

# Oracle® WebLogic Server

Understanding Domain Configuration

10g Release 3 (10.3)

July 2008

ORACLE®

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# Introduction and Roadmap

This document describes Oracle WebLogic Server domains and how they are configured. A domain is the basic administration unit for WebLogic Server. A domain consists of one or more WebLogic Server instances (and their associated resources) that you manage with a single Administration Server.

The following sections describe the contents and organization of this guide—*Understanding Domain Configuration*.

- [“Document Scope and Audience” on page 1-1](#)
- [“Guide to this Document” on page 1-2](#)
- [“Related Documentation” on page 1-2](#)
- [“Samples and Tutorials” on page 1-3](#)
- [“New and Changed Features in This Release” on page 1-3](#)

## Document Scope and Audience

This document is written mainly for Java Platform, Enterprise Edition (Java EE) system architects, application developers, and system administrators who are developing or deploying Web-based applications on one or more WebLogic Server domains.

The topics in this document are relevant during the design and development phases of a software project. This document does not address production phase administration, monitoring, or

performance tuning topics. For links to WebLogic Server documentation and resources for these topics, see [“Related Documentation” on page 1-2](#).

It is assumed that the reader is familiar with Java EE, basic concepts of XML, and general networking and application management concepts.

## Guide to this Document

- This chapter, [“Introduction and Roadmap”](#), introduces the purpose, organization, and context of this guide.
- [Chapter 2, “Understanding WebLogic Server Domains,”](#) introduces WebLogic Server domains.
- [Chapter 3, “Domain Configuration Files,”](#) describes the configuration and directories that maintain the on-disk representation of a domain and its contents.
- [Chapter 4, “Managing Configuration Changes,”](#) describes change management features in WebLogic Server.

## Related Documentation

For information about system administration tasks and the various tools you can use to perform them, see:

- The [System Administration for Oracle WebLogic Server](#) documentation page
- [Overview of WebLogic Server System Administration](#) in *Introduction to Oracle WebLogic Server*
- [Monitoring and Managing with the Java EE Management APIs](#)
- [WebLogic Server MBean Reference](#)
- [WebLogic SNMP Management Guide](#)

For more detailed information about tools you can use to create and configure WebLogic Server domains, see:

- [Creating WebLogic Domains Using the Configuration Wizard](#)
- [WebLogic Scripting Tool](#)
- [Developing Custom Management Utilities with JMX](#)

- WebLogic Server *Command Reference*
- *Administration Console Online Help*

## Samples and Tutorials

In addition to this document, Oracle provides code samples that are relevant to domain configuration and administration.

- The WebLogic Scripting Tool (WLST) examples show how to automate the creation of domains using WLST. See [WLST Sample Scripts](#) in *WebLogic Scripting Tool*.
- The Avitek Medical Records Sample Application is a WebLogic Server sample application suite that concisely demonstrates all aspects of the Java EE platform. To start this sample application, invoke the `startWeblogic` script in:  
`WL_HOME/samples/domains/medrec`  
where `WL_HOME` is the directory in which you installed WebLogic Server.

## New and Changed Features in This Release

For a comprehensive listing of the new WebLogic Server features introduced in this release, see [“What’s New in WebLogic Server”](#) in *Release Notes*.

## Introduction and Roadmap



# Understanding WebLogic Server Domains

The following sections introduce WebLogic Server domains and their contents:

- “What Is a Domain?” on page 2-1
- “Organizing Domains” on page 2-1
- “Contents of a Domain” on page 2-3
- “Domain Restrictions” on page 2-6

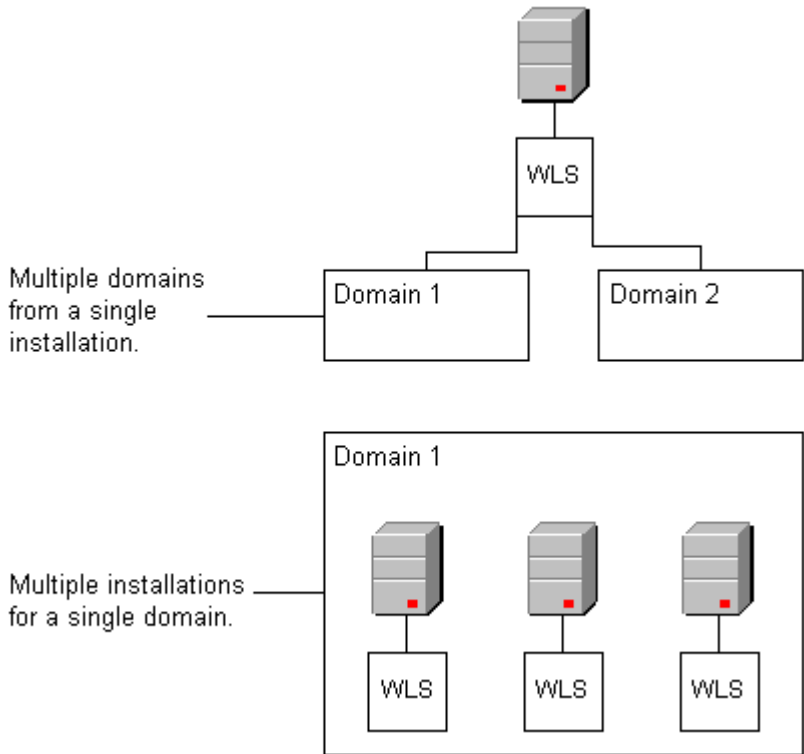
## What Is a Domain?

A WebLogic Server administration **domain** is a logically related group of WebLogic Server resources. Domains include 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 Web applications, EJBs, Web Services, and other resources onto the Managed Servers and use the Administration Server for configuration and management purposes only.

## Organizing Domains

You can use a single WebLogic Server installation to create and run multiple domains, or you can use multiple installations to run a single domain. See [Figure 2-1](#).

