

Oracle® Fusion Middleware

Concepts Guide

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Oracle Fusion Middleware Concepts Guide, 11g Release 1 (11.1.1)

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Preface

This preface includes the following topics:

- [Audience](#)
- [Documentation Accessibility](#)
- [Related Documents](#)
- [Conventions](#)

Audience

This guide is intended for anyone interested in an overview of the components and features that comprise Oracle Fusion Middleware 11g.

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Related Documents

For more information, see these Oracle resources:

- *Oracle Fusion Middleware Administrator's Guide*
- Oracle Fusion Middleware Documentation Library 11g Release 1 (11.1.1)

Conventions

The following text conventions are used in this guide:

Convention	Meaning
boldface	Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.
<i>italic</i>	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.

Overview of Oracle Fusion Middleware

Oracle Fusion Middleware is a comprehensive family of products ranging from application development tools and integration solutions to identity management, collaboration, and business intelligence reporting. This chapter provides an introduction to Oracle Fusion Middleware. It includes the following sections:

- [What is Oracle Fusion Middleware?](#)
- [Understanding the Functions of Middleware](#)
- [Understanding Middleware Architecture Design](#)
- [Understanding the Oracle Fusion Middleware Solution](#)

1.1 What is Oracle Fusion Middleware?

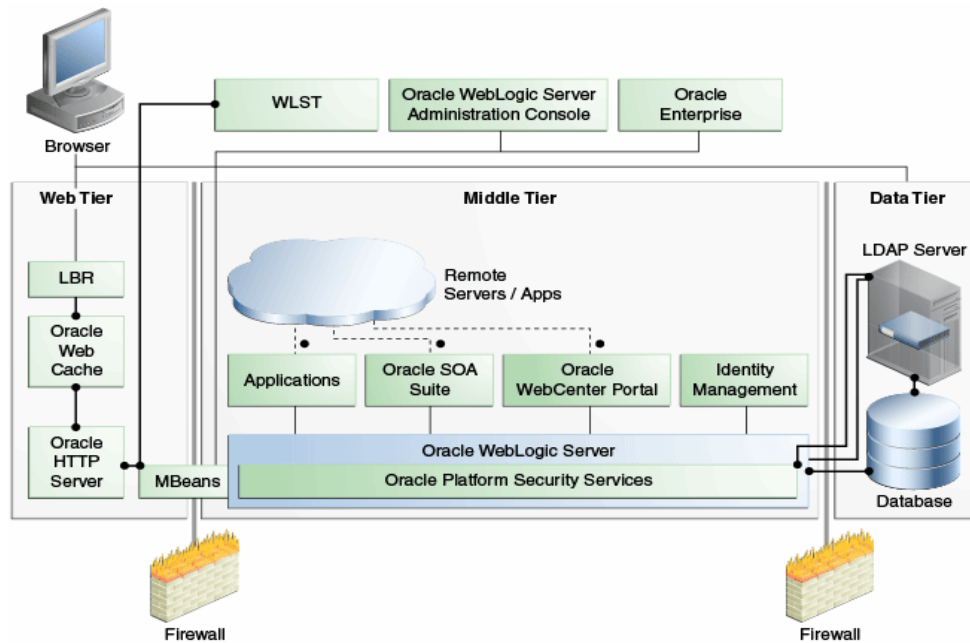
Oracle Fusion Middleware is a collection of standards-based software products that spans a range of tools and services: from Java EE and developer tools, to integration services, identity management, business intelligence, and collaboration. Oracle Fusion Middleware offers complete support for development, deployment, and management.

Specifically, middleware is the software that connects software components or enterprise applications. Middleware is the software layer that lies between the operating system and the applications on each side of a distributed computer network as shown in [Figure 1-1](#). Typically, middleware supports complex, distributed business software applications.

Middleware is also the infrastructure which facilitates creation of business applications, and provides core services like concurrency, transactions, threading, messaging, and the SCA framework for service-oriented architecture (SOA) applications. It also provides security and enables high availability functionality to your enterprise.

Middleware includes Web servers, application servers, content management systems, and similar tools that support application development and delivery. It is especially integral to information technology based on Extensible Markup Language (XML), Simple Object Access Protocol (SOAP), Web services, SOA, Unicode, Web 2.0 infrastructure, and Lightweight Directory Access Protocol (LDAP). Textual data is represented in the Unicode character set to support data exchange in any language. UTF-8 is used as the standard encoding for transporting data for optimal compatibility and efficiency, while traditional non-Unicode encodings can also be used where supported.

Figure 1–1 Oracle Fusion Middleware Architecture



Due to continued growth and use of network-based applications by businesses, middleware technologies are increasingly important. Companies and organizations are now building enterprisewide information systems by integrating previously independent applications with new software developments. The integration process may involve legacy applications which may be used only with, or through a nonmodifiable interface. In some cases, rewriting the code for a legacy application may be cost-prohibitive.

Increasingly, information systems are composed of a collection of various specialized hardware devices interconnected by a network. Each device performs a function that involves receipt of real time data and remote interaction with other devices of the system. Some examples include computer networks, telecommunication systems, uninterrupted power supply units, and decentralized manufacturing units.

Interaction with the information system may span a wide range of performance. You can interact with Internet applications through a variety of devices, whose characteristics and performance figures span an increasingly wide range. Between a high performance personal computer, a smart telephone, and a personal digital assistant, the variations in bandwidth, local processing power, screen capacity, and the ability to display color pictures, are extremely large.

1.2 Understanding the Functions of Middleware

Applications use intermediate software that resides on top of the operating systems and communication protocols to perform the following functions:

- Hide the distributed nature of the application. An application represents a collection of interconnected parts that are operational and running in distributed locations, out of view.
- Hide the heterogeneity of the enterprise. This includes the hardware components used, computer operating systems, and communication protocols.

- Provide uniform, standard, high-level interfaces to the application developers and integrators, so that applications can be easily composed, reused, ported, and made to interoperate.
- Supply a set of common services to perform various general purpose functions to avoid duplicating efforts, and to facilitate collaboration between applications.

Middleware makes application development easier, by providing common programming abstractions, by masking application heterogeneity and the distribution of the underlying hardware and operating systems, and by hiding low-level programming details.

