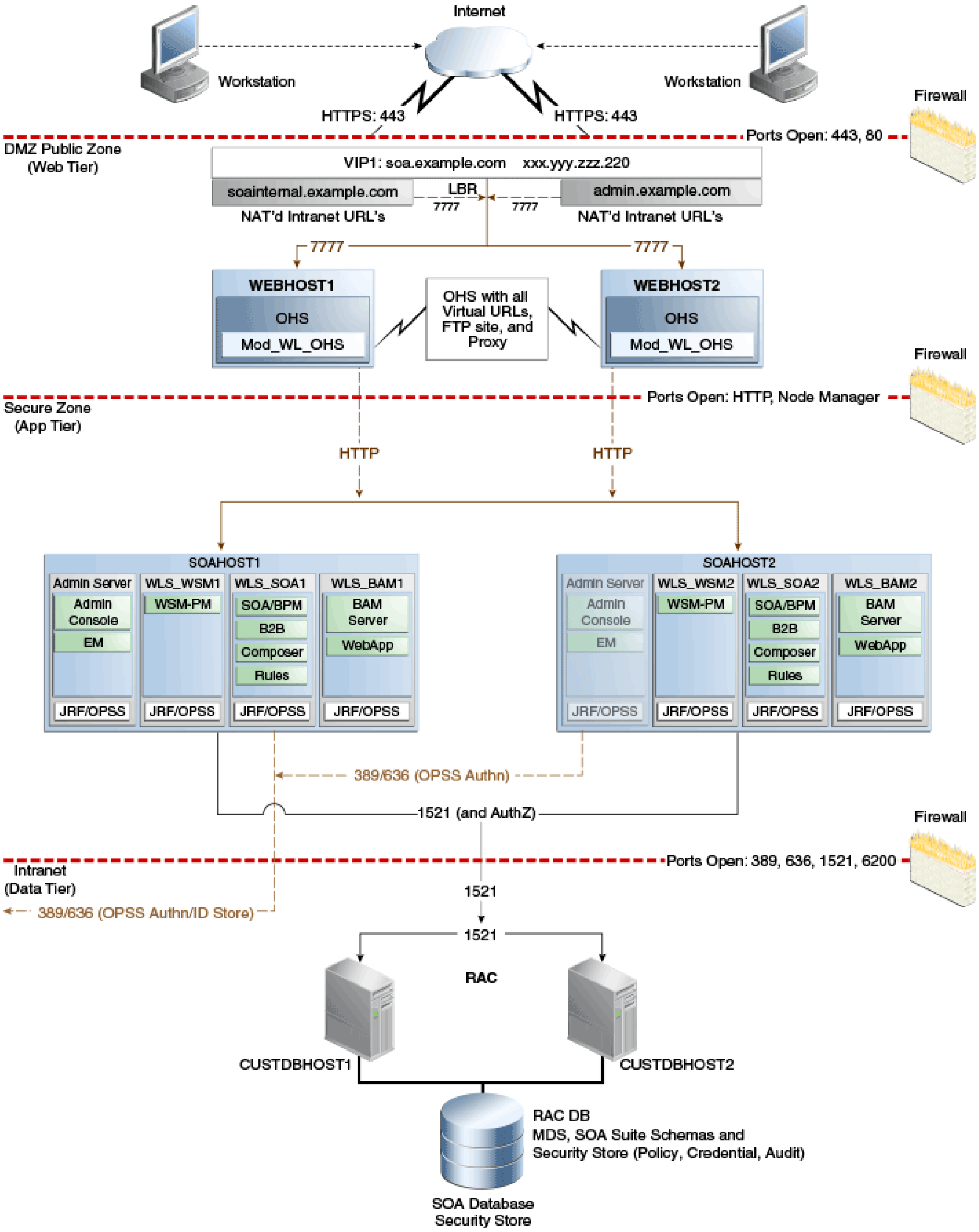


Figure 3-1 shows a diagram of the Oracle SOA, Business Process Management (BPM), and the Oracle Service Bus enterprise deployment topology. See the *Oracle Fusion Middleware Enterprise Deployment Guide for Oracle SOA Suite* for detailed information about installing and configuring an Oracle SOA Suite enterprise deployment.

The Oracle Fusion Middleware Disaster Recovery topology that you design must be symmetric for the following at the production site and the standby site.

- Directory names and paths

Every file that exists at a production site host must exist in the same directory path at the standby site peer host.

Thus, Oracle home names and directory paths must be the same at the production site and standby site.

- Port numbers

  Port numbers are used by listeners and for the routing of requests. Port numbers are stored in the configuration and must be the same at the production site hosts and their standby site peer hosts.

  Starting with an Existing Site describes how to check for port conflicts between production site and standby site hosts.

- Security

  The same user accounts must exist at both the production site and standby site. Also, you must configure the file system, SSL, and single sign-on identically at the production site and standby site. For example, if the production site uses SSL, then the standby site must also use SSL that is configured in exactly the same way as the production site.

- Load balancers and virtual server names

  A front-end load balancer should be set up with virtual server names for the production site, and an identical front-end load balancer should be set up with the same virtual server names for the standby site.

- Software

  The same versions of software must be used on the production site and standby site. Also, the operating system patch level must be the same at both sites, and patches to Oracle or third-party software must be made to both the production site and standby site.

This chapter includes the following topics:

- Network Considerations
  When you plan your Disaster Recovery solution, consider host names, load balance, and external clients.

- Storage Considerations
  When you design storage for your Disaster Recovery solution, consider Fusion Middleware artifacts, storage replication, and file-based persistent stores.

- Database Considerations
  When you plan your Disaster Recovery solution, consider synchronizing the databases in your system with Oracle Data Guard.

- Starting Points
  When you plan your Disaster Recovery solution, consider starting with an existing site or creating a new site.

- Topology Considerations
  When you plan your for your Disaster Recovery solution, consider designing a symmetric or an asymmetric topology.

## 3.1 Network Considerations

When you plan your Disaster Recovery solution, consider host names, load balance, and external clients.

This section includes the following topics:

- Planning Host Names
  In a Disaster Recovery topology, the production site host names must be resolvable to the IP addresses of the corresponding peer systems at the standby site.
- Virtual IP and Virtual Host Name Considerations
  When the system hosting the Oracle WebLogic Administration Server fails, Virtual IP addresses and host names are required to enable the Oracle WebLogic Administration Server to continue servicing requests .
- Load Balancer Considerations
  Oracle Fusion Middleware components require a hardware load balancer when deployed in high availability topologies.
- Virtual Server Considerations
  You must configure the Virtual servers and the associated ports on the load balancer for different types of network traffic and monitoring.
- External Clients Considerations
  Systems directly accessing the servers in the topology need to be aware of the listen address that is used by the different Oracle WebLogic Server instances.
- Wide Area DNS Operations
  When a site switchover or failover is carried out, client requests must be redirected transparently to the new site that is playing the production role.

## 3.1.1 Planning Host Names

In a Disaster Recovery topology, the production site host names must be resolvable to the IP addresses of the corresponding peer systems at the standby site.

It is important to plan the host names for the production site and standby site. After failover from a primary site to a standby site, the alias host name for the middle tier host on the standby site becomes active. If you set up an alias for the standby site, you do not need to reconfigure the host name for the host on the standby site.

Creating aliases for physical host names is required only when you use a single global DNS server to resolve host names.

This section describes how to plan physical host names and alias host names for the middle tier hosts that use the Oracle Fusion Middleware instances at the production site and standby site. It uses the Oracle SOA Suite enterprise deployment shown in Figure 3-1 for the host name examples. The host name examples in this section assume that a symmetric Disaster Recovery site is being set up, where the production site and standby site have the same number of hosts. Each host at the production site and standby site has a peer host at the other site. The peer hosts are configured the same, for example, using the same ports as their counterparts at the other site.

When you configure each component, use host-name-based configuration instead of IP-based configuration, unless the component requires you to use IP-based configuration. For example, if you configure the listen address of an Oracle Fusion Middleware component to a specific IP address (such as `172.16.10.255`), then use the host name `SOAHOST1.EXAMPLE.COM`, which resolves to `172.16.10.255`.

The following section shows how to set up host names at the Disaster Recovery production and standby sites:

**Note:**

In the examples listed, IP addresses for hosts at the initial production site have the format `172.16.x.x` and IP addresses for hosts at the initial standby site have the format `172.26.x.x`.

- Host Names for the Oracle SOA Suite Production and Standby Site Hosts
  Learn about the Oracle SOA Suite production and standby sites.

### 3.1.1.1 Host Names for the Oracle SOA Suite Production and Standby Site Hosts

Learn about the Oracle SOA Suite production and standby sites.

Table 3-1 shows the IP addresses and physical host names that are used for the Oracle SOA Suite Enterprise Deployment Guide (EDG) deployment production site hosts. Figure 3-1 shows the configuration for the Oracle SOA Suite EDG deployment at the production site.

**Table 3-1 IP Addresses and Physical Host Names for SOA Suite Production Site Hosts**

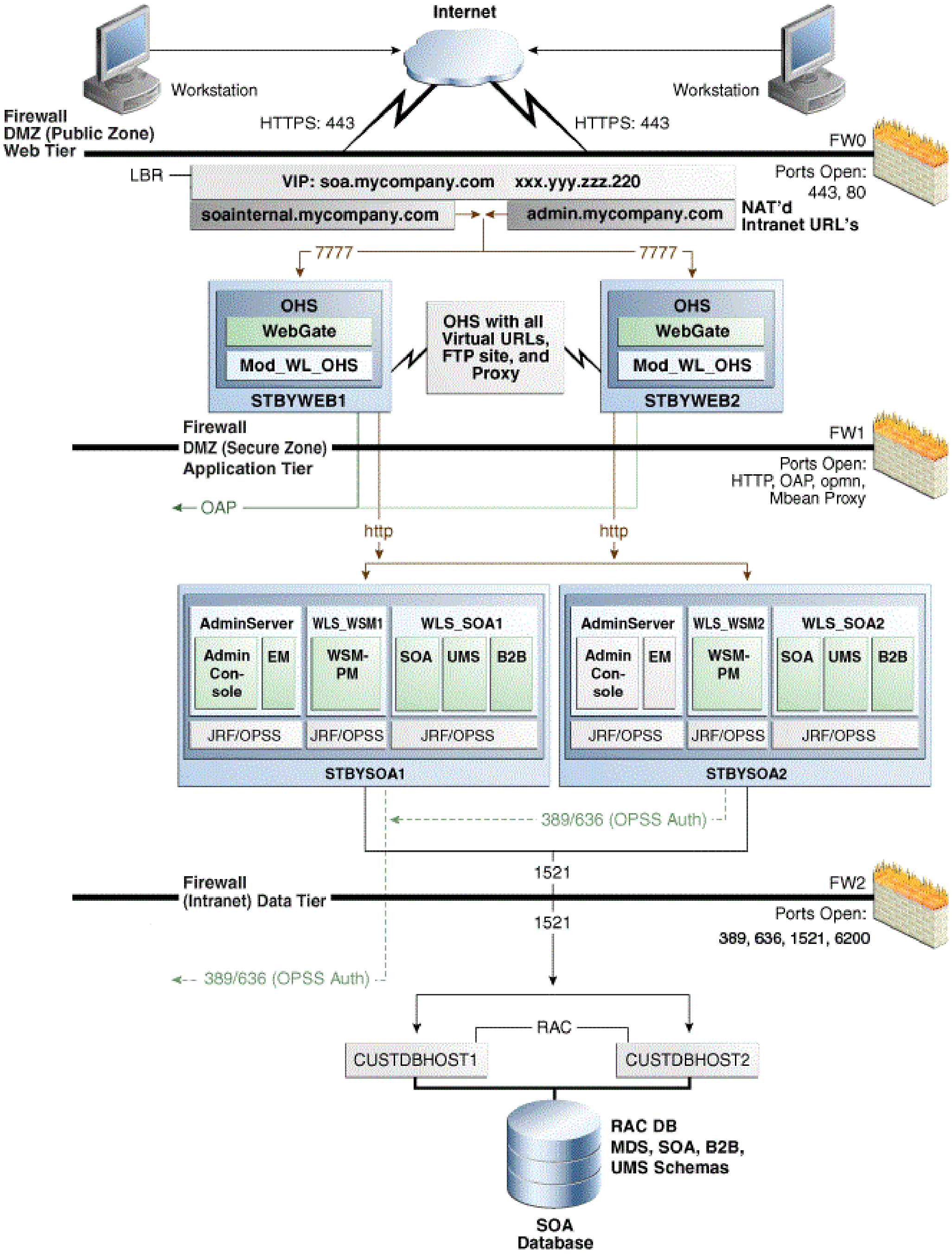
| IP Address | Physical Host Name | Host Name Alias |
|---|---|---|
| 172.16.2.111 | WEBHOST1 | None |
| 172.16.2.112 | WEBHOST2 | None |
| 172.16.2.113 | SOAHOST1 | None |
| 172.16.2.114 | SOAHOST2 | None |

Figure 3-2 shows the physical host names that are used for the Oracle SOA Suite EDG deployment at the standby site.

**Note:**

If you use separate DNS servers to resolve host names, then you can use the same physical host names for the production site hosts and standby site hosts, and you do not need to define the alias host names on the standby site hosts. For more information about using separate DNS servers to resolve host names, see Resolving Host Names Using Separate DNS Servers.

**Figure 3-2 Physical Host Names Used at Oracle SOA Suite Deployment Standby Site**



The Administration Server, the Managed Servers, and the SOA Managed Servers require a floating IP address to be provisioned on each site (Table 3-2). Ensure that you provision the floating IP addresses with the same virtual host names on the production site and the standby site.

Table 3-2    Floating IP Addresses

| Physical Host Name | Virtual Host Name | Floating IP |
|---|---|---|
| AdminServer | ADMINVHN | 172.16.2.134 |
| WEBHOST1 | WEBVHN1 | 172.16.2.135 |
| WEBHOST2 | WEBVHN2 | 172.16.2.136 |
| SOAHOST1 | SOAVHN1 | 172.16.2.137 |
| SOAHOST2 | SOAVHN2 | 172.16.2.138 |

The following topics describe the host name resolution and testing:

- Host Name Resolution
  Host name resolution means mapping a host name to the proper IP address for communication.
- Resolving Host Names Locally
  Local host name resolution uses the host name to IP mapping that is defined in the `/etc/hosts` file of a host.
- Resolving Host Names Using Separate DNS Servers
  Use separate DNS servers to resolve host names for your Disaster Recovery topology.
- Resolving Host Names Using a Global DNS Server
  Use a global DNS server to resolve host names for your Disaster Recovery topology.
- Testing the Host Name Resolution
  Validate the host name assignment by connecting to each host at the production site and by using the `ping` command to ensure that the host can locate the other hosts at the production site.

## 3.1.1.1.1 Host Name Resolution

Host name resolution means mapping a host name to the proper IP address for communication.

Host name resolution can be configured in one of the following ways:

- Resolving host names locally

  Local host name resolution uses the host name to IP address mapping that is specified by the `/etc/hosts` file on each host.

  For more information about using the `/etc/hosts` file to implement local host name file resolution, see Resolving Host Names Locally .

- Resolving host names using DNS

  A DNS server is a dedicated server or a service that provides DNS name resolution in an IP network.

  For more information about two methods of implementing DNS server host name resolution, see Resolving Host Names Using Separate DNS Servers and Resolving Host Names Using a Global DNS Server .

You must determine the method of host name resolution that you will use for your Oracle Fusion Middleware Disaster Recovery topology when you plan the deployment of the topology. Most site administrators use a combination of these resolution methods in a precedence order to manage host names.

The Oracle Fusion Middleware hosts and the shared storage system for each site must be able to communicate with each other.

**Host Name Resolution Precedence**

To determine the host name resolution method used by a particular host, search for the value of the hosts parameter in the /etc/nsswitch.conf file on the host.

If you want to resolve host names locally on the host, make the files entry the first entry for the hosts parameter, as shown in Example 3-1. When files is the first entry for the hosts parameter, entries in the host /etc/hosts file are used first to resolve host names.

If you want to resolve host names by using DNS on the host, make the dns entry the first entry for the hosts parameter, as shown in Example 3-2. When dns is the first entry for the hosts parameter, DNS server entries are used first to resolve host names.

For simplicity and consistency, Oracle recommends that all the hosts within a site (production site or standby site) should use the same host name resolution method (resolving host names locally or resolving host names using separate DNS servers or a global DNS server).

The recommendations in the following sections are high-level recommendations that you can adapt to meet the host name resolution standards used by your enterprise.

**Example 3-1    Specifying the Use of Local Host Name Resolution**

```
hosts:   files   dns   nis
```

**Example 3-2    Specifying the Use of DNS Host Name Resolution**

```
hosts:   dns    files   nis
```

#### 3.1.1.1.2 Resolving Host Names Locally

Local host name resolution uses the host name to IP mapping that is defined in the /etc/hosts file of a host.

When you resolve host names for your Disaster Recovery topology in this way, consider the following procedure:

1. Ensure that the hosts parameter in the /etc/nsswitch.conf file on all the production site and standby site hosts looks like this:

   ```
   hosts:   files   dns   nis
   ```

2. The /etc/hosts file entries on the hosts of the production site should have their physical host names mapped to their IP addresses. For simplicity and ease of maintenance, Oracle recommends that you provide the same entries on all the hosts of the production site. Example 3-3 shows the /etc/hosts file for the production site of a SOA enterprise deployment topology.
3. The /etc/hosts file entries on the hosts of the standby site should have their physical host names mapped to their IP addresses along with the physical host names of their corresponding peer on the production site defined as the alias

host names. For simplicity and ease of maintenance, Oracle recommends that you have the same entries on all the hosts of the standby site. Example 3-4 shows the /etc/hosts file for the standby site of a SOA enterprise deployment topology.

4. After you set up host name resolution by using /etc/host file entries, use the ping command to test host name resolution. For a system configured with static IP addressing and the /etc/hosts file entries shown in Example 3-3, a ping webhost1 command on the production site returns the correct IP address (172.16.2.111) and indicates that the host name is fully qualified.

5. Similarly, for a system configured with static IP addressing and the /etc/hosts file entries shown in Example 3-4, a ping webhost1 command on the standby site returns the correct IP address (172.26.2.111) and it shows that the name WEBHOST1 is associated with that IP address.

**Example 3-3 Making /etc/hosts File Entries for a Production Site Host**

```
174.0.0.1      localhost.localdomain    localhost
172.16.2.111    WEBHOST1.EXAMPLE.COM    WEBHOST1
172.16.2.112    WEBHOST2.EXAMPLE.COM    WEBHOST2
172.16.2.113    SOAHOST1.EXAMPLE.COM    SOAHOST1
172.16.2.114    SOAHOST2.EXAMPLE.COM    SOAHOST2
```

**Example 3-4 Making /etc/hosts File Entries for a Standby Site Host**

```
176.0.0.1      localhost.localdomain    localhost
172.26.2.111    STBYWEB1.EXAMPLE.COM    STBYWEB1 WEBHOST1.EXAMPLE.COM WEBHOST1
172.26.2.112    STBYWEB2.EXAMPLE.COM    STBYWEB2 WEBHOST2.EXAMPLE.COM WEBHOST2
172.26.2.113    STBYSOA1.EXAMPLE.COM    STBYSOA1 SOAHOST1.EXAMPLE.COM SOAHOST1
172.26.2.114    STBYSOA2.EXAMPLE.COM    STBYSOA2 SOAHOST2.EXAMPLE.COM SOAHOST2
```

> **Note:**
>
> The subnets in the production site and standby site are different.

### 3.1.1.1.3 Resolving Host Names Using Separate DNS Servers

Use separate DNS servers to resolve host names for your Disaster Recovery topology.

