Oracle® Containers for J2EE
Configuration and Administration Guide
10g (10.1.3.4.0)
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This book is the primary reference on configuring and managing Oracle Containers for J2EE (OC4J) in both standalone and OPMN-managed (Oracle Application Server) environments. It essentially replaces the Oracle Application Server Containers for J2EE User’s Guide and the Oracle Application Server Containers for J2EE Standalone User’s Guide released with previous versions of OC4J.

This preface contains the following sections:

- Intended Audience
- Documentation Accessibility
- Related Documents
- Conventions

**Intended Audience**

This document is intended for the following audiences:

- A systems administrator responsible for configuring and managing an OC4J installation
- A Java application developer using OC4J in a standalone environment

The document is based on the assumption that readers are already familiar with the following topics:

- The Java 2 Platform, Enterprise Edition (J2EE) environment
- General server and system administration concepts
- General Web technology
- The Java programming language

**Documentation Accessibility**

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Related Documents

For more information, see the following Oracle resources.

Additional OC4J documents:

■ Oracle Containers for J2EE Deployment Guide

This document covers information and procedures for deploying an application to an OC4J environment. This includes discussion of the deployment plan editor that comes with Oracle Enterprise Manager 10g Application Server Control.

■ Oracle Containers for J2EE Developer’s Guide

This document discusses items of general interest to developers writing an application to run on OC4J, issues that are not specific to a particular container, such as the servlet, EJB, or JSP container. (An example is class loading.)

■ Oracle Containers for J2EE Servlet Developer’s Guide

This document provides information for servlet developers regarding use of servlets and the servlet container in OC4J, including basic servlet development and use of JDBC and EJB modules.

■ Oracle Containers for J2EE Support for JavaServer Pages Developer’s Guide

This document provides information about JavaServer Pages development and the JSP implementation and container in OC4J. This includes discussion of Oracle features such as the command-line translator and OC4J-specific configuration parameters.

■ Oracle Containers for J2EE JSP Tag Libraries and Utilities Reference

This document provides conceptual information as well as detailed syntax and usage information for tag libraries, Enterprise JavaBeans (EJB) modules, and other Java utilities provided with OC4J.

■ Oracle Containers for J2EE Services Guide

This document provides information about standards-based Java services supplied with OC4J, such as JTA, JNDI, JMS, JAAS, and the Oracle Application Server Java Object Cache.

■ Oracle Containers for J2EE Security Guide
This document describes security features and implementations particular to OC4J. It includes information about using JAAS, the Java Authentication and Authorization Service, as well as other Java security technologies.

- **Oracle Containers for J2EE Enterprise JavaBeans Developer’s Guide**
  This document provides information about the development of Enterprise JavaBeans (EJB) modules and the EJB implementation and container in OC4J.

- **Oracle Containers for J2EE Resource Adapter Administrator’s Guide**
  This document provides an overview of J2EE Connector Architecture features and describes how to configure and monitor resource adapters in OC4J.

Oracle Application Server documents:

- **Oracle Application Server Web Services Developer’s Guide**
  This document describes development and configuration of Web services in OC4J and Oracle Application Server.

- **Oracle Application Server Advanced Web Services Developer’s Guide**
  This document covers topics beyond basic Web service assembly. For example, it describes how to diagnose common interoperability problems, how to enable Web service management features (such as reliability, auditing, and logging), and how to use custom serialization of Java value types.
  This document also describes how to employ the Web Service Invocation Framework (WSIF), the Web Service Provider API, message attachments, and management features (reliability, logging, and auditing). It also describes alternative Web service strategies, such as using JMS as a transport mechanism.

- **Oracle Application Server Web Services Security Guide**
  This document describes Web services security and configuration in OC4J and Oracle Application Server.

**Conventions**

The following text conventions are used in this document.

<table>
<thead>
<tr>
<th>Convention</th>
<th>Meaning</th>
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<tr>
<td><strong>boldface</strong></td>
<td>Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.</td>
</tr>
<tr>
<td><strong>italic</strong></td>
<td>Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.</td>
</tr>
<tr>
<td><strong>monospace</strong></td>
<td>Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.</td>
</tr>
</tbody>
</table>
This chapter provides a general introduction to Oracle Containers for J2EE (OC4J), in the following sections:

- Overview of OC4J
- J2EE Support in OC4J
- New and Changed Features in OC4J
- OC4J in a Standalone Configuration
- OC4J in an Oracle Application Server Configuration
- Overview of the Application Hierarchy in OC4J

Overview of OC4J

Oracle Containers for J2EE 10g (10.1.3.4.0), or OC4J, provides a complete Java 2 Enterprise Edition (J2EE) 1.4-compliant environment. OC4J provides all the containers, APIs, and services mandated by the J2EE specification.

OC4J is distributed in two configurations:

- A standalone configuration, in which OC4J is installed as a single, standalone instance and is started, managed, and stopped directly as a self-contained component.
  See "OC4J in a Standalone Configuration" on page 1-6 for details on this configuration.

- A managed configuration, in which OC4J is installed as part of a group of OC4J instances and managed as a component of Oracle Application Server.

For the purposes of Oracle Application Server 10g Release 3 (10.1.3.4.0), a group is a synchronized set of OC4J instances that belong to the same cluster topology, which comprises two or more loosely connected Oracle Application Server nodes. Configuration, administration, and deployment operations can be performed simultaneously on all OC4J instances in the group.

At a minimum, a managed OC4J installation will include Oracle Process Manager and Notification Server (OPMN), which manages the various Oracle Application Server components, including OC4J.

An installation will typically also include at least one Oracle HTTP Server (OHS) instance, which provides Web communication and load balancing functionality.
See "OC4J in an Oracle Application Server Configuration" on page 1-7 for details.

OC4J is written entirely in Java and executes on the Java Virtual Machine (JVM) of Java Platform, Standard Edition (Java SE) Development Kit (JDK) 6, Java Platform 2, Standard Edition (J2SE) Development Kit (JDK) 5.0 (also known as JDK 1.5), or JDK 1.4.2. For OPMN-managed OC4J, JDK 5.0 is installed with the server binaries and used by default to start the OC4J instance. For standalone OC4J, you must provide the JDK. You can configure an OC4J instance to run on multiple JVMs.

The OC4J documentation is based on the assumption that you have a basic understanding of Java programming, J2EE technology, and Web and EJB application technology. This includes deployment conventions such as the /WEB-INF and /META-INF directories.

**J2EE Support in OC4J**

OC4J 10g (10.1.3.4.0) supports the standard J2EE specifications listed in Table 1–1.

### Table 1–1  Supported J2EE Specifications

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<td>Java Authentication and Authorization Service (JAAS) Provider</td>
<td>1.0</td>
</tr>
<tr>
<td>J2EE Connector Architecture</td>
<td>1.5</td>
</tr>
<tr>
<td>Enterprise Web Services</td>
<td>1.1</td>
</tr>
<tr>
<td>Java API for XML-Based RPC (JAX-RPC)</td>
<td>1.1</td>
</tr>
<tr>
<td>SOAP with Attachments API for Java (SAAJ)</td>
<td>1.2</td>
</tr>
<tr>
<td>Java API for XML Processing (JAXP)</td>
<td>1.2</td>
</tr>
<tr>
<td>Java API for XML Registries (JAXR)</td>
<td>1.0.5</td>
</tr>
</tbody>
</table>

**New and Changed Features in OC4J**

The following topics outline new features in Oracle Containers for J2EE 10g (10.1.3.x) as well as functional changes from previous releases.
New Features in OC4J

Oracle Containers for J2EE 10g (10.1.3.x) includes a number of new features and enhancements, as described in the following topics:

- Support for Web Services
- Support for New J2EE 1.4 Application Management and Deployment Specifications
- Support for Enterprise JavaBeans 3.0
- Support for Oracle Application Server TopLink
- Oracle Job Scheduler
- New Two-Phase Commit Transaction Coordinator Functionality
- Generic JMS Resource Adapter Enhancements

Support for Web Services
OC4J provides full support for Web services in accordance with the J2EE 1.4 standard, including JAX-RPC 1.1. Web services interoperability is also supported.

- Support for the Enterprise Web Services 1.1 specification
- EJB 2.1 Web services endpoint model
- JSR 109 client and server deployment model
- CORBA Web services: Support for wrapping existing basic CORBA Servants as Web services and auto-generating WSDL from IDL
- Support for source code annotations to customize Web services behavior, such as invocation and ending styles (RPC/literal, RPC/encoded, Doc/literal); customizing the Java to XML mapping; enforcing security.
- Database and JMS Web services

Support for New J2EE 1.4 Application Management and Deployment Specifications
OC4J supports the following specifications defining new standards for deploying and managing applications in a J2EE environment:

- The J2EE Application Deployment API (JSR-88), which defines a standard API for configuring and deploying J2EE applications and modules into a J2EE-compatible environment. The OC4J implementation includes the ability to create or edit a deployment plan containing the OC4J-specific configuration data needed to deploy a component to OC4J.
- The Java Management Extensions (JMX) 1.2 specification, which allows standard interfaces to be created for managing resources, such as services and applications, in a J2EE environment. The OC4J implementation of JMX provides a JMX client that can be used to completely manage an OC4J server and applications running within it.
- The J2EE Management Specification (JSR-77), a specification that allows standard components to be created for managing applications in a J2EE environment.

Support for Enterprise JavaBeans 3.0
OC4J 10g (10.1.3.4.0) provides complete support for the Enterprise JavaBeans 3.0 final specification, including support for EJB annotations and dependency injections. The final specification is available at the following Web site:
Support for Oracle Application Server TopLink

Oracle Application Server TopLink is an advanced object-persistence framework for use with a wide range of Java 2 Enterprise Edition (J2EE) and Java application architectures. Oracle TopLink includes support for the OC4J Container Managed Persistence (CMP) container and base classes that simplify Bean Managed Persistence (BMP) development.

Oracle Job Scheduler

The Oracle Job Scheduler provides asynchronous scheduling services for J2EE applications. Its key features include capabilities for submitting, controlling, and monitoring jobs, each job defined as a unit of work that executes when the work is performed.

New Two-Phase Commit Transaction Coordinator Functionality

The new Distributed Transaction Manager in OC4J can coordinate two-phase transactions between any types of XA resources, including databases from Oracle as well as other vendors and JMS providers, such as IBM WebSphere MQ. Automatic transaction recovery in the event of a failure is also supported.

Generic JMS Resource Adapter Enhancements

The Generic JMS Resource Adapter can now be used as an OC4J plug-in for Oracle Enterprise Messaging Service (OEMS), which ships with OC4J 10g (10.1.3.4.0), as well as for IBM WebSphere MQ JMS version 5.3.

Support for lazy transaction enlistment has been added so that JMS connections can be cached and still be able to correctly participate in global transactions.

The Generic JMS Resource Adapter now has better error handling. Endpoints now automatically retry after provider or system failures, and onMessage() errors are handled correctly.

New admin_client.jar Commands and Remote Client

The admin_client.jar utility has new commands for managing data sources and the OC4J JMS connection factories and destinations. The admin_client.jar commands are also available in a remote Administrative Client Utility. You can use these commands through the command-line tool or through the relevant JMX MBeans to add, remove, and get information about data sources and JMS connection factories and destinations. For details, see Chapter 6, "Using the admin_client.jar Utility".