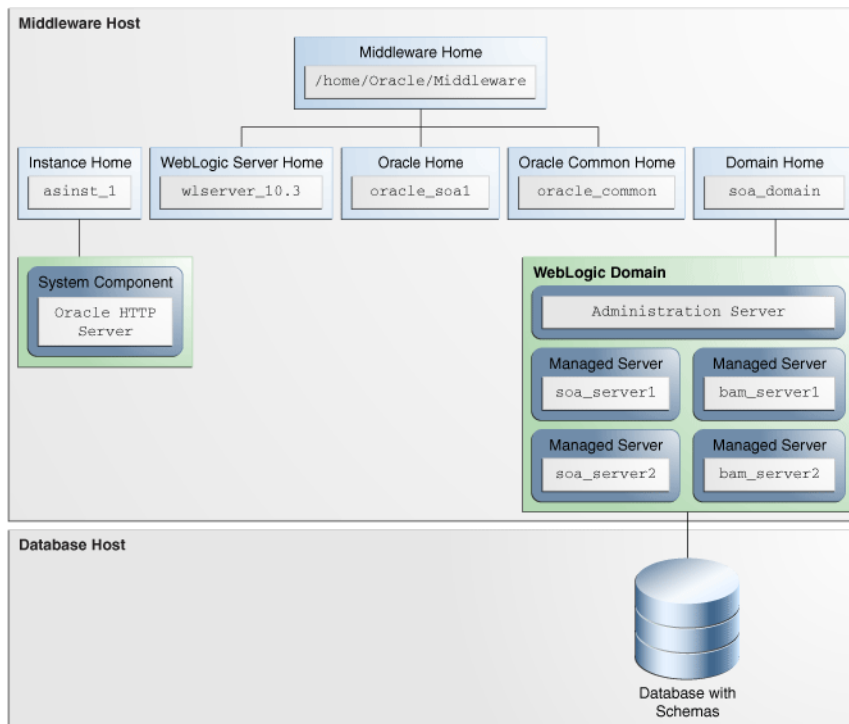
1.3 Understanding Middleware Architecture Design

The function of middleware is to mediate interaction between the parts of an application, or between applications. Therefore, considerations for architectural structure play a central role in middleware design. The architectural design encompasses the organization, overall structure, and communication patterns, both for applications and for the middleware itself.

[Figure 1–2](#) provides an overview of the Oracle Fusion Middleware architecture with a common Oracle SOA installation.

For more information see the following guides:

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

Figure 1–2 Oracle Fusion Middleware Architecture Overview

Besides architectural aspects, the main problems of middleware design pertain to various aspects of distributed systems. Any middleware system relies on a communication layer that allows its different pieces to interoperate. In addition, communication is a function provided by middleware itself to applications, in which the communicating entities may take on different roles such as client server or peer-to-peer. Middleware allows different interaction modes (synchronous invocations, asynchronous message passing, coordination through shared objects) embodied in different patterns.

Therefore, middleware system design faces several challenges:

- Middleware systems rely on interception and indirection mechanisms, which induce performance penalties. Adaptable middleware introduces additional indirections, which make the situation even worse.
- As applications become more and more interconnected and interdependent, the number of objects, users, and devices tends to increase. This poses the problem of the scalability of the communication and object management algorithms, and increases the complexity of administration. The availability, reliability, concurrency, security, and performance of applications may also be an issue.
- Widespread computing is a vision of the near future, in which an increasing number of devices embedded in various physical objects participate in a global information network. Mobility and dynamic reconfiguration will be dominant features, requiring permanent adaptation of the applications.
- Managing large applications that are heterogeneous, widely distributed, and in permanent evolution raises many questions, such as consistent observation, security, trade-offs between autonomy and interdependence for the different subsystems, and definition and implementation of resource management policies.

1.4 Understanding the Oracle Fusion Middleware Solution

Oracle Fusion Middleware is a collection of standards-based software products that includes a range of tools and services including developer tools, integration services, business intelligence, collaboration, and content management. Oracle Fusion Middleware offers complete support for development, deployment, and management.

Specifically, Oracle Fusion Middleware offers the following solutions through its middleware design:

- **Development Tools:** A unified SOA development tool and framework. An integrated, but modular, set of development tools to build complete applications, rather than using lots of specialized tools. The design tool includes a single design environment for user interface, business logic, service composition, business process or workflow, business rules, and business intelligence. The design tool enables simplified design and debugging, and to improve productivity. Includes Oracle JDeveloper, Oracle TopLink, Oracle Application Development Framework, and Oracle Eclipse.
- **User Interaction:** A single, end-user environment that enable access to enterprise applications, business processes, business intelligence and to share information with each other. This end user environment is multi-channel allowing it to be accessed from a variety of different clients (mobile clients, desktop clients, Voice-over IP (VOIP) clients) with Oracle WebCenter Portal.
- **Business Intelligence:** A suite of business intelligence tools from extract, transform, and load to integrate data into warehouses; query, analysis, and reporting tools for decision support; scorecards to compare how the business is doing against key performance indicators; and alerting to drive notifications to users about problems in the business software.
- **Content Management:** A repository within which to manage documents, digital assets, scanned images and other forms of content; to integrate this content with a company's enterprise applications, Web sites, and business processes.
- **SOA:** A means of using existing investments in applications and systems most efficiently to be able to focus more resources and budget on innovation and on delivering new business services.
- **Application Server:** A standards-based Java EE application server to run the enterprise applications and provide the Web services infrastructure for interoperability.
- **Integration and Business Process Management (BPM):** A standards-based service bus to connect applications with each other and with legacy systems using messaging; a BPM or workflow engine to connect the application into a business process or workflow; and business activity monitoring and optimize business processes in real time.
- **Security and Identity Management:** Security administration across multiple applications and systems in an enterprise, by centralizing how users are created and provisioned, their identities, and roles and by enabling them to have single sign-on access. Includes Oracle Internet Directory, Oracle Virtual Directory, Oracle Directory Integration Platform, Oracle Identity Federation.
- **Enterprise Management:** Operations and administration by running on a grid architecture with grouping, backup, and other high availability technologies, and integrating with Oracle Enterprise Manager for systems management. Includes Fusion Middleware Control, Oracle WebLogic Server Administration Console, Oracle WebLogic Scripting Tool, Oracle Process Manager and Notification Server.

Understanding Key Concepts

This chapter provides information about Oracle Fusion Middleware concepts that are related to administering Oracle Fusion Middleware.

- [Understanding Key Oracle Fusion Middleware Concepts](#)
- [What Is a Middleware Home?](#)
- [What Is an Oracle Home and the Oracle Common Home?](#)
- [What Is a WebLogic Server Home?](#)
- [What Is a Domain Home?](#)
- [What Is an Oracle Instance?](#)
- [What is the Oracle Metadata Repository?](#)

2.1 Understanding Key Oracle Fusion Middleware Concepts

Oracle Fusion Middleware provides two types of components:

- A **Java component**, which is an Oracle Fusion Middleware component that is deployed as one or more Java EE applications and a set of resources. Java components are deployed to an Oracle WebLogic Server domain as part of a domain template. Examples of Java components are the Oracle SOA Suite and Oracle WebCenter Portal components.
- A **system component**, which is a manageable process that is not deployed as a Java application. Instead, a system component is managed by Oracle Process Manager and Notification (OPMN).

A Java component and a system component are peers.

After you install and configure Oracle Fusion Middleware, your Oracle Fusion Middleware environment contains the following:

- An Oracle WebLogic Server domain, which contains one Administration Server and one or more Managed Servers. The Administration Server contains Oracle WebLogic Server Administration Console and Fusion Middleware Control. The Managed Servers contain components, such as Oracle WebCenter Portal and Oracle SOA Suite as shown in [Figure 1-1](#).

See [Section 2.5](#) for information about Oracle WebLogic Server domains.

- One or more Oracle instances, if your environment includes system components. See [Section 2.6](#) for information about Oracle instances.