The term *separate DNS servers* refers to a Disaster Recovery topology, where the production site and the standby site have separate and distinct DNS servers. When you use separate DNS servers to resolve host names for your Disaster Recovery topology, consider the following procedure:

1. Ensure that the hosts parameter in the /etc/nsswitch.conf file on all the production site and standby site hosts looks like this:

   ```
   hosts:   dns   files   nis
   ```

2. The DNS servers on the production site and standby site must not be aware of each other and must contain entries for host names used within their own site.

3. The DNS server entries on the production site should have the physical host names mapped to their IP addresses. Example 3-5 shows the DNS server entries for the production site of a SOA enterprise deployment topology.

4. The DNS server entries on the standby site should have the physical host names of the production site mapped to their IP addresses. Example 3-6 shows the DNS server entries for the standby site of a SOA enterprise deployment topology.

5. Ensure that there are no entries in the /etc/hosts file for any host at the production site or standby site.
6. Test the host name resolution by using the ping command. For a system configured with the production site DNS entries, as shown in Example 3-5, a ping webhost1 command on the production site returns the correct IP address (172.16.2.111) and indicates that the host name is fully qualified.
7. Similarly, for a system configured with the standby site DNS entries shown in Example 3-6, a ping webhost1 command on the standby site returns the correct IP address (172.26.2.111) and indicates that the host name is fully qualified.

**Example 3-5 DNS Entries for a Production Site Host in a Separate DNS Servers Configuration**

```
WEBHOST1.EXAMPLE.COM    IN    A    172.16.2.111
WEBHOST2.EXAMPLE.COM    IN    A    172.16.2.112
SOAHOST1.EXAMPLE.COM    IN    A    172.16.2.113
SOAHOST2.EXAMPLE.COM    IN    A    172.16.2.114
```

**Example 3-6 DNS Entries for a Standby Site Host in a Separate DNS Servers Configuration**

```
WEBHOST1.EXAMPLE.COM    IN    A    172.26.2.111
WEBHOST2.EXAMPLE.COM    IN    A    172.26.2.112
SOAHOST1.EXAMPLE.COM    IN    A    172.26.2.113
SOAHOST2.EXAMPLE.COM    IN    A    172.26.2.114
```

#### 3.1.1.1.4 Resolving Host Names Using a Global DNS Server

Use a global DNS server to resolve host names for your Disaster Recovery topology.

The term *global DNS server* refers to a Disaster Recovery topology, where a single DNS server is used for both the production site and the standby site. When you use a global DNS server to resolve host names for your Disaster Recovery topology, consider the following procedure:

1. When you use a global DNS server, for the sake of simplicity, use a combination of local host name resolution and DNS host name resolution.
2. In this example, it is assumed that the production site uses DNS host name resolution and the standby site uses local host name resolution.
3. The global DNS server should have the entries for both the production and standby site hosts. Example 3-7 shows the entries for a SOA enterprise deployment topology.
4. Ensure that the hosts parameter in the /etc/nsswitch.conf file on all the production site hosts looks like this:

   ```
   hosts:   dns   files   nis
   ```

5. Ensure that the hosts parameter in the /etc/nsswitch.conf file on all the standby site hosts looks like this:

   ```
   hosts:   files   dns   nis
   ```

6. The /etc/hosts file entries on the hosts of the standby site should have their physical host names mapped to their IP addresses along with the physical host names of their corresponding peer on the production site defined as the alias host names. For simplicity and ease of maintenance, Oracle recommends that you have the same entries on all the hosts of the standby site. Example 3-8

shows the /etc/hosts file for the production site of a SOA Enterprise Deployment topology.

7. Test the host name resolution by using the ping command. A ping webhost1 command on the production site returns the correct IP address (172.16.2.111) and indicates that the host name is fully qualified.

8. Similarly, a ping webhost1 command on the standby site returns the correct IP address (172.26.2.111) and indicates that the host name is fully qualified.

**Example 3-7 DNS Entries for Production Site and Standby Site Hosts When Using a Global DNS Server Configuration**

```
WEBHOST1.EXAMPLE.COM    IN    A    172.16.2.111
WEBHOST2.EXAMPLE.COM    IN    A    172.16.2.112
SOAHOST1.EXAMPLE.COM    IN    A    172.16.2.113
SOAHOST2.EXAMPLE.COM    IN    A    172.16.2.114
STBYWEB1.EXAMPLE.COM    IN    A    172.26.2.111
STBYWEB2.EXAMPLE.COM    IN    A    172.26.2.112
STBYSOA1.EXAMPLE.COM    IN    A    172.26.2.113
STBYSOA2.EXAMPLE.COM    IN    A    172.26.2.114
```

**Example 3-8 Standby Site /etc/hosts File Entries When Using a Global DNS Server Configuration**

```
176.0.0.1       localhost.localdomain    localhost
172.26.2.111     STBYWEB1.EXAMPLE.COM    WEBHOST1
172.26.2.112     STBYWEB2.EXAMPLE.COM    WEBHOST2
172.26.2.113     STBYSOA1.EXAMPLE.COM    SOAHOST1
172.26.2.114     STBYSOA2.EXAMPLE.COM    SOAHOST2
```

#### 3.1.1.1.5 Testing the Host Name Resolution

Validate the host name assignment by connecting to each host at the production site and by using the ping command to ensure that the host can locate the other hosts at the production site.

In addition, connect to each host at the standby site and use the ping command to ensure that the host can locate the other hosts at the standby site.

## 3.1.2 Virtual IP and Virtual Host Name Considerations

When the system hosting the Oracle WebLogic Administration Server fails, Virtual IP addresses and host names are required to enable the Oracle WebLogic Administration Server to continue servicing requests .

Virtual IP addresses enable Managed Servers in your domain to participate in server migration. Virtual servers should be provisioned in the application tier so that they can be bound to a network interface on any host in the application tier.

In a Disaster Recovery topology, the production site virtual IP host names must be resolvable to the IP addresses of the corresponding peer systems at the standby site. Therefore, it is important to plan the host names for the production site and the standby site. After failover from a primary site to a standby site, the alias host name for the middle tier host on the standby site becomes active. You do not need to reconfigure a host name for the host on the standby site if you set up aliases for the standby site.

This section describes how to plan virtual IP host names and alias host names for the middle tier hosts that use the Oracle Fusion Middleware instances at the production site and the standby site. This is required when you have a single corporate DNS.

It uses the Oracle SOA Suite enterprise deployment shown in Figure 3-1 for the host name examples. The host name examples in this section assume that a symmetric disaster recovery site is being set up, where the production site and standby site have the same number of hosts. Each host at the production site and the standby site has a peer host at the other site. The peer hosts are configured the same, for example, by using the same ports as their counterparts at the other site.

The following subsections show how to set up virtual IP addresses and host names at the Disaster Recovery production site and standby site for the following enterprise deployments:

**Virtual IP Addresses** and **Virtual Host Names** for the Oracle SOA Suite Production Site and Standby Site Hosts.

Table 3-3 shows the virtual IP addresses and virtual host names that are used for the Oracle SOA Suite EDG deployment production site hosts. Figure 3-1 shows the configuration for the Oracle SOA Suite EDG deployment at the production site.

**Table 3-3 Virtual IP Addresses and Virtual Host Names for the SOA Suite Production Site Hosts**

| Virtual IP Address | Virtual Host Name | Alias Host Name |
|---|---|---|
| 172.16.2.115 | ADMINVHN | None |
| 172.16.2.116 | SOAVHN1 | None |
| 172.16.2.117 | SOAVHN2 | None |

Table 3-4 shows the virtual IP addresses, virtual host names, and alias host names that are used for the Oracle SOA Suite EDG deployment standby site hosts. Figure 3-2 shows the physical host names that are used for the Oracle SOA Suite EDG deployment at the standby site. The alias host names shown in Table 3-4 should be defined for the SOA Oracle Suite standby site hosts, as shown in Figure 3-2.

> **Note:**
>
> If you use separate DNS servers to resolve host names, then you can use the same virtual IP addresses and virtual host names for the production site hosts and standby site hosts, and you do not need to define the alias host names.
>
> For more information about using separate DNS servers to resolve host names, see Resolving Host Names Using Separate DNS Servers .

**Table 3-4 Virtual IP Addresses, Virtual Host Names, and Alias Host Names for SOA Suite Standby Site Hosts**

| Virtual IP Address | Virtual Host Name | Host Name Alias |
|---|---|---|
| 172.26.2.115 | STBYADMINVHN | ADMINVHN |
| 172.26.2.116 | STBYSOAVHN1 | SOAVHN1 |

**Table 3-4 (Cont.) Virtual IP Addresses, Virtual Host Names, and Alias Host Names for SOA Suite Standby Site Hosts**

| Virtual IP Address | Virtual Host Name | Host Name Alias |
|---|---|---|
| `172.26.2.117` | `STBYSOAVHN2` | `SOAVHN2` |

## 3.1.3 Load Balancer Considerations

Oracle Fusion Middleware components require a hardware load balancer when deployed in high availability topologies.

Oracle recommends that your hardware load balancer support the following features:

- Ability to load balance traffic to a pool of real servers through a virtual host name: Clients access services by using the virtual host name instead of using actual host names. The load balancer can then load balance requests to the servers in the pool.
- Port translation configuration.
- Monitoring of ports (HTTP and HTTPS).
- Virtual servers and port configuration: Ability to configure virtual server names and ports on your external load balancer. The virtual server names and ports must meet the following requirements:
  - The load balancer should allow configuration of multiple virtual servers. For each virtual server, the load balancer should allow configuration of traffic management on more than one port. For example, for Oracle Internet Directory clusters, you must configure the load balancer with a virtual server and ports for LDAP and LDAPS traffic.
  - The virtual server names must be associated with IP addresses and be part of your DNS. Clients must be able to access the load balancer through the virtual server names.
- Ability to detect node failures and immediately stop routing traffic to the failed node.
- Resource monitoring, port monitoring, and process failure detection: The load balancer must be able to detect service and node failures (through notification or some other means) and stop directing non-Oracle Net traffic to the failed node. If your load balancer can automatically detect failures, you should use this feature.
- Fault-tolerant mode: It is highly recommended that you configure the load balancer to be in fault-tolerant mode.
- It is highly recommended that you configure the load balancer virtual server to return immediately to the calling client when the back-end services to which it forwards traffic are unavailable. This is preferred over the client disconnecting on its own after a timeout based on the TCP/IP settings on the client system.
- Sticky routing capability: Ability to maintain sticky connections to components based on cookies or URLs.
- SSL acceleration: This feature is recommended, but not required.
- For the Identity Management configuration with Oracle Access Manager, configure the virtual servers in the load balancer for the directory tier with a high value for

the connection timeout for TCP connections. This value should be more than the maximum expected time over which no traffic is expected between the Oracle Access Manager and the directory tier.

- Ability to preserve the client IP addresses: The load balancer must have the capability to insert the original client IP address of a request in an `X-Forwarded-For` HTTP header to preserve the client IP address.

## 3.1.4 Virtual Server Considerations

You must configure the Virtual servers and the associated ports on the load balancer for different types of network traffic and monitoring.

Configure them to the appropriate real hosts and ports for the services running. Also, the load balancer should be configured to monitor the real host and ports for availability so that the traffic to these is stopped as soon as possible when a service is down. This ensures that incoming traffic on a given virtual host is not directed to an unavailable service in the other tiers.

Oracle recommends that you use two load balancers when you deal with external and internal traffic. In such a topology, one load balancer is set up for external HTTP traffic and the other load balancer is set up for internal LDAP traffic. A deployment may choose to have a single load balancer device due to a variety of reasons. Although this is supported, the deployment should consider the security implications of doing this and if appropriate, open up the relevant firewall ports to allow traffic across the various DMZs. It is worth noting that in either case, it is highly recommended to deploy a given load balancer device in fault tolerant mode.

Some of the virtual servers defined in the load balancer are used for inter-component communication. These virtual servers are used for internal traffic and are defined in the internal DNS of a company.When you use a single global DNS server to resolve host names, Oracle highly recommends that you create aliases for these virtual servers .

Creating aliases is not required when you use separate DNS servers to resolve host names.

The virtual servers required for the various Oracle Fusion Middleware products are described in Table 3-5 and Table 3-6.

**Table 3-5 Virtual Servers for Oracle SOA Suite Production Site**

| Components | Access | Virtual Server Name | Alias Name |
|---|---|---|---|
| Oracle SOA | External | `soa.example.com` | None |
| Oracle SOA | Internal | `sointernal.example.com` | None |
| Administration Consoles | Internal | `admin.example.com` | None |

**Table 3-6 Virtual Servers for Oracle SOA Suite Standby Site**

| Components | Access | Virtual Server Name | Alias Virtual Server Name |
|---|---|---|---|
| Oracle SOA | External | `soa.example.com` | None |
| Oracle SOA | Internal | `stbysoainternal.example.com` | `soainternal.example.com` |
| Administration Consoles | Internal | `admin.example.com` | None |

## 3.1.5 External Clients Considerations

Systems directly accessing the servers in the topology need to be aware of the listen address that is used by the different Oracle WebLogic Server instances.

An appropriate host name resolution needs to be provided to the clients so that the host name alias used by the servers as listen address is correctly resolved. This is also applicable to the Oracle JDeveloper deployments. The client hosting Oracle Jdeveloper needs to map the `SOAHOSTx` and `SOAVHNx` aliases to correct the IP addresses for deployments to succeed.

## 3.1.6 Wide Area DNS Operations

When a site switchover or failover is carried out, client requests must be redirected transparently to the new site that is playing the production role.

To direct client requests to the entry point of a production site, use DNS resolution. To accomplish this redirection, the wide area DNS that resolves requests to the production site has to be switched over to the standby site. The DNS switchover can be accomplished by either using a global load balancer or manually changing DNS names.

> **Note:**
>
> A hardware load balancer is assumed to serve as a front end for each site. Check for supported load balancers at:
>
> `http://support.oracle.com`

This section includes the following topics:

- Using a Global Load Balancer
  A global load balancer deployed in front of the production and standby sites provides fault detection services and performance-based routing redirection for the two sites.
- Manually Changing DNS Names
  The DNS switch-over involves to manually change the name-to-IP mapping of the production site's load balancer.

### 3.1.6.1 Using a Global Load Balancer

A global load balancer deployed in front of the production and standby sites provides fault detection services and performance-based routing redirection for the two sites.

In addition, the load balancer can provide authoritative DNS name server equivalent capabilities.

During normal operations, you can configure the global load balancer with the production site's load balancer name-to-IP mapping. When a DNS switchover is required, this mapping in the global load balancer is changed to map to the standby site's load balancer IP. This allows requests to be directed to the standby site, which now has the production role.

This method of DNS switchover works for both site switchover and failover. One advantage of using a global load balancer is that the time for a new name-to-IP mapping to take effect can be almost immediate. The downside is that an additional investment must be made for the global load balancer.

### 3.1.6.2 Manually Changing DNS Names

The DNS switch-over involves to manually change the name-to-IP mapping of the production site's load balancer.

The mapping is changed to map to the IP address of the standby site's load balancer. Follow these instructions to perform the switchover:

1. Note the current Time to Live (TTL) value of the production site's load balancer mapping. This mapping is in the DNS cache, and it remains there until the TTL expires. As an example, assume that the TTL is 3600 seconds.
2. Modify the TTL value to a short interval (for example, 60 seconds).
3. Wait one interval of the original TTL. This is the original TTL of 3600 seconds from Step 1.
4. Ensure that the standby site is switched over to receive requests.
5. Modify the DNS mapping to resolve to the standby site's load balancer, giving it the appropriate TTL value for normal operation (for example, 3600 seconds).

This method of DNS switchover works for switchover or failover operations. The TTL value set in Step 2 should be a reasonable time period where client requests cannot be fulfilled. The modification of the TTL effectively modifies the caching semantics of the address resolution from a long period of time to a short period. Due to the shortened caching period, an increase in DNS requests can be observed.

If the clients that point to SOA are running on Java, another TTL property can be taken into account. Java has a DNS cache that can be configured for caching the successful DNS resolutions, so in that case, the change in DNS server is not refreshed until Java is restarted. This can be modified by setting the property `networkaddress.cache.ttl` to a low value:

- You can do it globally, for all the applications that are running on the JVM, by modifying the property in `JAVA_HOME/jre/lib/security/java.security file: networkaddress.cache.ttl=60`
- You can define it for a specific application only, by setting that property in the application's initialization code:
  `java.security.Security.setProperty("networkaddress.cache.ttl", "60")`

## 3.2 Storage Considerations

When you design storage for your Disaster Recovery solution, consider Fusion Middleware artifacts, storage replication, and file-based persistent stores.

This section includes the following topics:

- Oracle Fusion Middleware Artifacts
  Oracle Fusion Middleware components in a given environment are usually interdependent on one another, so it is important that the components in the topology be synchronized.

- Oracle Home and Oracle Inventory
  Oracle Fusion Middleware allows you to create multiple Oracle WebLogic Server Managed Servers from one single binary file installation.
- Storage Replication
  Learn about the guidelines to create volumes on a shared storage.
- File-Based Persistent Store
  The Java Message Service (JMS) and transaction logs (TLogs) can use a file-based persistent store in the Oracle SOA Suite topology. Oracle, however, recommends that for DR deployments JDBC stores are used both for JMS and TLOGS.

## 3.2.1 Oracle Fusion Middleware Artifacts

Oracle Fusion Middleware components in a given environment are usually interdependent on one another, so it is important that the components in the topology be synchronized.

This synchronization is important when you design volumes and consistency groups. Some artifacts are static whereas others are dynamic.

**Static Artifacts**

Static artifacts are files and directories that do not change frequently. These include:

- home: The Oracle home usually consists of an Oracle home and an Oracle WebLogic Server home.
- Oracle Inventory: This includes `oraInst.loc` and `oratab` files, which are located in the `/etc` directory.

**Dynamic or Runtime Artifacts**

Dynamic or runtime artifacts are files that change frequently. Runtime artifacts include:

- Domain home: Domain directories of the Administration Server and the Managed Servers.
- Oracle instances: Oracle Instance home directories.
- Application artifacts, such as `.ear` or `.war` files.
- Database artifacts, such as the MDS repository.
- Database metadata repositories that are used by Oracle Fusion Middleware.
- Persistent stores, such as JMS providers and transaction logs.
- Deployment plans: Used for updating technology adapters, such as file and JMS adapters. They need to be saved in a location that is accessible to all nodes in the cluster that the artifacts are being deployed to.

## 3.2.2 Oracle Home and Oracle Inventory

Oracle Fusion Middleware allows you to create multiple Oracle WebLogic Server Managed Servers from one single binary file installation.

You can install binary files in a single location on a shared storage and reuse this installation by servers in different nodes. Note that, for maximum availability, Oracle recommends that you use redundant binary installations.

When an Oracle home or a WebLogic home is shared by multiple servers in different nodes, Oracle recommends that you keep the Oracle Inventory and Oracle home list in those nodes that are updated for consistency in the installations and application of patches.

To update the inventory files in a node and attach an installation in a shared storage to it, use the `ORACLE_HOME/oui/bin/attachHome.sh` file.

## 3.2.3 Storage Replication

Learn about the guidelines to create volumes on a shared storage.

Depending on the capabilities of the storage replication technology available with your preferred storage device you may need to create mount points, directories, and symbolic links on each of the nodes within a tier.

If your storage device's storage replication technology guarantees consistent replication across multiple volumes, then complete the following:

- Create one volume per server running on that tier. For example, on the application tier, you can create one volume for the WebLogic Administration Server and another volume for the Managed Servers.
- Create one consistency group for each tier with the volumes for that tier as its members.
- If a volume is mounted by two systems simultaneously, a clustered file system may be required for this, depending on the storage subsystem. However, there is no known case of a single file or directory tree being concurrently accessed by Oracle processes on different systems. NFS is a clustered file system, so no additional clustered file system software is required if you are using NFS-attached storage.