**Figure 2-1 WebLogic Server Installations and Domains**



How you organize your WebLogic Server installations into domains depends on your business needs. You can define multiple domains based on different system administrators' responsibilities, application boundaries, or geographical locations of the machines on which servers run. Conversely, you might decide to use a single domain to centralize all WebLogic Server administration activities.

Depending on your particular business needs and system administration practices, you might decide to organize your domains based on criteria such as:

- Logical divisions of applications. For example, you might have one domain devoted to end-user functions such as shopping carts and another domain devoted to back-end accounting applications.
- Physical location. You might establish separate domains for different locations or branches of your business. Each physical location requires its own WebLogic Server installation.

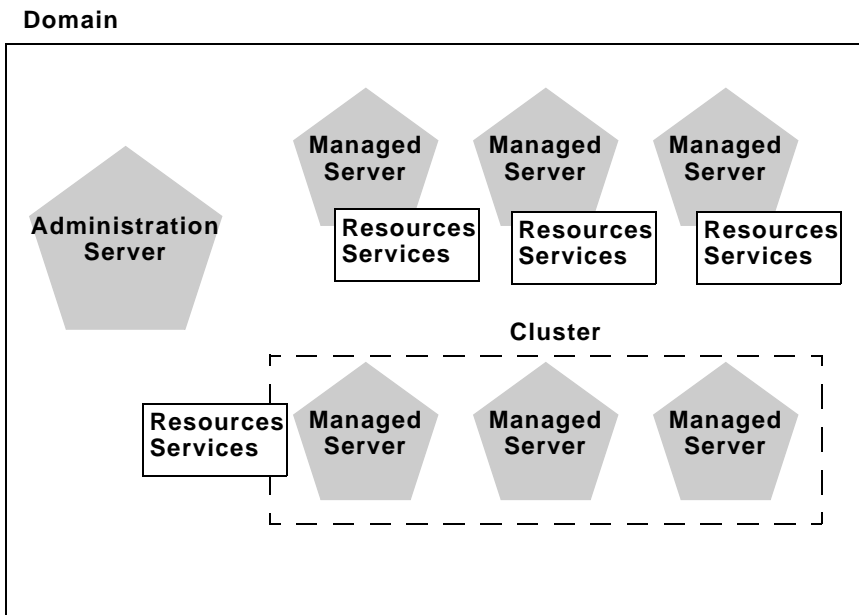
- **Size.** You might find that domains organized in small units can be managed more efficiently, perhaps by different system administrators. Contrarily, you might find that maintaining a single domain or a small number of domains makes it easier to maintain a consistent configuration.

For development or test environments, you can create a simple domain that consists of a single server instance. This single instance acts as an Administration Server and hosts the applications that you are developing. The `wl_server` domain that you can install with WebLogic Server is an example of this type of domain.

## Contents of a Domain

Figure 2-2 shows a production environment that contains an Administration Server, three stand-alone Managed Servers, and a cluster of three Managed Servers.

**Figure 2-2 Content of a Domain**



Although the scope and purpose of a domain can vary significantly, most WebLogic Server domains contain the components described in this section.

## 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. You can also use the Administration Server as a central location from which to monitor all resources in a domain.

To interact with the Administration Server, you can use the Administration Console, WLST, or create your own JMX client. See [Overview of WebLogic Server System Administration](#) in *Introduction to Oracle WebLogic Server* for information about modifying the domain's configuration.

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

### What Happens if the Administration Server Fails?

The failure of an Administration Server does not affect the operation of Managed Servers in the domain but it does prevent you from changing the domain's configuration. If an Administration Server fails because of a hardware or software failure on its host machine, other server instances on the same machine may be similarly affected. However, the failure of an Administration Server itself does not interrupt the operation of Managed Servers in the domain.

If an Administration Server for a domain becomes unavailable while the server instances it manages—clustered or otherwise—are up and running, those Managed Servers continue to run. Periodically, the Managed Servers attempt to reconnect to the Administration Server. If the domain contains clustered server instances, the load balancing and failover capabilities supported by the domain configuration remain available, even if the Administration Server fails.

You can start a Managed Server even if the Administration Server is not running. In this case, the Managed Server uses a local copy of the domain's configuration files for its starting configuration and then periodically attempts to connect with the Administration Server. When it does connect, it synchronizes its configuration state with that of the Administration Server.

For information on starting a Managed Server without a running Administration Server, see [Managed Server Independence Mode](#) in *Managing Server Startup and Shutdown*. For information on re-starting an Administration Server, see [Avoiding and Recovering From Server Failure](#) in *Managing Server Startup and Shutdown*.

## 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 up, it connects to the domain's Administration Server to synchronize its configuration document with the document that the Administration Server maintains.

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 WebLogic Server clusters, as well as multiple Managed Servers that are not configured as clusters. The key difference between clustered and non-clustered Managed Servers is support for failover and load balancing. These features are available only in a cluster of Managed Servers. For more information about the benefits and capabilities of a WebLogic Server cluster, see [Understanding WebLogic Server Clustering](#) in *Using Clusters*.

## Resources and Services

In addition to the Administration Server and Managed Servers, a domain also contains the resources and services that Managed Servers and deployed applications require.

Managed Servers can use the following resources:

- Machine definitions that identify a particular, physical piece of hardware. A machine definition is used to associate a computer with the Managed Servers it hosts. This information is used by Node Manager in restarting a failed Managed Server, and by a clustered Managed Server in selecting the best location for storing replicated session data. For more information about Node Manager, see [Node Manager Overview](#) in the *Node Manager Administrator's Guide*.
- Network channels that define default ports, protocols, and protocol settings that a Managed Server uses to communicate with clients. After creating a network channel, you can assign it to any number of Managed Servers and clusters in the domain. For more information, see [Configuring Network Resources](#) in *Configuring Server Environments*.
- Virtual hosting, which defines a set of host names to which WebLogic Server instances (servers) or clusters respond. When you use virtual hosting, you use DNS to specify one or

more host names that map to the IP address of a server or cluster. You also specify which Web applications are served by each virtual host.