Configuration File Changes from Previous Releases

The following changes have been made to configuration files utilized in standalone OC4J and in OC4J instances installed as components of Oracle Application Server. All of the files noted are installed by default in ORACLE_HOME/j2ee/instance/config, in which instance represents the OC4J instance name.
New and Changed Features in OC4J

application.xml
- The `<persistence>` element has been moved to the new `system-application.xml` file.
- The `<jazn>` element now points to the new `system-jazn-data.xml` file as the security configuration file for the OC4J instance. For more information about `<jazn>`, see the Oracle Containers for J2EE Security Guide.
- The `default-data-source` attribute of the root `<orion-application>` element now specifies `jdbc/OracleDS` as the default data source in both standalone OC4J and Oracle Application Server.
- The `<ejb-module>` element for PortComponentLinkResolver has been removed.
- The `<odl>` element, used to enable ODL logging for the default application, has been added but commented out as a subelement of `<log>`.

ascontrol-web-site.xml
- This file has been removed from both standalone OC4J and Oracle Application Server. The Application Server Control instance deployed to OC4J is now bound to `default-web-site.xml` by default and is accessible through the `/em` context root.

default-web-site.xml
- This file configures the default Web site used in both standalone OC4J and Oracle Application Server. All applications, including the Application Server Control instance deployed to the OC4J instance, are accessed by default through the default Web site using the context root specified in this file.

global-web-application.xml
- The `<dtd>` element has been removed from the Oracle Application Server version of this file.
- The `<url-pattern>` element in the rmi-tunnel servlet definition specifies `rmiTunnel/*` in both standalone OC4J and Oracle Application Server.

http-web-site.xml
- This file has been removed from both standalone OC4J and Oracle Application Server. All applications deployed to the OC4J instance are now bound to `default-web-site.xml` by default.

j2ee-logging.xml
- This new file is used to configure Java loggers, including the `oracle` logger.

jazn-data.xml
- This file no longer contains the security configuration for the OC4J instance. This configuration is now defined in the new `system-jazn-data.xml` file. The `jazn-data.xml` file can be specified, however, at the application level to define users and roles. For more information about the `jazn-data.xml` and `system-jazn-data.xml` files, see the Oracle Containers for J2EE Security Guide.

oc4j-connectors.xml
- The `location` attribute of the `<connector>` element is no longer specified for the data sources and Oracle Enterprise Messaging Service (OEMS) connectors.
server.xml

- The <web-site> elements pointing to http-web-site.xml and ascontrol-web-site.xml have been removed. A single element now points to default-web-site.xml, the configuration file for the default Web site.

- Multiple <shared-library> elements have been added, each referencing a shared library installed with OC4J.

- A <thread-pool> element has been added to the server.xml for defining thread pools for use by OC4J processes and applications deployed to OC4J instances. This element replaces the <global-thread-pool> and <work-manager-thread-pool> elements, which are deprecated in OC4J 10g (10.1.3.4.0)

- A <custom-thread-pool> element has been added to the server.xml file for defining separate, custom thread pools for applications.

system-application.xml

- This is a new file, added to provide configuration for the system application. See "The system Application" on page 1-10 for more information on this new internal component.

system-jazn-data.xml

- This new file contains the security configuration for the OC4J instance. It essentially replaces jazn-data.xml. For more information about the jazn-data.xml and system-jazn-data.xml files, see the Oracle Containers for J2EE Security Guide.

OC4J in a Standalone Configuration

The standalone, or unmanaged, OC4J configuration offers robust, J2EE-compliant containers that are easy to administer. In this configuration, a single OC4J instance is installed into a single ORACLE_HOME directory, the root directory in which Oracle software is installed. The standalone OC4J configuration includes the following components:

- Oracle Containers for J2EE 10g (10.1.3.4.0)

- Oracle Enterprise Manager 10g Application Server Control, a Web-based administration application installed by default with OC4J

Application Server Control is enabled immediately upon installation. See "Oracle Enterprise Manager 10g Application Server Control" on page 3-1 for details on using this management interface.

Installation

The standalone OC4J distribution, which includes Application Server Control, is provided as a ZIP archive. See Chapter 2, "Installing Standalone OC4J," for instructions.

Administration

Standalone OC4J is administered as a standalone OC4J instance, using the Application Server Control application installed with the instance, one of the built-in command-line utilities, such as admin_client.jar, or OC4J Ant tasks. For more information about these tools, see Chapter 3, "Tools for Administering OC4J."

You can also administer standalone OC4J remotely with the Administrative Client Utility, which includes OC4J Ant task and admin_client.jar. For more information
about remote administration, see "Downloading and Extracting the Remote Administration Client" on page 6-5.

The admin.jar tool provided with OC4J can perform administration tasks only on a standalone OC4J server. For information about using this tool, see Example 7, "Using the admin.jar Utility."

Starting, Stopping, and Restarting
In a standalone configuration, an OC4J instance is started using an oc4j command script or the executable oc4j.jar archive. Startup options and system properties are set before startup for the command script or at startup with the oc4j.jar direct execution model.

See "Starting OC4J in a Standalone Environment" on page 5-1 for details.

You can stop and restart a standalone OC4J server with the admin_client.jar or admin.jar command-line utility or an oc4j command script. For details, see "Stopping OC4J in a Standalone Environment" on page 5-3, "Restarting an OC4J Instance in a Standalone Environment" on page 5-5, or "Stopping and Restarting OC4J in a Standalone Environment" on page 7-3.

Backup, Restore, and Disaster Recovery Capabilities
The standalone OC4J configuration does not have backup, restore and disaster recovery capabilities.

Web Communications
Web communications in a standalone environment is provided through the built-in OC4J Web server, which supports HTTP and HTTPS communications natively without the use of the Oracle HTTP Server.

The default Web site is defined in the default-web-site.xml file, which specifies the default HTTP listener on port 8888. You can define additional Web sites using variations of this file. See Chapter 13, "Managing Web Sites in OC4J" for instructions on creating additional Web sites in OC4J.

OC4J in an Oracle Application Server Configuration
In this configuration, OC4J is installed as a component of Oracle Application Server, in a group of one or more OC4J instances within an Oracle Application Server cluster. A typical configuration includes the following components:

- Oracle Containers for J2EE 10g (10.1.3.4.0), one or more instances in one or more groups
- Oracle Enterprise Manager 10g Application Server Control, a Web-based administration application installed by default with OC4J
- Oracle HTTP Server 1.3, which provides front-end Web communication and load-balancing functionality
- Oracle Process Manager and Notification Server (OPMN), used to start, stop, and monitor the other installed components, including OC4J and Oracle HTTP Server. OMPN includes Oracle Notification Server (ONS), which manages communications between components.

Oracle Application Server provides support for HTTP session and stateful session Enterprise JavaBeans (EJB) replication and load balancing across a group of OC4J
instances within a cluster topology. See Chapter 9, "Application Clustering in OC4J" for details.

The connectivity provided within an Oracle Application Server cluster is a function of Oracle Notification Server (ONS), which manages communications between Oracle Application Server components, including OC4J and Oracle HTTP Server. The ONS server is a component of Oracle Process Manager and Notification Server (OPMN), which is installed by default on every Oracle Application Server host.

The Oracle Universal Installer provides a number of installation options:

- **Integrated Web Server, J2EE Server, and Process Management**
  
  In this configuration, all components are installed into a single `ORACLE_HOME` directory, including OC4J, Oracle HTTP Server, and OPMN.
  
  Multiple OC4J instances can be created within this `ORACLE_HOME` directory. Multiple host machines, each hosting one or more OC4J instances, can be included in an Oracle Application Server cluster.

- **J2EE Server and Process Management**
  
  This installation includes OC4J and OPMN. It can be utilized as a standalone OPMN-managed OC4J instance for development or testing purposes, or can be included within an Oracle Application Server cluster.

- **Web Server and Process Management**
  
  This installation includes only Oracle HTTP Server and OPMN. It can be used as a standalone Oracle HTTP Server instance, typically serving as the front-end Web listener for an Oracle Application Server cluster.

**Installation**

Installation of the various components is done using the Oracle Universal Installer. OPMN must be installed in every `ORACLE_HOME` directory to enable monitoring of each installed component.

**Administration**

Administration tasks can be performed using any of these tools:

- The Web-based Application Server Control user interface
- The `admin_client.jar` command-line tool
- OC4J Ant tasks
- The `admin.jar` command-line tool, only for standalone OC4J servers

For more information about these tools, see Chapter 3, "Tools for Administering OC4J."

In an Oracle Application Server clustered environment, you can use a single Application Server Control instance to manage all OC4J instances in a cluster. For more information about this application, see "Oracle Enterprise Manager 10g Application Server Control" on page 3-1 for details on this application.

OC4J includes a set of Ant tasks for performing administration tasks on a group of OC4J instances within an Oracle Application Server cluster, on an OPMN-managed OC4J instance, or on a standalone OC4J server. For details about the Ant tasks and guidelines for integrating the tasks into your application build process, see "Deploying with the OC4J Ant Tasks" in the Oracle Containers for J2EE Deployment Guide.

The `admin_client.jar` tool provided with OC4J can perform administration tasks on a group of OC4J instances within an Oracle Application Server cluster or on an
OC4J instance. Also, the Administrative Client Utility distribution, oc4j_admin_client_101340.zip, contains the client-side jars necessary for performing administrative operations from a remote client in three ways:

- Using admin_client.jar commands remotely against an OPMN-managed or standalone OC4J instance
- Using OC4J Ant tasks remotely against an OPMN-managed or standalone OC4J instance
- Using a JMX programmatic client to manage OC4J remotely

For more information about remote administration, see “Downloading and Extracting the Remote Administration Client” on page 6-5.

Starting and Stopping
In a managed environment, you must use OPMN to start and stop all components, including OC4J. See “Starting OC4J in an Oracle Application Server Environment” on page 5-2 for details.

OC4J runtime options and system properties can be manually set in the OPMN configuration file, opmn.xml. See Chapter 4, "OC4J Runtime Configuration" for details.

Backup, Restore, and Disaster Recovery Capabilities
These capabilities are available with the managed Oracle Application Server configuration.

Web Communications
A standalone OPMN-managed OC4J instance (the J2EE Server and Process Manager install type) can use the built-in OC4J Web server to directly receive and respond to HTTP[S] requests.

Web communications with OC4J can also be managed through Oracle HTTP Server, which serves as a front-end listener, and the mod_oc4j module, which forwards HTTP requests to OC4J instances using the Apache JServ Protocol (AJP) 1.3.

The request and response flow between Oracle HTTP Server and OC4J is as follows:
1. An incoming HTTP request is received by the Oracle HTTP Server listener.
2. Oracle HTTP Server passes the request to an OC4J instance through the mod_oc4j module. The connection between Oracle HTTP Server and OC4J uses the Apache JServ Protocol (AJP) on a port number negotiated during OC4J startup.

Figure 1–1 OC4J Web Communications Through OHS

Mount points that map request URLs to OC4J instances serving the requesting applications are dynamically created in mod_oc4j at the time the applications are deployed. Requests that come in for a specific mount point are routed to the OC4J instance corresponding to that mount point.
For more information about configuring and managing OHS and the mod_oc4j module, see the Oracle HTTP Server Administrator’s Guide.

Overview of the Application Hierarchy in OC4J

This section provides an overview of the application hierarchy within an OC4J instance.

The system Application

The system application is an internal component of Oracle Containers for J2EE 10g (10.1.3.4.0). This application is automatically deployed to an OC4J instance or standalone OC4J the first time it starts.

The application was added primarily to address issues related to deploying or redeploying applications to OC4J. It sits at the root of the application hierarchy, and provides classes and configuration required at OC4J startup. For example, it provides the shared libraries imported by default by all other deployed applications, such as the Oracle JDBC driver and XML parser implementations.

The system application is an OC4J internal component only. Applications cannot be deployed to it, nor can it be declared the parent of another application. The default application continues to serve as the default parent of all deployed applications.

The configuration for the system application is defined in system-application.xml, which is installed in ORACLE_HOME/j2ee/instance/config by default.

Important: Because system is a key internal component that is critical to OC4J startup, the system-application.xml file should not be modified except for the <jazn> and <log> tags.

You can modify the <jazn> tag as needed to specify changes to the security provider, the location of the OC4J security configuration file (system-jazn-data.xml), or both. For more information about <jazn> and the system-jazn-data.xml file, see the Oracle Containers for J2EE Security Guide.

You can modify the <log> tag to rotate the system log file.

The default Application

The default application sits just below system in the application hierarchy. It continues to serve as the default parent of all other J2EE applications deployed into the OC4J instance. As such, all configuration parameters defined for the default application are inherited by all other applications, unless explicitly overridden at the application level.

Standalone Web modules (WAR files) may also be deployed to the default application.

The configuration for the default application is defined in application.xml, which is installed in ORACLE_HOME/j2ee/instance/config by default.

The Global Web Application

The global Web application is the Web module component of the default application. It provides configuration data applied by default to all Web modules.
deployed to the OC4J instance. It also contains initialization parameters applied by default to all servlets.

The configuration file for the default Web application is `global-web-application.xml`, which is installed in `ORACLE_HOME/j2ee/instance/config` by default. This file contains parameters that apply by default to all Web modules deployed to the OC4J instance, as well as servlet initialization parameters that apply to all servlets. You can override any of these parameter values with corresponding values in a Web module’s `orion-web.xml` file.

In a standalone OC4J installation, the root directory of the default Web application is `j2ee/home/default-web-app/`. To deploy to the default Web application, you can place your JSP pages and class files under this directory in the standard directory structure for a Web application.

**J2EE Applications**

By default, an application deployed to an OC4J instance inherits configuration parameters from its designated parent application, or from the default application if no other parent is specified. However, a parameter value set in an application’s `orion-application.xml` descriptor overrides an equivalent parameter inherited from the parent.