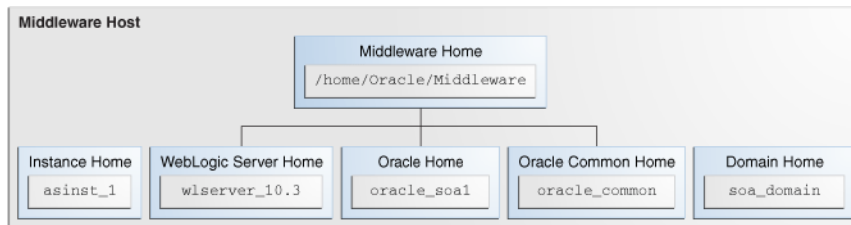
- A database that is used as a metadata repository, if the components you installed require one. For example, Oracle SOA Suite requires a metadata repository. See [Section 2.7](#) for information about metadata repositories.

2.2 What Is a Middleware Home?

A **Middleware home** is a container for the Oracle WebLogic Server home, and, optionally, one Oracle Common home and one or more Oracle homes. A Middleware home can reside on a local file system or on a remote shared disk that is accessible through NFS.

A Middleware home can reside on a local file system or on a remote shared disk that is accessible through a network file system (NFS). The default Oracle Middleware home is `/Oracle/Middleware` on a UNIX operating system or `\Oracle\Middleware` on a Windows operating system. `MW_HOME` represents the location of a Middleware home in path names. The contents of an Oracle Middleware Home with a SOA installation are shown in [Figure 2–1](#).

Figure 2–1 *Middleware Home*



See [Section 2.3](#) for information about Oracle homes. See [Section 2.4](#) for information about Oracle WebLogic Server homes.

2.3 What Is an Oracle Home and the Oracle Common Home?

An **Oracle home** contains installed files necessary to host a specific component or software suite. An **Oracle home** resides within the directory structure of the Middleware home. Each Oracle home can be associated with multiple Oracle instances or Oracle WebLogic Server domains. There can be multiple Oracle homes within each Middleware home.

The **Oracle Common home** contains the binary and library files required for Fusion Middleware Control and Java Required Files (JRF). There can be only one Oracle Common home within each Middleware home.

2.4 What Is a WebLogic Server Home?

A **WebLogic Server home** contains installed files necessary to host a WebLogic Server. The WebLogic Server home directory is a peer of Oracle home directories and resides within the directory structure of the Middleware home.

2.5 What Is a Domain Home?

The top-level directory of an Oracle WebLogic Server administration domain is referred to as the **domain home**. The directory structure of a domain is separate from

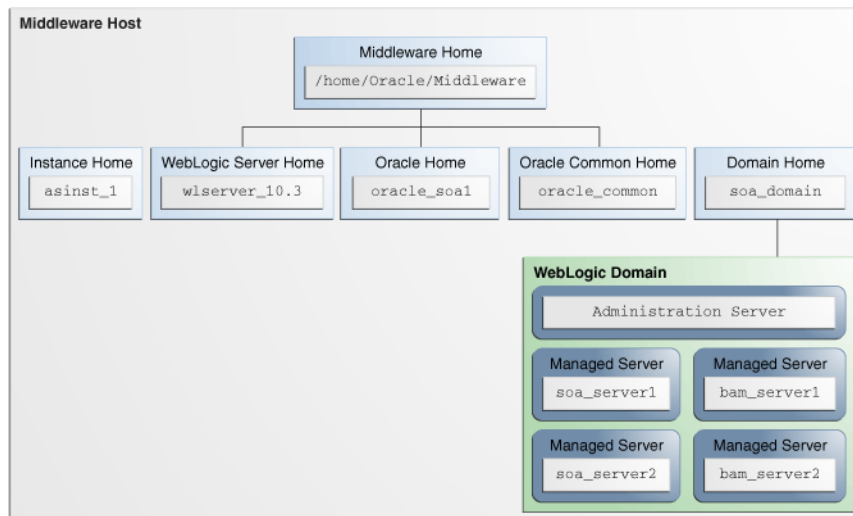
the directory structure of the WebLogic Server home. A domain home can reside anywhere; it need not be within the Middleware home directory.

An Oracle WebLogic Server administration **domain** is a logically related group of Java components. A domain includes a special WebLogic Server instance called the **Administration Server**, which is the central point from which you configure and manage all resources in the domain. Usually, you configure a domain to include additional WebLogic Server instances called **Managed Servers**. You deploy Java components, such as Web applications, EJBs, and Web services, and other resources, to the Managed Servers and use the Administration Server for configuration and management purposes only.

A domain is a peer of an Oracle instance. Both contain specific configurations outside of their Oracle homes.

Figure 2–2 shows a SOA installation with an Oracle WebLogic Server domain containing an Administration Server and four managed servers.

Figure 2–2 Directory Structure after a WebLogic Domain is Created



See Also: *Oracle Fusion Middleware Understanding Domain Configuration for Oracle WebLogic Server* for more information about domain configuration

The following topics describe entities in the domain:

- [What Is the Administration Server?](#)
- [What are Managed Servers and Managed Server Clusters?](#)
- [What Is Node Manager?](#)

2.5.1 What Is the Administration Server?

The **Administration Server** operates as the central control entity for the configuration of the entire domain. It maintains the domain's configuration documents and distributes changes in the configuration documents to Managed Servers. The Administration Server serves as a central location from which to manage and monitor all resources in a domain.

Each domain must have one server instance that acts as the Administration Server.

To interact with the Administration Server, you can use the Oracle WebLogic Server Administration Console, Oracle WebLogic Scripting Tool (WLST), or create your own Java Management Extensions (JMX) client. In addition, you can use Fusion Middleware Control for some tasks.

Oracle WebLogic Server Administration Console and Fusion Middleware Control run in the Administration Server. Oracle WebLogic Server Administration Console is the Web-based administration console used to manage the resources in an Oracle WebLogic Server domain, including the Administration Server and Managed Servers. Fusion Middleware Control is a Web-based administration console used to manage Oracle Fusion Middleware, including components such as Oracle HTTP Server, Oracle SOA Suite, Oracle WebCenter, and Oracle Identity Management.

See Also:

- "Getting Started Using Oracle Enterprise Manager Fusion Middleware Control" in *Oracle Fusion Middleware Administrator's Guide* for more information about Fusion Middleware Control
- "Getting Started Using Oracle WebLogic Server Administration Console" in *Oracle Fusion Middleware Administrator's Guide*, as well as the *Oracle Fusion Middleware Introduction to Oracle WebLogic Server* and the Oracle WebLogic Server Administration Console Online help, for more information about Oracle WebLogic Server Administration Console

2.5.2 What are Managed Servers and Managed Server Clusters?

Managed Servers host business applications, application components, Web services, and their associated resources. To optimize performance, Managed Servers maintain a read-only copy of the domain's configuration document. When a Managed Server starts, it connects to the domain's Administration Server to synchronize its configuration document with the document that the Administration Server maintains.

When you create a domain, you create it using a particular domain template. That template supports a particular component or group of components, such as the Oracle SOA Suite. The Managed Servers in the domain are created specifically to host those particular Oracle Fusion Middleware components.

Oracle Fusion Middleware Java components (such as Oracle SOA Suite, Oracle WebCenter Portal, and some Identity Management components), as well as customer-developed applications, are deployed to Managed Servers in the domain.

If you want to add other components, such as Oracle WebCenter Portal, to a domain that was created using a template that supports another component, you can extend the domain using the domain extension template for the component you want to add, this will create the additional Managed Servers for that component in the domain. See "Extending a Domain to Support Additional Components" in *Oracle Fusion Middleware Administrator's Guide* for more information.