Applications can use the following resources and services:

- Security providers, which are modular components that handle specific aspects of security, such as authentication and authorization.
- Resource adapters, which are system libraries specific to Enterprise Information Systems (EIS) and provide connectivity to an EIS.
- Diagnostics and monitoring services.
- JDBC data sources, which enable applications to connect to databases.
- Mail sessions.
- XML entity caches and registry of XML parsers and transformer factories.
- Messaging services such as JMS servers and store-and-forward services.
- Persistent store, which is a physical repository for storing data, such as persistent JMS messages. It can be either a JDBC-accessible database or a disk-based file.
- Startup classes, which are Java programs that you create to provide custom, system-wide services for your applications.
- Work Managers, which determine how an application prioritizes the execution of its work based on rules you define and by monitoring actual run-time performance. You can create Work Managers for entire WebLogic Server domains or for specific application components.
- Work Contexts, which enable applications to pass properties to a remote context without including the properties in a remote call.

## Domain Restrictions

In designing your domain configuration, note the following restrictions:

- Each domain requires its own Administration Server for performing management activities. When you use the Administration Console to perform management and monitoring tasks, you can switch back and forth between domains, but in doing so, you are connecting to different Administration Servers.
- All Managed Servers in a cluster must reside in the same domain; you cannot split a cluster over multiple domains.

- All Managed Servers in a domain must run the same version of the WebLogic Server software. The Administration Server may run either the same version as the Managed Servers in the domain, or a later service pack.

If you have created multiple domains, each domain must reference its own database schema. You cannot share a configured resource or subsystem between domains. For example, if you create a JDBC data source in one domain, you cannot use it with a Managed Server or cluster in another domain. Instead, you must create a similar data source in the second domain. Furthermore, two or more system resources cannot have the same name.

## Understanding WebLogic Server Domains



# Domain Configuration Files

The following sections describe the files that WebLogic Server uses to persist the configuration of a domain:

- [“Overview of Domain Configuration Files” on page 3-1](#)
- [“Domain Directory Contents” on page 3-4](#)
- [“A Server’s Root Directory” on page 3-9](#)

## Overview of Domain Configuration Files

Each domain describes its configuration in an XML document that is located in the domain’s configuration directory. At run time, each WebLogic Server instance in a given domain creates an in-memory representation of the configuration described in this document.

The central configuration file for a domain is `DOMAIN_NAME/config/config.xml`. This file specifies the name of the domain and the configuration of each server instance, cluster, resource, and service in the domain. The file includes references to additional XML files that are stored in subdirectories of the `DOMAIN_NAME/config` directory. These included files are used to describe major subsystems of WebLogic Server.

As a performance optimization, WebLogic Server does not store most of its default values in the domain's configuration files. In some cases, this optimization prevents XML elements from being written to the configuration files. For example, if you never modify the default logging severity level for a domain while the domain is active, the `config.xml` file does not contain an XML element for the domain's logging configuration.

As an additional performance optimization, each Managed Server maintains a copy of the domain's configuration files. This copy is read-only and can be updated only as part of a change management process (see [“Managing Configuration Changes” on page 4-1](#)).

## Editing Configuration Documents

In most circumstances, you should not use a text editor or other non-Oracle tools to modify a domain's configuration document. Instead, use the Administration Console, WebLogic Scripting Tool (WLST), or one of the other tools described in [Overview of WebLogic Server System Administration](#) in *Introduction to Oracle WebLogic Server*.

However, because the WebLogic Server configuration document is an XML file that conforms to a schema, it is possible to modify them using XSLT or an XML parser application such as Apache Xerces or JDOM. Be sure to test any scripts that you create thoroughly and always make a backup copy of each configuration file before you make any changes to it.

The schemas that define a domain's configuration document are in the following locations:

- <http://www.bea.com/ns/weblogic/920/domain.xsd>
- <http://www.bea.com/ns/weblogic/90/security.xsd>
- <http://www.bea.com/ns/weblogic/weblogic-diagnostics/1.1/weblogic-diagnostics.xsd>
- In JAR files under `WL_HOME/server/lib/schema`, where `WL_HOME` is the directory in which you install WebLogic Server. Within this directory:
  - The `domain.xsd` document is represented in the `weblogic-domain-binding.jar` under the pathname `META-INF/schemas/schema-1.xsd`.
  - The `security.xsd` document is represented in the `weblogic-domain-binding.jar` under the pathname `META-INF/schemas/schema-0.xsd`.
  - The `weblogic-diagnostics.xsd` document is represented in the `diagnostics-binding.jar` under the pathname `META-INF/schemas/schema-0.xsd`.

**WARNING:** Do not edit configuration files for a domain that is currently running. Because WebLogic Server rewrites the files periodically, your changes will be lost. Depending on your platform, you also could cause WebLogic Server failures.

## Security Credentials in Configuration Files

Security credentials for domain security and the embedded LDAP server are stored in the `config.xml` file in encrypted form. If you create your `config.xml` file with a text editor or other non-Oracle tool, you need to locate these credentials, encrypt them, and copy the encrypted credential into your `config.xml` file.

For information about WebLogic Server's encryption utility, see [encrypt](#) in the *Command Reference*. Once you have encrypted the credentials, include the encrypted values in your `config.xml` file in elements as in [Listing 3-1](#):

---

### Listing 3-1 Configuring Encrypted Credentials

---

```
<security-configuration>
  <credential-encrypted>{3DES}encrypted-value-here</credential-encrypted>
</security-configuration>

<embedded-ldap>
  <credential-encrypted>{3DES}encrypted-value-here</credential-encrypted>
</embedded-ldap>
```

---

## Configuration File Archiving

You can configure WebLogic Server to make backup copies of the configuration files. This facilitates recovery in cases where configuration changes need to be reversed or the unlikely case that configuration files become corrupted. When the Administration Server starts up, it saves a JAR file named `config-booted.jar` that contains the configuration files. When you make changes to the configuration files, the old files are saved in the `configArchive` directory under the domain directory, in a JAR file with a sequentially-numbered name like `config-1.jar`.