A Web module must be contained within a parent J2EE application. A WAR file is typically packaged and deployed with the EAR file that defines the parent J2EE application. However, a WAR file can be deployed to the default application as a standalone Web module.
Installing Standalone OC4J

This chapter describes the prerequisites and process for installing the standalone OC4J distribution, which is distributed as the as oc4j_extended.zip archive.

For instructions on installing OC4J as a component of Oracle Application Server, see the environment-specific Oracle Application Server Installation Guide.

The following topics are covered in this chapter:
- Meeting Installation Prerequisites for a Standalone OC4J Server
- Installing the Standalone OC4J Distribution

Meeting Installation Prerequisites for a Standalone OC4J Server

Ensure that the following prerequisites are met before installing a standalone OC4J server.

**Install JDK 6, 5.0, or 1.4.2**

Before installing standalone OC4J, you must install one of the following JDK releases on the OC4J host machine:

- Java Platform, Standard Edition (Java SE) Development Kit (JDK) 6
- Java Platform 2, Standard Edition (J2SE) Development Kit (JDK) 5.0 (also known as JDK 1.5)
- Java Platform 2, Standard Edition (J2SE) Development Kit (JDK) 1.4

You can download the JDK release from [http://java.sun.com/j2se/](http://java.sun.com/j2se/).

**Note:** For standalone OC4J, you must provide the JDK. For OPMN-managed OC4J, JDK 5.0 is packaged with the server binaries.

**Set Environment Variables**

After installing J2SE, ensure that the JAVA_HOME and ORACLE_HOME environment variables are set. You can also set the J2EE_HOME environment variable.
Instead of the environment variables `ORACLE_HOME` and `J2EE_HOME`, you can use the system properties `oracle.home` and `oracle.j2ee.home` to set the Oracle and J2EE home directories.

If you want to use a locale other than the default locale for the operating system, also set the `LC_ALL` and `LANG` environment variables, both to the same value.

### Installing the Standalone OC4J Distribution

Install the standalone OC4J distribution by extracting the `oc4j_extended.zip` file into the directory that will serve as the OC4J installed directory, referenced in this document as `ORACLE_HOME`, using the archive utility of your choice. The installer automatically creates the required directory structure for you, as follows:

```
ORACLE_HOME
 /ant
 /bin
 /diagnostics
 /j2ee
 /javacache
 /javavm
 /jdbc
 /jlib
 /lib
 /opmn
 /rdbms
 /sqlj
 /toplink
 /webservices
 /xqs
```
You will be prompted to set a password for the OC4J Administrator account the first time OC4J is started. The user name for this account is set to oc4jadmin by default.

You can also activate the oc4jadmin account before starting OC4J, using the jazn.jar tool. This tool is located in the ORACLE_HOME/j2ee/home directory. The syntax is as follows:

```
jazn.jar -activateadmin password
```

---

**Note:** The file permissions are not set correctly after the jar utility has been used to unzip standalone OC4J. To fix the file permissions, you can either extract the distribution again using the unzip utility or set the permissions on the executables to allow them to be run.

---

The standalone OC4J distribution is installed with a default configuration that includes a default Web site where you can access applications and a Web site that enables you to use Application Server Control. These are provided so that you can start using OC4J immediately. See Chapter 13, "Managing Web Sites in OC4J" for additional information.

---

**Note:** The oc4j.jar -install command, previously used to activate the oc4jadmin account as well as set the password for this account, is deprecated in OC4J 10g (10.1.3.4.0).
This chapter provides an overview of the administrative capabilities provided with OC4J. It includes the following sections:

- **Oracle Enterprise Manager 10g Application Server Control**
- The admin_client.jar Command Line Utility
- The admin.jar Command Line Utility
- The oc4j Executable Scripts
- Oracle Process Manager and Notification Server (OPMN)

**Oracle Enterprise Manager 10g Application Server Control**

*Oracle Enterprise Manager 10g Application Server Control* is a JMX-compliant, Web-based user interface for deploying, configuring, and monitoring applications within OC4J, as well as for managing a standalone OC4J server, a group of OC4J instances within an Oracle Application Server cluster, and the Web services used by your applications. This section covers the following topics:

- Accessing Application Server Control in Standalone OC4J
- Accessing Application Server Control in Oracle Application Server
- Functional Overview of the Application Server Control Interface

See the online Help provided with Application Server Control for detailed instructions on using this interface.

![Note](Note: The current release of Application Server Control supports some configuration of OPMN and starting and stopping Oracle HTTP Server, but not the Oracle HTTP Server configuration. For instructions on configuring OPMN and Oracle HTTP Server, see the *Oracle Process Manager and Notification Server Administrator’s Guide*.)

**Accessing Application Server Control in Standalone OC4J**

Application Server Control is installed and configured automatically when you install the OC4J software. It is started by default when OC4J is started.

The console is accessed through the default Web site, which is configured to listen for HTTP requests on port 8888. To access the console, simply type the following URL in a Web browser:

```
http://hostname:8888/em
```
Accessing Application Server Control in Oracle Application Server

Application Server Control is installed and configured as an embedded component of OC4J. The console is started with all other installed Oracle Application Server components, using the OPMN command-line tool, opmnctl, which is installed in the ORACLE_HOME/opmn/bin directory on each server node.

You can start all installed components by issuing the following command:

```bash
cd ORACLE_HOME/opmn/bin
opmnctl startall
```

For a cluster topology that includes multiple OC4J instances, if the OPMN configuration file for the cluster, opmn.xml, does not include the `sequential` option, you should use the `-sequential` flag in the command:

```bash
cd ORACLE_HOME/opmn/bin
opmnctl startall -sequential
```

The `sequential` option causes the OC4J instances to start sequentially. If you started the components in parallel, resource contention issues might occur. For information about how to specify the `sequential` option in the `opmn.xml` file, see "Setting Runtime Options in a Managed OC4J Configuration" on page 4-2.

In a typical Oracle Application Server installation, all Web applications, including Application Server Control, are accessed through Oracle HTTP Server. Use the following URL to access the console:

```
http://ohs_host_address:port/em
```

- `ohs_host_address` is the address of the Oracle HTTP Server host machine; for example, server07.company.com
- `port` is an HTTP listener port assigned to Oracle HTTP Server by OPMN. Run the following `opmnctl` command on the Oracle HTTP Server host machine to get the list of assigned listener ports from OPMN:

  ```bash
  opmnctl status -l
  ```

  Supply the port designated as `http1` in the OPMN status output as the value for `port`:

```
HTTP_Server | HTTP_Server | 6412 | Alive | 1970872013 | 1
```

Functional Overview of the Application Server Control Interface

Application Server Control is organized into several functional areas, described in the following text.

**Applications**

- Start or stop applications, modules, or standalone resource adapters deployed into an OC4J instance or group of instances within an Oracle Application Server cluster
- Deploy, undeploy, or redeploy an application or module
- Create or edit a deployment plan as part of deploying an application
- View statistics on HTTP requests and active EJB method calls

**Administration**

- Manage J2EE services, including JMS and JTA
The admin_client.jar Command Line Utility

OC4J provides a command-line utility—admin_client.jar—that can be used to perform operations on active OC4J instances in an Oracle Application Server clustered environment as well as on standalone OC4J servers.

Among the tasks you can perform with this utility:

- Deploy an application (EAR), a standalone Web module (WAR), a standalone EJB module (EJB JAR), or a standalone resource adapter (RAR) to a specific OC4J instance or to a group of instances within an Oracle Application Server cluster
- Undeploy an application, Web module, EJB module, or resource adapter
- Incrementally update a deployed EJB module with modified classes

See Chapter 11, "Logging in OC4J" for more on the logging capabilities provided by OC4J.
The admin.jar Command Line Utility

OC4J provides a command-line utility called admin.jar that can be used to perform operations on an active standalone OC4J instance.

Note: The admin.jar utility can be used only to manage a single OC4J instance in a standalone OC4J installation.

Due to its more advanced capabilities, the admin_client.jar utility should be used instead of admin.jar. See Chapter 6, "Using the admin_client.jar Utility" for details on using this utility.

Among other things, you can use this utility to:

- Shut down and restart a standalone OC4J instance
- Restart a specific application
- Deploy or undeploy applications to a standalone OC4J instance
- Add, remove, or test a global or application-specific data source

The utility is installed by default in ORACLE_HOME/j2ee/instance/. OC4J must be started before this utility can be used, except when you upgrade data sources. Also, the utility cannot be used to start OC4J. See Chapter 7, "Using the admin.jar Utility" for instructions on using this tool.

The oc4j Executable Scripts

The OC4J distribution includes executable scripts that can be used in a standalone OC4J configuration to start and stop a local OC4J instance, get the OC4J version, and complete the OC4J installation process. These scripts include a shell script for Linux and UNIX environments and a batch file for Windows environments.

The oc4j executable scripts are located in the ORACLE_HOME/bin directory. The scripts are environment-specific:

- Use the oc4j shell script in a Linux or UNIX environment.
- Use the oc4j.cmd batch file in a Windows environment.

Before you use one of these scripts, the ORACLE_HOME and JAVA_HOME environment variables must be set, as described in "Set Environment Variables" on page 2-1.

Both executables use the same syntax, which follows:

```
oc4j [options]
```

The set of options that can be passed to the executables is identical for both, as summarized in Table 3–1.
In a managed OC4J environment, OPMN is used to manage as well as start and stop all installed Oracle Application Server components, including all OC4J instances. OPMN also monitors OC4J and associated components, such as Oracle HTTP Server. As a result, OPMN must be installed into each ORACLE_HOME directory to monitor installed Oracle Application Server components.

See the Oracle Process Manager and Notification Server Administrator’s Guide for instructions on configuring and using OPMN.

A command-line utility, opmnctl, is used to control the OPMN daemon. The utility is installed by default in the ORACLE_HOME/opmn/bin directory on any machine hosting Oracle Application Server host components.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-start</td>
<td>Starts the OC4J instance.</td>
</tr>
<tr>
<td>-shutdown</td>
<td>Stops the OC4J instance.</td>
</tr>
<tr>
<td>-port</td>
<td>You do not need to specify the port if OC4J is running on the default ORMI port, which is 23791.</td>
</tr>
<tr>
<td>ormiport</td>
<td>Specify the oc4jadmin account password.</td>
</tr>
<tr>
<td>-password</td>
<td>password</td>
</tr>
<tr>
<td>password</td>
<td>Returns the OC4J version number.</td>
</tr>
<tr>
<td>-version</td>
<td>Displays the syntax and set of options.</td>
</tr>
</tbody>
</table>

**Oracle Process Manager and Notification Server (OPMN)**

In a managed OC4J environment, OPMN is used to manage as well as start and stop all installed Oracle Application Server components, including all OC4J instances. OPMN also monitors OC4J and associated components, such as Oracle HTTP Server. As a result, OPMN must be installed into each ORACLE_HOME directory to monitor installed Oracle Application Server components.

See the Oracle Process Manager and Notification Server Administrator’s Guide for instructions on configuring and using OPMN.

A command-line utility, opmnctl, is used to control the OPMN daemon. The utility is installed by default in the ORACLE_HOME/opmn/bin directory on any machine hosting Oracle Application Server host components.

**Note:** The current release of Application Server Control supports some configuration of OPMN and starting and stopping Oracle HTTP Server, but not the Oracle HTTP Server configuration. For instructions on configuring OPMN and Oracle HTTP Server, see the Oracle Process Manager and Notification Server Administrator’s Guide.

OPMN is configured through the opmn.xml configuration file, which is located in the ORACLE_HOME/opmn/conf directory. Most edits to this file must be made manually because the current release of Application Server Control does not provide a file-editing capability.

The following example shows how OC4J configuration data is structured in the opmn.xml configuration file:

- Configuration data for each component is set in an <ias-component> element, in which the id attribute equals the component name, in this case default_group.
- Each individual OC4J instance created on the host machine is configured within a <process-type> element. The id attribute uniquely identifies the instance.
- The <process-set> element defines a group of OC4J processes created at startup.