If your storage device's storage replication technology does not guarantee consistent replication across multiple volumes, then complete the following:

- Create a volume for each tier. For example, you can create one volume for the application tier, one for the web tier, and so on.
- Create a separate directory for each node in that tier. For example, you can create a directory for SOAHOST1 under the application tier volume, create a directory for WEBHOST1 under the web tier volume, and so on.
- Create a mount point directory on each node to the directory on the volume.
- Create a symbolic link to the mount point directory. This enables the same directory structure to be used across the nodes in a tier.
- If a volume is mounted by two systems simultaneously, a clustered file system may be required for this, depending on the storage subsystem. However, there is no known case of a single file or directory tree being concurrently accessed by Oracle processes on different systems. NFS is a clustered file system, so no additional clustered file system software is required if you are using NFS-attached storage.

> **Note:**
>
> Before you set up the shared storage for your Disaster Recovery sites, read the high availability chapter in the *Oracle Fusion Middleware Release Notes* to learn of any known shared storage-based deployment issues in high availability environments.

### 3.2.4 File-Based Persistent Store

The Java Message Service (JMS) and transaction logs (TLogs) can use a file-based persistent store in the Oracle SOA Suite topology. Oracle, however, recommends that for DR deployments JDBC stores are used both for JMS and TLOGS.

Oracle WebLogic Servers are usually clustered for high availability, and this file-based persistent store must reside on a shared storage that is accessible to all members of the cluster.

A Storage Area Network (SAN) storage system should use either a host-based clustered or a shared file system technology such as the Oracle Clustered File System (OCFS2). OCFS2 is a symmetric shared disk cluster file system that allows each node to read and write both metadata and data directly to the SAN.

Additional clustered file systems are not required when you use NAS storage systems.

## 3.3 Database Considerations

When you plan your Disaster Recovery solution, consider synchronizing the databases in your system with Oracle Data Guard.

This section provides the recommendations and considerations to set up Oracle databases that are used in an Oracle Fusion Middleware Disaster Recovery topology.

- Oracle recommends that you create Oracle Real Application Cluster (Oracle RAC) databases on both the production site and standby site, as required by your topology.
- Oracle Data Guard is the recommended disaster protection technology for the databases running the metadata repositories. You can also use Oracle Active Data Guard or Oracle GoldenGate.

  > **Note:**
  >
  > You can use Oracle GoldenGate in an active-passive configuration only.

- The Oracle Data Guard configuration that is used should be decided based on the data loss requirements of the database as well as the network considerations such as the available bandwidth and latency when compared to the redo generation. Ensure that this is determined correctly before you set up the Oracle Data Guard configuration.

- Ensure that your network is configured for low latency with sufficient bandwidth, because synchronous redo transmission can affect the response time and throughput.
- The LOG_ARCHIVE_DEST_n parameter on standby site databases should have the SYNC or ASYNC attributes. If no attributes are specified,ASYNC is the default attribute.
- The standby site database should be in Managed Recovery mode. This ensures that the standby site databases are in a constant state of media recovery. Managed Recovery mode is enabled for shorter failover times.
- The tnsnames.ora file on the production site and the standby site must have entries for databases on both the production and standby sites.
- Oracle strongly recommends that you force Oracle Data Guard to perform manual database synchronization whenever middle tier synchronization is performed. This is especially important for components that store configuration data in the metadata repositories.
- Oracle strongly recommends that you set up aliases for the database host names on both the production and standby sites. This enables seamless switchovers, switchbacks, and failovers.
- When one of the databases at either site is an Oracle RAC database, it is required that the single instance database at the peer site must have the same value for instance_name.

> **Note:**
>
> – The values for ORACLE_HOME, home, ORACLE_INSTANCE, DOMAIN_HOME in the middle tier must be identical.
>
> – The values for DB_NAME, INSTANCE_NAME, Listen Port, and ORACLE_SID in the database tier must be identical.
>
> – To avoid manipulation of the WLS data sources, the SERVICE_NAME specified in the Application Data Source must be identical. However, each database can have additional services defined.

The following sections explain database points:

- Recommended Setup for Two Node Cluster Database with ASM
  Learn about the recommended setup for a database with ASM (Automatic Storage Management) with two cluster nodes.
- Making TNSNAMES.ORA Entries for Databases
  Oracle Data Guard is used to synchronize production and standby databases, so the production and standby databases can reference each other.
- Synchronizing Databases Manually
  Use SQL to synchronize production and standby databases.
- Setting Up Dataguard-ready DataSources in the Middle Tier
  Configure the data sources that Oracle Fusion Middleware uses to automate connections failover, in case of a failover or switchover of the primary database.

## 3.3.1 Recommended Setup for Two Node Cluster Database with ASM

Learn about the recommended setup for a database with ASM (Automatic Storage Management) with two cluster nodes.

ASM is a volume manager and a file system for Oracle database files that supports single-instance Oracle Database and Oracle Real Application Clusters (Oracle RAC) configurations. ASM is Oracle's recommended storage management solution that provides an alternative to conventional volume managers, file systems, and raw device.

For additional information about RAC and ASM, see the following documents:

- *Oracle Database Storage Administrator's Guide*
- *Oracle Real Application Clusters Installation Guide*

**Sysctl Setup**

1. 1. Set the values of `sysctl` by running the following command.
   To set up a database with clusters `custdbhost1.example.com` and `custdbhost2.example.com`, run the commands on both `custdbhost1.example.com` and `custdbhost2.example.com` secondary systems.

   > **Note:**
   >
   > The values and parameters mentioned below are the minimum required; they may vary according to your particular system requirements.

   - `/sbin/sysctl -w net.ipv4.ip_forward=0`
   - `/sbin/sysctl -w net.ipv4.conf.default.rp_filter =1`
   - `/sbin/sysctl -w net.ipv4.tcp_tw_recycle=1`
   - `/sbin/sysctl -w kernel.sysrq=1`
   - `/sbin/sysctl -w kernel.panic=60`
   - `/sbin/sysctl -w kernel.sysrq=1`
   - `/sbin/sysctl -w kernel.shmall=2097152`
   - `/sbin/sysctl -w kernel.shmmni=4096`
   - `/sbin/sysctl -w kernel.shmmax=8178892800`
   - `/sbin/sysctl -w kernel.shmall=1073741824`
   - `/sbin/sysctl -w fs.file-max=6815744`
   - `/sbin/sysctl -w kernel.msgmni=2878`
   - `/sbin/sysctl -w kernel.sem="50 32000 100 142"`
   - `/sbin/sysctl -w net.core.rmem_default=1048576`
   - `/sbin/sysctl -w net.core.rmem_max=4194304`
   - `/sbin/sysctl -w net.core.wmem_default=524288`

- `/sbin/sysctl -w net.core.wmem_max=1048586`
- `/sbin/sysctl -w fs.aio-max-nr=1048576`
- `/sbin/sysctl -w "net.ipv4.ip_local_port_range"="9000 65500"`

2. To load the changed values, run the following command:
   - `/sbin/sysctl -p`

### Create the Swap Size

To setup swap size:

1. Update Swap Space to minimum 500MB.
2. Update Temp Space to minimum 500MB(`/tmp`).
3. chmod 600 `/root/myswapfile`
4. `/sbin/mkswap /root/myswapfile`.
5. `/sbin/swapon /root/myswapfile`.
6. Edit the `/etc/fstab` file to add the following entry:

   ```
   /root/myswapfile swap  swap defaults  0 0
   ```

   Example:

   ```
   dd if=/dev/zero of=/root/myswapfile bs=1M count=6144
   ```

### Set Soft & Hard Limits

Edit the `/etc/security/limits.conf` file and add the following entries as the root user.

> **Note:**
>
> The values mentioned below are the minimum required; they may vary according to your particular system requirements.

```
soft    nproc          2047

hard    nproc          16384

soft    nofile         8192

hard    nofile         65536
```

### Create the Folder Structure for Mount and Grid Installation

The following commands create a sample file structure and may vary per user.

To create the folder structure, run as root the following commands:

```
mkdir -p /u01/app/12.1.0/grid

chown aime1:svrtech /u01/app/12.1.0/grid

mkdir -p /u01/app/aime1

mkdir -p /u01/app/oracle/db/RACDATA
```

```
chown aime1:svrtech /u01/app/oracle/db/RACDATA

mkdir -p /u01/app/oracle/db/RACDATA

chown aime1:svrtech /u01/app/oracle/db/RACDATA

mkdir -p /u01/app/oracle/db/12.1.0.1

chown aime1:svrtech /u01/app/oracle/db/12.1.0.1

mkdir -p /u01/app/oracle/crl

chown aime1:svrtech /u01/app/oracle/crl
```

### 3.3.2 Making TNSNAMES.ORA Entries for Databases

Oracle Data Guard is used to synchronize production and standby databases, so the production and standby databases can reference each other.

Oracle Data Guard uses the `tnsnames.ora` file entries to direct requests to the production and standby databases, so entries for production and standby databases must be made to the `tnsnames.ora` file. See *Oracle Data Guard Concepts and Administration* in the Oracle Database documentation set for more information about using `tnsnames.ora` files with Oracle Data Guard.

### 3.3.3 Synchronizing Databases Manually

Use SQL to synchronize production and standby databases.

The SQL `alter system archive log all` statement switches logs and thus forces a synchronization of the production and standby site databases.

To manually synchronize production and standby site databases, use the following SQL statement:

```
ALTER SYSTEM ARCHIVE LOG ALL;
```

### 3.3.4 Setting Up Dataguard-ready DataSources in the Middle Tier

Configure the data sources that Oracle Fusion Middleware uses to automate connections failover, in case of a failover or switchover of the primary database.

Configure all the data sources that are used in the domain, including datasources used by jdbc persistence stores, leasing data sources, and custom datasources. The `GridLink` data sources must be modified to include information about the standby database.

For detailed information to configure Dataguard-ready data sources, see Configuring Data Sources for Oracle Fusion Middleware Active-Passive Deployment.

## 3.4 Starting Points

When you plan your Disaster Recovery solution, consider starting with an existing site or creating a new site.

Before setting up the standby site, the administrator must evaluate the starting point of the project. The starting point for designing an Oracle Fusion Middleware Disaster Recovery topology is usually one of the following:

- The production site is already created and the standby site is being planned and created.

  Starting with an Existing Site describes how to design the Oracle Fusion Middleware Disaster Recovery standby site when you have an existing production site.

- There is no existing production site or standby site. Both need to be designed and created.

  Starting with a New Site describes how to design a new Oracle Fusion Middleware Disaster Recovery production site and standby site when you do not have an existing production site or standby site.

- Some hosts or components may exist at a current production site, but new hosts or components must be added at that site or at a standby site to set up a functioning Oracle Fusion Middleware Disaster Recovery topology.

  Use the pertinent information in this chapter to design and implement an Oracle Fusion Middleware Disaster Recovery topology.

This section includes the following topics:

- Starting with an Existing Site
  When you start with an existing production site, the configuration data and the Oracle binary files for the production site are already on the file system.
- Starting with a New Site
  When you start with a new production site for an Oracle Fusion Middleware Disaster Recovery topology, consider host names and ensure that storage replication is set up to copy the configuration (based on these names) to the standby site.

## 3.4.1 Starting with an Existing Site

When you start with an existing production site, the configuration data and the Oracle binary files for the production site are already on the file system.

In addition, the host names, ports, and user accounts are already defined. When you start with an existing production site, choose either of the following designs:

- Design a symmetric standby site. See Design Considerations for a Symmetric Topology.
- Design an asymmetric standby site. See Design Considerations for an Asymmetric Topology.
- First migrate the production site to shared storage (if not already in a shared storage), and then create either a symmetric standby or an asymmetric standby site by using the migrated data.

To migrate a production site, see the following section:

- Migrating an Existing Production Site to Shared Storage

### 3.4.1.1 Migrating an Existing Production Site to Shared Storage

The Oracle Fusion Middleware Disaster Recovery solution relies on shared storage to implement storage replication for disaster protection of the Oracle Fusion Middleware middle tier configuration. When a production site has already been created, it is likely that the Oracle home directories for the Oracle Fusion Middleware instances that comprise the site are not located on the shared storage. If this is the case, then these homes must be migrated completely to the shared storage to implement the Oracle Fusion Middleware Disaster Recovery solution.

Follow these guidelines for migrating the production site from the local disk to shared storage:

- All backups performed must be offline backups. See Types of Backups and Recommended Backup Strategy in *Oracle Fusion Middleware Administering Oracle Fusion Middleware*.
- The backups must be performed as the root user and the permissions must be preserved. See the Overview of the Backup Strategies in *Oracle Fusion Middleware Administering Oracle Fusion Middleware*.
- Because this is a one-time operation, you should recover the entire domain.
- The directory structure on the shared storage must be set up as described in Designing Directory Structure and Volumes.
- For Oracle SOA Suite, see Introducing Backup and Recovery in *Oracle Fusion Middleware Administering Oracle Fusion Middleware*.
- For Web Tier, see Introducing Backup and Recovery in *Oracle Fusion Middleware Administering Oracle Fusion Middleware*.

## 3.4.2 Starting with a New Site

When you start with a new production site for an Oracle Fusion Middleware Disaster Recovery topology, consider host names and ensure that storage replication is set up to copy the configuration (based on these names) to the standby site.

When you design a new production site, plan also the standby site, and use Oracle Universal Installer to install software on the production site. Parameters such as alias host names and software paths must be carefully designed to ensure that they are the same on both sites.

When you create a new Oracle Fusion Middleware Disaster Recovery production and standby sites, consider the following choices:

- Design your Oracle Fusion Middleware Disaster Recovery solution so that each host at the production site and at the standby site has the desired alias host name and physical host name. For more information about host name planning, see Planning Host Names.
- Choose the Oracle home name and Oracle home directory for each Fusion Middleware installation.

  Designing and creating your own site is easier than modifying an existing site to meet the design requirements described in this chapter.
- Assign ports for the Oracle Fusion Middleware installations for the production site hosts that do not conflict with the ports used by the standby site hosts.

This setup is easier than checking for and resolving port conflicts between an existing production and standby sites.

## 3.5 Topology Considerations

When you plan your for your Disaster Recovery solution, consider designing a symmetric or an asymmetric topology.

This section includes the following topics:

- Design Considerations for a Symmetric Topology
  A symmetric topology is an Oracle Fusion Middleware Disaster Recovery configuration that is identical across tiers on the production and standby sites.
- Design Considerations for an Asymmetric Topology
  An asymmetric topology is an Oracle Fusion Middleware Disaster Recovery configuration that differs across some tiers on the production and standby sites.

### 3.5.1 Design Considerations for a Symmetric Topology

A symmetric topology is an Oracle Fusion Middleware Disaster Recovery configuration that is identical across tiers on the production and standby sites.

In a symmetric topology, the production site and standby site have the identical number of hosts, load balancers, instances, and applications. The same ports are used for both sites. The systems are configured identically and the applications access the same data. This manual describes how to set up a symmetric Oracle Fusion Middleware Disaster Recovery topology for an enterprise configuration.

### 3.5.2 Design Considerations for an Asymmetric Topology

An asymmetric topology is an Oracle Fusion Middleware Disaster Recovery configuration that differs across some tiers on the production and standby sites.

In an asymmetric topology, the standby site can use less hardware (for example, the production site could include four hosts with four Oracle Fusion Middleware instances while the standby site includes two hosts with four Oracle Fusion Middleware instances).

For example, consider an asymmetric topology where the standby site uses fewer Oracle Fusion Middleware instances (for example, the production site could include four Oracle Fusion Middleware instances while the standby site includes just two Oracle Fusion Middleware instances).

Another asymmetric topology includes a different configuration for a database (for example, using an Oracle Real Application Clusters (Oracle RAC) database at the production site and a single instance database at the standby site.

# 4 Setting Up and Managing Disaster Recovery Sites

Learn about the Oracle SOA Suite enterprise deployment topology that illustrates how to set up production and standby sites.

> **Note:**
>
> You can automate disaster recovery operations such as switchover and failover by using Oracle Site Guard. See *Oracle Site Guard Administrator's Guide*.

This chapter includes the following sections:

- Setting Up a Site
  Learn how to set up an Oracle Disaster Recovery site.
- Creating a Production Site
  Learn how to create a production site on an Oracle SOA enterprise deployment topology.
- Creating a Standby Site
  Learn how to create a standby site.
- Creating an Asymmetric Standby Site
  Learn how to create an asymmetric Oracle Fusion Middleware Disaster Recovery topology.
- Performing Site Operations and Administration
  Learn how to operate and administer your Oracle Fusion Middleware Disaster Recovery topology.
- Using Oracle Site Guard for Disaster Recovery
  Oracle Site Guard orchestrates switchover and failover between two disaster recovery sites.
- Patching an Oracle Fusion Middleware Disaster Recovery Site
  Apply an Oracle Fusion Middleware patch set to upgrade the Oracle homes that participate in an Oracle Fusion Middleware Disaster Recovery site.

## 4.1 Setting Up a Site

Learn how to set up an Oracle Disaster Recovery site.

Before you start creating the production site, ensure that you:

- Set up the host name aliases for the middle tier hosts, as described in Planning Host Names.

- Create the required volumes on the shared storage on the production site, as described in Designing Directory Structure and Volumes.
- Determine the Oracle Data Guard configuration to use based on the data loss requirements of the database and network considerations, such as the available bandwidth and latency when compared to the redo generation.

This section includes the following topics:

- Designing Directory Structure and Volumes
  Learn about the recommended directory structure in your disaster recovery topology.
- Setting Up Storage Replication
  Learn how to set up storage replication for the Oracle Fusion Middleware Disaster Recovery topology.
- Installing and Configuring Databases
  Learn how to install and configure Oracle Database 11.2 or Oracle Database 12.1 MAA databases in an Oracle SOA Suite enterprise deployment.

## 4.1.1 Designing Directory Structure and Volumes

Learn about the recommended directory structure in your disaster recovery topology.

You can choose a directory layout different from the one recommended in this document, but the model adopted enables maximum availability, provides the best isolation of components and symmetry in the configuration, and facilitates backup and disaster recovery.

The following list describes directories and directory environment variables:

- `ORACLE_BASE`: This environment variable and related directory path refers to the base directory below which Oracle products are installed.
- `ORACLE_HOME`: This related directory path refers to the location where Oracle Fusion Middleware resides.
- `WL_HOME`: This environment variable and related directory path contains installed files that are necessary to host an Oracle WebLogic Server.
- `PROD_DIR`: This environment variable and related directory path refers to the location where a product suite, such as Oracle SOA Suite, Oracle WebCenter Portal, or Oracle Identity Management is installed.
- `DOMAIN` directory: This directory path refers to the location where the Oracle WebLogic Domain information (configuration artifacts) is stored. Different WebLogic Servers can use different domain directories even when in the same node.
- `ORACLE_INSTANCE`: An Oracle instance contains one or more system components. An Oracle instance directory contains updatable files, such as configuration files, log files, and temporary files.

See Recommended Directory Structure for Oracle SOA Suite.

This section includes the following topic:

- Recommended Directory Structure for Oracle SOA Suite
  Learn about the recommended directory structures for Oracle SOA Suite.

- Recommended Volume Design for Oracle SOA Suite
  Learn about the recommended volume design for Oracle SOA Suite.