For production environments that require increased application performance, throughput, or high availability, you can configure two or more Managed Servers to operate as a cluster. A **cluster** is a collection of multiple WebLogic Server instances running simultaneously and working together to provide increased scalability and reliability. In a cluster, most resources and services are deployed identically to each Managed Server (as opposed to a single Managed Server), enabling failover and load balancing. A single domain can contain multiple Oracle WebLogic Server clusters, as well as multiple Managed Servers that are not configured as clusters. The key

difference between clustered and nonclustered Managed Servers is support for failover and load balancing. These features are available only in a cluster of Managed Servers.

See Also: "Understanding WebLogic Server Clustering" in *Oracle Fusion Middleware Using Clusters for Oracle WebLogic Server*

2.5.3 What Is Node Manager?

Node Manager is a Java utility that runs as a separate process from Oracle WebLogic Server and allows you to perform common operations for a Managed Server, regardless of its location with respect to its Administration Server. While use of Node Manager is optional, it provides valuable benefits if your Oracle WebLogic Server environment hosts applications with high-availability requirements.

If you run Node Manager on a computer that hosts Managed Servers, you can start and stop the Managed Servers remotely using the Administration Console or the command line. Node Manager can also automatically restart a Managed Server after an unexpected failure.

See Also: *Oracle Fusion Middleware Node Manager Administrator's Guide for Oracle WebLogic Server*

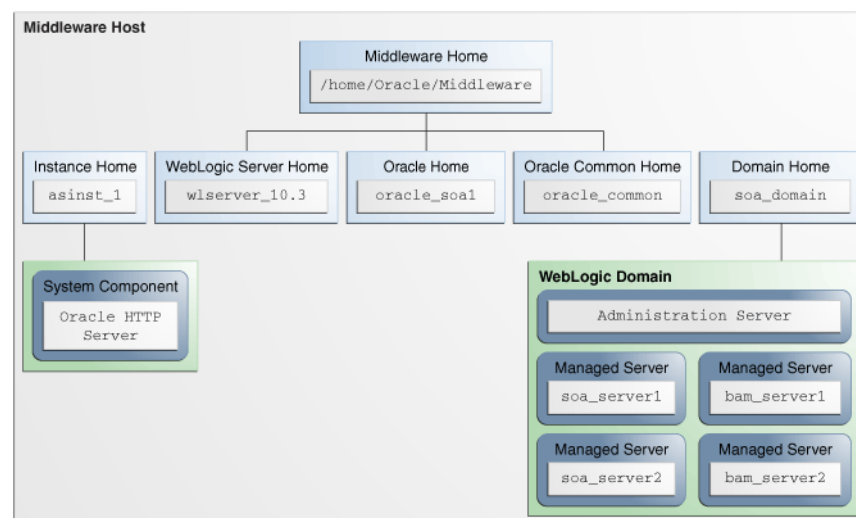
2.6 What Is an Oracle Instance?

An **Oracle instance** contains one or more system components, such as Oracle Web Cache, Oracle HTTP Server, or Oracle Internet Directory as shown in [Figure 2-3](#). The system components in an Oracle instance must reside on the same computer. An Oracle instance directory contains updatable files, such as configuration files, log files, and temporary files.

An Oracle instance is a peer of an Oracle WebLogic Server domain. Both contain specific configurations outside of their Oracle homes.

The directory structure of an Oracle instance is separate from the directory structure of the Oracle home. It can reside anywhere; it need not be within the Middleware home directory.

Figure 2-3 Directory Structure of the Instance Home with an Oracle HTTP Server



2.7 What is the Oracle Metadata Repository?

The metadata repository contains metadata for Oracle Fusion Middleware system components, such as Oracle BPEL Process Manager, Oracle B2B, and Oracle WebCenter Portal. It can also contain metadata about the configuration of Oracle Fusion Middleware and metadata for enterprise applications.

A metadata repository can be database-based or file-based. If it is database-based, Oracle Metadata Repository can be installed into an existing database using the Repository Creation Utility (RCU).

Oracle Fusion Middleware supports multiple repository types. A repository type represents a specific schema or a set of schemas that belongs to a specific Oracle Fusion Middleware component (for example, Oracle SOA Suite or Oracle Internet Directory.)

For more information, see "Managing the Oracle Metadata Repository" in the *Oracle Fusion Middleware Administrator's Guide*.

A particular type of repository, the MDS Repository, contains metadata for most Oracle Fusion Middleware components, such as Oracle B2B, and for certain types of applications. For more information about the MDS Repository see "Managing the MDS Repository" in the *Oracle Fusion Middleware Administrator's Guide*.

Overview of Oracle Fusion Middleware Components

This chapter provides an overview of the Oracle Fusion Middleware components. It includes the following sections:

- [Understanding Oracle WebLogic Server](#)
- [Understanding Oracle SOA Suite](#)
- [Understanding Oracle Identity Management](#)
- [Understanding Oracle WebCenter Portal](#)
- [Understanding Oracle Business Intelligence](#)
- [Understanding Oracle Business Intelligence Discoverer](#)
- [Understanding Oracle Portal](#)
- [Understanding Oracle Reports](#)
- [Understanding Oracle Forms Services](#)
- [Understanding Oracle HTTP Server](#)
- [Understanding Oracle Web Services](#)
- [Understanding Oracle WebCenter Content](#)
- [Understanding Oracle Data Integrator](#)

3.1 Understanding Oracle WebLogic Server

The 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 SOA.

Java EE is a widely used platform for server programming in the Java programming language. The Java EE Platform differs from the standard edition of Java in that it adds libraries which provide functionality to deploy fault-tolerant, distributed, multi-tier Java software, based largely on modular components running on an application server.

In addition to the Java EE implementation, Oracle WebLogic Server enables enterprises to deploy business-critical applications in a robust, secure, highly available, manageable, and scalable environment. These features allow enterprises to configure clusters of Oracle WebLogic Server instances to distribute load and provide extra capacity in case of hardware or other failures. New diagnostic tools allow system administrators to monitor and tune the performance of deployed applications and the

Oracle WebLogic Server environment itself. You can also configure Oracle WebLogic Server to monitor and tune application throughput automatically, without human intervention. Extensive security features protect access to services, keep enterprise data secure, and prevent malicious attacks.

For more information, see the *Oracle Fusion Middleware Oracle WebLogic Server Administration Console Online Help*.

3.2 Understanding Oracle SOA Suite

Oracle SOA Suite is a middleware component of Oracle Fusion Middleware. Oracle SOA Suite enables services to be created, managed, and orchestrated into SOA composite applications. Composite applications enable you to easily assemble multiple technology components into one SOA composite application. Oracle SOA Suite plugs into heterogeneous infrastructures and enables enterprises to incrementally adopt SOA.

For more information, see the *Oracle Fusion Middleware Administrator's Guide for Oracle SOA Suite and Oracle Business Process Management Suite*

3.3 Understanding Oracle Identity Management

Oracle Identity Management is an enterprise identity management system that automatically manages users' access privileges within the resources of an enterprise. The architecture of Oracle Identity Management works with the most demanding business requirements without requiring changes to existing infrastructure, policies, or procedures. Oracle Identity Management components manage throughout the entire identity management lifecycle; from initial creation of access privileges to dynamically adapting to changes in enterprise business requirements.