The value of the id attribute identifies the group and is appended to log files generated for processes within the group to aid in management.
Changing the oc4jadmin Account Password

The following element is an abridged example of the OC4J configuration data structure in opmn.xml:

```xml
<opmn>
   . . .
   <ias-component id='default_group'>
      <process-type id='home' module-id='OC4J' status='enabled'>
         <module-data>
            <category id='start-parameters'>
               <data id='java-options' value='-Djava.awt.headless=true'/>
               <data id='java-bin' value='/jdk/bin'/>
               <data id='oc4j-options' value='-validateXML -verbosity 10'/>
            </category>
            <category id='stop-parameters'>
               <data id='java-options' value='-Djava.awt.headless=true'/>
            </category>
         </module-data>
         <start timeout='600' retry='2'/>
         <stop timeout='120'/>
         <restart timeout='720' retry='2'/>
         <port id='default-web-site' protocol='ajp' range='12501-12600'/>
         <port id='rmi' range='12401-12500'/>
         <port id='jms' range='12601-12700'/>
         <port id='rmis' range='12701-12800'/>
         <process-set id='default_group' numprocs='1'/>
      </process-type>
   </ias-component>
</opmn>
```

Changing the oc4jadmin Account Password

The OC4J administrator account is created by default with the user name `oc4jadmin`. This account is required to invoke commands using the various tools provided with OC4J, such as the `admin_client.jar` command-line utility, and can also be used to log in to Application Server Control.

The `oc4jadmin` account is assigned the `oc4j-administrators` role, which an account must have to manage users and roles. An account must also have this role to connect to the MBeanServer server.

The initial password for this account can be set when OC4J is installed; otherwise, you will be prompted to set it the first time OC4J is started. All OC4J instances in a group within an Oracle Application Server cluster need to have the same password for the `oc4jadmin` account so that you can access all of the instances through Application Server Control and perform group operations. Also, all OC4J instances in an Oracle Application Server cluster must have the same password for the `oc4jadmin` account to prevent problems with OPMN.

The password can later be changed, as described in Appendix A of the Oracle Application Server Administrator's Guide. The following guidelines apply to changing the `oc4jadmin` password:

- As a best practice, Oracle suggests that you use the `oc4jadmin` account only for the initial login to Application Server Control. After that, you should create a new account (and accounts for your fellow administrators) to use for your everyday work. The `oc4jadmin` account and its password should be used only internally by the ascontrol application, which uses that account to log into and manage the other OC4J instances in the Oracle Application Server cluster.
If you change the `oc4jadmin` password, you must change it for all OC4J instances in the cluster. Changing this password involves quite a few steps, which are documented in Appendix A of the *Oracle Application Server Administrator’s Guide*. Specifically, the procedure to change the `oc4jadmin` password for the Administration OC4J instance, which runs the active `ascontrol` application, is different from the procedure to change the `oc4jadmin` password for the remotely managed OC4J instances.
This chapter provides details on runtime options and system properties that can be set at OC4J startup. It includes the following topics:

- Specifying the JDK Version
- Setting OC4J Runtime Options at Startup
- Setting System Properties at Startup
- Enabling Remote Debugging from an Integrated Development Environment

**Specifying the JDK Version**

OC4J requires one of the following JDK releases:

- Java Platform, Standard Edition (Java SE) Development Kit (JDK) 6
- Java Platform 2, Standard Edition (J2SE) Development Kit (JDK) 5.0 (also known as JDK 1.5)
- Java Platform 2, Standard Edition (J2SE) Development Kit (JDK) 1.4

You must specify the JDK version to use for a standalone OC4J configuration. You can specify the JDK version for each OC4J instance, which uses JDK 5.0 by default in an Oracle Application Server installation.

**Specifying the JDK in a Standalone Configuration**

In a standalone OC4J configuration, set the `JAVA_HOME` environment variable to the location of the JDK you want OC4J to use. The JDK that will be used must be added to the host machine’s `PATH` environment variable.

Alternatively, you can specify the JDK to use at OC4J startup. For example:

```
C:\ORACLE_HOME\j2ee\home\C:\jdk\bin\java -jar oc4j.jar
```

**Specifying the JDK in a Managed Configuration**

An OPMN-managed OC4J instance installed as a component of Oracle Application Server will use JDK 5.0 by default. JDK 5.0 or JDK 6 is required to utilize EJB 3.0. If applications that will be deployed to OC4J require a JDK 6 or JDK 1.4.2 release, you need to switch to the other version.

Before switching from JDK 5.0 to JDK 6 or JDK 1.4.2, you must remove all compiled application files from the OC4J instance:

1. Stop the OC4J instance.
2. Delete the ORACLE_HOME/j2ee/instance/application-deployments directory.

Deleting this directory will cause the application files to be recompiled when OC4J is restarted with JDK 6 or JDK 1.4.2.

You can specify the JDK to use for each OC4J instance through manual edits to the opmn.xml configuration file. If you want to use the javac compiler installed with the JDK defined in the JAVA_HOME environment variable, also remove the <java-compiler> element from the server.xml file and let OC4J rediscover the default settings.

Set Java system properties in the <data> element where the id attribute is java-bin. This <data> element is enclosed within the <category id="start-parameters"> subelement of the <ias-component id="default_group"> element in the XML structure. For example:

```xml
<iias-component id="default_group">
  <process-type id="home" module-id="OC4J" status="enabled">
    <module-data>
      <category id="start-parameters">
        <data id="java-bin" value="c:/myhost/jdk/bin/java"/>
      </category>
      ...
    </module-data>
  </process-type>
</iias-component>
```

Setting OC4J Runtime Options at Startup

A number of OC4J runtime options can be set on OC4J instances at OC4J startup, most providing options for managing standard output messages. How these options are set differs for standalone OC4J and managed Oracle Application Server configurations.

- Setting Runtime Options in a Standalone OC4J Configuration
- Setting Runtime Options in a Managed OC4J Configuration
- Overview of OC4J Runtime Options

Setting Runtime Options in a Standalone OC4J Configuration

OC4J runtime options can be set by passing arguments on the oc4j.jar command line at OC4J startup. The syntax for oc4j.jar is as follows:

```
java [props] -jar oc4j.jar [args]
```

Runtime options ([args]) are specified after oc4j.jar in the syntax. For example:

```
java -jar oc4j.jar -userthreads
```

Setting Runtime Options in a Managed OC4J Configuration

When OC4J is installed as a component of Oracle Application Server, OC4J runtime options must be manually added to the opmn.xml configuration file. Options will be passed to managed OC4J instances at startup.

Set OC4J runtime options in the <data> element where the id attribute is oc4j-options. This <data> element is enclosed within the <category
Setting OC4J Runtime Options at Startup

id="start-parameters"> subelement of the <ias-component id="default_group"> element in the XML structure. For example:

<i>ias-component id="default_group">
  <process-type id="home" module-id="OC4J" status="enabled">
    <module-data>
      <category id="start-parameters">
        <data id="oc4j-options" value="-userthreads"/>

      </category>

    </module-data>
  </process-type>
</ias-component>

Overview of OC4J Runtime Options

Table 4–1 describes the OC4J runtime options.

<table>
<thead>
<tr>
<th>Command-Line Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-quiet</td>
<td>Suppresses standard output to the console.</td>
</tr>
<tr>
<td>-config path</td>
<td>Specifies the path to the server.xml descriptor file. The default location is the ORACLE_HOME/j2ee/instance/config directory.</td>
</tr>
<tr>
<td>-validateXML</td>
<td>Validates XML configuration files defined by an XSD at the time they are read.</td>
</tr>
<tr>
<td></td>
<td>If you add the tx-retry-wait attribute to the &lt;entity-deployment&gt; or &lt;session-deployment&gt; element in your orion-ejb-jar.xml file, do not use the -validateXML option on the OC4J startup command line.</td>
</tr>
<tr>
<td>-out [file]</td>
<td>Specifies a file to route the standard output to. The file contains messages that are printed to System.out, as well as the messages sent to output through the servlet logging interface. If not specified, all output is written to standard out.</td>
</tr>
<tr>
<td></td>
<td>See &quot;Managing the stdout and stderr Log Files&quot; on page 4-6 for additional system properties that can be set to manage stdout files.</td>
</tr>
<tr>
<td></td>
<td>In an OPMN-managed configuration, the file will be generated within an instance_default_group_1 directory appended to the path specified.</td>
</tr>
<tr>
<td></td>
<td>For example, suppose you specify the following element in omnn.xml:</td>
</tr>
<tr>
<td></td>
<td>&lt;data id=&quot;oc4j-options&quot; value=&quot;...-out /mypath/mylog.log&quot;/&gt;</td>
</tr>
<tr>
<td></td>
<td>The mylog.log file will actually be generated in this file:</td>
</tr>
<tr>
<td></td>
<td>/mypath/instance_default_group_1/mylog.log</td>
</tr>
<tr>
<td>-err [file]</td>
<td>Specifies a file to route standard error output to. The file contains messages that are printed to System.err. If not specified, all errors are written to standard error.</td>
</tr>
<tr>
<td></td>
<td>See &quot;Managing the stdout and stderr Log Files&quot; on page 4-6 for additional system properties that can be set to manage stderr files.</td>
</tr>
<tr>
<td></td>
<td>Note that in an OPMN-managed configuration, the file will be generated within an instance_default_group_1 directory appended to the path specified. See the -out description for details.</td>
</tr>
</tbody>
</table>
Setting System Properties at Startup

You can set a number of OC4J-specific system properties on the JVM at OC4J startup, as the following topics describe:

- Setting System Properties in a Standalone OC4J Configuration
- Setting System Properties in an OPMN-Managed OC4J Configuration
- Allowing Different Dependencies on a Shared Library with manifest.dependencies.warn.only
- Preventing the Use of Symbolic Links
- Managing the stdout and stderr Log Files
- Overview of General System Properties
- Overview of Debug Properties

Note: You can output a list of all of the OC4J-specific system properties that can be set on the JVM at OC4J startup using the oc4j.jar -listProperties option. The following example will redirect the output to a text file in the working directory:

    java -jar oc4j.jar -listProperties > props.txt

Setting System Properties in a Standalone OC4J Configuration

You can set system properties on the JVM through the OC4J command line at startup. If OC4J is running, you must restart the instance for new property settings to take effect.

The syntax follows:

    java [props] -jar oc4j.jar [args]
All system properties (props) are specified before oc4j.jar in the syntax. Each system property must be prefaced on the command line with a `-D`. For example:

```
java -Doc4j.formauth.redirect=true -jar oc4j.jar
```

### Setting System Properties in an OPMN-Managed OC4J Configuration

When OC4J is installed as a component of Oracle Application Server, you can add OC4J system properties manually to the opmn.xml configuration file. Options will be passed to a managed OC4J instance at startup.

Set Java system properties in the `<data>` element where the `id` attribute is `java-options`. This `<data>` element is enclosed within the `<category id="start-parameters"/>` subelement of the `<ias-component id="default_group"/>` element in the XML structure. Preface all system properties with a `-D`. For example:

```
<ias-component id="default_group">
  <process-type id="home" module-id="OC4J" status="enabled">
    <module-data>
      <category id="start-parameters">
        <data id="java-options" value="-Doc4j.formauth.redirect=true -Dhttp.session.debug=true"/>
      </category>
      ...
    </module-data>
  </process-type>
</ias-component>
```

### Allowing Different Dependencies on a Shared Library with `manifest.dependencies.warn.only`

When OC4J initializes, it validates the dependencies of the shared libraries defined in the container-level configurations by verifying the versions specified in the MANIFEST.MF file. The default behavior for a dependency check failure is to issue an error and stop the initialization process. If you want to use different versions of the same shared library, you can set the `manifest.dependencies.warn.only` property to `true` at startup to have OC4J issue a warning and continue initializing when a dependency check fails.

This property is useful if you have a methodology of performing simultaneous project releases and builds that have different dependencies on the same application library.

When `manifest.dependencies.warn.only` is set to `true`, OC4J issues a warning message by default. The logged message goes to the locations specified in the ORACLE_HOME/j2ee/instance/config/j2ee-logging.xml configuration file for the oracle logger. This logger has two output locations, the console and an ODL-formatted XML file in `j2ee/instance/log/oc4j/log.xml`. In standalone OC4J, the `instance` name is `home`. In an OPMN-managed, Oracle Application Server environment, all console output gets redirected to the `ORACLE_HOME/opmn/logs/instance_default_group_1` file (or some variant of this name).

### Preventing the Use of Symbolic Links

By default, OC4J10g (10.1.3.4.0) ships with the `http.file.allowAlias` property set to `false`. This setting prevents the use of symbolic links. Oracle strongly recommends that this setting not be changed to `true`, which might allow JSP source code to be visible to end users in some circumstances.
Instead of changing the property setting, you can use one of the following work-arounds:

- Temporarily switch from using the OC4J lightweight HTTP listener to front ending the OC4J application through Oracle HTTP Server, so that browsers access the pages indirectly through mod_oc4j and Apache JServ Protocol (AJP), rather than directly through HTTP.