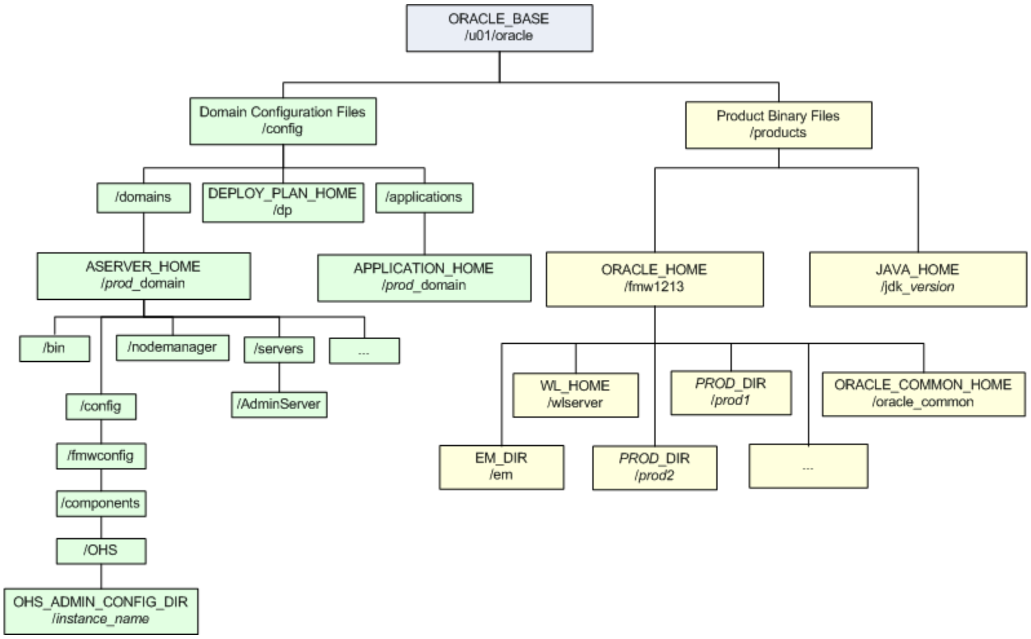
### 4.1.1.1 Recommended Directory Structure for Oracle SOA Suite

Learn about the recommended directory structures for Oracle SOA Suite.

Oracle Fusion Middleware allows you to create multiple SOA Managed Servers from a single binary installation. This allows the installation of binary files in a single location on a shared storage and the reuse of this installation by the servers in different nodes. However, for maximum availability, Oracle recommends that you use redundant binary installations. In this model, two Oracle homes (each of which has a `WL_HOME` and an `ORACLE_HOME` for each product suite) are installed in a shared storage. Additional servers (when scaling out or up) of the same type can use either one of these two locations without requiring more installations. Ideally, users should use two different volumes for redundant binary location, this isolating the failures as much as possible in each volume. For additional protection, Oracle recommends using storage replication for these volumes. If multiple volumes are not available, Oracle recommends that you use mount points to simulate the same mount location in a different directory in the shared storage. Although this does not guarantee the protection that multiple volumes provide, it does allow protection from user deletions and individual file corruption.

Oracle also recommends separating the domain directory that is used by the Administration Server from the domain directory that is used by Managed Servers. This allows a symmetric configuration for the domain directories that is used by Managed Servers, and isolates the failover of the Administration Server. The domain directory for the Administration Server must reside in a shared storage to allow failover to another node with the same configuration. In addition, Oracle recommends that you place the Managed Servers' domain directories on a shared storage, although having them on the local file system is also supported. This is especially important when you design a production site with the disaster recovery site in mind. Figure 4-1 represents the directory structure layout for Oracle SOA Suite.

**Figure 4-1 Directory Structure for Oracle SOA Suite**



For information about setting up this directory structure, see *Oracle Fusion Middleware Enterprise Deployment Guide for Oracle SOA Suite*.

For volume design, see the following section:

### 4.1.1.2 Recommended Volume Design for Oracle SOA Suite

Learn about the recommended volume design for Oracle SOA Suite.

Figure 4-2 and Figure 4-3 shows an Oracle SOA Suite topology diagram. The volume design described in this section is for this Oracle SOA Suite topology. Detailed instructions for installing and configuring this topology are provided in the *Oracle Fusion Middleware Enterprise Deployment Guide for Oracle SOA Suite*.

### Figure 4-2 Oracle SOA Suite and Oracle Business Activity Monitoring Enterprise Topology Diagram

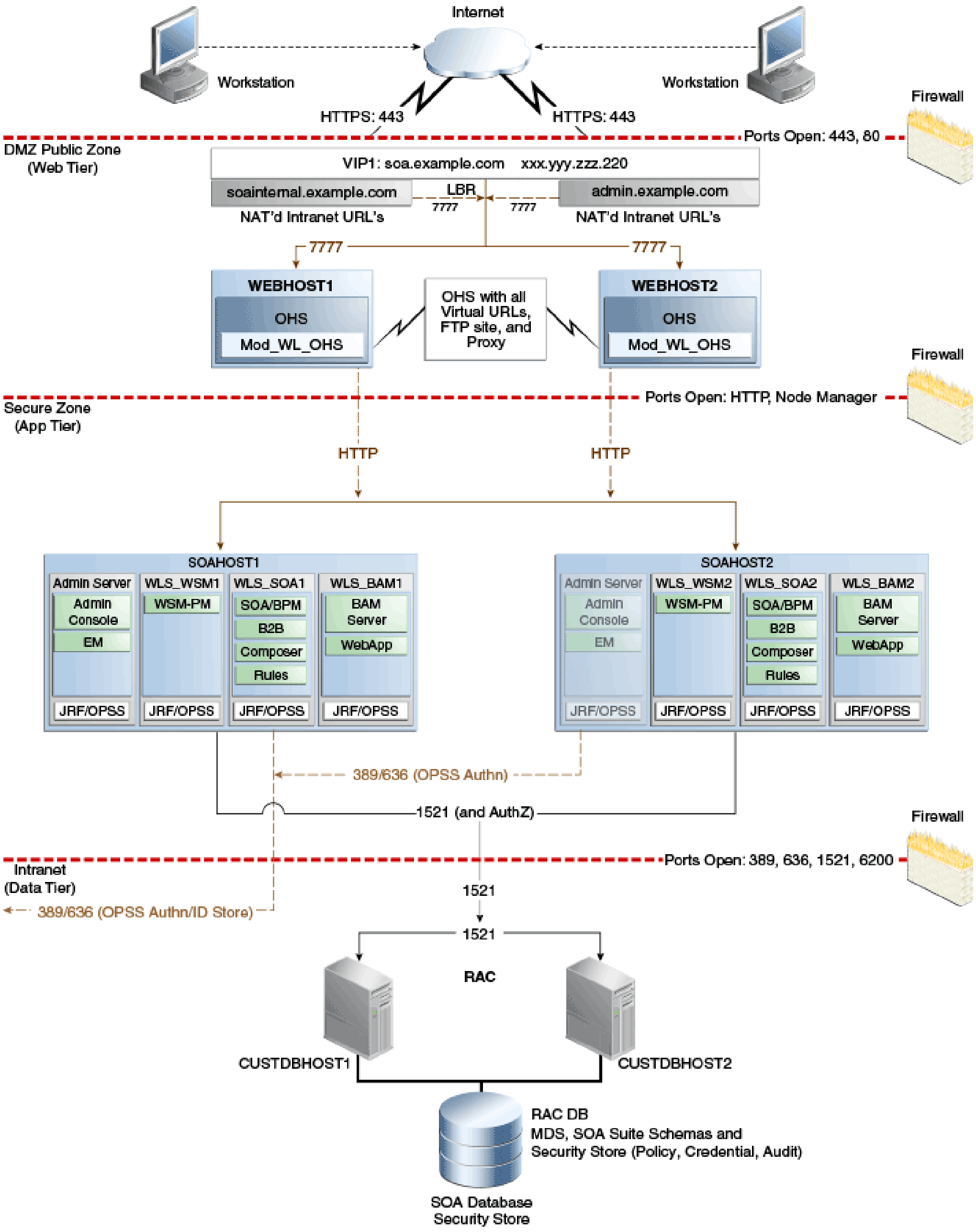
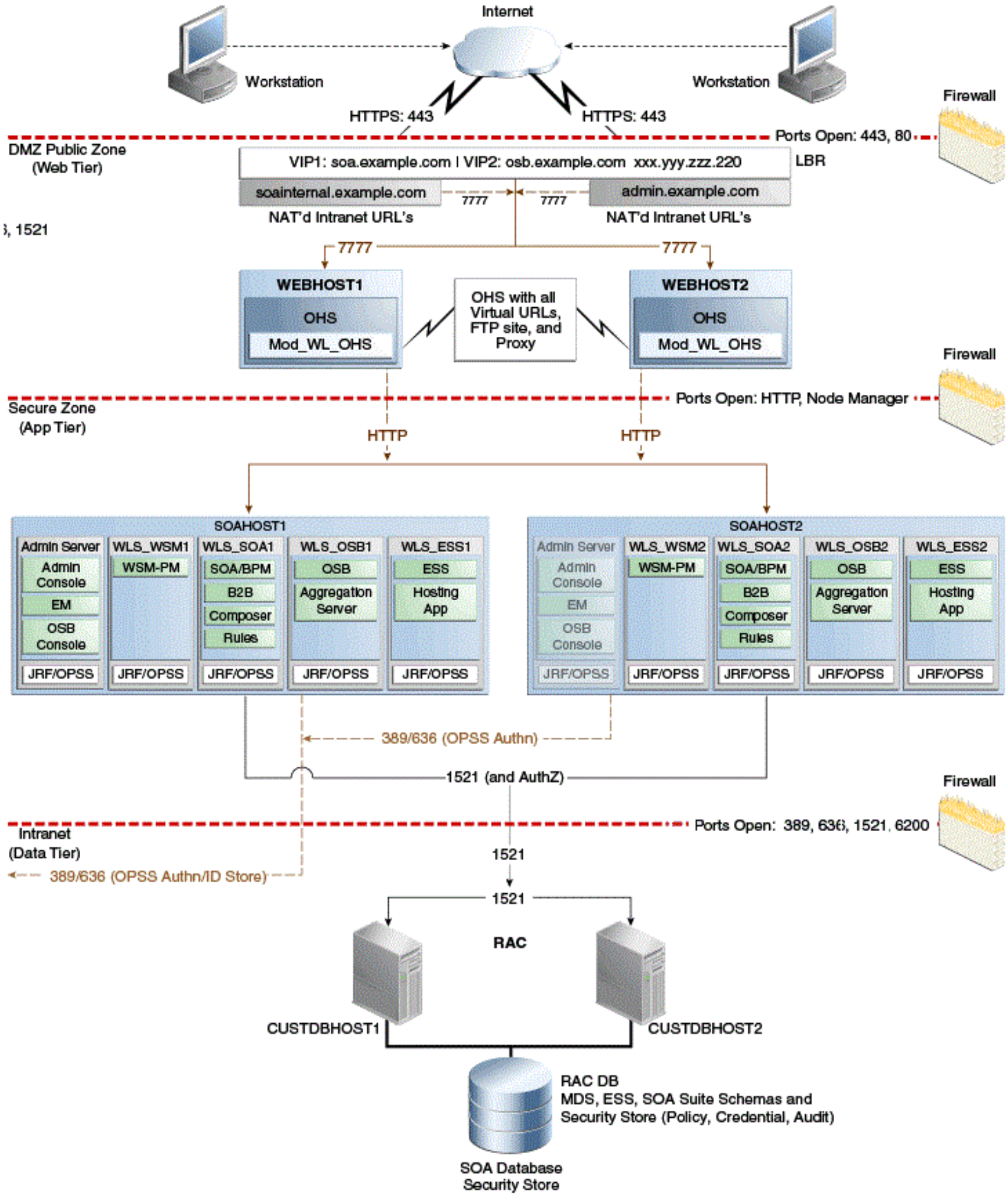


**Figure 4-3 Oracle SOA Suite and Oracle Service Bus Enterprise Deployment Reference Topology Diagram**



For disaster recovery of this Oracle SOA Suite topology, Oracle recommends the following volume design:

- Provision two volumes for two Oracle homes that contain the redundant product binary files (`VOLFMW1` and `VOLFMW2` in Table 4-1).
- Provision one volume for the Administration Server domain directory (`VOLADMIN` in Table 4-1).
- Provision one volume on each node for the Managed Server domain directory (`VOLSOA1` and `VOLSOA2` in Table 4-1). This directory is shared among all the Managed Servers on that node.

- Provision one volume for the JMS file store and the JTA transaction logs (VOLDATA in Table 4-1). One volume for the entire domain is mounted on all the nodes in the domain.
- Provision one volume on each node for the Oracle HTTP Server Oracle home (VOLWEB1 and VOLWEB2 in Table 4-1).
- Provision one volume on each node for the Oracle HTTP Server Domain Directory (VOLOHS1 and VOLOHS2 in Table 4-1).

> **Note:**
>
> For WebTier hosts, local storage is usually recommended. You can replicate this configuration on a regular basis to one of the other app tier volumes to sync to standby or directly from the production webhost to the standby webhost.

Table 4-1 provides a summary of Oracle recommendations for volume design for the Oracle SOA Suite topology shown in Figure 4-2 and Figure 4-3.

**Table 4-1 Volume Design Recommendations for Oracle SOA Suite**

| Tier | Volume Name | Mounted on Host | Mount Point | Comments |
|---|---|---|---|---|
| Web | VOLWEB1 | WEBHOST1 | /u02/oracle/products/fmw | Volume for Oracle HTTP Server installation |
| Web | VOLWEB2 | WEBHOST2 | /u02/oracle/products/fmw | Volume for Oracle HTTP Server installation |
| Web | VOLOHS1 | WEBHOST1 | /u02/oracle/config/domains/ohs_domain | Volume for Oracle HTTP Server domain directory |
| Web | VOLOHS2 | WEBHOST2 | /u02/oracle/config/domains/ohs_domain | Volume for Oracle HTTP Server domain directory |
| Web | VOLSTATIC1 | WEBHOST1 | /u02/oracle/config/static | (Optional) Volume for static HTML content |
| Web | VOLSTATIC2 | WEBHOST2 | /u02/oracle/config/static | (Optional) Volume for static HTML content |
| Application | VOLFMW1 | SOAHOST1 | /u01/oracle/products/fmw | Volume for the WebLogic Server and Oracle SOA Suite binary files |
| Application | VOLFMW2 | SOAHOST2 | /u01/oracle/products/fmw | Volume for the WebLogic Server and Oracle SOA Suite binary files |

**Table 4-1 (Cont.) Volume Design Recommendations for Oracle SOA Suite**

| Tier | Volume Name | Mounted on Host | Mount Point | Comments |
|---|---|---|---|---|
| Application | VOLADMIN | SOAHOST1, SOAHOST2 | /u01/oracle/config | Volume for Administration Server domain directory and other shared configurations, such as Deployment Plans, applications, and keystores |
| Application | VOLSOA1 | SOAHOST1 | /u02/oracle/config | Volume for Managed Server domain directory |
| Application | VOLSOA2 | SOAHOST2 | /u02/oracle/config | Volume for Managed Server domain directory |
| Application | VOLRUNTIME | SOAHOST1, SOAHOST2 | /u01/oracle/runtime | Volume for transaction logs and JMS data |

For consistency group recommendations, see:

- Recommended Consistency Groups for Oracle SOA Suite
  Learn about the recommended consistency groups for Oracle SOA Suite.

#### 4.1.1.2.1 Recommended Consistency Groups for Oracle SOA Suite

Learn about the recommended consistency groups for Oracle SOA Suite.

Oracle recommends the following consistency groups for the Oracle SOA Suite topology:

- Create one consistency group with the volumes that contains the domain directories for the Administration Server and Managed Servers as members (DOMAINGROUP in Table 4-2).
- Create one consistency group with the volume that contains the JMS file store and transaction log data as members (RUNTIMEGROUP in Table 4-2).
- Create one consistency group with the volume that contains the Oracle homes as members (FMWHOMEGROUP in Table 4-2).

Table 4-2 provides a summary of Oracle recommendations for consistency groups for the Oracle SOA Suite topology as shown in Figure 4-2.

**Table 4-2 Consistency Groups for Oracle SOA Suite**

| Tier | Group Name | Members | Comments |
|---|---|---|---|
| Application | DOMAINGROUP | VOLADMIN<br>VOLSOA1<br>VOLSOA2 | Consistency group for the Administration Server, and the Managed Server domain directory |

**Table 4-2 (Cont.) Consistency Groups for Oracle SOA Suite**

| Tier | Group Name | Members | Comments |
|---|---|---|---|
| Application | `RUNTIMEGROUP` | `VOLRUNTIME` | Consistency group for the JMS file store and transaction log data |
| Application | `FMWHOMEGROUP` | `VOLFMW1`<br>`VOLFMW2` | Consistency group for the Oracle homes |

## 4.1.2 Setting Up Storage Replication

Learn how to set up storage replication for the Oracle Fusion Middleware Disaster Recovery topology.

To set up storage replication for the Oracle Fusion Middleware Disaster Recovery topology:

- On the standby site, ensure that the alias host names that are created are the same as the physical host names that are used for the peer hosts at the production site.
- On the shared storage at the standby site, create the same volumes as were created on the shared storage at the production site.
- On the standby site, create the same mount points and symbolic links that you created at the production site.

  **Note:**

  – The symbolic links only need to be set up on the standby site if you set up symbolic links at the production site.

  – The symbolic links are required only in cases where the storage system does not guarantee consistent replication across multiple volumes. For more information about symbolic links, see Storage Replication.

- It is not necessary to install the same Oracle Fusion Middleware instances at the standby site as were installed at the production site. When the production site storage is replicated to the standby site storage, the Oracle software installed on the production site volumes are replicated at the standby site volumes.
- Create the baseline snapshot copy of the production site shared storage that sets up the replication between the production site and standby site shared storage. Create the initial baseline copy and subsequent snapshot copies by using asynchronous replication mode. After the baseline snapshot copy is performed, validate that all the directories inside the standby site volumes have the same contents as the directories inside the production site volumes.
- Set up the frequency of subsequent copies of the production site shared storage, which is replicated at the standby site. When asynchronous replication mode is used, then at the requested frequency the changed data blocks at the production site shared storage (based on comparison to the previous snapshot copy) become

the new snapshot copy, and the snapshot copy is transferred to the standby site shared storage.

- Ensure that disaster protection for any database that is included in the Oracle Fusion Middleware Disaster Recovery production site is provided by Oracle Data Guard. Do not use storage replication technology to provide disaster protection for Oracle databases.
- The standby site shared storage receives snapshots transferred periodically from the production site shared storage. After the snapshots are applied, the standby site shared storage includes all the data up to and including the data contained in the last snapshot transferred from the production site before the failover or switchover.
- Oracle strongly recommends that you manually force a synchronization operation whenever a change is made to the middle tier at the production site (for example, when a new application is deployed at the production site). Follow the vendor-specific instructions for forcing a synchronization by using storage replication technology.

## 4.1.3 Installing and Configuring Databases

Learn how to install and configure Oracle Database 11.2 or Oracle Database 12.1 MAA databases in an Oracle SOA Suite enterprise deployment.

For recommendations and considerations for setting up Oracle databases that are used in an Oracle Fusion Middleware Disaster Recovery topology, see Database Considerations.

- Installing and Configuring Oracle Database 11.2 or 12.1 MAA Environments

### 4.1.3.1 Installing and Configuring Oracle Database 11.2 or 12.1 MAA Environments

Oracle Maximum Availability Architecture (MAA) is Oracle's comprehensive architecture to reduce downtime for scheduled outages, and to prevent, detect and recover, from unscheduled outages.

Real Application Clusters (RAC) and Data Guard provide the basis of the database MAA solution, where the primary site contains the RAC database, and the secondary site contains the RAC physical standby database.