Oracle Identity Management products provide for a shared infrastructure for all Oracle applications. It also provides services and interfaces that facilitate third-party enterprise application development. These interfaces are useful for application developers who must incorporate identity management into their applications.

Oracle Identity Management 11g Release 1 includes the following components:

- Oracle Internet Directory (OID)
- Oracle Directory Integration Platform (ODIP)
- Oracle Virtual Directory (OVD)
- Oracle Directory Services Manager (ODSM)
- Oracle Identity Federation (OIF)

Oracle Identity and Access Management 11g Release 1 includes the following components:

- Oracle Identity Manager (OIM)
- Oracle Access Manager (OAM)
- Oracle Adaptive Access Manager (OAAM)
- Oracle Identity Navigator (OIN)
- Oracle Entitlements Server (OES)

Refer to the following documents for additional information on Oracle Identity Management components:

Oracle Identity Management

- *Oracle Fusion Middleware Getting Started with Oracle Identity Management*
- *Oracle Fusion Middleware User Reference for Oracle Identity Management*

Oracle Internet Directory

- *Oracle Fusion Middleware Administrator's Guide for Oracle Internet Directory*
- *Oracle Fusion Middleware Application Developer's Guide for Oracle Identity Management*

Oracle Directory Integration Platform

- *Oracle Fusion Middleware Integration Guide for Oracle Identity Management*

Oracle Virtual Directory

- *Oracle Fusion Middleware Administrator's Guide for Oracle Virtual Directory.*

Oracle Directory Services Manager

- *Oracle Fusion Middleware Administrator's Guide for Oracle Internet Directory*
- *Oracle Fusion Middleware Administrator's Guide for Oracle Virtual Directory*

Oracle Identity Federation

- *Oracle Fusion Middleware Administrator's Guide for Oracle Identity Federation.*

Oracle Identity Manager

- *Oracle Fusion Middleware Administrator's Guide for Oracle Identity Manager*

Oracle Access Manager

- *Oracle Fusion Middleware Administrator's Guide for Oracle Access Manager*

Oracle Adaptive Access Manager

- *Oracle Fusion Middleware Administrator's Guide for Oracle Adaptive Access Manager*

Oracle Identity Navigator

- *Oracle Fusion Middleware Administrator's Guide for Oracle Identity Navigator*

3.4 Understanding Oracle WebCenter Portal

Oracle WebCenter Portal provides an open, standards-based, and extensible portal framework that allows users to interact with business applications and services. It supports a single, modern framework for developing popular styles of websites that are critical to the success of the modern organization: internet sites, intranets, extranets, and social networks. WebCenter Portal applications make it easy for users to get the information they need and to work with others to make the necessary changes to business processes.

WebCenter Portal includes WebCenter Portal services like instant messaging, document and content management, discussion forums, wikis, blogs, tagging, activity tracking, personalization, polls, and others. To provide an accessible and streamlined user experience, Oracle WebCenter Portal is integrated and certified with Oracle WebCenter Content, Oracle Identity Management Suite, Oracle SOA Suite, Oracle Enterprise Manager, and Oracle eBusiness Suite, as well as PeopleSoft, Siebel, and JD Edwards enterprise applications. Together, these tools and services empower end users and IT to build and deploy next-generation collaborative portals that take

advantage of the creativity and intellect of every user, and improve the productivity of key internal and external business processes.

Oracle WebCenter Portal 11g includes components that provide a full range of functionality to develop customer facing internet web sites, intranets, extranets, and social networking applications. These components include:

- Oracle WebCenter Portal: Framework
- Oracle WebCenter Portal: Spaces
- Oracle WebCenter Portal: Services
- Composer in WebCenter Portal

For more information about WebCenter Portal, see "Introducing Oracle WebCenter Portal" in the *Oracle Fusion Middleware Administrator's Guide for Oracle WebCenter Portal*.

3.5 Understanding Oracle Business Intelligence

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

3.6 Understanding Oracle Business Intelligence Discoverer

Oracle Business Intelligence Discoverer (Oracle BI Discoverer) is a business intelligence tool for analyzing data, and is a key component of Oracle Fusion Middleware. The latest release of Oracle Business Intelligence Discoverer 11g offers new functionality, including published Discoverer Webservice APIs, integration with Oracle WebCenter Portal, integration with Oracle WebLogic Server, integration with Enterprise Manager (Fusion Middleware Control) and improved performance and scalability.

For more information, see "What is Oracle BI Discoverer?" in the *Oracle Fusion Middleware Configuration Guide for Oracle Business Intelligence Discoverer*.

3.7 Understanding Oracle Portal

Oracle Portal offers a complete and integrated framework for building, deploying, and managing enterprise portals. Only Oracle Portal delivers a unified and secure point of access to all enterprise information and services to improve business visibility and collaboration, reduce integration costs, and ensure investment protection.

For more information about Oracle Portal, see the *Oracle Fusion Middleware Administrator's Guide for Oracle Portal*.

3.8 Understanding Oracle Reports

Oracle Reports is an enterprise reporting tool that enables businesses to give immediate access to information to all levels within and outside of the organization in a scalable and secure environment.

With Oracle Reports, you can rapidly develop and deploy sophisticated Web and paper reports against any data source, including an Oracle database, JDBC, XML, and

text files. By leveraging Java EE technologies, such as JSP and XML, you can publish your reports in a variety of formats to any destination in a scalable, efficient manner.

For more information about Oracle Reports, see the *Oracle Fusion Middleware Publishing Reports to the Web with Oracle Reports Services*.

3.9 Understanding Oracle Forms Services

Oracle Forms Services is a middle-tier application framework for deploying complex, transactional forms applications to a network such as an intranet or the Internet. Developers build Forms applications with Oracle Forms Builder and deploy them with Oracle Forms Services.

For more information, see the following:

- *Oracle Fusion Middleware Forms Services Deployment Guide*
- *Oracle Forms Upgrading Oracle Forms 6i to Oracle Forms 11g*

3.10 Understanding Oracle HTTP Server

Oracle HTTP Server (OHS) is the underlying deployment platform for all programming languages and technologies that Oracle Fusion Middleware supports. It provides a Web listener and the framework for hosting static and dynamic pages and applications over the Web. Based on the proven technology of the Apache 2.2.10 infrastructure, OHS includes significant enhancements that facilitate load balancing, administration, and configuration. It also includes a number of enhanced modules, or mods, which are extensions to the HTTP server that extend its functionality for other enterprise applications and services.

OHS is, and includes modules developed specifically by Oracle. The features of single sign-on, clustered deployment, and high availability enhance the operation of the Oracle HTTP Server.

OHS allows developers to program their sites in a variety of languages and technologies, such as Java, Perl, C, C++, PHP, and PL/SQL. Additionally, it can serve as either a forward or reverse proxy server.

For more information about OHS see the *Oracle Fusion Middleware Administrator's Guide for Oracle HTTP Server*.

3.11 Understanding Oracle Web Services

A Web Service is a set of functions packaged into a single application that is available to other systems on a network. The network can be a corporate intranet or the Internet. Because Web Services rely on basic, standard technologies which most systems provide, they are an excellent means for connecting distributed systems together. They can be shared by and used as a component of distributed Web-based applications. Other systems, such as customer relationship management systems, order-processing systems, and other existing back-end applications, can call a Web Service function to request data or perform an operation.