- Replace all symbolic links in an application with the names of the real files they represent.

You can use a shell script to automate the replacement of symbolic links. For example:

```bash
#!/bin/ksh

PROGNAME="${0##*/}"
LN_EXTN="ln"

function displaySyntax
{
    echo "$PROGNAME! SYNTAX: $PROGNAME some_dir_path"
    exit 1
}

if [[ $# < 0 ]]
then
    displaySyntax
fi

DIR="$1"

if [[ ! -d $DIR ]]
then
    displaySyntax
fi

find $DIR -type l|while read filepath
do
    echo "FIXING: $filepath (=> $filepath.$LN_EXTN)"
    mv $filepath $filepath.$LN_EXTN
    cp -L $filepath.$LN_EXTN $filepath
done
```

This example KSH script would be invoked in a UNIX environment as follows:

```
$ fixLinks web_module_root
```

The script will go through any directory recursively and rename every file it finds that is a symbolic link with an additional .ln extension. Then the script will place a copy of the link target in the original location where the link was found.

**Managing the stdout and stderr Log Files**

The following properties are used to manage standard stderr and stdout log files. You can specify the types and locations of the log files to which the properties pertain with the -out and -err options of the oc4j.jar command.

For example, the following command specifies rotation of the stdout and stderr files when the file size reaches 2.5 MB. Log files will be output to the d:\logs directory.
java -Dstdstream.filesize=2.5 -jar oc4j.jar -out d:\logs\oc4j.out -err d:\logs\oc4j.err

The next example specifies rotation of the stdout log file at 2:30 p.m. every day and limits the log archive to a maximum of 10 files:

java -Dstdstream.rotatetime=14:30 -Dstdstream.filenumber=10 -jar oc4j.jar -out d:\logs\oc4j.out

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>stdstream.filesize=max_file_size</td>
<td>The maximum size for file in the archive, in megabytes. A file will be rotated when it reaches this maximum.</td>
</tr>
<tr>
<td>stdstream.filenumber=max_files</td>
<td>The maximum number of files to keep as archives. The oldest file will be automatically deleted when the limit is exceeded.</td>
</tr>
<tr>
<td>stdstream.rotatetime=HH:mm</td>
<td>The time at which the log file will be rotated each day.</td>
</tr>
</tbody>
</table>

**Overview of General System Properties**

Table 4–3 describes the general system properties that can be set for OC4J.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>java.ext.dirs</td>
<td>Sets the external directories to be searched for classes when compiling.</td>
</tr>
<tr>
<td>java.io.tmpdir=new_tmpdir</td>
<td>Sets the temporary directory for the deployment wizard. The default is /tmp/var. The deployment wizard uses 20 MB in swap space of the temporary directory for storing information during the deployment process. At completion, the deployment wizard cleans up the temp directory. However, if the wizard is interrupted, it may not have the time or opportunity to clean up the temporary directory. In this case, you must clean up any additional deployment files from this directory yourself. If not, the directory may fill up, which will disable any further deployment. If you receive an Out of Memory error, check for space available in the temporary directory.</td>
</tr>
<tr>
<td>java.awt.headless=true</td>
<td>false</td>
</tr>
<tr>
<td>oracle.home</td>
<td>Sets the root directory into which you will install the OC4J distribution.</td>
</tr>
<tr>
<td>oracle.j2ee.home</td>
<td>Sets the J2EE home directory to the installed directory of the oc4j.jar and admin.jar files, ORACLE_HOME/j2ee/instance. The value of ORACLE_HOME is the root directory into which you will install the OC4J distribution. Setting this system property or the J2EE_HOME environment variable to the J2EE home directory enables you to invoke oc4j.jar and admin.jar from any directory.</td>
</tr>
<tr>
<td>GenerateIIOP=true</td>
<td>false</td>
</tr>
<tr>
<td>KeepIIOPCode=true</td>
<td>false</td>
</tr>
</tbody>
</table>
Setting System Properties at Startup

Table 4–3 (Cont.) -D General System Properties for OC4J

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>oracle.arraylist.deepCopy=true</td>
<td>false</td>
</tr>
<tr>
<td>dedicated.rmicontext=true</td>
<td>false</td>
</tr>
<tr>
<td></td>
<td>When two or more clients in the same process retrieve an InitialContext, OC4J returns a cached context. Thus, each client receives the same InitialContext, which is assigned to the process. Server lookup, which results in server load balancing, happens only if the client retrieves its own InitialContext.</td>
</tr>
<tr>
<td></td>
<td>If you set dedicated.rmicontext=true, then each client receives its own InitialContext instead of a shared context. When each client has its own InitialContext, then the clients can be load balanced.</td>
</tr>
<tr>
<td></td>
<td>You can also set this in the JNDI properties.</td>
</tr>
<tr>
<td></td>
<td>The oracle.j2ee.rmi.loadBalance property replaces the dedicated.rmicontext, dedicated.connection, and LoadBalanceOnLookup properties, which are deprecated in OC4J 10g (10.1.3.4.0).</td>
</tr>
<tr>
<td>manifest.dependencies.warn.only</td>
<td>This property can override the default behavior of halting OC4J initialization when JAR dependencies in its system libraries are not satisfied. The default property value is false.</td>
</tr>
<tr>
<td></td>
<td>When OC4J initializes, it validates the dependencies of the libraries defined in the container-level configurations by verifying their versions specified in the MANIFEST.MF file.</td>
</tr>
<tr>
<td></td>
<td>When this property is set to true, the system will only issue a warning message describing the problem and continue to initialize. For more information about using this property, see “Allowing Different Dependencies on a Shared Library with manifest.dependencies.warn.only” on page 4-5.</td>
</tr>
<tr>
<td>oracle.j2ee.rmi.loadBalance</td>
<td>This property configures replication-based load balancing, with one of these settings:</td>
</tr>
<tr>
<td></td>
<td>- client: The client interacts with the OC4J process that was initially chosen at the first lookup for the entire conversation.</td>
</tr>
<tr>
<td></td>
<td>- context: The client goes to a new server when a separate context is used (similar to the deprecated dedicated.rmicontext property).</td>
</tr>
<tr>
<td></td>
<td>- lookup: The client goes to a new server for every lookup.</td>
</tr>
<tr>
<td></td>
<td>The default setting is client.</td>
</tr>
<tr>
<td></td>
<td>The oracle.j2ee.rmi.loadBalance property replaces the deprecated dedicated.rmicontext, dedicated.connection, and LoadBalanceOnLookup properties.</td>
</tr>
</tbody>
</table>
### Table 4–3 (Cont.) -D General System Properties for OC4J

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>oracle.mdb.fastUndeploy</td>
<td>Sets the interval at which OC4J polls the underlying database to check if an MDB session is shut down, in seconds. This property enables you to shut down OC4J cleanly when you are running MDBs in a Windows environment or when the back-end database is running in a Windows environment. Normally when you use an MDB, it is blocked in a receive state waiting for incoming messages. However, if you shut down OC4J while the MDB is in a wait state in a Windows environment, the OC4J instance cannot be stopped and the applications are not undeployed since the MDB is blocked. Setting this property enables OC4J to poll the database to see if the session is shut down when the MDB is not processing incoming messages and in a wait state. If you do not set this property and you try to shut down OC4J using CTRL-C, then the OC4J process will hang for at least 2.5 hours. This polling process can be expensive for performance, and should not be set to start too frequently.</td>
</tr>
<tr>
<td>oracle.dms.sensors</td>
<td>You can set the value for Oracle built-in performance metrics to the following:</td>
</tr>
<tr>
<td></td>
<td>- none: Disables metrics</td>
</tr>
<tr>
<td></td>
<td>- normal: Medium number of metrics (default)</td>
</tr>
<tr>
<td></td>
<td>- heavy: High number of metrics</td>
</tr>
<tr>
<td></td>
<td>- all: Every possible metric</td>
</tr>
<tr>
<td>associateUsingThirdTable</td>
<td>For container-managed relationships in entity beans, you can designate whether a third database table is used to manage the relationship. Set to false if you do not want a third association table. The default is false. This property has been deprecated and works only with OrionCMP.</td>
</tr>
<tr>
<td>DefineColumnType</td>
<td>Set this to true if you are using a pre-9.2.0 Oracle JDBC driver. For these drivers, setting this variable to true avoids a round-trip when executing a select over the Oracle JDBC driver. This parameter should be set on the OC4J server. The default is false. When you change the value of this option and restart OC4J, it is valid only for applications deployed after the change. Any applications deployed before the change are not affected. When true, the DefineColumnType extension saves a round trip to the database that would otherwise be necessary to describe the table. When the Oracle JDBC driver performs a query, it first uses a round trip to a database to determine the types that it should use for the columns of the result set. Then, when JDBC receives data from the query, it converts the data, as necessary, as it populates the result set. When you specify column types for a query with the DefineColumnType extension set to true, you avoid the first round trip to the Oracle database. The server, which is optimized to do so, performs any necessary type conversions.</td>
</tr>
</tbody>
</table>
Table 4–3 (Cont.) -D General System Properties for OC4J

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>oc4j.formauth.redirect=</td>
<td>This property is applicable when form-based authentication is used by a Web application. If set to true, OC4J will perform a client side redirect back to the request URL after a user enters valid credentials when accessing a resource. If the user does not have valid credentials, the Web browser will be redirected to the form authentication error page defined for the Web application. If set to false, the /j-security-check URL will be displayed in the browser after the user enters valid credentials. The default is false.</td>
</tr>
<tr>
<td>file.encoding=value</td>
<td>This property specifies the default character set for file encoding. If an encoding is not specified, OC4J uses ISO-8859-1 as the default character set. In a Windows environment, the default character set for file encoding should be Windows-1252, which is a superset of the ISO 8859-1 character set. To use the Windows-1252 character set as the default, specify -Dfile.encoding=Cp1252 as an OC4J startup property. This prevents the replacement of a Windows-1252 character with a question mark (?) in PrintWriter output.</td>
</tr>
<tr>
<td>http.file.allowAlias</td>
<td>This property controls the use of symbolic links. The default value is false, to prevent using symbolic links. Oracle strongly recommends that this setting not be changed to true, which might allow JSP source code to be visible to end users in some circumstances. For more information, see “Preventing the Use of Symbolic Links” on page 4-5.</td>
</tr>
<tr>
<td>http.maxFileInfoCacheEntries</td>
<td>This property controls the cache in which OC4J stores file information it collects when a client accesses an application using path information. The following settings enable you to control the cache:</td>
</tr>
<tr>
<td></td>
<td>Set http.maxFileInfoCacheEntries &lt; 0 to never cache the file information.</td>
</tr>
<tr>
<td></td>
<td>Set http.maxFileInfoCacheEntries == 0 to store all the file information and not free objects from the cache.</td>
</tr>
<tr>
<td></td>
<td>Set http.maxFileInfoCacheEntries &gt; 0 to specify the maximum number of cached entries. The default value is 2000.</td>
</tr>
</tbody>
</table>
Overview of Debug Properties

Table 4–4  OC4J Debug Properties

<table>
<thead>
<tr>
<th>Debug Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>http.session.debug</td>
<td>Provides information about HTTP session events to the console.</td>
</tr>
<tr>
<td>http.request.debug</td>
<td>Provides information about each HTTP request to the console.</td>
</tr>
<tr>
<td>http.cluster.debug</td>
<td>Provides information about HTTP clustering events to the console.</td>
</tr>
<tr>
<td>http.error.debug</td>
<td>Prints all HTTP errors to the console.</td>
</tr>
</tbody>
</table>

You can use the following properties for debugging applications running within OC4J. Debug messages are printed to the console. All properties take a Boolean value.

Preface all properties with a `-D`.

---

Note: The debug properties listed in this section are deprecated in OC4J 10g (10.1.3.4.0).

See "Using and Configuring the OC4J Component Loggers" on page 11-8 for details on using the component loggers provided with OC4J.
Enabling Remote Debugging from an Integrated Development Environment

You can debug applications on OC4J remotely, from an Integrated Development Environment (IDE), if you start the OC4J instance or instances with JVM debug commands, specified as start parameters, so that a remote debugger can connect. The following topics describe how to specify these parameters:

- Enabling Remote Debugging for an OC4J Instance with Application Server Control
- Specifying Debug Start Parameters in the opmn.xml File
- Specifying Debug Start Parameters on a Startup Command Line

## Enabling Remote Debugging for an OC4J Instance with Application Server Control

To enable remote debugging for a single OC4J instance with Application Server Control:

1. Navigate to the OC4J Home page.
2. Click **Administration** to display the OC4J Administration page.
3. Under Properties in the table of administration tasks, click the task icon in the Server Properties row.