This section contains the following topics:

- Prerequisites and Assumptions
- Oracle Data Guard Environment Description
- Procedure for Duplicating the Primary Database
- Procedure for Completing RAC Configuration for Standby Database
- Creating a Data Guard Broker Configuration
- Verifying the Data Guard Broker Configuration
- Testing Database Switchover and Switchback

> **Tip:**
>
> Alternatively, you can perform many of the tasks in this section by using Oracle Enterprise Manager Cloud Control (Cloud Control).
>
> Setting up and managing databases using Cloud Control helps in controlling downtime and simplifies disaster recovery operations.
>
> For information about installing Enterprise Manager Cloud Control 12c, see *Oracle Enterprise Manager Cloud Control Basic Installation Guide*.
>
> For more information about setting up Oracle Data Guard using Cloud Control, see *Set Up and Manage Oracle Data Guard using Oracle Enterprise Manager Cloud Control 12c*.

- Prerequisites and Assumptions
- Oracle Data Guard Environment Description
- Procedure for Duplicating the Primary Database
- Procedure for Completing RAC Configuration for Standby Database
- Creating a Data Guard Broker Configuration

### 4.1.3.1.1 Prerequisites and Assumptions

Ensure that the following prerequisites are met:

- The Oracle RAC cluster and Automatic Storage Management (ASM) instances on the standby site have been created.
- The Oracle RAC databases on the standby site and the production site are using a flash recovery area.
- The Oracle RAC databases are running in `archivelog` mode.
- The database hosts on the standby site already have Oracle software installed.
- In a shared `ORACLE_HOME` configuration, the `TNS_ADMIN` directory must be a local, non-shared directory.

### 4.1.3.1.2 Oracle Data Guard Environment Description

The examples given in this section contain environment variables as described in Table 4-3.

**Table 4-3 Variables Used by Primary and Standby Databases**

| Variable | Primary Database | Standby Database |
|---|---|---|
| Database names | `soa` | `soa` |
| SOA Database Host Names | `soadc1.dbhost1`,<br>`soadc1.dbhost2` | `soadc2.dbhost1`,<br>`soadc2.dbhost2` |
| Database unique names | `psoa` | `ssoa` |

**Table 4-3 (Cont.) Variables Used by Primary and Standby Databases**

| Variable | Primary Database | Standby Database |
|---|---|---|
| Instance names | `soa1`, `soa2` | `soa1`, `soa2` |
| Service names | `psoa`, `ssoa` | `psoa`, `ssoa` |

### 4.1.3.1.3 Procedure for Duplicating the Primary Database

Follow these steps to prepare the primary database for setting up Oracle Data Guard:

> **Note:**
>
> For information about prerequisites for setting up Oracle Data Guard, see Prerequisites in *Oracle Data Guard Broker.*

1. Enable force logging on the primary database:

   ```
   SQL> alter database force logging;
   SQL> select name, log_mode, force_logging from v$database;
   NAME LOG_MODE FOR
   ---------- ---------------- -------
   PSOA ARCHIVELOG YES
   ```

2. Create standby redo logs that are the same size as the online redo logs, on the primary database. The *Duplicate* command automatically creates the standby redo log on the standby database.

   Oracle recommends that you have the same number plus one additional redo logs for each thread as shown in #unique_105/unique_105_Connect_42_CJAHBBEC.

3. In the standby node 1, create and start a listener (for example, `LISTENER_DUPLICATE`) that offers a static `SID` entry for the standby database, and has the same value of `ORACLE_SID` as the primary (`soa1`), as shown in Example 4-1.

   Provide the following path to the `listener.ora` file:

   *`GRID_HOME`*`/network/admin/listener.ora`

4. Run the following command to start and verify the listeners by using `lsnrctl` from `GRID_HOME/bin`::

   ```
   lsnrctl start listener_duplicate
   lsnrctl status listener_duplicate
   ```

5. In the standby node 2, create and start a listener (for example, `LISTENER_DUPLICATE`) that offers a static `SID` entry for the standby database, and has the same value of `ORACLE_SID` as the primary (`soa2`), as shown in Example 4-2.

   Provide the following path to the `listener.ora` file:

   *`GRID_HOME`*`/network/admin/listener.ora`

> **Note:**
>
> Listeners are configured at the cluster level, and all nodes inherit the port and environment settings of the listener. Therefore, the `TNS_ADMIN` directory path have the same values on all nodes.
>
> In a shared `ORACLE_HOME` configuration, the `TNS_ADMIN` directory must be a local, non-shared directory. These network files are included as `IFILES`.
>
> Complete the following steps to set up `TNS_ADMIN` for a shared `ORACLE_HOME` in a two-node cluster, `SOADC1.DBHOST1`, and `SOADC1.DBHOST2`, with respective instances of `SOA1` and `SOA2`:
>
> a. Create a local network directory on each node. For example, `/`*`local_network_dir`*`/network_admin`.
>
> b. Create a local `listener.ora` file in the location: `/`*`local_network_dir`*`/network_admin` on each node.
>
> c. In the local `listener.ora` file, add the values for the `LISTENER_duplicate` parameter.
>
> d. In the common `listener.ora` file, in *`GRID_HOME`*`/network/admin`, add the `IFILE` parameter values, as follows:
>
> ```
> IFILE=/local_network_dir/network_admin/listener.ora
> ```

6. Run the following command to start and verify the listeners:

   ```
   lsnrctl start listener_duplicate
   lsnrctl status listener_duplicate
   ```

7. In the database home of the primary node, create an Oracle Net alias to connect to the listener that you created in step 3. See Example 4-3.

   For example: `GRID_HOME/bin/tnsping dup`.

8. Configure the Oracle password file authentication for redo transport. Make sure it meets the following requirements:

   - Set `remote_login_passwordfile` to `EXCLUSIVE`.

     ```
     SQL> show parameter
     remote_login_passwordfile
     NAME TYPE VALUE
     -------------------------------- --------------
     --------------------------------
     remote_login_passwordfile string EXCLUSIVE
     ```

   - Copy the primary password file to the auxiliary instance location.

9. In the `ORACLE_HOME/dbs` directory of the standby host, create a pfile `initsoa1.ora`, with the following parameters:

   ```
   db_name=soa
   db_unique_name=ssoa
   sga_target=5g
   ```

10. Create the audit directory for the `soa` database on all standby hosts:

    ```
    mkdir -p /u01/app/oracle/admin/soa/adump
    ```

11. Create an Oracle Net alias on all primary hosts to reach the `ssoa` database on the standby hosts.

    Ensure that all hosts have an Oracle Net alias for `psoa` and `ssoa`. All the aliases that you create need to reference the scan listener and not the VIP node. Also, if the `local_listener` variable is set to an alias on the primary host, then enter the details of the variable on the standby site, that point to the local listener on the primary host. See Example 4-4 and Example 4-5.

> **Note:**
>
> - For primary node 2 (SOADC1.DBHOST2), update the HOST value in psoa_local_listener to point to the VIP of primary node 2, as follows:
>
>   ```
>   psoa_local_listener =
>       (ADDRESS_LIST =
>         (ADDRESS=(PROTOCOL = TCP)
>   (HOST=prmy2-vip)(PORT = 1521))
>       )
>     )
>   ```
>
> - If you are using a shared Oracle home, add the VIPs of the two nodes to the local_listener parameter.
>
>   For example:
>
>   ```
>   psoa_local_listener =
>     (DESCRIPTION =
>       (ADDRESS_LIST =
>         (ADDRESS=(PROTOCOL = TCP)
>   (HOST=prmy1-vip)(PORT = 1521))
>       (ADDRESS=(PROTOCOL = TCP)
>   (HOST=prmy2-vip)(PORT = 1521))
>       )
>     )
>   ```
>
> - For standby node 2 (SOADC2.DBHOST2), update the HOST value in ssoa_local_listener to point to the VIP of standby node 2, as follows:
>
>   ```
>   ssoa_local_listener = (ADDRESS_LIST =
>         (ADDRESS=(PROTOCOL = TCP)
>   (HOST=stby2-vip)(PORT = 1521))
>       )
>     )
>   ```
>
> - If you are using a shared Oracle home, add the VIPs of the two nodes to the local_listener parameter.
>
>   For example:
>
>   ```
>   ssoa_local_listener =
>     (DESCRIPTION =
>       (ADDRESS_LIST =
>         (ADDRESS=(PROTOCOL = TCP)
>   (HOST=stby1-vip)(PORT = 1521))
>       (ADDRESS=(PROTOCOL = TCP)
>   (HOST=stby2-vip)(PORT = 1521))
>       )
>     )
>   ```

12. On the standby host, set the ORACLE_SID to the same value as that of the primary database (ORACLE_SID=soa1), and run the startup nomount command on the standby database with standby PFILE, as created in step 9.

13. To obtain the values use this query:

    ```
    SQL> select p.inst_id,instance_name, name,value from gv$parameter p,
    gv$instance i where p.inst_id=i.inst_id and p.name='cluster_interconnects';
    ```

| INST<br>_ID | INSTANCE_<br>NAME | NAME | VALUE |
|---|---|---|---|
| 1 | dbm1 | cluster_interconnects | 192.168.44.225 |
| 2 | dbm2 | cluster_interconnects | 192.168.44.226 |

14. Disable the parameter `cluster_interconnects` on the primary host, if it is set:

    ```
    SQL> alter system reset cluster_interconnects scope=spfile sid='soa1';
    SQL> alter system reset cluster_interconnects scope=spfile sid='soa2';
    ```

15. On the primary host, run the Recovery Manager (RMAN) script to duplicate the primary database by using the command `duplicate target database for standby from active database`.

    > **Note:**
    >
    > This command varies depending on your environment. For information about how to use the command, see Duplicating a Database in *Oracle Database Backup and Recovery User's Guide*.

    See Example 4-6 to understand how to duplicate data between two systems with different disk-group names.

    See Example 4-7 to understand how to duplicate data between two systems that have the same disk-group name `+DATA`.

16. If you have disabled the parameter `cluster_interconnects` on the primary host as described in step 14, then you must set it back to the original values in the `spfile`.

17. (Optional) Stop and remove the listener that you created in step 3.

**Example 4-1 Script for Creating and Starting a Listener with Static SID**

```
LISTENER_duplicate =
 (DESCRIPTION_LIST =
  (DESCRIPTION =
   (ADDRESS = (PROTOCOL = TCP)
   (HOST = soadc2.dbhost1)
   (PORT = 1521)(IP = FIRST))))

SID_LIST_LISTENER_duplicate =
 (SID_LIST =
  (SID_DESC =
   (SID_NAME = soa1)
   (ORACLE_HOME = /u01/app/oracle/product/11.2.0/db_1)))
```

**Example 4-2 Script for Creating and Starting a Listener with Static SID**

```
LISTENER_duplicate =
 (DESCRIPTION_LIST =
  (DESCRIPTION =
   (ADDRESS = (PROTOCOL = TCP)
   (HOST = soadc2.dbhost2)
   (PORT = 1521)(IP = FIRST))))
```

```
SID_LIST_LISTENER_duplicate =
 (SID_LIST =
  (SID_DESC =
   (SID_NAME = soa2)
   (ORACLE_HOME = /u01/app/oracle/product/11.2.0/db_1)))
```

### Example 4-3 Script for Creating an Oracle Net Alias

```
dup =
(DESCRIPTION =
 (ADDRESS =
  (PROTOCOL = TCP)
   (HOST = soadc2.dbhost1)
   (PORT = 1521))
 (CONNECT_DATA =
  (SERVER = DEDICATED)
   (SID = soa1)))
```

### Example 4-4 Sample tnsnames.ora File on Primary Node 1 (SOADC1.DBHOST1)

```
psoa =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS=(PROTOCOL= TCP)
(HOST=prmy-scan)(PORT = 1521))
    )
    (CONNECT_DATA =
      (SERVER = DEDICATED)
      (SERVICE_NAME = psoa)
    )
  )

ssoa =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS=(PROTOCOL = TCP)
(HOST=stby-scan)(PORT = 1521))
    )
    (CONNECT_DATA =
      (SERVER = DEDICATED)
      (SERVICE_NAME = ssoa)
    )
  )

psoa_local_listener =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS=(PROTOCOL = TCP)
(HOST=prmy1-vip)(PORT = 1521))
    )
  )
```

### Example 4-5 Sample tnsnames.ora File on Standby Node 1 (SOADC2.DBHOST1)

```
psoa =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS=(PROTOCOL= TCP)(HOST=prmy-scan)(PORT = 1521))
    )
    (CONNECT_DATA =
      (SERVER = DEDICATED)
      (SERVICE_NAME = psoa)
    )
  )

ssoa =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS=(PROTOCOL = TCP)
(HOST=stby-scan)(PORT = 1521))
    )
    (CONNECT_DATA =
      (SERVER = DEDICATED)
      (SERVICE_NAME = ssoa)
    )
  )

ssoa_local_listener =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS=(PROTOCOL = TCP)
(HOST=stby1-vip)(PORT = 1521))
    )
  )
```

### Example 4-6 Duplicating Data Between Two Systems with Different Disk-Group Names

```
rman <<EOF
connect target sys/password;
connect auxiliary sys/password@dup;
run {
allocate channel prmy1 type disk;
allocate channel prmy2 type disk;
allocate channel prmy3 type disk;
allocate channel prmy4 type disk;
allocate auxiliary channel stby type disk;
duplicate target database for standby from active database
spfile
parameter_value_convert '+DATA_prmy','+DATA_stby','+RECO_prmy','+RECO_stby'
set db_file_name_convert '+DATA_prmy','+DATA_stby'
set db_unique_name='ssoa'
set db_create_online_log_dest_1='+DATA_stby'
set db_create_file_dest='+DATA_stby'
set db_recovery_file_dest='+RECO_stby'
set log_file_name_convert '+DATA_prmy','+DATA_stby','+RECO_prmy','+RECO_stby'
set control_files='+DATA_stby/ssoa/standby.ctl'
set local_listener='ssoa_local_listener'
set remote_listener='stby-scan:1521';
} EOF
```

### Example 4-7 Duplicating Data Between Two Systems with Same Disk-Group Name +DATA

```
rman <<EOF
connect target sys/password;
connect auxiliary sys/password@dup;
run {
allocate channel prmy1 type disk;
allocate channel prmy2 type disk;
allocate channel prmy3 type disk;
allocate channel prmy4 type disk;
allocate auxiliary channel stby type disk;

duplicate target database for standby from active database
spfile
set db_unique_name='ssoa'
set control_files='+DATA/ssoa/standby.ctl'
set local_listener='ssoa_local_listener'
set remote_listener='stby-scan:1521';
}
EOF
```

**Example 4-8    Sample Redo Log**

```
SQL> alter database add standby logfile thread 1
group 9 size 500M,
group 10 size 500M,
group 11 size 500M;

SQL> alter database add standby logfile thread 2
group 12 size 500M,
group 13 size 500M,
group 14 size 500M;
```

#### 4.1.3.1.4 Procedure for Completing RAC Configuration for Standby Database

To complete the RAC configuration on the standby database, complete the steps given in Procedure for Duplicating the Primary Database. Then, perform the following steps:

1. Create a temporary parameter file in the standby database:

   ```
   SQL> create pfile='/tmp/p.ora' from spfile;
   ```

2. Create an `SPFILE` in `+DATA_stby` for the standby database:

   ```
   SQL> create spfile='+DATA_stby/ssoa/spfilessoa.ora' from pfile='/tmp/p.ora';
   ```

3. Remove the default file.

   ```
   $rm /u01/app/oracle/product/12.1.0.2/dbhome_1/dbs/spfilesoa1.ora
   ```

4. Create an `initsoa`*`n`*`.ora` file on all the standby hosts. The file needs to point to the location of the `SPFILE` created in step 2.

   In the `soadc2.dbhost1` file, add the following:

   ```
   cat /u01/app/oracle/product/11.2.0/dbs/initsoa1.ora
   spfile='+DATA/ssoa/spfilesoa.ora
   ```

5. On the standby system, restart the instances in mount state:

   ```
   startup mount
   ```

6. Register the RAC database with CRS as follows:

   ```
   srvctl add database -d ssoa –o /u01/app/oracle/product/11.2.0/db_1
   srvctl add instance -d ssoa -i soa1 -n soadc2.dbhost1
   srvctl add instance -d ssoa -i soa2 -n soadc2.dbhost2
   srvctl modify database –d ssoa –r physical_standby
   ```

#### 4.1.3.1.5 Creating a Data Guard Broker Configuration

This section describes the basic steps for creating a Data Guard configuration.

For complete information about Data Guard Broker, see the *Oracle Data Guard Installation* guide.

To create a Data Guard Broker configuration, complete the following steps:

1. Add the values of static SID to the local node file, `listener.ora`, that is located in the grid infrastructure home on all hosts in the configuration:

   ```
   LISTENER_SCAN2=(DESCRIPTION=(ADDRESS_LIST=(ADDRESS=(PROTOCOL=IPC)
   (KEY=LISTENER_SCAN2))))
   LISTENER_SCAN3=(DESCRIPTION=(ADDRESS_LIST=(ADDRESS=(PROTOCOL=IPC)
   (KEY=LISTENER_SCAN3))))
   LISTENER=(DESCRIPTION=(ADDRESS_LIST=(ADDRESS=(PROTOCOL=IPC)(KEY=LISTENER))))

   LISTENER_SCAN1=(DESCRIPTION=(ADDRESS_LIST=(ADDRESS=(PROTOCOL=IPC)
   (KEY=LISTENER_SCAN1))))
   ENABLE_GLOBAL_DYNAMIC_ENDPOINT_LISTENER_SCAN1=ON
   ENABLE_GLOBAL_DYNAMIC_ENDPOINT_LISTENER=ON
   SID_LIST_LISTENER =
   (SID_LIST =
   (SID_DESC =
   (GLOBAL_DBNAME = psoa_DGMGRL)
   (SID_NAME = soa1)
   (ORACLE_HOME = /u01/app/oracle/product/11.2.0/db_1)))
   ENABLE_GLOBAL_DYNAMIC_ENDPOINT_LISTENER_SCAN3=ON
   ```

   > **Note:**
   >
   > - Ensure that you enter the appropriate values for the `GLOBAL_DBNAME` and `SID_NAME` parameters, for each host.
   > - If `IFILE` is used for the shared `ORACLE_HOME`, modify the corresponding local `listener.ora` file that is specified in `IFILE`.

2. Bounce the listeners on the primary site and standby site to apply the modifications made to the files:

   ```
   srvctl stop listener
   srvctl start listener
   ```

3. Configure the Data Guard Broker metadata files, and enable the broker on the primary site and standby site as follows:

   **On the primary site**

   ```
   SQL> alter system set dg_broker_config_file1='+DATA_prmy/psoa/dr1.dat'
   scope=both;
   SQL> alter system set dg_broker_config_file2='+DATA_prmy/psoa/dr2.dat'
   scope=both;
   SQL> alter system set dg_broker_start=true scope=both;
   ```

   **On the standby site**

   ```
   SQL> alter system set dg_broker_config_file1='+DATA_stby/ssoa/dr1.dat'
   scope=both;
   SQL> alter system set dg_broker_config_file2='+DATA_stby/ssoa/dr2.dat'
   scope=both;
   SQL> alter system set dg_broker_start=true scope=both;
   ```

4. Access dgmgrl on the primary host, and create the configuration. See Example 4-9.

**Example 4-9 Accessing dgmgrl to Create the Data Guard Broker Configuration on Primary Host**

```
dgmgrl sys/password

DGMGRL> create configuration 'dg_config' as
primary database is 'psoa'
connect identifier is psoa;

Configuration "dg_config" created with primary database "psoa"

DGMGRL> add database 'ssoa' as
connect identifier is ssoa;

Database "ssoa" added

DGMGRL> enable configuration;

Enabled.
```

- Verifying the Data Guard Broker Configuration
- Testing Database Switchover and Switchback
  You can perform a database switchover and switchback.