For information on archiving configuration files, see [Archive configuration files](#) in *Administration Console Online Help*. If you want to use WLST to configure WebLogic Server to make backup copies, set the `ConfigBackupEnabled` attribute in `DomainMBean` to `true` and the `ArchiveConfigurationCount` attribute to the number of configuration archive files that you want to retain.

## Domain Directory Contents

By default, WebLogic Server creates domain directories under the `BEA_HOME/user_projects/domains` directory. This section describes the contents of the domain directory and its subfolders. In this section, *domain-name*, *deployment-name*, and *server-name* represent names that you define when you create a domain.

Individual applications in a domain might create additional files and directories in the domain directory.

If you have not yet created a domain, you can see an example of an existing domain directory by looking in `WL_HOME/examples/domains/wl_server` where `WL_HOME` is the directory in which you installed WebLogic Server.

### ***domain-name***

The name of this directory is the name of the domain.

### **autodeploy**

This directory provides a quick way to deploy applications in a development server. When the WebLogic Server instance is running in development mode, it automatically deploys any applications or modules that you place in this directory.

The files you place in this directory can be Java EE applications, such as:

- An EAR file
- A WAR, EJB JAR, RAR, or CAR archived module
- An exploded archive directory for either an application or a module

### **bin**

This directory contains scripts that are used in the process of starting and stopping the Administration Server and the Managed Servers in the domain. These scripts are generally provided as `.sh` files for UNIX and `.cmd` files for Windows. The `bin` directory can optionally contain other scripts of domain-wide interest, such as scripts to start and stop database management systems, full-text search engine processes, etc. For more information, see [Managing Server Startup and Shutdown](#).

## **config**

This directory contains the current configuration and deployment state of the domain. The central domain configuration file, `config.xml`, resides in this directory.

## **config/configCache**

Contains data that is used to optimize performance when validating changes in the domain's configuration documents. This data is internal to WebLogic Server and does not need to be backed up.

## **config/diagnostics**

This directory contains system modules for instrumentation in the WebLogic Diagnostic Framework. For more information, see [Configuring and Using the WebLogic Diagnostic Framework](#).

## **config/jdbc**

This directory contains system modules for JDBC: global JDBC modules that can be configured directly from JMX (as opposed to JSR-88). For more information, see [Database Connectivity for Oracle WebLogic Server](#).

## **config/jms**

This directory contains system modules for JMS: global JMS modules that can be configured directly from JMX (as opposed to JSR-88). For more information, see [Messaging for Oracle WebLogic Server](#).

## **config/lib**

This directory is not used in the current release of WebLogic Server.

## **config/nodemanager**

This directory holds configuration information for connection to the Node Manager. For more information, see [Node Manager Configuration and Log Files](#) in the *Node Manager Administrator's Guide*.

## **config/security**

This directory contains system modules for the security framework. It contains one security provider configuration extension for each kind of security provider in the domain's current realm. For more information, see [Understanding WebLogic Security](#).

## **config/startup**

This directory contains system modules that contain startup plans. Startup plans are used to generate shell scripts that can be used as part of server startup.

## **configArchive**

This directory contains a set of JAR files that save the domain's configuration state. Just before pending changes to the configuration are activated, the domain's existing configuration state, consisting of the `config.xml` file and the other related configuration files, is saved in a versioned JAR file with a name like `config.jar#1`, `config.jar#2`, etc.

The maximum number of versioned JAR files to be kept is specified by the `archiveConfigurationCount` attribute of `DomainMBean`. Once this maximum number is reached, the oldest conversion archive is deleted before a new one is created.

## **console-ext**

This directory contains extensions to the Administration Console, which enable you to add content to the WebLogic Server Administration Console, replace content, and change the logos, styles and colors without modifying the files that are installed with WebLogic Server. For example, you can add content that provides custom monitoring and management facilities for your applications. See [Extending the Administration Console](#).

## **init-info**

This directory contains files used for WebLogic domain provisioning. You should not modify any files in this directory.

## **lib**

Any JAR files you put in this directory are added to the system classpath of each server instance in the domain when the server's Java virtual machine starts.

## pending

This directory contains domain configuration files representing configuration changes that have been requested, but not yet activated. Once the configuration changes have been activated, the configuration files are deleted from this directory. For more information, see [“Managing Configuration Changes” on page 4-1](#).

## security

This directory holds those security-related files that are the same for every WebLogic Server instance in the domain:

- SerializedSystemIni.dat

This directory also holds security-related files that are only needed by the domain’s Administration Server:

- DefaultAuthorizerInit.ldift
- DefaultAuthenticatorInit.ldift
- DefaultRoleMapperInit.ldift

For more information, see [Understanding WebLogic Security](#).

## servers

This directory contains one subdirectory for each WebLogic Server instance in the domain. The subdirectories contain data that is specific to each server instance.

### **servers/server-name**

This directory is the server directory for the WebLogic Server instance with the same name as the directory.

### **servers/server-name/bin**

This directory holds executable or shell files that can be or must be different for each server. The server environment script (`setServerEnv.sh` or `setServerEnv.cmd`) is an example of a file that resides here because it can differ from one WebLogic Server instance to the next, for example, depending on whether the server instance has its own startup plan.

### **servers/*server-name*/cache**

This directory holds directories and files that contain cached data. By “cached” here we mean that the data is a copy, possibly in a processed form (compiled, translated, or reformatted), of other data.

### **servers/*server-name*/cache/EJBCompilerCache**

This directory is a cache for compiled EJBs.