For an overview of Web services in Oracle Fusion Middleware 11g, a description of the Web services and clients supported in each category, and a roadmap for implementing Oracle Fusion Middleware Web services, see *Oracle Fusion Middleware Introducing Web Services*.

3.12 Understanding Oracle WebCenter Content

Oracle WebCenter Content is a comprehensive suite of digital content management tools. These tools can be used across the enterprise to cohesively track, manage, and dispose of content whether written, in digital images, or as email. It brings together the most complete portfolio of portal, web experience management, content, social, and collaboration technologies into a single integrated product suite.

Because of the interaction between tools in WebCenter Content, it is recommended that you read the *Oracle WebCenter Content Concepts Guide* to familiarize yourself with the entire product family.

3.13 Understanding Oracle Data Integrator

Oracle Data Integrator provides a fully unified solution for building, deploying, and managing complex data warehouses or as part of data-centric architectures in a SOA or business intelligence environment. In addition, it combines all the elements of data integration—data movement, data synchronization, data quality, data management, and data services—to ensure that information is timely, accurate, and consistent across complex systems.

Oracle Data Integrator (ODI) features an active integration platform that includes all styles of data integration: data-based, event-based and service-based. ODI unifies silos of integration by transforming large volumes of data efficiently, processing events in real time through its advanced Changed Data Capture (CDC) capability, and providing data services to the Oracle SOA Suite. It also provides robust data integrity control features, assuring the consistency and correctness of data. With powerful core differentiators - heterogeneous E-LT, Declarative Design and Knowledge Modules - Oracle Data Integrator meets the performance, flexibility, productivity, modularity and hot-pluggability requirements of an integration platform.

For more information about Oracle Data Integrator refer to the *Oracle Fusion Middleware Developer's Guide for Oracle Data Integrator*.

Oracle Fusion Middleware Administration and Operations

This chapter describes Oracle Fusion Middleware administration. It includes the following sections:

- [Section 4.1, "Enterprise Deployment"](#)
- [Section 4.2, "Management"](#)
- [Section 4.3, "Scalability"](#)
- [Section 4.4, "High Availability"](#)
- [Section 4.5, "Load Balancing"](#)
- [Section 4.6, "Diagnostic Data"](#)
- [Section 4.7, "Cloning"](#)
- [Section 4.8, "Oracle RAC"](#)
- [Section 4.9, "Backup and Recovery"](#)

4.1 Enterprise Deployment

An enterprise deployment is an Oracle best practices blueprint based on proven Oracle high-availability technologies and recommendations for Oracle Fusion Middleware. The high-availability best practices include all Oracle products across the entire technology stack—Oracle Database, Oracle Fusion Middleware, Oracle Applications, Oracle Collaboration Suite, and Oracle Grid Control.

An Oracle Fusion Middleware enterprise deployment:

- Considers various business service level agreements (SLA) to make high-availability best practices as widely applicable as possible
- Takes advantage of database grid servers and storage grids with low-cost storage to provide highly resilient, lower cost infrastructure
- Uses results from extensive performance impact studies for different configurations to ensure that the high-availability architecture is optimally configured to perform and scale to business needs
- Enables control over the length of time to recover from an outage and the amount of acceptable data loss from a natural disaster
- Evolves with each Oracle release and is completely independent of hardware and operating system

For more information on enterprise deployment see the following guides:

- *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 SOA Suite*
- *Oracle Fusion Middleware High Availability Guide*

For more information on high-availability practices, visit:

<http://www.oracle.com/technology/deploy/availability/htdocs/maa.htm>

4.2 Management

You manage your Oracle Fusion Middleware environment using one of the following management tools:

- [Fusion Middleware Control](#)
- [Oracle WebLogic Server Administration Console](#)
- [Oracle WebLogic Scripting Tool](#)
- [Oracle Process Manager and Notification Server](#)
- [Oracle Enterprise Manager Grid Control](#)

4.2.1 Fusion Middleware Control

Oracle Enterprise Manager Fusion Middleware Control (Fusion Middleware Control) is a Web browser-based, graphical user interface that you can use to monitor and administer a farm or cluster.

A farm is a collection of components managed by Fusion Middleware Control. It can contain Oracle WebLogic Server domains, one Administration Server, one or more Managed Servers, clusters, and the Oracle Fusion Middleware components that are installed, configured, and running in the domain.

Fusion Middleware Control organizes a wide variety of performance data and administrative functions into distinct, Web-based home pages for the farm, cluster, domain, servers, components, and applications. The Fusion Middleware Control home pages make it easy to locate the most important monitoring data and the most commonly used administrative functions all from your Web browser.

Fusion Middleware Control provides direct access to Oracle WebLogic Server Administration Console. The Web pages in the Fusion Middleware Control interface contain links that take enable you to access the Administration Console. For example, on the Domain home page, if you go to the Summary area there is a link that takes you to the Administration Console in order to configure and manage the domain.

For more information, see "Getting Started Using Oracle Enterprise Manager Fusion Middleware Control" in the *Oracle Fusion Middleware Administrator's Guide*.

4.2.2 Oracle WebLogic Server Administration Console

Oracle WebLogic Server Administration Console is a Web browser-based, graphical user interface that you use to manage an Oracle WebLogic Server domain. It is accessible from any supported Web browser with network access to the Administration Server.

Use the Administration Console to:

- Configure, start, and stop Oracle WebLogic Server instances
- Configure Oracle WebLogic Server clusters
- Configure Oracle WebLogic Server services, such as database connectivity (JDBC) and JMS messaging
- Configure security parameters, including creating and managing users, groups, and roles
- Configure and deploy Java EE applications
- Monitor server and application performance
- View server and domain log files
- View application deployment descriptors
- Edit selected run time application deployment descriptor elements

For more information, see "Getting Started Using Oracle WebLogic Server Administration Console" in the *Oracle Fusion Middleware Administrator's Guide*.

4.2.3 Oracle WebLogic Scripting Tool

The Oracle WebLogic Scripting Tool (WLST) is a command-line scripting environment that you can use to create, manage, and monitor Oracle WebLogic Server domains. It is based on the Java scripting interpreter, Jython. In addition to supporting standard Jython features such as local variables, conditional variables, and flow control statements, WLST provides a set of scripting functions (commands) that are specific to Oracle WebLogic Server. You can extend the WebLogic scripting language to suit your needs by following the Jython language syntax.

You can use any of the following techniques to invoke WLST commands:

- Interactively, on the command line
- In script mode, supplied in a file
- Embedded in Java code

For more information, see "Getting Started Using Oracle WebLogic Server Scripting Tool (WLST)" in the *Oracle Fusion Middleware Administrator's Guide*.

For more information about the WebLogic scripting tool see the Oracle Fusion Middleware WebLogic Scripting Tool Command Reference .

4.2.4 Oracle Process Manager and Notification Server

Oracle Process Manager and Notification Server (OPMN) manages and monitors the following Oracle Fusion Middleware components, referred to as system components:

- Oracle HTTP Server
- Oracle Web Cache
- Oracle Internet Directory
- Oracle Virtual Directory
- Oracle Forms Services
- Oracle Reports
- Oracle Business Intelligence Discoverer

- Oracle Business Intelligence

For more information, see "Getting Started Using Oracle Process Manager and Notification Server" in the *Oracle Fusion Middleware Administrator's Guide*.