   Enterprise Manager displays the Server Properties page.

4. In the **Start-parameters: Java Options** section under Command Line Options, click **Add Another Row** to add each of the following debug start parameters:
   - `-Xdebug`
   - `-Xnoagent`
   - `-Xrunjdwp:transport=dt_socket,server=y,suspend=n,address=4000`

5. Click **Apply** to apply your changes to the OC4J configuration.

   When you make changes to the server properties, you must restart the OC4J instance before the changes take effect.

### Table 4–4 (Cont.) OC4J Debug Properties

<table>
<thead>
<tr>
<th>Debug Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>http.method.trace.allow=true</td>
<td>false</td>
</tr>
<tr>
<td>datasource.verbose=true</td>
<td>false</td>
</tr>
<tr>
<td>jdbc.debug=true</td>
<td>false</td>
</tr>
<tr>
<td>ejb.cluster.debug=true</td>
<td>false</td>
</tr>
<tr>
<td>rmi.debug=true</td>
<td>false</td>
</tr>
<tr>
<td>rmi.verbose=true</td>
<td>false</td>
</tr>
<tr>
<td>jca.connection.debug=true</td>
<td>false</td>
</tr>
<tr>
<td>ws.debug=true</td>
<td>false</td>
</tr>
</tbody>
</table>
Enabling Remote Debugging from an Integrated Development Environment

Specifying Debug Start Parameters in the opmn.xml File

For OPMN-managed OC4J instances, you can put the debug parameters in the opmn.xml file, as the value of a <data> subelement where the id attribute is java-options, within a <category> element where the id attribute is start-parameters, and then restart the instance. The entry in opmn.xml should look like this one:

```
<module-data>
  <category id='start-parameters'>
    <data id='java-options' value='-server -Xdebug -Xnoagent
      -Djava.compiler=NONE
      -Xrunjdwp:transport=dt_socket,server=y,suspend=n,address=4000
      -Djava.security.policy=$ORACLE_HOME/j2ee/home/config/java2.policy
      -Djava.awt.headless=true'/>
  </category>
</module-data>
```

Make sure you never use suspend=y, which specifies not to start OC4J until the debugger is attached. If you used this debug parameter, OPMN would attempt to restart the OC4J instance or instances continuously because OPMN would not get a response from its query pings.

Attach to the server the port to which you set address, such as port 4000.

---

**Note:** The port value of 4000 is arbitrary. You should set a value suitable for your connection. The specified port is the port that must be set in the remote debugging client to connect to the server.

---

Specifying Debug Start Parameters on a Startup Command Line

For a standalone OC4J instance, you can specify the debug start parameters on a startup command line, as follows:

```
java -Xdebug -Xnoagent -Djava.compiler=NONE
-Xrunjdwp:transport=dt_socket,server=y,suspend=n,address=4000 -jar oc4j.jar
```

Debugging Web Applications Remotely

For debugging Web applications from an IDE, you need to set up for servlet and JSP debugging, as the following topics describe:

- Setting Up for Remote Debugging of Servlets
- Setting Up for Remote Debugging of JSPs

Setting Up for Remote Debugging of Servlets

To set up remote debugging for a servlet:

1. Mark your project run or debug configuration to do remote debugging.
2. Set the attach to JPDA in the remote-debug specific runtime configuration node.
3. Start your OC4J instance with the debug parameters, as the example under “Specifying Debug Start Parameters on a Startup Command Line” on page 4-13 shows.
4. Set a breakpoint in your servlet.
5. Run a remote debugger.

After you invoke the servlet from a Web browser, the servlet should reach the breakpoint.
Setting Up for Remote Debugging of JSPs

For JSPs, you can set up as described in the preceding topic, "Setting Up for Remote Debugging of Servlets," but one more step is needed. You need to edit the `global-web-application.xml` file, which is installed in `ORACLE_HOME/j2ee/instance/config` by default, and have at least the following parameters set for the JSP part:

```xml
<init-param>
  <param-name>debug</param-name>
  <param-value>true</param-value>
</init-param>
<init-param>
  <param-name>developer_mode</param-name>
  <param-value>true</param-value>
</init-param>
<init-param>
  <param-name>encode_to_java</param-name>
  <param-value>true</param-value>
</init-param>
<init-param>
  <param-name>reduce_tag_code</param-name>
  <param-value>false</param-value>
</init-param>
<init-param>
  <param-name>extra_imports</param-name>
  <param-value></param-value>
</init-param>
<init-param>
  <param-name>main_mode</param-name>
  <param-value>recompile</param-value>
</init-param>
<init-param>
  <param-name>debug_mode</param-name>
  <param-value>true</param-value>
</init-param>
```
This chapter provides instructions for installing OC4J, as well as for starting, stopping, and restarting an OC4J instance. It includes the following sections:

- Starting OC4J in a Standalone Environment
- Starting OC4J in an Oracle Application Server Environment
- Stopping OC4J in a Standalone Environment
- Stopping OC4J in an Oracle Application Server Environment
- Restarting an OC4J Instance in a Standalone Environment
- Restarting an OC4J Instance in an Oracle Application Server Environment

**Starting OC4J in a Standalone Environment**

You can start an OC4J server instance in a standalone environment using the default configuration with one of the oc4j command scripts or the executable oc4j.jar archive.

**Starting OC4J with an oc4j Script**

To start OC4J using an oc4j script, issue the following command from the ORACLE_HOME/bin directory:

```
oc4j -start
```

Before you can use this command, the ORACLE_HOME and JAVA_HOME environment variables must be set. See "Meeting Installation Prerequisites for a Standalone OC4J Server" on page 2-1 for details.

**Starting OC4J with oc4j.jar**

To start OC4J by invoking oc4j.jar, issue the following command from the ORACLE_HOME/j2ee/home directory:

```
java -jar oc4j.jar [args]
```

Invoking oc4j.jar as shown in this command starts OC4J using the default server.xml configuration file, which you can find in the j2ee/home/config directory. To start OC4J using a nondefault version of the server.xml file, issue the following command. You must supply the path to the modified configuration file.

```
java -jar oc4j.jar -config /yourpath/server.xml [args]
```
You can pass in arguments at startup to set runtime options in OC4J. For an overview of valid arguments, see "Setting OC4J Runtime Options at Startup" on page 4-2. You can also view the console help by issuing the following command from the `ORACLE_HOME/j2ee/home` directory:

```java
java -jar oc4j.jar -help
```

You can also set system properties on the JVM through the `oc4j.jar` command line at OC4J startup. For details on setting system properties, see "Setting System Properties at Startup" on page 4-4.

### Starting OC4J in an Oracle Application Server Environment

In a managed configuration, all Oracle Application Server components, including OC4J and Oracle HTTP Server, must be started using OPMN, either from the Cluster Topology page in Application Server Control or with `opmnctl`, the OPMN command-line tool. This tool is installed in the `ORACLE_HOME/opmn/bin` directory.

Use the following command to start all OPMN-managed processes, including OC4J, on a local Oracle Application Server instance:

```
opmnctl startall
```

Use the following command to start a specific managed process, in this case OC4J, on a local Oracle Application Server instance:

```
opmnctl startproc ias-component=default_group
```

In a cluster topology that includes multiple OC4J instances, if the EARs that the OC4J instances will use are in a shared directory at a single location, you should start the instances with the `-sequential` flag:

```
opmnctl startproc ias-component=default_group -sequential
```

This option prevents resource contention that might occur if you started all the OC4J instance in parallel.

Alternatively, to start the OC4J instances sequentially, you can specify the `sequential` option in `opmn.xml`, the OPMN configuration file for the cluster, as follows:

```xml
<ias-component id="default_group">
  <process-type id="home" module-id="OC4J" status="enabled">
    <module-data>
      <category id="start-parameters">
        <data id="oc4j-options" value="-sequential"/>
      </category>
      ...
    </module-data>
  </process-type>
</ias-component>
```

For more information about `opmnctl` commands, see the Oracle Process Manager and Notification Server Administrator’s Guide.

---

**Note:** Before attempting to connect to Oracle Application Server in a Windows environment, you need to update the `C:\WINDOWS\system32\drivers\etc\hosts` file with the server IP address.
Stopping OC4J in a Standalone Environment

You can stop a standalone OC4J server by invoking the -shutdown command in the admin_client.jar or admin.jar command-line utility or an oc4j.cmd or oc4j executable script.

---

**Note:** You should not use operating system commands such as Control-C in a Windows environment or kill in a Linux or UNIX environment to stop OC4J.

This is especially true when applications utilizing EJB modules are actively running within OC4J, as such commands do not allow EJB method calls or timer operations to complete before shutting down the server.

---

Stopping Standalone OC4J with admin_client.jar

To stop OC4J using admin_client.jar, issue the following command:

```java
java -jar admin_client.jar uri adminId adminPassword -shutdown
```

For example:

```java
java -jar admin_client.jar deployer:oc4j:localhost oc4jadmin password -shutdown
```

This command shuts down the entire OC4J server, terminating all threads immediately, as if the host machine were unplugged. If you use this command, the current state for clustered applications will not be replicated.

For descriptions of the `uri`, `adminId`, and `adminPassword` variables, see “Understanding the admin_client.jar Syntax and URI Specification” on page 6-2.

On a standalone OC4J instance, the -shutdown option of admin_client.jar is equivalent to the -shutdown_force option of the admin.jar utility, which “Stopping OC4J with admin.jar” on page 5-3 describes.

---

Stopping OC4J with admin.jar

To stop OC4J using admin.jar, issue the following command:

```java
java -jar admin.jar ormi://oc4jHost:oc4jOrmiPort adminId adminPassword
-shutdown [ordinary|force] [reason]
```

You can specify the following options:

- **ordinary|force**
  
  The type of shutdown. The default is ordinary, which allows each thread to terminate normally.

  The force option terminates all threads immediately. It is essentially the same as unplugging the host machine. If this option is used, the current state for clustered applications will not be replicated.

- **reason**

  You can specify a reason for the shutdown as a string that is written to the `ORACLE_HOME/j2ee/home/log/server.log` file. Spaces are not allowed in the string.
The following example forces a shutdown of the OC4J server using admin.jar, which terminates all threads immediately. The string entered as the reason for the shutdown is written to the `ORACLE_HOME/j2ee/home/config/server.log` file.

```
java -jar admin.jar ormi://localhost:23791 oc4jadmin password -shutdown force need_to_reboot_host_machine
```

### Stopping OC4J with an oc4j Script

To stop OC4J using one of the oc4j scripts, issue the following command from the `ORACLE_HOME/bin` directory. You must supply the ORMI port used by OC4J, which is 23791 by default, as well as the password for the oc4jadmin account.

```
oc4j -shutdown -port oc4jOrmiPort -password adminPassword
```

For example:

```
oc4j -shutdown -port 23791 -password adminpwd
```

The `ORACLE_HOME` and `JAVA_HOME` environment variables must be set to use this command. See "Meeting Installation Prerequisites for a Standalone OC4J Server" on page 2-1 for details.

### Stopping OC4J in an Oracle Application Server Environment

In a managed configuration, you can stop an OC4J instance from the Cluster Topology page of Application Server Control, with `opmnctl`, the OPMN command-line tool, or with the `admin_client.jar` command-line utility, which notifies OPMN that the instance has been stopped. The OPMN tool is installed in the `ORACLE_HOME/opmn/bin` directory. The `admin_client.jar` utility is installed by default in the `ORACLE_HOME/j2ee/instance` directory.

Use the following command to stop all OPMN-managed processes, including OC4J, on a local Oracle Application Server instance:

```
opmnctl stopall
```

You can use the following command to stop a specific managed component, in this case OC4J, on a local Oracle Application Server instance:

```
opmnctl stopproc ias-component=default_group
```

For more information about `opmnctl` commands, see the Oracle Process Manager and Notification Server Administrator’s Guide.

Alternatively, you can use `admin_client.jar` to stop an OC4J instance, with the following command:

```
java -jar admin_client.jar uri adminId adminPassword -shutdown
```

For example:

```
java -jar admin_client.jar deployer:oc4j:opmn://localhost/home oc4jadmin password -shutdown
```

This command shuts down the entire OC4J instance, terminating all threads immediately. For an OPMN-managed OC4J instance, `admin_client.jar` notifies OPMN that the server is being shut down on purpose, to prevent OPMN from attempting to restart it. If you use this command, the current state for clustered applications will not be replicated.
For descriptions of the `uri`, `adminId`, and `adminPassword` variables, see "Understanding the admin_client.jar Syntax and URI Specification" on page 6-2.