### **servers/*server-name*/data**

This directory holds files that maintain persistent per-server state used to run the WebLogic Server instance, other than security state, as opposed to temporary, cached or historical information. Files in this directory are important data that must be retained as the WebLogic Server instance is brought up, is brought down, crashes, restarts, or is upgraded to a new version.

### **servers/*server-name*/data/ldap**

This directory holds the embedded LDAP database. The run-time security state for the WebLogic Server instance is persisted in this directory.

### **servers/*server-name*/data/store**

This directory holds WebLogic persistent stores. For each persistent store, there is a subdirectory that holds the files that represent the persistent store. The name of the subdirectory is the name of the persistent store. By convention there is one store named `default`.

### **servers/*server-name*/logs**

This directory holds logs and diagnostic information. This information is historical in nature. It is not crucial to the operation of the server, and can be deleted (while the WebLogic Server instance is down, at least) without affecting proper operation. However, the information can be quite useful for debugging or auditing purposes and should not be deleted without good reason.

### **servers/*server-name*/logs/diagnostic\_images**

This directory holds information created by the Server Image Capture component of the WebLogic Diagnostic Framework. For more information, see [Configuring and Using the WebLogic Diagnostics Framework](#).



### **servers/server-name/logs/jmsServers**

This directory contains one subdirectory for each JMS server in the WebLogic Server instance. Each such subdirectory contains the logs for that JMS server. The name of the subdirectory is the name of the JMS server.

### **servers/server-name/logs/connector**

This directory is the default base directory for connector module (JCA ResourceAdapter) logs.

### **servers/server-name/security**

This directory holds security-related files that can be or must be different for each WebLogic Server instance. The file `boot.properties` is an example of a file that resides here because it can differ from one server to the next. This directory also maintains files related to SSL keys.

### **servers/server-name/tmp**

This directory holds temporary directories and files that are created while a server instance is running. For example, a JMS paging directory is automatically created here unless another location is specified. Files in this directory must be left alone while the server is running, but may be freely deleted when the server instance is shut down.

### **tmp**

This directory stores temporary files used in the change management process. You should not modify any files in this directory.

### **user\_staged\_config**

By default, configuration information is automatically copied from the Administration Server to each Managed Server. If instead you prefer to stage configuration changes manually, you can use this directory as an alternative to the `config` directory.

## **A Server's Root Directory**

All instances of WebLogic Server use a root directory to store their working copy of the domain's configuration files, to store run-time data, and to provide the context for any relative pathnames in the server's configuration. An Administration Server always uses the domain directory as its root directory. A Managed Server can use the domain directory but can also use any other directory that you define.

For example, if you start a Managed Server on a computer that does not share a file system with the computer that hosts the Administration Server, the Managed Server will create its own root directory. The server will copy data from the domain directory to this root directory and will write run-time data in this directory.

You can specify the path and name of the server root directory for each server instance. You can specify a common server root directory for multiple server instances hosted on a single computer or you can specify a different server root directory for each server. A domain may have one or more server root directories.

## Specifying a Server Root Directory

You can specify the path for the server root directory by one of the following means:

- Use the `-Dweblogic.RootDirectory=path` option when starting a WebLogic Server instance from command line. For example the following command:

```
java -Dweblogic.RootDirectory=c:\MyServerRootDirectory weblogic.Server
```

starts a WebLogic Server instance and uses `c:\MyServerRootDirectory` as the server root directory.

- If you use Node Manager to start a WebLogic Server instance, you can specify a server root directory with the Root Directory attribute in the Administration Console on the **Environment: Servers: <servername>: Configuration: Server Start** tab.

If you do not use one of the above means to specify a server root directory, the path and name of the server root directory depend on whether a server instance is a Managed Server or the Administration Server and whether or not you use Node Manager to start the server instance. These variations are discussed in the next sections.

## Server Root Directory for an Administration Server

An Administration Server uses its server root directory as a repository for the domain's configuration data (such as `config.xml`) and security resources (such as the default, embedded LDAP server).

To determine the root directory for an Administration Server, WebLogic Server does the following:

- If the server's startup command includes the `-Dweblogic.RootDirectory=path` option, then the value of `path` is the server root directory.

- If `-Dweblogic.RootDirectory=path` is not specified, then the working directory is the server root directory. However, if you are upgrading a domain created under WebLogic Server 6.x, then the server root directory is the parent of the working directory.

If WebLogic Server cannot find a `config.xml` file, then it offers to create one. You can use this method to create a new domain. For more information, see [Using the `weblogic.Server` Command Line to Create a Domain](#) in the *Command Reference*.

## Server Root Directory for a Managed Server Started with Node Manager

If you use the Node Manager to start a Managed Server, the root directory is located on the computer that hosts the Node Manager process. To determine the location of the server's root directory, WebLogic Server does the following:

- If you specified a root directory in the Administration Console on the Environment→Servers→*server-name*→Configuration→Server Start page, then the directory you specified is the server root directory.
- If you did not specify a root directory in the Administration Console, then the server root directory is:  
`WL_HOME\common\nodemanager`  
 where `WL_HOME` is the directory in which you installed WebLogic Server on the Node Manager's host computer.

The server root directory for a Managed Server started with Node Manager directory contains a subdirectory for each Managed Server instance. The name of the subdirectory is the name of the server as defined in the domain configuration.

## Server Root Directory for a Managed Server Not Started with Node Manager

If you do not use the Node Manager to start a Managed Server (and therefore use the `java weblogic.Server` command or a script that calls that command), WebLogic Server does the following to determine the root directory:

- If the server's startup command includes the `-Dweblogic.RootDirectory=path` option, then the value of `path` is the server's root directory.
- If `-Dweblogic.RootDirectory=path` is not specified, then the working (current) directory is the root directory. For example, if you run the `weblogic.Server` command

## Domain Configuration Files

from `c:\config\MyManagedServer`, then `c:\config\MyManagedServer` is the root directory.