## 4.1.3.1.5.1 Verifying the Data Guard Broker Configuration

Complete the following steps to verify that the Data Guard Broker configuration was created successfully.

1. Verify the Oracle Data Guard configuration by querying the V$ARCHIVED_LOG view to identify existing files in the archived redo log. For example:

```
SQL> SELECT SEQUENCE#, FIRST_TIME, NEXT_TIME
  2> FROM V$ARCHIVED_LOG ORDER BY SEQUENCE#;

SEQUENCE# FIRST_TIME NEXT_TIME
---------- ------------------ ------------------
         8 11-JUL-13 17:50:45 11-JUL-13 17:50:53
         9 11-JUL-1317:50:53 11-JUL-1317:50:58
        10 11-JUL-13 17:50:58 11-JUL-13 17:51:03

3 rows selected
```

2. On the primary database, issue the following SQL statement to force a log switch and archive the current online redo log file group:

```
SQL> alter system archive log current;
```

3. On the standby database, query the V$ARCHIVED_LOG view to verify that the redo data was received and archived on the standby database:

```
SQL> SELECT SEQUENCE#, FIRST_TIME, NEXT_TIME
  2> FROM V$ARCHIVED_LOG ORDER BY SEQUENCE#;

SEQUENCE# FIRST_TIME NEXT_TIME
---------- ------------------ ------------------
         8 11-JUL-13 17:50:45 11-JUL-13 17:50:53
         9 11-JUL-1317:50:53 11-JUL-1317:50:58
         10 11-JUL-13 17:50:58 11-JUL-13 17:51:03
         11 11-JUL-13 17:51:03 11-JUL-1318:34:11

4 rows selected
```

4. Use the `show configuration` command to verify that the configuration was created successfully on the standby site. See Example 4-10.

**Example 4-10    Verifying the Data Guard Broker Configuration**

```
DGMGRL> show configuration;

Configuration - dg_config

Protection Mode: MaxPerformance
Databases:
psoa- Primary database
ssoa- Physical standby database

Fast-Start Failover: DISABLED

Configuration Status:
SUCCESS
```

#### 4.1.3.1.5.2 Testing Database Switchover and Switchback

You can perform a database switchover and switchback.

**Performing a Switchover Operation by Using Oracle Data Guard Broker**

To perform a switchover operation by using Oracle Data Guard Broker, complete the following tasks:

1. Verify the Oracle Data Guard Broker configuration that you created by using the instructions provided in Creating a Data Guard Broker Configuration.

   To verify the configuration, run the following command:

   ```
   DGMGRL> show configuration;

   Configuration - dg_config

   Protection Mode: MaxPerformance
   Databases:
   psoa- Primary database
   ssoa- Physical standby database

   Fast-Start Failover: DISABLED

   Configuration Status:
   SUCCESS
   ```

2. Swap the roles of the primary and standby databases by running the `SWITCHOVER` command. #unique_108/unique_108_Connect_42_CJADHFDG shows how Data Guard Broker automatically shuts down and restarts the old primary database as part of the switchover operation.

   ```
   DGMGRL> switchover to 'ssoa';
   Performing switchover NOW, please wait...
   New primary database "ssoa" is opening...
   Operation requires shutdown of instance "psoa1" on database "psoa"
   Shutting down instance "psoa1"...
   ORA-01109: database not open
   ```

```
Database dismounted.
ORACLE instance shut down.
Operation requires startup of instance "psoa1" on database "psoa"
Starting instance "psoa1"...
ORACLE instance started.
Database mounted.
Switchover succeeded, new primary is "ssoa"
```

3. After the switchover is complete, use the `SHOW CONFIGURATION` command to verify that the switchover operation was successful:

   ```
   DGMGRL> show configuration;
   Configuration - dg_config
   Protection Mode: MaxPerformance
   Databases:
   ssoa- Primary database
   psoa- Physical standby database
   Fast-Start Failover: DISABLED
   Configuration Status:
   SUCCESS
   ```

#### Performing a Switchover Operation Using SQL Plus

Perform the following operations to switchover or switchback databases correctly between the newly created physical standby database and the primary Oracle RAC databases:

1. Shut down all but one instance of the Oracle RAC databases (PSOA) on the primary site. For example, run the following command on `SOADC1.DBHOST1` of the production site:

   ```
   srvctl stop instance -d psoa -i soa2
   ```

2. Initiate the role transition to the physical standby on the current primary database. For example, run the following command on `SOADC1.DBHOST1` of the production site:

   ```
   SQL > ALTER DATABASE COMMIT TO SWITCHOVER TO PHYSICAL STANDBY WITH SESSION
   SHUTDOWN;
   ```

3. Shut down the primary instance and mount the primary instance. For example, run the following command on `SOADC1.DBHOST1` of the production site:

   ```
   SQL > shutdown immediate
   SQL > startup mount
   ```

4. At this point, both the databases are in Physical Standby mode.

   Sign in to the instances to continue.

5. To verify that both the databases are in Physical Standby mode, run this SQL query on both the databases:

   ```
   SQL> select database_role from v$database;
   DATABASE_ROLE
   ----------------
   PHYSICAL_STANDBY
   ```

6. Switch the physical standby database role to the primary role. For example, run the following command on `SOADC2.DBHOST1` of the standby site:

   ```
   SQL> ALTER DATABASE COMMIT TO SWITCHOVER TO PRIMARY WITH SESSION SHUTDOWN;
   ```

7. Now the physical standby database is the new primary database.

8. Shut down the new primary database and start up both the RAC nodes by using `srvctl`. For example, run the following command on the new primary site `SOADC2.DBHOST1`:

   ```
   srvctl start database -d ssoa
   ```

9. On the new physical standby database (the old primary) start the managed recovery of the database. For example, run the following command on `SOADC1.DBHOST1` of the primary site:

   ```
   SQL> ALTER DATABASE RECOVER MANAGED STANDBY DATABASE DISCONNECT FROM SESSION;
   ```

10. Start sending the redo data to the new physical standby database. For example, run the following command on the new primary site `SOADC2.DBHOST1`:

    ```
    SQL> ALTER SYSTEM SWITCH LOGFILE;
    ```

11. Check the new physical standby database to see if it is receiving the archive log files by querying the `V$ARCHIVED_LOG` view.

12. Perform a switchback operation. A switchback operation is a subsequent switchover operation to return the roles to their original state.

> **Note:**
>
> For information about switchover and failover operation of Oracle Data Guard Broker, see Switchover and Failover Operations in the *Oracle Data Guard Broker*.

## 4.2 Creating a Production Site

Learn how to create a production site on an Oracle SOA enterprise deployment topology.

Before you create your production site:

- Set up the host name aliases for the middle tier hosts, as described in Planning Host Names.
- Create the required volumes on the shared storage on the production site, as described in Designing Directory Structure and Volumes.
- Determine the Oracle Data Guard configuration to use based on the data loss requirements of the database and network considerations, such as the available bandwidth and latency when compared to the redo generation.

This section includes the following topics:

- Creating a Production Site
  Create a production site for a topology.
- Configuring Data Sources for Oracle Fusion Middleware Active-Passive Deployment
  Configure the data sources that Oracle Fusion Middleware uses to automate connections failover, in case of a failover or switchover of the primary database.

## 4.2.1 Creating a Production Site

Create a production site for a topology.

> **Note:**
>
> This section provides information about how to create a production site for the Oracle SOA Suite topology. If you plan to create a production site for a different topology, see the appropriate Oracle Fusion Middleware Enterprise Deployment Guide listed under the *Install a Production Environment: Plan, Install & Configure an Enterprise Deployment* category.

Install and configure your production site as described in the *Oracle Fusion Middleware Enterprise Deployment Guide for Oracle SOA Suite*.

The following sections describe how to complete the installation and configuration of your production site:

- Creating Volumes and Consistency Groups
  Create volumes and consistency groups on the shared storage device.
- Setting Up Physical Host Names and Alias Host Names
  Set up physical host names on the production site and physical host names and alias host names on the standby site.
- Installing and Configuring Oracle SOA Suite
  Install and configure Oracle SOA Suite.

### 4.2.1.1 Creating Volumes and Consistency Groups

Create volumes and consistency groups on the shared storage device.

To create volumes and consistency groups on the shared storage device, see Recommended Volume Design for Oracle SOA Suite.

### 4.2.1.2 Setting Up Physical Host Names and Alias Host Names

Set up physical host names on the production site and physical host names and alias host names on the standby site.

For information about planning host names for the production and standby sites, see Planning Host Names.

### 4.2.1.3 Installing and Configuring Oracle SOA Suite

Install and configure Oracle SOA Suite.

To install and configure Oracle SOA Suite, see *Oracle Fusion Middleware Enterprise Deployment Guide for Oracle SOA Suite* and apply the following modifications:

1. Install the Oracle SOA Suite components into the volumes created on the shared storage device.

2. Set up the production and standby sites by using the aliases to the physical and virtual host names.
3. Create a separate volume on each site for the JMS stores and transaction logs.
4. After the installation and configuration of the production site, turn off host name verification. See *Oracle Fusion Middleware Enterprise Deployment Guide for Oracle SOA Suite* for detailed instructions about turning off host name verification for an Administration Server and Managed Server.
5. If you do not plan on turning the host name verification off, follow the steps in Updating Self-Signed Certificates and Keys on the Standby Site to configure Node Manager communication.
6. Create SSL certificates by using the host name aliases on all of the Oracle Fusion Middleware hosts for proper Node Manager communication.

## 4.2.2 Configuring Data Sources for Oracle Fusion Middleware Active-Passive Deployment

Configure the data sources that Oracle Fusion Middleware uses to automate connections failover, in case of a failover or switchover of the primary database.

Configure all the data sources that are used in the domain, including datasources used by jdbc persistence stores, leasing data sources, and custom datasources. The `GridLink` data sources must be modified to include information about the standby database.

- Update the ONS configuration to include both production and standby site ONS.

  The items in the list of ONS addresses must be separated by commas, as the following example illustrates:

  ```
  prmy-scan:6200,stby-scan:6200
  ```

  On the Test ONS Client Configuration page, review the connection parameters, and click **Test All ONS Nodes**. The following example illustrates a successful connection notification:

  ```
  Connect test for prmy-scan:6200 succeeded.
  ```

- Update the JDBC URL to include the appropriate services in both sites.

  The following is a sample JDBC URL for the SOA Data source in an Oracle Fusion Middleware SOA Active or Passive configuration, where the database uses Data Guard.

  ```
  jdbc:oracle:thin:@
  (DESCRIPTION=
  (CONNECT_TIMEOUT=15)
  (RETRY_COUNT=5)
  (RETRY_DELAY=5)
  (ADDRESS_LIST=(LOAD_BALANCE=on)(ADDRESS=(PROTOCOL=TCP)(HOST=prmy-scan)
  (PORT=1521)))
  (ADDRESS_LIST=(LOAD_BALANCE=on)(ADDRESS=(PROTOCOL=TCP)(HOST=stby-scan)
  (PORT=1521)))
  (CONNECT_DATA=(SERVICE_NAME=soaedg.example.com))
  )
  ```

In the Test GridLink Database Connection page, review the connection parameters, and click **Test All Listeners**. The following example illustrates a successful connection notification:

```
Connection test
for jdbc:oracle:thin:@(DESCRIPTION=(ADDRESS_LIST=(ADDRESS=(PROTOCOL=TCP)
(HOST=prmy-scan)(PORT=1521)))
(CONNECT_DATA=(SERVICE_NAME=soaedg.example.com))) succeeded.
```

- Update the JDBC URL of the OPSS Security Stores to include the appropriate services in both sites.

  Complete the following steps:

  1. Sign in to APPHOST1 and go to the *$ASERVER_HOME*/config/fmwconfig folder.
  2. Take a backup copy of the jps-config-jse.xml and jps-config.xml files.
  3. Edit both files to update value of the property name="jdbc.url" with the appropriate JDBC URL used in the datasources.
  4. Restart the Admin Server and the managed servers.
  5. To verify that the JDBC URL is correctly updated, go to Enterprise Manager Console.
  6. Navigate to **WebLogic Domain** > **Security** > **Security Provider Configuration**.
  7. Expand **Security Stores** and verify that the Database URL is updated.

- **For BI only**: The command synchronizes connection details to the mid-tier database and ensures that BI components can access the mid-tier database when connection details are changed. Location of the command:

  ```
  DOMAIN_HOME/bitools/bin/sync_midtier_db.sh
  ```

  > **Note:**
  >
  > On UNIX this must be performed on the primary host.

  To synchronize the mid-tier database connection details:

  - Execute the synchronisation script:

    ```
    DOMAIN_HOME/bitools/bin/sync_midtier_db.sh
    ```

  - Script displays the data sources that are updated.
  - Restart the Managed Server and BI system components.

## 4.3 Creating a Standby Site

Learn how to create a standby site.

To create the standby site, the Oracle SOA enterprise deployment topology is used as an example.

This section includes the following topics:

- Preparing the Standby Site
  Prepare your standby site for operation.
- Updating Self-Signed Certificates and Keys on the Standby Site
  If you have enabled host name verification in the Oracle WebLogic Administration Server, update the appropriate trust and key stores with the certificates of the standby site.
- Validating the Standby Site Setup
  Validate your standby site.

## 4.3.1 Preparing the Standby Site

Prepare your standby site for operation.

To prepare it for operation, on your standby site:

- Set up the correct alias host names and physical host names by following the instructions in Planning Host Names.

  Ensure that each standby site host has an alias host name that is the same as the physical host name of its peer host at the production site.
- Create, on the shared storage, the same volumes that were created on the shared storage at the production site
- Create the same mount points and symbolic links (if required) that you created at the production site. Note that symbolic links are required only in cases where the storage system does not guarantee consistent replication across multiple volumes.

  For more details about symbolic links, see Storage Replication.
- Setting Up Middle Tier Hosts
  Middle tier hosts on a standby site do not require installation nor configuration of Oracle Fusion Middleware or Oracle WebLogic Server software. When the production site storage is replicated to the standby site storage, the software installed on the production site is replicated at the standby site.

### 4.3.1.1 Setting Up Middle Tier Hosts

Middle tier hosts on a standby site do not require installation nor configuration of Oracle Fusion Middleware or Oracle WebLogic Server software. When the production site storage is replicated to the standby site storage, the software installed on the production site is replicated at the standby site.

To set up the middle tier hosts on the standby site:

1. Create a baseline snapshot copy of the shared storage on the production site, which sets up the replication between the storage devices. Create the initial baseline copy and subsequent snapshot copies by using asynchronous replication mode.
2. Synchronize the shared storage at the production site with the shared storage at the standby site. This transfers the initial baseline snapshot from the production site to the standby site.
3. Set up the frequency of subsequent copies of the production site shared storage, which is replicated at the standby site. When asynchronous replication mode is used, then at the requested frequency the changed data blocks at the production site shared storage (based on comparison to the previous snapshot copy) become

the new snapshot copy, and the snapshot copy is transferred to the standby site shared storage.

4. After the baseline snapshot copy is performed, validate that all the directories inside the standby site volumes have the same content as the directories inside the production site volumes.

## 4.3.2 Updating Self-Signed Certificates and Keys on the Standby Site

If you have enabled host name verification in the Oracle WebLogic Administration Server, update the appropriate trust and key stores with the certificates of the standby site.

Certificates must be specifically created for the nodes in the standby site.

For more information about creating certificates for nodes, see Enabling SSL Communication Between the Middle Tier and the Hardware Load Balancer in *Oracle Fusion Middleware Enterprise Deployment Guide for Oracle SOA Suite*.

The examples in these sections show how to perform tasks for the Oracle SOA Suite enterprise topology shown in Figure 4-2.

> **Note:**
>
> - When you set up the Oracle SOA Suite enterprise topology shown in Figure 4-2 as the production site for a Disaster Recovery topology, you must use the physical host names shown in Table 3-1 for the production site hosts instead of the host names shown in Figure 4-2.
> - The steps in this section must be performed on the application tier hosts on which Oracle WebLogic Server is installed.

This section includes the following topics:

- Generating Self-Signed Certificates
  Learn how to generate self-signed certificates.
- Importing Certificates into a Key Store
  Import certificates into your key store with the `utils.ImportPrivateKey` utility.
- Creating a Trust Key Store
  Create a trust key store and import certificates with the `keytool` utility.

### 4.3.2.1 Generating Self-Signed Certificates

Learn how to generate self-signed certificates.

To generate self-signed certificates:

1. Set up your environment by running the `WL_HOME/server/bin/setWLSEnv.sh` script:

   In the Bourne shell, run the following command:

   ```
   . setWLSEnv.sh
   ```

Verify that the `CLASSPATH` environment variable is set:

```
echo $CLASSPATH
```

2. Create a user-defined directory for the certificates.

   ```
   mkdir home/user_projects/domains/SOADomain/certs
   ```

3. Change directory to the user-defined directory.

   ```
   cd home/user_projects/domains/SOADomain/certs
   ```

4. Run the `utils.CertGen` tool from the user-defined directory to create the certificates for both the physical hostnames and the virtual hostnames used by the servers in the node:

   ```
   java utils.CertGen key_passphrase cert_file_name key_file_name [export|
   domestic] [hostname]
   ```

   For example:

   ```
   java utils.CertGen password soadc1host1_cert soahost1_key domestic soahost1
   java utils.CertGen password soadc1host2_cert soahost2_key domestic soahost2
   ```

### 4.3.2.2 Importing Certificates into a Key Store

Import certificates into your key store with the `utils.ImportPrivateKey` utility.

To import certificates into a key store by using the `utils.ImportPrivateKey` utility:

1. Run the following utility to import the certificate and private key into the Identity Store, and make sure that you use a different alias for each of the certificate/key pairs imported:

   ```
   java utils.ImportPrivateKey
      keystore_file
      keystore_password
      certificate_alias_to_use private_key_passphrase
      certificate_file private_key_file keystore_type
   ```

   > **Note:**
   >
   > The default value for `keystore_type` is `jks`.

   The following example illustrates the use of this utility:

   ```
   java utils.ImportPrivateKey
      appIdentityKeyStore.jks password
      appIdentity1 password
      ASERVER_HOME/certs/SOAHOST1.example.com_cert.pem
      ASERVER_HOME/certs/SOAHOST1.example.com_key.pem
   ```

2. Repeat the preceding step for all the hosts on the primary and the standby sites.

### 4.3.2.3 Creating a Trust Key Store

Create a trust key store and import certificates with the `keytool` utility.

To create a trust key store and to import certificates into it:

1. Copy the standard java key store to create the new trust key store since it already contains most of the root CA certificates needed. Oracle recommends not modifying the standard Java trust key store directly.

   Copy the standard Java key store CA certificates located under the `WL_HOME/server/lib` directory to the same directory as the certificates, as illustrated in the following example:

   ```
   cp $WL_HOME/server/lib/cacerts
      $home/user_projects/domains/SOADomain/certs/appTrustKeyStore.jks
   ```

2. The default password for the standard Java key store is `changeit`. Oracle recommends that you change the default password by using the `keytool` utility:

   ```
   keytool
     -storepasswd
     -new NewPassword
     -keystore TrustKeyStore
     -storepass OriginalPassword
   ```

   The following example illustrates the use of this utility:

   ```
   keytool
     -storepasswd
     -new passwrd
     -keystore home//user_projects/domains/SOADomain/certs/appTrustKeyStore.jks
     -storepass changeit
   ```

3. The CA certificate `CertGenCA.der` is used to sign all certificates that are generated by the `utils.CertGen` tool and is located at `WL_HOME/server/lib` directory. Import this CA certificate into the `appTrustKeyStore` by using the `keytool` utility:

   ```
   keytool
     -import
     -v
     -noprompt
     -trustcacerts
     -alias AliasName
     -file CA_file_location
     -keystore key_store_location
     -storepass key_store_password
   ```

   The following example illustrates the use of this utility to import certificates:

   ```
   keytool
     -import
     -v
     -noprompt
     -trustcacerts
     -alias clientCACert
     -file $WL_HOME/server/lib/CertGenCA.der
     -keystore appTrust.jks
     -storepass password
   ```

### 4.3.3 Validating the Standby Site Setup

Validate your standby site.