**Restarting an OC4J Instance in a Standalone Environment**

You can use the admin_client.jar utility to restart a standalone OC4J server, with the following command:

```
java -jar admin_client.jar uri adminId adminPassword -restart
```

For example:

```
java -jar admin_client.jar deployer:oc4j:localhost oc4jadmin password -restart
```

For descriptions of the `uri`, `adminId`, and `adminPassword` variables, see "Understanding the admin_client.jar Syntax and URI Specification" on page 6-2. Alternatively, you can use the admin.jar command-line utility to restart a standalone OC4J instance, with the following command:

```
java -jar admin.jar ormi://oc4jHost:oc4jOrmiPort adminId adminPassword -restart [reason]
```

You can enter a string as the value for `[reason]`. The string is written to the ORACLE_HOME/j2ee/home/config/server.log file.

**Restarting an OC4J Instance in an Oracle Application Server Environment**

In a managed configuration, you can restart OC4J from the Cluster Topology page of Application Server Control, with opmnctl, the OPMN command-line tool, or with the admin_client.jar command-line utility. The OPMN tool is installed in the ORACLE_HOME/opmn/bin directory. The admin_client.jar utility is installed by default in the ORACLE_HOME/j2ee/instance directory.

You can use the following command to restart all OPMN-managed processes, including OC4J, on a local Oracle Application Server instance:

```
opmnctl startall
```

Alternatively, you can use the following command to restart a specific managed process, in this case OC4J, on a local Oracle Application Server instance:

```
opmnctl restartproc ias-component=home
```

In a cluster topology that includes multiple OC4J instances, you should restart the instances with the opmnctl command and `-sequential` flag:

```
opmnctl startproc ias-component=default_group -sequential
```

The `-sequential` flag prevents resource contention that might occur if you started all the OC4J instance in parallel, especially if the EARs that the OC4J instances will use are in a shared directory at a single location. If the opmn.xml configuration file for the cluster includes the `sequential` option, as described in "Starting OC4J in an Oracle Application Server Environment" on page 5-2, you need not specify the `-sequential` flag.

You can use admin_client.jar to restart an OC4J instance, with the following command:

```
java -jar admin_client.jar uri adminId adminPassword -restart
```
For descriptions of the *uri*, *adminId*, and *adminPassword* variables, see "Understanding the admin_client.jar Syntax and URI Specification" on page 6-2.
Using the admin_client.jar Utility

OC4J provides a command-line utility, admin_client.jar, for performing configuration, administration, and deployment tasks on active OC4J instances in an Oracle Application Server clustered environment as well as on a standalone OC4J server. In addition, you can use admin_client.jar to restart or stop an OC4J instance or group of instances.

The admin_client.jar utility is also part of the Administrative Client Utility for performing operations remotely, available on the companion CD for Oracle Application Server 10g Release 3 (10.1.3.4.0) or for downloading from Oracle Technology Network.

You can perform operations on a specific OC4J instance or simultaneously on all OC4J instances in a group. In Oracle Application Server 10g Release 3 (10.1.3.4.0), a group is a synchronized set of OC4J instances that belong to the same cluster topology, which is two or more loosely connected Oracle Application Server nodes. With the admin_client.jar command-line utility, you can perform the following operations on an OC4J instance or group of OC4J instances:

- Deploy an enterprise application archive (EAR), standalone Web module (WAR), Enterprise JavaBeans (EJB) module (EJB JAR), or standalone resource adapter (RAR)
- Undeploy an application, Web module, EJB module, or resource adapter
- Incrementally update a deployed EJB module with modified classes
- Create, modify, or remove shared libraries for an application
- Start, restart, or stop applications
- Restart or stop an OC4J instance or group of instances
- Add, test, and remove data sources and data source connection pools
- Add and remove JMS connection pools and destinations

You can perform similar operations with Application Server Control or OC4J Ant tasks. For more information, see "Using Application Server Control for Deployment" or "Using OC4J Ant Tasks for Deployment" in the Oracle Containers for J2EE Deployment Guide.

This chapter includes the following topics:

- Preparing to Use admin_client.jar
- Deploying an Archive
- Binding Web Modules to a Web Site After Deployment
- Redeploying an Archive
Preparing to Use admin_client.jar

The admin_client.jar utility is installed by default in the ORACLE_HOME/j2ee/instance directory in each OC4J instance. This is the preferred command-line tool for performing operations on OC4J. This utility is also in the Administrative Client Utility for performing operations remotely, available on the companion CD for Oracle Application Server 10g Release 3 (10.1.3.4.0) or for downloading from Oracle Technology Network.

Before this utility can perform operations on an OC4J instance, the instance must be started.

This section covers these topics:

- Understanding the admin_client.jar Syntax and URI Specification
- Downloading and Extracting the Remote Administration Client
- Printing Usage Text to the Console
- Enabling Logging

Understanding the admin_client.jar Syntax and URI Specification

The admin_client.jar utility uses the following syntax:

```
java -jar admin_client.jar uri adminId adminPassword command
```

The key parameter passed on the command line is `uri`, which specifies the target for the command or commands supplied. The syntax for the URI varies depending on the instance or instances being targeted. See the following topics for the format of this URI:

- Performing Operations on a Group of OC4J Instances Within a Cluster
- Performing Operations on a Specific OC4J Instance
- Performing Operations on a Standalone OC4J Server
- Validating a URI

The OC4J administration user name and password are also passed to the admin_client.jar utility. The user name for the default administrator account is `oc4jadmin`.

As an example, the following command will start the petstore application, which is installed in the OC4J instance named `oc4j_2` on `node1`, a member of a cluster:

```
java -jar admin_client.jar deployer:oc4j:opmn://node1.company.com/oc4j_2
oc4jadmin password -application petstore -start
```
Figure 6–1 shows four processes that are configured to run from an OC4J instance named OC4J_home in one of the Oracle Application Server instances within a cluster.

**Figure 6–1  OC4J Instance Running on Multiple JVMs in an Oracle Application Server Instance Within a Cluster**

Note: The OC4J instance named home typically cannot be configured to run with multiple processes because it hosts the Application Server Control application, which is not suitable for running in the multiple-process model.

### Performing Operations on a Group of OC4J Instances Within a Cluster

Use the following URI to specify all OC4J instances in a group as the target. A group is a synchronized set of OC4J instances that belong to the same cluster topology. You can perform configuration, administration, and deployment operations simultaneously on all OC4J instances in the group. For example, you could stop all OC4J instances that belong to a group named oc4j_soa simultaneously within an Oracle Application Server cluster.

The URI utilizes the OPMN-based clustering framework, in which cluster nodes are aware of one another. You need to supply only the host name and, optionally, the OPMN request port for any Oracle Application Server node within the cluster. The application is then able to retrieve the host names and OPMN ports for all other nodes within the cluster.

The URI syntax follows:

```
deployer:cluster:[rmis]:opmn://opmnHost[:opmnPort]/groupName
```

For example:

```
deployer:cluster:opmn://node1.company.com/oc4j_soa
```

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>rmis</td>
<td>Optional. Include if the target utilizes ORMI over SSL, or ORMIS.</td>
</tr>
</tbody>
</table>
Performing Operations on a Specific OC4J Instance

Use the following URI syntax to target a specific OPMN-managed OC4J instance, including an instance within a cluster. In the prefix, `oc4j` replaces `cluster`.

Specify the host name for the Oracle Application Server node hosting the instance. If you are not sure of the host name or port for the node, you can specify the host name for another node within the cluster, as well as the name of the Oracle Application Server instance. The application will then use the OPMN clustering framework to locate the node hosting the Oracle Application Server instance.

The URI syntax follows:

```
deployer:oc4j:[rmis]:opmn://host[:opmnPort]/{iASInstanceName}/oc4jInstanceName
```

For example:

```
```

Table 6–2 URI Parameters for Targeting a Specific Instance

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>rmis</td>
<td>Optional. Include if the target utilizes ORMI over SSL, or ORMIS.</td>
</tr>
<tr>
<td>host</td>
<td>Required. The host name of the Oracle Application Server node to target within the cluster to use as the OPMN server.</td>
</tr>
<tr>
<td>opmnPort</td>
<td>Optional. The OPMN request port, as specified in <code>opmn.xml</code>. If no port is specified, the default port, 6003, will be used.</td>
</tr>
<tr>
<td>iASInstanceName</td>
<td>Optional. The name of the Oracle Application Server instance to target, if it does not reside on the node specified for <code>host</code>.</td>
</tr>
<tr>
<td>oc4jInstanceName</td>
<td>Required. The name of the target OC4J instance.</td>
</tr>
</tbody>
</table>

Performing Operations on a Standalone OC4J Server

Use one of the following URIs to target a standalone OC4J server instance.

If you are using RMI, specify the URI as follows:

```
deployer:oc4j:host:rmiPort
```

For example:

```
deployer:oc4j:myserver:23791
```

If you are using ORMI over SSL (ORMIS), specify the URI as follows:

```
deployer:oc4j:rmis:host:ormisPort
```

For example:
Preparing to Use admin_client.jar

Using the admin_client.jar Utility

Validating a URI

You can validate a URI using the -validateURI command.

```
java -jar admin_client.jar uri adminId adminPassword -validateURI
```

For example:

```
java -jar admin_client.jar deployer:ocl4j:rmis:myserver:23943
```

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>rmis</td>
<td>Required if the target utilizes ORMI over SSL, or ORMIS.</td>
</tr>
<tr>
<td>host</td>
<td>Required. The host name of an Oracle Application Server node within the cluster. Any node can be specified; the list of other nodes in the cluster will be retrieved from this node.</td>
</tr>
<tr>
<td>rmiPort</td>
<td>Required if RMI used. The RMI port, as specified in the instance-specific rmi.xml file.</td>
</tr>
<tr>
<td>ormisPort</td>
<td>Required if ORMIS is used. The SSL port, as specified in the instance-specific rmi.xml file.</td>
</tr>
</tbody>
</table>

Download and Extracting the Remote Administration Client

The Administrative Client Utility distribution contains the `admin_client.jar` command-line utility. This utility can connect to OC4J or Oracle Application Server targets and perform a range of life cycle, deployment, and resource configuration operations.

Consider the scenario in which a remote system needs to perform regular operations against an Oracle Application Server instance. For example, a remote system might have some automated build or test process, such as deployment operations or querying or manipulating some application-specific or server JMX MBeans for administrative purposes. Or perhaps the remote system performs a regularly scheduled test-to-production set of configuration and deployment operations. The Administrative Client Utility can be used to do this, removing the need for the remote system to have a full OC4J or Oracle Application Server installation.

The Administrative Client Utility, a separate distribution for Oracle Application Server 10g Release 3 (10.1.3.4.0), is available for downloading from Oracle Technology Network and is on the Oracle Application Server companion CD. The distribution file, `oc4j_admin_client_101340.zip`, contains all you need to manage an OC4J instance remotely:

- The Java libraries required to establish remote JMX connections, using the ORMI protocol, to either an OC4J or Oracle Application Server target
- The executable `admin_client.jar` utility with the libraries it requires to operate
- The standard J2EE libraries relevant to the remote client role

To download and extract the Administrative Client Utility:

1. Download `oc4j_admin_client_101340.zip` from the Oracle Technology Network:

```
```
2. Extract the contents of oc4j_admin_client_101340.zip into a local directory. For example:

```bash
>mkdir oc4j_admin_client
>cd oc4j_admin_client
>jar xvf d:\software\oc4j_admin_client_101340.zip
```

The resulting directory structure looks like this:

```
j2ee
  \home
    oc4jclient.jar
    admin_client.jar
  \lib
    ejb.jar
    mail.jar
    adminclient.jar
    javax88.jar
    javax77.jar
    jmx_remote_api.jar
    jmxri.jar
  \lib
    xmlparserv2.jar
    dms.jar
  \opmn
    \lib
    optic.jar
  \jlib
    oraclepki.jar
    ojpse.jar
```

The following URIs use different patterns for different OC4J targets:

- **Standalone OC4J server:**
  
  ```
  deployer:oc4j:test-cycle.oracle.com:23791
  ```

- **Specific OC4J instance on Oracle Application Server:**
  
  ```
  deployer:oc4j:opmn://test-cycle.oracle.com/testunit
  ```

- **Group of OC4J instances within a cluster:**
  
  ```
  deployer:cluster:opmn://test-cycle.oracle.com/[groupName]
  ```

3. Connect admin_client.jar to a target OC4J instance or instances and test the connection. For example:

```bash
>cd j2ee\home
>java -jar admin_client.jar
  deployer:oc4j:opmn://test-cycle.oracle.com/testunit
  oc4jadmin welcome1
  --validateURI
```

**Printing Usage Text to the Console**

To print the online help text for the admin_client.jar commands to the console, simply type `-help` on the command line. For example:

```
java -jar admin_client.jar -help
```
To view detailed help for a specific command, type \texttt{-usage} followed by the command identifier. For example:

\texttt{java -jar admin\_client.jar -usage [command]}

**Enabling Logging**

To help troubleshoot errors that occur when running \texttt{admin\_client.jar}, you can enable Java logging when running this tool. Log messages will be output to the console.