4.2.5 Oracle Enterprise Manager Grid Control

Oracle Enterprise Manager Grid Control is a Web browser-based, graphical user interface that you can use to monitor multiple Oracle Fusion Middleware Farms and Oracle WebLogic Server Domains. In fact, Grid Control provides deep management solutions for Oracle technologies including Oracle packaged applications, Oracle Database and Oracle VM. Grid Control also offers extensive support for non-Oracle technologies through more than two dozen heterogeneous management plug-ins and connectors including Microsoft MOM, IBM WebSphere, JBoss, EMC storage, F5 BIG IP, Check Point Firewall, and Remedy.

Beyond managing your entire data center from a single interface, Grid Control offers critical features that help you manage Oracle Fusion Middleware and Oracle WebLogic Server more effectively and efficiently. Such additional management capabilities include:

- Analyze and report on trends based upon collected availability and performance data.
- Receive alert notifications (via email, page, SNMP) for metrics which have crossed thresholds previously defined by you.
- Automate common administrative operations (e.g. start/stop, WLST scripts).
- Resolve problems faster through visibility into all Java activity - including in-flight transactions - and tracing transactions from Java to Database and vice-versa.
- Detect, validate, and report authorized and unauthorized configuration changes in real time.
- Ensure configuration consistency across development and production environments.

For more information about Oracle Enterprise Manager Grid Control refer to the *Oracle Enterprise Manager Grid Control Concepts Guide* available on OTN.

4.3 Scalability

Scalability is the ability of a system to provide throughput in proportion to, and limited only by, available hardware resources. A scalable system is one that can handle increasing numbers of requests without adversely affecting response time and throughput.

The growth of computational power within one operating environment is called vertical scaling. Horizontal scaling is leveraging multiple systems to work together on a common problem, in parallel.

Oracle Fusion Middleware scales both vertically and horizontally. Horizontally, Oracle Fusion Middleware can increase its throughput with several Managed Servers grouped together to share a workload. Also, Oracle Fusion Middleware provides great vertical scalability, allowing you to add more Managed Servers or components in the same node.

High availability refers to the ability of users to access a system. Deploying a high-availability system minimizes the time when the system is down, or unavailable and maximizes the time when it is running, or available. Oracle Fusion Middleware is

designed to provide a wide variety of high-availability solutions, ranging from load balancing and basic clustering to providing maximum system availability during catastrophic hardware and software failures.

High-availability solutions can be divided into two basic categories: local high availability and disaster recover.

For more information about high availability see the *Oracle Fusion Middleware High Availability Guide*.

4.4 High Availability

A high availability architecture is one of the key requirements for any Enterprise Deployment. Oracle Fusion Middleware has an extensive set of high availability features, which protect its components and applications from unplanned down time and minimize planned downtime to achieve your business goals.

High availability refers to the ability of users to access a system without loss of service. Deploying a high availability system minimizes the time when the system is down, or unavailable and maximizes the time when it is running, or available. This section provides an overview of high availability from a problem-solution perspective. This section includes the following topics:

- [High Availability Problems](#)
- [High Availability Solutions](#)
- [Disaster Recovery](#)

4.4.1 High Availability Problems

Mission critical computer systems need to be available 24 hours a day, 7 days a week, and 365 days a year. However, part or all of the system may be down during planned or unplanned downtime. A system's availability is measured by the percentage of time that it is providing service in the total time since it is deployed. [Table 4-1](#) provides an example.

Table 4-1 Availability Percentages and Corresponding Downtime Values

Availability Percentage	Approximate Downtime Per Year
95%	18 days
99%	4 days
99.9%	9 hours
99.99%	1 hour
99.999%	5 minutes

System downtime may be categorized as planned or unplanned. Unplanned downtime is any sort of unexpected failure. Planned downtime refers to scheduled operations that are known in advance and that render the system unavailable. The effect of planned downtime on end users is typically minimized by scheduling operational windows when system traffic is slow. Unplanned downtime may have a larger effect because it can happen at peak hours, causing a greater impact on system users.

These two types of downtimes (planned and unplanned) are usually considered separately when designing a system's availability requirements. A system's needs may be very restrictive regarding its unplanned downtimes, but very flexible for planned

downtimes. This is the typical case for applications with high peak loads during working hours, but that remain practically inactive at night and during weekends. You may choose different high availability features depending on the type of failure is being addressed.

4.4.2 High Availability Solutions

High availability solutions can be categorized into local high availability solutions that provide high availability in a single data center deployment, and disaster recovery solutions, which are usually geographically distributed deployments that protect your applications from disasters such as floods or regional network outages.

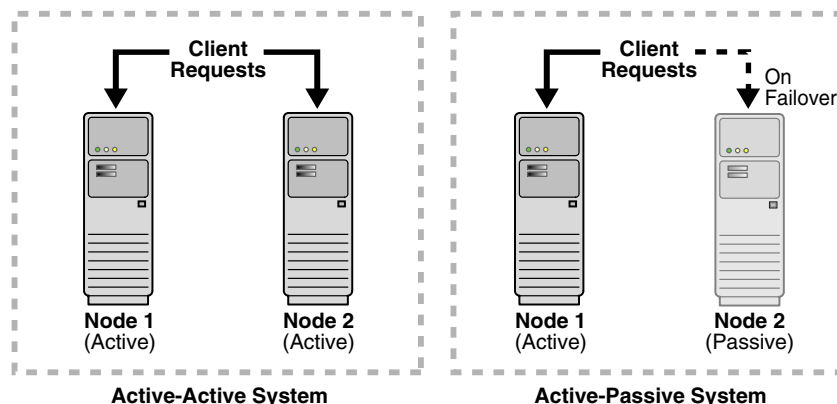
Amongst possible types of failures, process, node, and media failures as well as human errors can be protected by local high availability solutions. Local physical disasters that affect an entire data center can be protected by geographically distributed disaster recovery solutions.

To solve the high availability problem, a number of technologies and best practices are needed. The most important mechanism is redundancy. High availability comes from redundant systems and components. You can categorize local high availability solutions by their level of redundancy, into active-active solutions and active-passive solutions (see [Figure 4-1](#)):

- **Active-active solutions** deploy two or more active system instances and can be used to improve scalability as well as provide high availability. In active-active deployments, all instances handle requests concurrently.
- **Active-passive solutions** deploy an active instance that handles requests and a passive instance that is on standby. In addition, a heartbeat mechanism is set up between these two instances. This mechanism is provided and managed through operating system vendor-specific clusterware. Generally, vendor-specific cluster agents are also available to automatically monitor and failover between cluster nodes, so that when the active instance fails, an agent shuts down the active instance completely, brings up the passive instance, and application services can successfully resume processing. As a result, the active-passive roles are now switched. The same procedure can be done manually for planned or unplanned downtime. Active-passive solutions are also generally referred to as cold failover clusters.

You can use Oracle Cluster Ready Services (CRS) to manage the Fusion Middleware Active-Passive (CFC) solutions.