To make it easier to maintain your domain configurations and applications across upgrades of WebLogic Server software, it is recommended that the server root directory not be the same as the installation directory for the WebLogic Server software.

# Managing Configuration Changes

To provide a secure, predictable means for distributing configuration changes in a domain, WebLogic Server imposes a change management process that loosely resembles a two-phase commit database transaction. The following sections describe configuration change management:

- [“Overview of Change Management”](#) on page 4-1
- [“Change Management in the Administration Console”](#) on page 4-3
- [“Configuration Change Management Process”](#) on page 4-4
- [“Configuration Management State Diagram”](#) on page 4-8
- [“Restricting Configuration Changes”](#) on page 4-9

## Overview of Change Management

Each domain describes its configuration in an XML document that is located in the domain’s configuration directory. At run time, each WebLogic Server instance in a given domain creates an in-memory representation of the configuration described in this document. The in-memory representation of a domain’s configuration is a collection of read-only managed beans (MBeans) called Configuration MBeans.

In addition to the read-only Configuration MBeans, the Administration Server maintains another collection of Configuration MBeans that you can edit (see [Figure 4-2](#)). To edit these Configuration MBeans, you use a JMX client (either the Administration Console, WLST, or a client that you create) to obtain a lock.

While you have the lock on the editable Configuration MBeans, you can save your in-memory changes, which causes the Administration Server to write the changes to a set of pending configuration documents in the domain directory. WebLogic Server instances do not consume the changes until you activate the changes.

When you active changes, each server in the domain determines whether it can accept the change. If all servers are able to accept the change, they update their copy of the domain's configuration document. Then they update their working copy of Configuration MBeans and the change is completed (see [Figure 4-3](#)).

Note that WebLogic Server's change management process applies to changes in domain and server configuration data, not to security or application data.

## Changes Requiring Server Restart

Some configuration changes can take effect on the fly, while others require the affected servers to be restarted before they take effect. Configuration changes that can take effect without a server restart are sometimes referred to as *dynamic* changes; configuration changes that require a server restart are sometimes referred to as *non-dynamic* changes. In the Administration Console, an attribute that requires a server restart for changes to take effect is marked with this icon:



Edits to dynamic configuration attributes become available once they are activated, without restarting the affected server or system resource. Edits to non-dynamic configuration attributes require that the affected servers or system resources be restarted before they become effective.

If an edit is made to a non-dynamic configuration setting, no edits to dynamic configuration settings will take effect until after restart. This is to assure that a batch of updates having a combination of dynamic and non-dynamic attribute edits will not be partially activated.

## Configuration Change Tools

As described in [Summary of System Administration Tools and APIs](#) in *Overview of WebLogic Server System Administration*, you can use a variety of different WebLogic Server tools to make configuration changes:

- Administration Console
- WebLogic Scripting Tool
- JMX APIs

Whichever tool you use to make configuration changes, WebLogic Server handles the change process in basically the same way.

For more detailed information about how configuration changes are carried out through JMX and Configuration MBeans, see [Understanding WebLogic Server MBeans](#) in *Developing Custom Management Utilities with JMX*. For more detailed information about making configuration changes with WLST, see [Configuring Existing Domains](#) in *WebLogic Scripting Tool*.

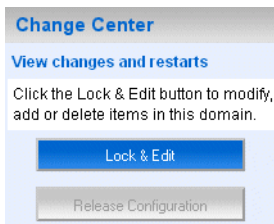
## Configuration Auditing

Using the WebLogic Auditing provider or another auditing security provider, you can record audit information about changes made to your WebLogic Server configuration. See [Configuration Auditing](#) in *Securing WebLogic Server*.

# Change Management in the Administration Console

The WebLogic Administration Console centralizes the configuration change management process in the Change Center pane:

**Figure 4-1 Change Center**



If you want to use the Administration Console to make configuration changes, you must first click the Lock & Edit button in the Change Center. When you click Lock & Edit, you obtain a lock on the editable collection of Configuration MBeans for all servers in the domain (the edit tree).

**Note:** The domain configuration locking feature is always enabled in production domains. It can be enabled or disabled in development domains. It is disabled by default when you create a new development domain. See [Enable and disable the domain configuration lock](#) in *Administration Console Online Help*.

As you make configuration changes using the Administration Console, you click Save on the appropriate pages. This does not cause the changes to take effect immediately; instead, when you click Save, you are saving the change to the edit tree and to the

`DOMAIN_NAME/pending/config.xml` file and related configuration files. The changes take

effect when you click Activate Changes in the Change Center. At that point, the configuration changes are distributed to each of the servers in the domain. If the changes are acceptable to each of the servers, then they take effect. (Note, however, that some changes require a server to be restarted.) If any server cannot accept a change, then all of the changes are rolled back from all of the servers in the domain. The changes are left in a pending state; you can then either edit the pending changes to resolve the problem or revert the pending changes.

# Configuration Change Management Process

Configuration changes happen in basically the same way, regardless of the JMX tool you choose to use (the Administration Console, WLST, or JMX APIs). The following steps describe the process in detail, starting from when you first boot the domain's Administration Server:

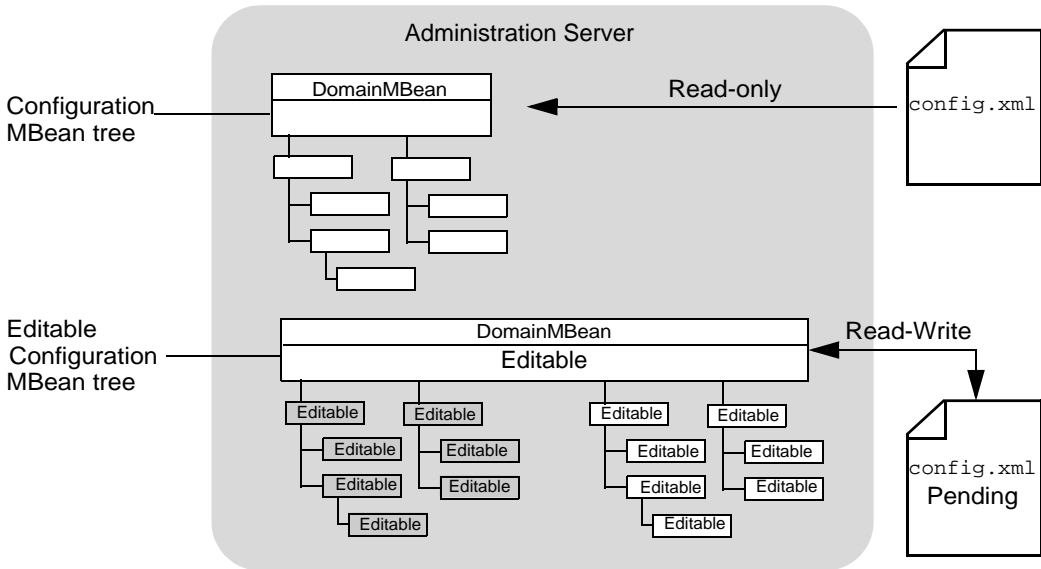
1. When the Administration Server starts, it reads the domain's configuration files, including `config.xml` file and any subsidiary configuration files referred to by the `config.xml` file and uses the data to instantiate the following MBean trees in memory:
  - A read-only tree of Configuration MBeans that contains the current configuration of resources that are on the Administration Server.
  - An editable tree of all Configuration MBeans for all servers in the domain.

**Note:** The Administration Server also instantiates a Runtime MBean tree and a DomainRuntime MBean tree, but these are not used for configuration management.
2. To initiate a configuration change, you do the following:
  - a. Obtain a lock on the current configuration.
  - b. Make any changes you desire, using the tool of your choice (the Administration Console, WLST, the JMX APIs, and such)
  - c. Save your changes to a pending version of the `config.xml` file, using the Save button in the Administration Console; using the WLST `save` command; or using the `save` operation on the `ConfigurationManagerMBean`.
3. The Configuration Manager service saves all data from the edit MBean tree to a separate set of configuration files in a directory named `pending`. See [Figure 4-2](#).

The `pending` directory is immediately below the domain's root directory. For example, if your domain is named `mydomain`, then the default pathname of the pending `config.xml` file is `mydomain/pending/config.xml`.



**Figure 4-2 The Administration Server's Pending config.xml File**



4. Make additional changes or undo changes that you have already made.
5. When you are ready, activate your changes in the domain, using the Activate Changes button in the Administration Console's Change Center; using the WLST `activate` command; or using the `activate` operation on the `ConfigurationManagerMBean`.

When you activate changes (see [Figure 4-3](#)):

- a. For each server instance in the domain, the Configuration Manager service copies the pending configuration files to a `pending` directory in the server's root directory.
 

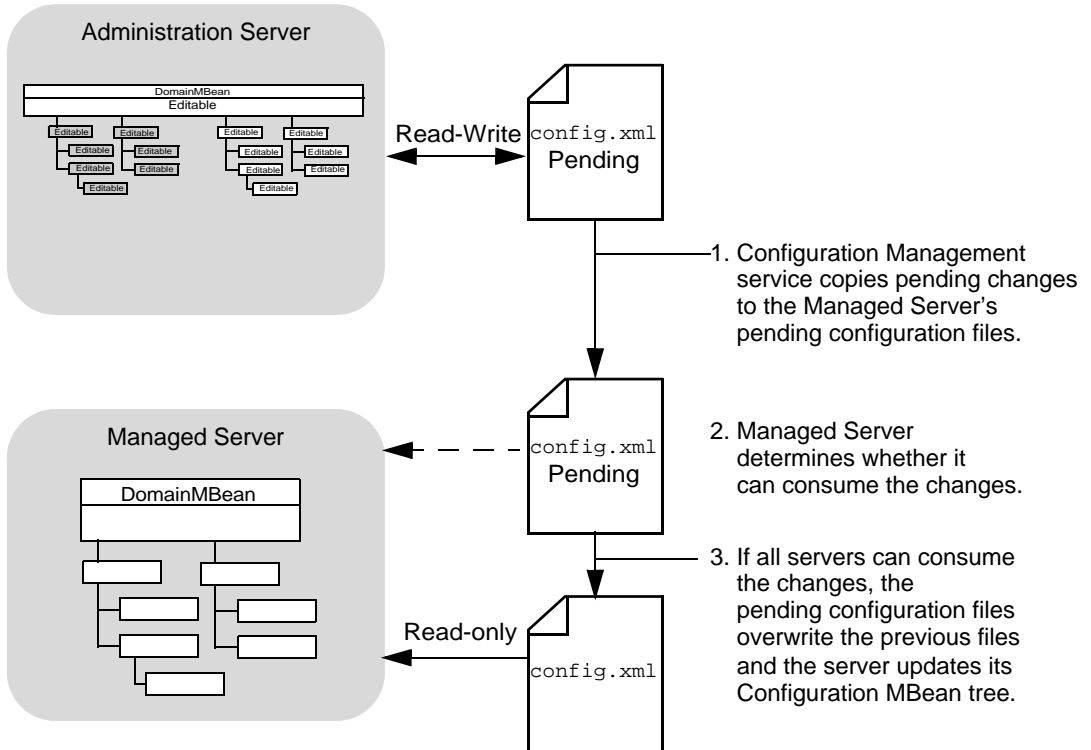
If a Managed Server shares its root directory with the Administration Server, `ConfigurationManagerMBean` does not copy the pending configuration files; the Managed Server uses the Administration Server's pending file.
- b. Each server instance compares its current configuration with the configuration in the pending file.
- c. Subsystems within each server vote on whether they can consume the new configuration.
 