To validate a standby site:

1. Shut down any processes still running on the production site. These include the database instances in the data tier, Oracle Fusion Middleware instances, and any other processes in the application tier and web tier.
2. Stop the replication between the production site shared storage and the standby site shared storage.
3. Perform a switchback operation. A switchback operation is a subsequent switchover operation to return the roles to their original state.
4. On the standby site host, manually start all the processes. These include the database instances in the data tier, Oracle Fusion Middleware instances, and any other processes in the application tier and web tier.
5. Use a browser client to perform post-failover testing to confirm that requests are being resolved and redirected to the standby site.

## 4.4 Creating an Asymmetric Standby Site

Learn how to create an asymmetric Oracle Fusion Middleware Disaster Recovery topology.

An asymmetric topology is a disaster recovery configuration where the production and standby sites differ. In most asymmetric Disaster Recovery topologies, the standby site differs from the production site in that it has fewer resources than the production site.

Ensure that you understand how to set up a symmetric topology presented earlier in this document. Many of the concepts used to set up a symmetric topology are also valid when you set up an asymmetric topology.

This section include the following topics:

- Creating an Asymmetric Standby Site
  Create an asymmetric standby site for your Oracle Fusion Middleware Disaster Recovery topology.
- Validating the Asymmetric Standby Site Setup
  Validate your standby site.

### 4.4.1 Creating an Asymmetric Standby Site

Create an asymmetric standby site for your Oracle Fusion Middleware Disaster Recovery topology.

The production site is assumed to be the Oracle SOA Suite enterprise deployment shown in Figure 4-2. An asymmetric standby site differs from the production site.

To create an asymmetric standby site:

1. Design the production site and the standby site. Determine the resources that are necessary at the standby site to ensure acceptable performance when the standby site assumes the production role.

> **Note:**
>
> The ports for the standby site instances must use the same port numbers as the peer instances at the production site. Therefore, ensure that all the port numbers that are required at the standby site are available (not in use at the standby site).

2. Create the Oracle Fusion Middleware Disaster Recovery production site by performing these operations:

   a. Create volumes on the production site's shared storage system for the Oracle Fusion Middleware instances that are installed for the production site. See Designing Directory Structure and Volumes.

   b. Create mount points and symbolic links on the production site hosts to the Oracle home directories for the Oracle Fusion Middleware instances on the production site's shared storage system volumes. Note that symbolic links are required only in cases where the storage system does not guarantee consistent replication across multiple volumes.

      For more details about symbolic links, see Storage Replication.

      For more information about volume design, see Recommended Volume Design for Oracle SOA Suite.

   c. Create mount points and symbolic links on the production site hosts to the Oracle Central Inventory directories for the Oracle Fusion Middleware instances on the production site's shared storage system volumes. Note that symbolic links are required only in cases where the storage system does not guarantee consistent replication across multiple volumes.

      For more details about symbolic links, see Storage Replication.

      For more information about the Oracle Central Inventory directories, see Oracle Home and Oracle Inventory.

   d. Create mount points and symbolic links on the production site hosts to the static HTML pages directories for the Oracle HTTP Server instances on the production site's shared storage system volumes, if applicable. Note that symbolic links are required only in cases where the storage system does not guarantee consistent replication across multiple volumes.

      For more details about symbolic links, see Storage Replication.

   e. Install the Oracle Fusion Middleware instances for the production site on the volumes in the production site's shared storage system. See Creating a Production Site.

3. Create the same volumes with the same file and directory privileges on the standby site's shared storage system as you created for the Oracle Fusion Middleware instances on the production site's shared storage system. This step is critical because it enables you to use storage replication later to create the peer Oracle Fusion Middleware instance installations for the standby site instead of installing them by using Oracle Universal Installer.

> **Note:**
>
> When you configure storage replication, ensure that all the volumes you set up on the production site's shared storage system are replicated to the same volumes on the standby site's shared storage system.
>
> Even though some of the instances and hosts at the production site may not exist at the standby site, you must configure storage replication for all the volumes set up for the production site's Oracle Fusion Middleware instances.

4. Configure the shared storage to enable storage replication between the production site's shared storage system and the standby site's shared storage system. Configure storage replication to asynchronously copy the volumes in the production site's shared storage system to the standby site's shared storage system.
5. Create the initial baseline snapshot copy of the production site shared storage system to set up the replication between the production site and standby site shared storage systems. Create the initial baseline snapshot and subsequent snapshot copies by using the asynchronous replication mode. After the baseline snapshot copy is performed, validate that all the directories for the standby site volumes have the same contents as the directories for the production site volumes. Refer to the documentation for your shared storage vendor for information about creating the initial snapshot and enabling storage replication between the production site and standby site shared storage systems.
6. After the baseline snapshot has been taken, perform these steps for the Oracle Fusion Middleware instances for the standby site hosts:
   a. Set up a mount point directory on the standby site host to the Oracle home directory for the Oracle Fusion Middleware instance on the standby site's shared storage system. The mount point directory that you set up for the peer instance on the standby site host must be the same as the mount point directory that you set up for the instance on the production site host.
   b. Set up a symbolic link on the standby site host to the Oracle home directory for the Oracle Fusion Middleware instance on the standby site's shared storage system. Note that symbolic links are required only in cases where the storage system does not guarantee consistent replication across multiple volumes.

      For more details about symbolic links, see Storage Replication. The symbolic link that you set up for the peer instance on the standby site host must be the same as the symbolic link that you set up for the instance on the production site host.
   c. Set up a mount point directory on the standby site host to the Oracle Central Inventory directory for the Oracle Fusion Middleware instance on the standby site's shared storage system. The mount point directory that you set up for the peer instance on the standby site host must be the same as the mount point directory that you set up for the instance on the production site host.
   d. Set up a symbolic link on the standby site host to the Oracle Central Inventory directory for the Oracle Fusion Middleware instance on the standby site's shared storage system. Note that symbolic links are required only in cases

where the storage system does not guarantee consistent replication across multiple volumes.

For more details about symbolic links, see Storage Replication. The symbolic link you set up for the peer instance on the standby site host must be the same as the symbolic link that you set up for the instance on the production site host.

e. Set up a mount point directory on the standby site host to the Oracle HTTP Server static HTML pages directory for the Oracle HTTP Server instance on the standby site's shared storage system. The mount point directory that you set up for the peer instance on the standby site host must be the same as the mount point directory that you set up for the instance on the production site host.

f. Set up a symbolic link on the standby site host to the Oracle HTTP Server static HTML pages directory for the Oracle HTTP Server instance on the standby site's shared storage system. Note that symbolic links are required only in cases where the storage system does not guarantee consistent replication across multiple volumes; see Storage Replication for more details about symbolic links. The symbolic link that you set up for the peer instance on the standby site host must be the same as the symbolic link that you set up for the instance on the production site host.

At this point, the Oracle Fusion Middleware instance installations for the production site have been replicated to the standby site. At the standby site, all of the following are true:

- The Oracle Fusion Middleware instances are installed into the same Oracle home directories on the same volumes as at the production site, and the hosts use the same mount point directories and symbolic links for the Oracle home directories as at the production site. Note that symbolic links are required only in cases where the storage system does not guarantee consistent replication across multiple volumes; see Storage Replication for more details about symbolic links.
- The Oracle Central Inventory directories are located in the same directories on the same volumes as at the production site, and the hosts use the same mount point directories and symbolic links for the Oracle Central Inventory directories as at the production site. Note that symbolic links are required only in cases where the storage system does not guarantee consistent replication across multiple volumes; see Storage Replication for more details about symbolic links.
- The Oracle HTTP Server static HTML pages directories are located in the same directories on the same volumes as at the production site, and the hosts use the same mount point directories and symbolic links for the Oracle HTTP Server static HTML pages directories as at the production site. Note that symbolic links are required only in cases where the storage system does not guarantee consistent replication across multiple volumes; see Storage Replication for more details about symbolic links.
- The same ports are used for the standby site Oracle Fusion Middleware instances as were used for the same instances at the production site.

To further create an asymmetric standby with fewer hosts and instances, see the following topic:

- Creating an Asymmetric Standby Site with Fewer Hosts and Instances
  Create an asymmetric standby site that has fewer hosts and Oracle Fusion Middleware instances than the production site.

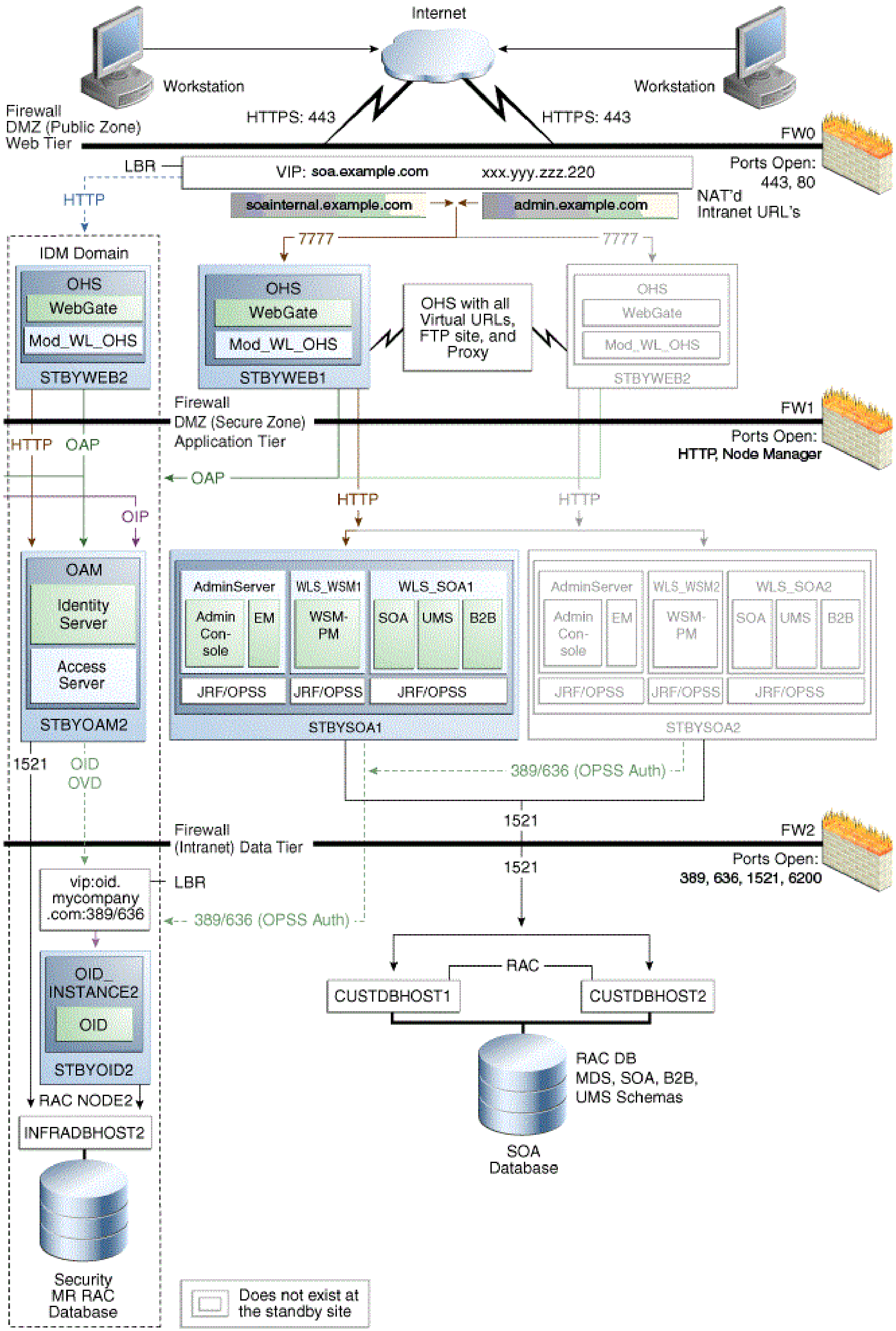
#### 4.4.1.1 Creating an Asymmetric Standby Site with Fewer Hosts and Instances

Create an asymmetric standby site that has fewer hosts and Oracle Fusion Middleware instances than the production site.

The production site for this Oracle Fusion Middleware Disaster Recovery topology is assumed to be the Oracle SOA Suite enterprise deployment shown in Figure 4-2. Setting Up a Site through Designing Directory Structure and Volumes describe how to set up this production site and the volumes for its shared storage system, and how to create the necessary mount points.

Figure 4-4 shows the asymmetric standby site for the production site shown in Figure 4-2.

**Figure 4-4 An Asymmetric Standby Site with Fewer Hosts and Instances**



The Oracle SOA Suite asymmetric standby site shown in Figure 4-4 has fewer hosts and instances than the Oracle SOA Suite production site shown in Figure 4-2.

The hosts WEBHOST2 and SOAHOST2 and the instances on those hosts exist at the production site in Figure 4-2, but these hosts and their instances do not exist at the asymmetric standby site in Figure 4-4. The standby site therefore has fewer hosts and fewer instances than the production site.

It is important to ensure that this asymmetric standby site has sufficient resources to provide adequate performance when it assumes the production role.

When you follow the steps in Creating an Asymmetric Standby Site to set up this asymmetric standby site, the standby site should be properly configured to assume the production role.

To set up the asymmetric standby site correctly, create the same volumes and consistency groups on the standby site shared storage as you did on the production site shared storage. For example, for the Oracle SOA Suite deployment, the volume design recommendations in Table 4-1 and the consistency group recommendations in Table 4-2 were used to set up the production site shared storage. Use these same volume design recommendations and consistency group recommendations that you used for the production site shared storage to set up the asymmetric standby site shared storage.

Note that at an asymmetric standby site, some hosts that exist at the production site do not exist at the standby site. For example, the asymmetric standby site for Oracle SOA Suite shown in Figure 4-4, WEBHOST2 and SOAHOST2 do not exist; therefore, it is not possible or necessary for you to create mount points on these hosts to the standby site shared storage volumes.

### 4.4.2 Validating the Asymmetric Standby Site Setup

Validate your standby site.

To validate the standby site:

1. Shut down any processes running on the production site. These include the database instances in the data tier, Oracle Fusion Middleware instances, and any other processes in the application tier and web tier.
2. Stop the replication between the production site shared storage and the standby site shared storage.
3. Use Oracle Data Guard to switchover the databases.
4. On the standby site host, manually start all the processes. These include Oracle Fusion Middleware instances and any other processes in the application tier and web tier.
5. Use a browser client to perform post-failover testing to confirm that requests are being resolved and redirected to the standby site.

## 4.5 Performing Site Operations and Administration

Learn how to operate and administer your Oracle Fusion Middleware Disaster Recovery topology.

This section includes the following topics:

- Synchronizing the Production and Standby Sites
  Learn how to force a synchronization of the production and standby sites when you introduce a change in the middle tier at the production site.
- Performing a Switchover
  A switchover operation sets the standby site as the production role.
- Performing a Switchback
  A switchback operation reverts the roles of the current production and standby sites.
- Performing a Failover
  A failover operation sets the standby site as the production role when the production site becomes unavailable.
- Testing the Standby Site
  Learn how to create a clone of the read-only standby site shared storage and use it for testing the standby site.
- Using Peer-To-Peer File Copy for Testing
  Use the utility `rsync` in test environments to replicate the middle tier file system data from a production site host to a standby site peer host in an Oracle Fusion Middleware Disaster Recovery topology.

## 4.5.1 Synchronizing the Production and Standby Sites

Learn how to force a synchronization of the production and standby sites when you introduce a change in the middle tier at the production site.

In normal operations, the standby site shared storage receives snapshots transferred periodically from the production site shared storage. After the snapshots are applied, the standby site shared storage includes all the data up to and including the data contained in the last snapshot transferred from the production site before the failover or switchover.

Be sure to force a synchronization when you introduce a change to the middle tier at the production site such as, for example, when you deploy a new application at the production site. Follow the vendor-specific instructions to force a synchronization by using the storage replication technology.

The databases synchronization in an Oracle Fusion Middleware Disaster Recovery topology is managed by Oracle Data Guard.

## 4.5.2 Performing a Switchover

A switchover operation sets the standby site as the production role.

This operation is needed when you plan to take down the production site (for example, to perform maintenance) and to make the current standby site the production site.

To perform a switchover operation:

1. Shut down any processes running on the production site. These include the database instances in the data tier, Oracle Fusion Middleware instances, and any other processes in the application tier and web tier.
2. Stop the replication between the production site shared storage and the standby site shared storage.

3. Unmount the shared storage volume with the middle tier artifacts, on the current production site, and mount the corresponding volumes on the current standby site, which is the new production site.
4. Use Oracle Data Guard to switch over the databases.
5. On the standby site host, manually start all the processes. These include the database instances in the data tier, Oracle Fusion Middleware instances, and any other processes in the application tier and web tier.
6. Ensure that all user requests are routed to the standby site by performing a global DNS push or something similar, such as updating the global load balancer.
7. Use a browser client to perform post-switchover testing to confirm that requests are being resolved and redirected to the standby site.

   At this point, the former standby site is the new production site and the former production site is the new standby site.
8. Reestablish the replication between the two sites, but configure the replication so that the snapshot copies go in the opposite direction (from the current production site to the current standby site). See the documentation for your shared storage to learn how to configure the replication so that snapshot copies are transferred in the opposite direction.

At this point, the former standby site becomes the new production site, and you can perform maintenance at the original production site. After you have carried out the maintenance of the original production site, you can use it as either the production site or the standby site.

**Note:**

This note is applicable for BI-specific systems only.

After a switchover operation, the creation of an Essbase cube with CDS may fail with an error similar to the following:

```
oracle.essbase.cds.util.CDSException:
oracle.essbase.cds.util.CDSException: java.sql.SQLException:
ORA-25153:
```

To work around this issue and to create an Essbase cube, on the current primary database:

- Identify the temporary tablespaces by using a select statement similar to the following (where `BIS17V1` is the Oracle Business Intelligence RCU prefix):

  ```
  select username,temporary_tablespace from dba_users where
  username like 'BIS17V1%'
  ```

  Assume that the above command returns the following list of temporary tablespaces:

  ```
  USERNAME.....TEMPORARY_TABLESPACE

  BIS17V1_IAU_VIEWER.....BIS17V1_IAS_TEMP

  BIS17V1_STB.....BIS17V1_IAS_TEMP

  BIS17V1_IAU_APPEND.....BIS17V1_IAS_TEMP

  BIS17V1_MDS.....BIS17V1_IAS_TEMP

  BIS17V1_IAU.....BIS17V1_IAS_TEMP

  BIS17V1_BIPLATFORM......BIS17V1_IAS_TEMP

  BIS17V1_OPSS.....BIS17V1_IAS_TEMP
  ```

- After the switchover, drop the tablespace `BIS17V1_IAS_TEMP` including contents and datafiles.

- Create the temporary tablespace `BIS17V1_IAS_TEMP`, as a tempfile, in the location (for example) `/work/primy/oradata/stnby/BIS17V1_IAS_TEMP.dbf`, with size 250 m.