Figure 4-1 Active-Active and Active-Passive High Availability Solutions



In addition to architectural redundancies, the following local high availability technologies are also necessary in a comprehensive high availability system:

- **Process death detection and automatic restart**

Processes may die unexpectedly due to configuration or software problems. A proper process monitoring and restart system should monitor all system processes constantly and restart them should problems appear.

A system process should also maintain the number of restarts within a specified time interval. This is also important since continually restarting within short time periods may lead to additional faults or failures. Therefore a maximum number of restarts or retries within a specified time interval should also be designed as well.

- **Clustering**

Clustering components of a system together allows the components to be viewed functionally as a single entity from the perspective of a client for run time processing and manageability. A cluster is a set of processes running on single or multiple computers that share the same workload. There is a close correlation between clustering and redundancy. A cluster provides redundancy for a system.

If failover occurs during a transaction in a clustered environment, the session data is retained as long as there is at least one surviving instance available in the cluster.

- **State replication and routing**

For stateful applications, client state can be replicated to enable stateful failover of requests in the event that processes servicing these requests fail.

- **Failover**

With a load-balancing mechanism in place, the instances are redundant. If any of the instances fail, requests to the failed instance can be sent to the surviving instances.

- **Server load balancing**

When multiple instances of identical server components are available, client requests to these components can be load balanced to ensure that the instances have roughly the same workload.

- **Server Migration**

Some services can only have one instance running at any given point of time. If the active instance becomes unavailable, the service is automatically started on a different cluster member. Alternatively, the whole server process can be automatically started on a different machine in the cluster.

- **Integrated High Availability**

Components depend on other components to provide services. The component should be able to recover from dependent component failures without any service interruption.

- **Rolling Patching**

Patching product binaries often requires down time. Patching a running cluster in a rolling fashion can avoid downtime. Patches can be uninstalled in a rolling fashion as well.

- **Configuration management**

A clustered group of similar components often need to share common configuration. Proper configuration management ensures that components

provide the same reply to the same incoming request, allows these components to synchronize their configurations, and provides high availability configuration management for less administration downtime.

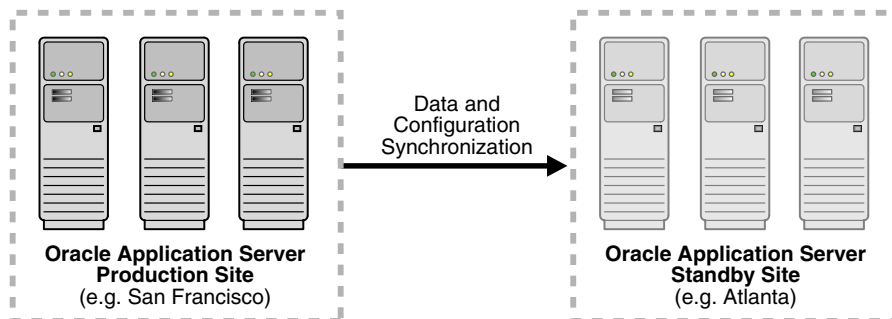
- **Backup and Recovery**

User errors may cause a system to malfunction. In certain circumstances, a component or system failure may not be repairable. A backup and recovery facility should be available to back up the system at certain intervals and restore a backup when a failure occurs.

4.4.3 Disaster Recovery

Disaster recovery solutions typically set up two homogeneous sites, one active and one passive. Each site is a self-contained system. The active site is generally called the production site, and the passive site is called the standby site. During normal operation, the production site services requests; in the event of a site failover or switchover, the standby site takes over the production role and all requests are routed to that site. To maintain the standby site for failover, not only must the standby site contain homogeneous installations and applications, data and configurations must also be synchronized constantly from the production site to the standby site.

Figure 4–2 Geographically Distributed Disaster Recovery



4.4.3.1 Components Protected by High Availability Solutions

The Oracle Fusion Middleware High Availability Guide discusses high availability solutions for the following components:

- Oracle WebLogic Server
- Oracle SOA Suite
- Oracle ADF
- Oracle WebCenter Portal and Oracle WebCenter Content
- Oracle Identity Management Components
- Oracle HTTP Server
- Oracle Web Cache
- Oracle Portal, Forms, Reports, and Discoverer

4.5 Load Balancing

Origin server load balancing is a feature in which HTTP requests are distributed among origin servers so that no single origin server is overloaded.

Oracle Web Cache supports load balancing and failover detection for application Web servers.

Oracle Web Cache ensures that cache misses are directed to the most available, highest-performing Web server in the server farm. A capacity heuristic guarantees performance and provides surge protection when the application Web server load increases.

For more information about load balancing and failover, see Oracle Fusion Middleware Administrator's Guide for Oracle Web Cache.

4.6 Diagnostic Data

Oracle Fusion Middleware components generate log files containing messages that record all types of events, including startup and shutdown information, errors, warning messages, and access information on HTTP requests. This chapter describes how to find information about the cause of an error and its corrective action, to view and manage log files to assist in monitoring system activity and to diagnose problems.

For more information see the *Oracle Fusion Middleware Administrator's Guide*.

4.7 Cloning

Cloning is the process of copying an existing entity to a different location while preserving its state. Some situations in which cloning Oracle Fusion Middleware is useful are:

- Creating a Middleware home or Oracle home that is a copy of a production, test, or development environment. Cloning enables you to create a new Middleware home or an Oracle home with all patches applied to it in a single step. This is in contrast to separately installing, configuring and applying any patches to separate Oracle homes.
- Preparing a "gold" image of a patched home and deploying it to many hosts.

The cloned entity behaves the same as the source entity. For example, a cloned Oracle home can be deinstalled or patched using the installer. It can also be used as the source for another cloning operation.

For more information about cloning see *Oracle Fusion Middleware Administrator's Guide*.

4.8 Oracle RAC

Oracle Real Application Clusters (Oracle RAC) is a computing environment that harnesses the processing power of multiple, interconnected computers. Along with a collection of hardware, called a cluster, it unites the processing power of each component to become a single, robust computing environment. A cluster comprises two or more computers, also called nodes. Oracle Real Application Clusters simultaneously provides a highly scalable and highly available database for Oracle Fusion Middleware.

Every Oracle RAC instance in the cluster has equal access and authority, therefore, node and instance failure may affect performance, but does not result in downtime, since the database service is available or can be made available on surviving server instances.

For more information on Oracle Real Application Clusters, see the Oracle Fusion Middleware High Availability Guide.

4.9 Backup and Recovery

An Oracle Fusion Middleware environment can consist of different components and configurations. A typical Oracle Fusion Middleware environment contains an Oracle WebLogic Server domain with Java component such as Oracle SOA Suite and an Oracle WebLogic Server domain with Oracle Identity Management components. It can also include one or more Oracle instances.

The installations of an Oracle Fusion Middleware environment are interdependent in that they contain configuration information, applications, and data that are kept in synchronization. For example, when you perform a configuration change, you might update configuration files in the installation. When you deploy an application, you might deploy it to all Managed Servers in a domain or cluster.

It is important to consider your entire Oracle Fusion Middleware environment when performing backup and recovery. You should back up your entire Oracle Fusion Middleware environment once, then periodically thereafter perform incremental backup and recovery operations. If a loss occurs, you can restore your environment to a consistent state.

For information about backup and recovery, see "Advanced Administration: Backup and Recovery" in the *Oracle Fusion Middleware Administrator's Guide*.