If any subsystem indicates that it cannot consume the changes, the entire activation process is rolled back and the `ConfigurationManagerMBean` emits an exception. You can modify your changes and retry the change activation, or you can abandon your

## Managing Configuration Changes

- lock, in which case the edit Configuration MBean tree and the pending configuration files are reverted to the configuration in the read-only Configuration MBean tree and configuration files.
- d. If all subsystems on all servers can consume the change, the Configuration Manager service replaces the read-only configuration files on each server instance in the domain with the pending configuration files.
  - e. Each server instance updates its beans and its read-only Configuration MBean tree according to the changes in the new configuration files. In cases that include one or more changes that require the server to be restarted, this occurs the next time the server is restarted.
  - f. The pending configuration files are then deleted from the `pending` directory.
6. You can retain your lock to make additional changes or release it so that others can update the configuration. You can configure a time-out period that causes the Configuration Manager service to abandon a lock.

Figure 4-3 Activating Changes in Managed Servers



## Configuration Locks

When you start an edit session, whether you use the Administration Console, WLST, or the Management APIs, you obtain a lock on the Configuration MBean edit tree.

The configuration change lock does not by itself prevent you from making conflicting configuration edits using the same administrator user account. For example, if you obtain a configuration change lock using the Administration Console, and then use the WebLogic Scripting Tool with the same user account, you will access the same edit session that you opened in the Administration Console and you will not be locked out of making changes with the Scripting Tool. You can reduce the risk that such a situation might occur by maintaining separate administrator user accounts for each person with an administrative role. Similar problems can still occur, however, if you have multiple instances of the same script using the same user account.

To reduce further the risk of this situation, you can obtain an *exclusive* configuration change lock. When you have an exclusive configuration lock, a subsequent attempt to start an edit session by the same owner will wait until the edit session lock is released. To obtain an exclusive configuration lock using WLST, use `true` for the exclusive argument in the `startEdit` command:

```
wls:/mydomain/edit> startEdit(60000, 120000, true)
```

To obtain an exclusive configuration lock using the Management API, use `true` for the exclusive parameter in the `ConfigurationMBean.startEdit` operation:

```
Object [] startEdit(60000, 120000, true)
```

You cannot modify the domain configuration using the compatibility MBean server when either of the following is true:

- there is an existing editing session, or
- there are pending changes saved, but not yet activated from a previous edit session.

For information about the compatibility MBean server, which is used with the deprecated `weblogic.management.MBeanHome` interface, see [Deprecated MBeanHome and Type-Safe Interfaces](#) in *Developing Custom Management Utilities with JMX*.

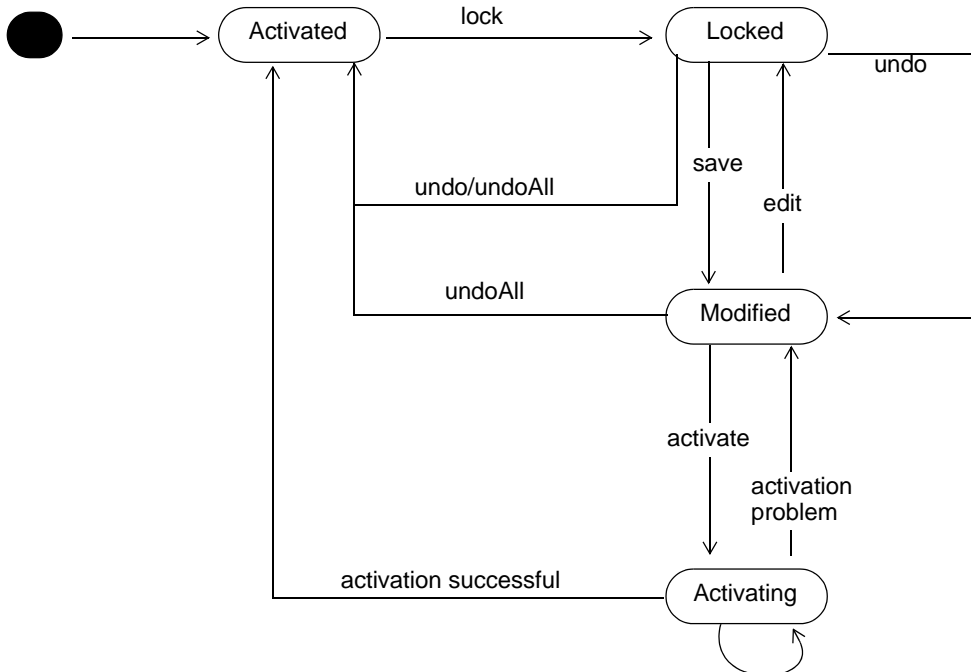
## Resolving Change Conflicts

In the event that you have saved more than one change set without activating them and one change would invalidate a prior change, the Change Management service requires you to manually resolve the invalidation before it will save your changes.

## Configuration Management State Diagram

The Configuration Management service follows a series of states, which are described in [Figure 4-4](#).

Figure 4-4 Configuration Management State Diagram



## Restricting Configuration Changes

You can block configuration changes by setting a domain to be read-only. Do this by setting the `EditMBeanServerEnabled` attribute of the `JMXMBean` configuration MBean to false, using either WLST or the Management APIs.

Note that once you have set your domain to be read-only, you can no longer edit its configuration using the Administration Console, WLST online, or the Management APIs. To make the domain editable again, you must either edit the `config.xml` file directly in a text editor, or use WLST offline, and then restart the affected servers.

You should also establish appropriate access controls to the domain's configuration, limiting access to users with the proper security roles. In addition, using the WebLogic Auditing provider

## Managing Configuration Changes

or another auditing security provider, you can record audit information about changes made to your WebLogic Server configuration. See [Configuration Auditing](#) in *Securing WebLogic Server*.