- Issue the following alter commands (here is where you use the list temporary tablespaces):

  ```
  alter user BIS17V1_OPSS temporary
  tablespace  BIS17V1_IAS_TEMP ;

  alter user BIS17V1_BIPLATFORM temporary
  tablespace  BIS17V1_IAS_TEMP ;

  alter user BIS17V1_IAU temporary
  tablespace  BIS17V1_IAS_TEMP ;

  alter user BIS17V1_MDS temporary
  tablespace  BIS17V1_IAS_TEMP ;

  alter user BIS17V1_IAU_APPEND temporary
  tablespace  BIS17V1_IAS_TEMP ;
  ```

```
        alter user BIS17V1_STB temporary
        tablespace  BIS17V1_IAS_TEMP ;

        alter user BIS17V1_IAU_VIEWER temporary
        tablespace  BIS17V1_IAS_TEMP ;
```

To use the original production site as the production site, perform a switchback as explained in Performing a Switchback.

## 4.5.3 Performing a Switchback

A switchback operation reverts the roles of the current production and standby sites.

To perform a switchback operation:

1. Shut down any processes running on the current production site. These include the database instances in the data tier, Oracle Fusion Middleware instances, and any other processes in the application tier and web tier.
2. Stop the replication between the current production site shared storage and standby site shared storage.
3. Unmount the shared storage volume with the middle tier artifacts, on the current production site, and mount the corresponding volumes on the current standby site, which is the new production site.
4. Use Oracle Data Guard to switch back the databases.
5. On the new production site hosts, manually start all the processes. These include Oracle Fusion Middleware instances and any other processes in the application tier and web tier.
6. Ensure that all user requests are routed to the new production site by performing a global DNS push or something similar, such as updating the global load balancer.
7. Use a browser client to perform post-switchback testing to confirm that requests are being resolved and redirected to the new production site.

   At this point, the former standby site is the new production site and the former production site is the new standby site.
8. Reestablish the replication between the two sites, but configure the replication so that the snapshot copies go in the opposite direction (from the new production site to the new standby site). See the documentation for your shared storage to learn how to configure the replication so that snapshot copies are transferred in the opposite direction.

## 4.5.4 Performing a Failover

A failover operation sets the standby site as the production role when the production site becomes unavailable.

To perform a failover operation:

1. Stop the replication between the production site shared storage and the standby site shared storage.
2. Mount the shared storage volume with the middle-tier artifacts, on the current standby site, which is the new production site.

3. From the standby site, use Oracle Data Guard to fail over the databases.
4. On the standby site hosts, manually start all the processes. These include the Oracle Fusion Middleware instances and any other processes in the application tier and web tier.
5. Ensure that all user requests are routed to the standby site by performing a global DNS push or something similar, such as updating the global load balancer.
6. Use a browser client to perform post-failover testing to confirm that requests are being resolved and redirected to the production site.

   At this point, the standby site is the new production site. You can examine the issues that caused the former production site to become unavailable.
7. To use the original production site as the current standby site, you must reestablish the replication between the two sites, but configure the replication so that the snapshot copies go in the opposite direction (from the current production site to the current standby site). See the documentation for your shared storage system to learn how to configure the replication so that snapshot copies are transferred in the opposite direction.

**Note:**

After a failover operation, the creation of an Essbase cube with CDS may fail with an error similar to the following:

```
oracle.essbase.cds.util.CDSException:
oracle.essbase.cds.util.CDSException: java.sql.SQLException:
ORA-25153:
```

To work around this issue and to create an Essbase cube, on the current primary database:

- Identify the temporary tablespaces by using a select statement similar to the following, where `BIS17V1` is the Oracle Business Intelligence RCU prefix):

  ```
  select username,temporary_tablespace from dba_users where
  username like 'BIS17V1%'
  ```

  Assume that the above command returns the following list of temporary tablespaces:

  ```
  USERNAME.....TEMPORARY_TABLESPACE

  BIS17V1_IAU_VIEWER.....BIS17V1_IAS_TEMP

  BIS17V1_STB.....BIS17V1_IAS_TEMP

  BIS17V1_IAU_APPEND.....BIS17V1_IAS_TEMP

  BIS17V1_MDS.....BIS17V1_IAS_TEMP

  BIS17V1_IAU.....BIS17V1_IAS_TEMP

  BIS17V1_BIPLATFORM......BIS17V1_IAS_TEMP

  BIS17V1_OPSS.....BIS17V1_IAS_TEMP
  ```

- After the failover, drop the tablespace `BIS17V1_IAS_TEMP` including contents and datafiles.
- Create the temporary tablespace `BIS17V1_IAS_TEMP`, as a tempfile, in location. For example, `/work/primy/oradata/stnby/BIS17V1_IAS_TEMP.dbf` with size 250 m.
- Issue the following alter commands (here is where you use the list temporary tablespaces):

  ```
  alter user BIS17V1_OPSS temporary
  tablespace  BIS17V1_IAS_TEMP ;

  alter user BIS17V1_BIPLATFORM temporary
  tablespace  BIS17V1_IAS_TEMP ;

  alter user BIS17V1_IAU temporary
  tablespace  BIS17V1_IAS_TEMP ;

  alter user BIS17V1_MDS temporary
  tablespace  BIS17V1_IAS_TEMP ;

  alter user BIS17V1_IAU_APPEND temporary
  tablespace  BIS17V1_IAS_TEMP ;
  ```

```
        alter user BIS17V1_STB temporary
        tablespace  BIS17V1_IAS_TEMP ;

        alter user BIS17V1_IAU_VIEWER temporary
        tablespace  BIS17V1_IAS_TEMP ;
```

To again use the original production site as the production site, perform a switchback as explained in Performing a Switchback.

## 4.5.5 Testing the Standby Site

Learn how to create a clone of the read-only standby site shared storage and use it for testing the standby site.

A typical Oracle Fusion Middleware Disaster Recovery configuration uses:

- Storage replication to copy Oracle Fusion Middleware middle tier file systems and data from the production site shared storage to the standby site shared storage. During normal operation, the production site is active and the standby site is passive. When the production site is active, the standby site is passive and the standby site shared storage is in read-only mode; the only write operations made to the standby site shared storage are the storage replication operations from the production site shared storage to the standby site shared storage.
- Oracle Data Guard to copy database data for the production site Oracle databases to the standby databases at standby site. By default, the production site databases are active and the standby databases at the standby site are passive. The standby databases at the standby site are in Managed Recovery mode while the standby site is in the standby role (is passive). When the production site is active, the only write operations made to the standby databases are the database synchronization operations performed by Oracle Data Guard.
- The standby site as the production role when the production site becomes unavailable. If the current production site becomes unavailable unexpectedly, then a failover operation (described in Performing a Failover) is performed to enable the standby site to assume the production role. Or, if the current production site is taken down intentionally (for example, for planned maintenance), then a switchover operation (described in Performing a Switchover) is performed to enable the standby site to assume the production role.

The usual method of testing a standby site is to shut down the current production site and perform a switchover operation to enable the standby site to assume the production role. However, some enterprises may want to perform periodic testing of their Disaster Recovery standby site without shutting down the current production site and performing a switchover operation.

Another method to test the standby site is to create a clone of the read-only standby site shared storage and then use the cloned standby site shared storage in testing.

To use this alternate testing method:

1. Use the cloning technology provided by the shared storage vendor to create a clone of the standby site's read-only volumes on the shared storage at the standby site. Ensure that the cloned standby site volumes are writable. If you want to test the standby site just once, then this can be a one-time clone operation. However, if you want to test the standby site regularly, you can set up periodic cloning of the standby site read-only volumes to the standby site's cloned read/write volumes.

2. Perform a backup of the standby site databases, then modify the Oracle Data Guard replication between the production site and standby site databases.
    - For the 12*c* and later databases, complete the following steps to establish a snapshot standby database:
        a. Cancel Redo Apply, if active.
        b. Ensure that the database is mounted, but not open.
        c. Ensure that a fast recovery area has been configured. It is not necessary for flashback database to be enabled.

           To perform the conversion, run the following SQL command:

           ```
           SQL> ALTER DATABASE CONVERT TO SNAPSHOT STANDBY;
           ```
        d. To open the snapshot standby in read/write mode, run following SQL command:

           ```
           SQL> ALTER DATABASE OPEN READ WRITE;
           ```
    - For the 11*g* database, complete the following steps to establish a snapshot standby database:
        a. Cancel Redo Apply, if active.
        b. Ensure that the database is mounted, but not open.
        c. To perform the conversion, run the following SQL command:

           ```
           SQL> ALTER DATABASE CONVERT TO SNAPSHOT STANDBY;
           ```

           The database is dismounted after the conversion is complete.
        d. Restart the database.
3. Use Oracle Data Guard database recovery procedures to bring the standby databases online.
4. On the standby site computers, modify the mount commands to point to the volumes on the standby site's cloned read/write shared storage by following these steps:
    a. Unmount the read-only shared storage volumes.
    b. Mount the cloned read/write volumes at the same mount point.
5. Before you test the standby site, modify the host name resolution method for the computers that are used to perform the testing to ensure that the host names point to the standby site computers and not the production site computers. For example, on a Linux computer, change the `/etc/hosts` file to point to the virtual IP of the load balancer for the standby site.
6. Perform the standby site testing.

After you complete the standby site testing, follow these steps to begin using the original production site as the production site again:

1. Modify the mount commands on the standby site computers to point to the volumes on the standby site's read-only shared storage. In other words, reset the mount commands back to what they were before the testing was performed.
    a. Unmount the cloned read/write shared storage volume.
    b. Mount the read-only shared storage volumes.

At this point, the mount commands are reset to what they were before the standby site testing was performed.

2. Configure Oracle Data Guard to perform replication between the production site databases and standby databases at the standby site. Performing this configuration puts the standby database into Managed Recovery mode again:

   - For Oracle Database 10.2 and later, follow these steps:

     a. Revert the activated database back to a physical standby database:

        ```
        SQL> STARTUP MOUNT FORCE;
        SQL> FLASHBACK DATABASE TO POINT standbytest;
        SQL> ALTER DATABASE CONVERT TO PHYSICAL STANDBY;
        SQL> STARTUP MOUNT FORCE;
        ```

     b. Restart managed recovery:

        ```
        SQL> ALTER DATABASE RECOVER MANAGED STANDBY
             DATABASE USING CURRENT LOGFILE DISCONNECT;
        ```

     c. Reenable the standby destination and switch logs:

        ```
        SQL> ALTER SYSTEM SET
             LOG ARCHIVE DEST STATE 2=ENABLE;
        ```

   - For Oracle Database 12*c*, set up the replication again by following the steps in *Managing Physical and Snapshot Standby Databases* .

3. Before you use the original production site again, modify the host name resolution method for the computers that are used to access the production site to ensure that the host names point to the production site computers and not the standby site computers. For example, on a Linux computer, change the `/etc/hosts` file to point to the virtual IP of the load balancer for the production site.

## 4.5.6 Using Peer-To-Peer File Copy for Testing

Use the utility `rsync` in test environments to replicate the middle tier file system data from a production site host to a standby site peer host in an Oracle Fusion Middleware Disaster Recovery topology.

An alternative to replicating middle tier components in test environments is to use the `rsync` utility (which uses peer-to-peer file copy) to replicate middle tier file system data from a production site host to a standby site peer host in an Oracle Fusion Middleware Disaster Recovery topology. The use of the `rsync` utility is explained in the context of symmetric topologies.

Ensure that you are familiar with storage replication and Oracle Data Guard in an Oracle Fusion Middleware Disaster Recovery topology, because there are many similarities between using storage replication and using the `rsync` utility for disaster protection and disaster recovery of your Oracle Fusion Middleware components.

**Note:**

Note the following important differences between using storage replication technologies and using the `rsync` utility to replicate middle tier file systems:

- When you use storage replication, you can roll changes back to the point in time when any previous snapshot was taken at the production site.

  When you use the `rsync` utility, replicated production site data overwrites the standby site data, and you cannot roll back a replication.

- When you use storage replication, the volume that you set up for each host cluster in the shared storage systems ensures data consistency for that host cluster across the production site's shared storage system and the standby site's shared storage system.

  When you use the `rsync` utility, data consistency is not guaranteed.

Because of these differences, the `rsync` utility is not supported in production environments but in test environments only.

This section includes the following topic:

- Using rsync and Oracle Data Guard in Oracle Fusion Middleware Disaster Recovery Topologies
  Learn how to use the UNIX `rsync` utility and Oracle Data Guard in your Oracle Fusion Middleware Disaster Recovery topology.

### 4.5.6.1 Using rsync and Oracle Data Guard in Oracle Fusion Middleware Disaster Recovery Topologies

Learn how to use the UNIX `rsync` utility and Oracle Data Guard in your Oracle Fusion Middleware Disaster Recovery topology.

**Note:**

For information about how to set up Oracle Data Guard for Oracle database, see Database Considerations.

The following sections describe how to use the `rsync` utility and Oracle Data Guard to protect and force synchronization between your production and standby sites in an Oracle Fusion Middleware Disaster Recovery topology:

- Using rsync for Oracle Fusion Middleware Middle Tier Components
  Use the UNIX `rsync` utility to protect and recover your Oracle Fusion Middleware middle tier components.
- Performing Failover and Switchover Operations
  Learn how to perform failover or switchover operations when you use the `rsync` utility.

#### 4.5.6.1.1 Using rsync for Oracle Fusion Middleware Middle Tier Components

Use the UNIX `rsync` utility to protect and recover your Oracle Fusion Middleware middle tier components.

To use the `rsync` utility:

1. Install and set up `rsync` to enable replication of files from a production site host to its standby site peer host. For instructions about how to install, set up, and use the utility, see the utility man pages and also `http://rsync.samba.org`.
2. For each production site host on which one or more Oracle Fusion Middleware components has been installed, set up `rsync` to copy the following directories and files to the same directories and files on the standby site peer host:
   - The Oracle home directory, subdirectories, and all the files in them.
   - The Oracle Central Inventory directory and files for the host, which includes the Oracle Universal Installer entries for the Oracle Fusion Middleware installations.
   - If applicable, the Oracle Fusion Middleware static HTML pages directory for the Oracle HTTP Server installations on the host.
   - If applicable, the `.fmb` and `.fmx` deployment files that are created by Oracle Forms on the host, and the `.rdf` deployment artifact files that are created by Oracle Reports on the host.

   > **Note:**
   >
   > Run the `rsync` utility as root. If you want it to work without prompting users for a password, set up SSH keys between the production site host and standby site host, so that SSH does not prompt for a password.
3. Set up scheduled jobs, for example, cron jobs, for the production site hosts for which you set up `rsync` in the previous step. These scheduled jobs enable `rsync` to automatically perform replication of these files from the production site hosts to the standby site hosts on a regular interval. An interval of once a day is recommended for a production site where the Oracle Fusion Middleware configuration does not change very often.
4. Whenever a change is made to the configuration of an Oracle Fusion Middleware middle tier configuration on a production site host (for example, when a new application is deployed), perform a manual synchronization of that host with its standby site peer host by using `rsync`.
5. Whenever you use `rsync` to a manually synchronize an Oracle Fusion Middleware middle tier instance on a production site host with the peer standby site host, also use Oracle Data Guard to synchronize database repositories in the production site with the databases in the standby site. For information about synchronizing Oracle databases with Oracle Data Guard, see Synchronizing Databases Manually.

#### 4.5.6.1.2 Performing Failover and Switchover Operations

Learn how to perform failover or switchover operations when you use the `rsync` utility.

To perform a failover or switchover from the production site to the standby site when you use `rsync`:

1. Shut down any processes running on the production site (if applicable).
2. Stop `rsync` jobs between the production site hosts and standby site peer hosts.
3. Use Oracle Data Guard to failover the production site databases to the standby site.
4. On the standby site, manually start the processes for the Oracle Fusion Middleware Server instances.
5. Route all user requests to the standby site by performing a global DNS push or something similar, such as updating the global load balancer.
6. Use a browser client to perform post-failover or post-switchover testing to confirm that requests are being resolved at the standby site (current production site).

   At this point, the standby site is the new production site and the production site is the new standby site.
7. Reestablish `rsync` between the two sites, but configure it so that replications go now in the opposite direction (from the current production site to the current standby site).

To use the original production site as the new production site, perform the preceding steps again but configure the rsync replications to go in the original direction (from the original production site to the original standby site).

## 4.6 Using Oracle Site Guard for Disaster Recovery

Oracle Site Guard orchestrates switchover and failover between two disaster recovery sites.

Oracle Site Guard:

- Ensures high availability, data protection, and disaster recovery for enterprise data.
- Performs Oracle Site Guard operations such as switchover and failover. If the primary site becomes unavailable due to a planned or an unplanned outage, a Switchover or Failover process needs to be initiated using Oracle Site Guard.

For more information about how to use Oracle Site Guard, see *Oracle Site Guard Administrator's Guide*.

## 4.7 Patching an Oracle Fusion Middleware Disaster Recovery Site

Apply an Oracle Fusion Middleware patch set to upgrade the Oracle homes that participate in an Oracle Fusion Middleware Disaster Recovery site.

It is assumed that the Oracle Central Inventory for any Oracle Fusion Middleware instance that you are patching is located on the production site shared storage, so that the Oracle Central Inventory for the patched instance can be replicated to the standby site.

To apply an Oracle Fusion Middleware patch:

1. Perform a backup of the production site to ensure that the starting state is secured.
2. Apply the patch set to upgrade the production site instances.
3. After you apply the patch set, manually force a synchronization of the production site shared storage and standby site shared storage. This replicates the production site's patched instance and Oracle Central Inventory in the standby site's shared storage.
4. After you apply the patch set, use Oracle Data Guard to manually force a synchronization of the Oracle databases at the production site and standby sites. Because some Oracle Fusion Middleware patch sets make updates to repositories, this step ensures that any changes made to production site databases are synchronized to the standby site databases.
5. The upgrade is now complete. Your Disaster Recovery topology is ready to resume processing.

> **Note:**
>
> Patches must be applied only at the production site for an Oracle Fusion Middleware 12*c* Disaster Recovery topology. If a patch is for an Oracle Fusion Middleware instance or for the Oracle Central Inventory, the patch is copied when the production site shared storage is replicated to the standby site shared storage. A synchronization operation should be performed when a patch is installed at the production site.
>
> Similarly, if a patch is installed for a production site database, Oracle Data Guard copies the patch to the standby database at the standby site when a synchronization is performed.

# A

# Managing Oracle Inventory

Learn how to manage Oracle Inventory on the production and standby sites for an Oracle Fusion Middleware Disaster Recovery topology.

This appendix includes the following sections:

- Updating Oracle Inventory
  Update Oracle Inventory on both the production site host and the standby site peer host.
- Updating the Windows Registry
  Export Windows Registry keys on the production site host and import them on the standby site peer host.

## A.1 Updating Oracle Inventory

Update Oracle Inventory on both the production site host and the standby site peer host.

When you update Oracle Inventory (for example, by installing new Oracle software, or by applying an Oracle patch set or patch to existing Oracle software) on a production site host, ensure that the same software updates are made on the standby site peer host. To accomplish this task, update Oracle inventory on the standby site peer host by executing the following script:

```
ORACLE_HOME/oui/bin/attachHome.sh
```

## A.2 Updating the Windows Registry

Export Windows Registry keys on the production site host and import them on the standby site peer host.

When you update Oracle inventory (for example, by installing new Oracle software or by applying an Oracle patch set or a patch to existing Oracle software) on a production site Windows host, you must ensure that the same software updates are made on the standby site peer host by exporting the following Windows Registry key on the production site host and importing it on the standby site peer host:

```
HKEY_LOCAL_MACHINE\Software\oracle
```

In addition, when you modify system components, such as Oracle Web Cache, export the following Windows Registry key on the production site host and import it on the standby site peer host:

```
HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services
```

To import a key that you have previously exported, use the following command:

```
regedit /I FileName
```

as illustrated in the following example:

```
regedit /I C:\oracleregisitry.reg
```

Alternatively, you can use the Registry Editor to import the key. See Registry Editor Help.