To enable logging:

1. Create a \texttt{logging.properties} file containing a single line:

   \begin{verbatim}
   oracle.oc4j.admin.jmx.client.CoreRemoteMBeanServer.level=INFO
   \end{verbatim}

   If you create this file in a location other than \texttt{ORACLE\_HOME/j2ee/instance}, you must include the path to the file in the following command.

2. Set \texttt{-Djava.util.logging.config.file=logging.properties} on the \texttt{admin\_client.jar} command line as follows:

\begin{verbatim}
java -Djava.util.logging.config.file=logging.properties -jar admin\_client.jar
\end{verbatim}

uri adminId adminPassword command

You can set the value in the \texttt{logging.properties} file to one of the Java log-level values in Table 6–4.

**Table 6–4 Java Log Levels**

<table>
<thead>
<tr>
<th>Java Log Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEVERE</td>
<td>Log system errors requiring attention from the system administrator.</td>
</tr>
<tr>
<td>WARNING</td>
<td>Log actions or a conditions discovered that should be reviewed and might require action before an error occurs.</td>
</tr>
<tr>
<td>INFO</td>
<td>Log normal actions or events. This could be a user operation, such as \texttt{login completed}, or an automatic operation, such as a \texttt{log file rotation}.</td>
</tr>
<tr>
<td>CONFIG</td>
<td>Log messages or problems related to log configuration.</td>
</tr>
<tr>
<td>FINE</td>
<td>Log trace or debug messages used for debugging or performance monitoring. Typically contains detailed event data.</td>
</tr>
<tr>
<td>FINER</td>
<td>Log fairly detailed trace or debug messages.</td>
</tr>
<tr>
<td>FINEST</td>
<td>Log highly detailed trace or debug messages.</td>
</tr>
</tbody>
</table>

For example:

\begin{verbatim}
oracle.oc4j.admin.jmx.client.CoreRemoteMBeanServer.level=FINE
\end{verbatim}

**Deploying an Archive**

You can use the \texttt{admin\_client.jar} utility to deploy an application (EAR), a standalone Web module (WAR), or a standalone resource adapter (RAR) to a specific OC4J instance or to a group of OC4J instances.

This section covers the following topics:
Deploying a J2EE Application (EAR)

Use the `-deploy` command to deploy or redeploy a J2EE application packaged as an EAR file. The EAR-specific syntax follows:

```
java -jar admin_client.jar uri adminId adminPassword -deploy -file path/filename -deploymentName appName [-bindAllWebApps [webSiteName]] [-targetPath path] [-parent appName] [-deploymentDirectory path] [sequential [waitsec]] [-enableIIOP] [-iiopClientJar path/filename] [-deploymentPlan path/filename] [-removeArchive]
```

You can include the `-bindAllWebApps` parameter to bind all Web modules within the EAR to the Web site through which they will be accessed. If no Web site is specified, modules will be bound to the default Web site.

For example, the following command deploys the `utility` application to all OC4J instances that belong to the group `default_group` within a cluster. All Web modules within the application will be bound to the default Web site.

```
java -jar admin_client.jar deployer:cluster:opmn://node1.company.com/default_group oc4jadmin password -deploy -file C:/dev/utility.ear -deploymentName utility -bindAllWebApps
```

<table>
<thead>
<tr>
<th>Table 6–5 -deploy Command Parameters for EAR Deployment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parameter</strong></td>
</tr>
<tr>
<td><code>-file</code></td>
</tr>
<tr>
<td><code>-deploymentName</code></td>
</tr>
<tr>
<td><code>-bindAllWebApps</code></td>
</tr>
<tr>
<td><code>-targetPath</code></td>
</tr>
<tr>
<td><code>-parent</code></td>
</tr>
</tbody>
</table>
Table 6–5 (Cont.) -deploy Command Parameters for EAR Deployment

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-deploymentPlan</td>
<td>Optional. The path and file name for a deployment plan to apply to the application. The plan would have been saved during a previous deployment as an XML file. The file must exist on the local host.</td>
</tr>
<tr>
<td>-deploymentDirectory</td>
<td>Optional. The directory containing the OC4J-specific deployment descriptors and generated files, such as compiled JSP classes and EJB wrapper classes. The default directory is ORACLE_HOME/j2ee/instance/applications.</td>
</tr>
<tr>
<td>-sequential [waitsec]</td>
<td>Optional. Specify to deploy the archive to each OC4J instance in a group. The deployment to each target OC4J instance must complete before deployment begins on the next target instance. Requests will not be routed to an OC4J instance while the EAR is being deployed to it. You can use the waitsec option to specify a number of seconds to wait between deployments, as follows: -sequential 15</td>
</tr>
<tr>
<td>-enableIIOP</td>
<td>Optional. Specify this parameter to generate IIOP client stubs on the OC4J server. The application-level stubs generated for all EJB modules are output to an archive named _iiopClient.jar in the ORACLE_HOME/j2ee/instance/application-deployments/appName directory. In addition, stubs for each individual EJB module are generated in an archive with the same name in the ORACLE_HOME/j2ee/instance/application-deployments/appName/ebModuleName directory. The GenerateIIOP system property must be enabled at OC4J startup to use this feature. This property is set as -DGenerateIIOP=true on the OC4J command line for standalone OC4J or as an oc4j-options value in opmn.xml.</td>
</tr>
<tr>
<td>-iiopClientJar</td>
<td>Optional. The path and file name of the JAR to output IIOP client stubs to. The application-level stubs generated for all EJB modules are output to an archive named _iiopClient.jar in the ORACLE_HOME/j2ee/instance/application-deployments/appName directory. If a path is supplied, the archive is also set on this path. In addition, stubs for each individual EJB module are generated in an archive with the same name in the ORACLE_HOME/j2ee/instance/application-deployments/appName/ebModuleName directory. The GenerateIIOP system property must be enabled at OC4J startup to use this feature. This property is set as -DGenerateIIOP=true on the OC4J command line for standalone OC4J or as an oc4j-options value in opmn.xml.</td>
</tr>
</tbody>
</table>
Deploying an Archive

### Deploying a J2EE Application from a Remote Client

The following example shows how to deploy an EAR from a remote client to a specific OC4J instance on Oracle Application Server:

```java
cd j2ee/home
>java -jar admin_client.jar
deployer:oc4j:opmn://test-cycle.oracle.com/testunit
cd\javadmin welcome
>deploy
>-file d:\temp\rupg\testru.ear
>-deploymentName testru -bindAllWebApps
```

```java
06/06/20 17:00:16 Notification ==>Uploading file testru.ear ...
06/06/20 17:00:18 Notification ==>Application Deployer for testru STARTS.
06/06/20 17:00:19 Notification ==>Copy the archive to /scratch/sbutton/ml_
06/06/20 17:00:19 Notification ==>Initialize /scratch/sbutton/ml_
06/06/20 17:00:19 Notification ==>Unpacking testru.ear
06/06/20 17:00:20 Notification ==>Unpacking testru-web.war
06/06/20 17:00:20 Notification ==>Initialize /scratch/sbutton/ml_
06/06/20 17:00:20 Notification ==>Organizing testru-web.war
06/06/20 17:00:20 Notification ==>Initialize /scratch/sbutton/ml_
06/06/20 17:00:20 Notification ==>Starting application : testru
06/06/20 17:00:20 Notification ==>Committing ClassLoader(s)
06/06/20 17:00:20 Notification ==>Initialize EJB container
06/06/20 17:00:20 Notification ==>Loading connector(s)
06/06/20 17:00:20 Notification ==>Starting up resource adapters
06/06/20 17:00:20 Notification ==>Starting EJB sessions
06/06/20 17:00:20 Notification ==>Committing ClassLoader(s)
06/06/20 17:00:20 Notification ==>Initialize testru-web begins...
06/06/20 17:00:20 Notification ==>Initialize testru-web ends...
06/06/20 17:00:21 Notification ==>Started application : testru
06/06/20 17:00:21 Notification ==>Binding web application(s) to site
06/06/20 17:00:21 Notification ==>Binding testru-web module for application
06/06/20 17:00:21 Notification ==>Binding testru-web under context root /testru
06/06/20 17:00:21 Notification ==>Application Deployer for testru COMPLETES.
Operation time: 3785 msecs
```

### Deploying a Standalone Web Module (WAR)

Use the `-deploy` command to deploy or redeploy a standalone Web module packaged as a WAR file.

The WAR-specific syntax follows:

```java
java -jar admin_client.jar uri adminId adminPassword -deploy -file
path/filename -deploymentName appName [-bindAllWebApps [webSiteName]]
[-targetPath path] [-parent appName] [-deploymentDirectory path]
```
[-contextRoot context]  
[-removeArchive]  

The WAR can be designated a child of another deployed application that does not already contain a Web module component; otherwise, the WAR will be deployed to the default application.

A WAR cannot be deployed as the child of an application that already contains a Web module. That is, if the acme application already contains acme-web.war, an additional WAR file cannot be deployed into that application. Repackage the WAR in the application’s EAR file and redeploy the application instead.

The following command deploys the standalone acme-web.war Web module to the default application in all OC4J instances that belong to default_group within the cluster of which node1 is a member. Because the -bindAllWebApps parameter is included, but a Web site to bind to is not specified, the module will be bound to the default Web site.

```
java -jar admin_client.jar deployer:cluster:opmn://node1.company.com/default_group
oc4jadmin password -deploy -file C:/dev/acme-web.war -deploymentName utility
-bindAllWebApps -parent default
```

### Table 6–6  -deploy Command Parameters for WAR Deployment

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-file</td>
<td>Required. The path and file name of the archive to deploy.</td>
</tr>
<tr>
<td>-deploymentName</td>
<td>Required. The user-defined name for the Web module, used to identify it within OC4J.</td>
</tr>
<tr>
<td>-bindAllWebApps</td>
<td>Optional. Binds the Web module to the specified Web site or, if none is specified, to the default Web site.</td>
</tr>
<tr>
<td></td>
<td>You can supply a value for webSiteName, which is the name portion of the name_web-site.xml file that contains the Web site configuration.</td>
</tr>
<tr>
<td>-targetPath</td>
<td>Optional. The directory to deploy the archive to. If a directory is not specified, the archive is deployed to the ORACLE_HOME/j2ee/instance/applications directory by default.</td>
</tr>
<tr>
<td></td>
<td>The generated EAR file containing the standalone WAR file is also copied to this directory. Each successive deployment will cause this archive to be overwritten.</td>
</tr>
<tr>
<td>-parent</td>
<td>Optional. The parent application the module will be deployed to. The default is the default application.</td>
</tr>
<tr>
<td>-deploymentDirectory</td>
<td>Optional. The directory containing the OC4J-specific deployment descriptors and generated files, such as compiled JSP classes.</td>
</tr>
<tr>
<td></td>
<td>The default directory is ORACLE_HOME/j2ee/instance/application-deployments.</td>
</tr>
<tr>
<td>-contextRoot</td>
<td>Optional. The Web module context root, which will be appended to the URL used to access the application through a Web browser.</td>
</tr>
<tr>
<td></td>
<td>If the contest root is not specified, the value passed in for -deploymentName will be used.</td>
</tr>
<tr>
<td></td>
<td>For example, if you supply /petstore as the context root, the module could be accessed with the following URL:</td>
</tr>
<tr>
<td></td>
<td><a href="http://node1.company.com:7777/petstore">http://node1.company.com:7777/petstore</a></td>
</tr>
<tr>
<td>-removeArchive</td>
<td>Optional. Include to delete the WAR file from the server’s file system after deployment.</td>
</tr>
</tbody>
</table>
Deploying a Standalone Resource Adapter (RAR)

Use the -deploy command to deploy or redeploy a Java Connector Architecture-compliant resource adapter packaged as a RAR file. By default, resource adapters are deployed to the $ORACLE_HOME/j2ee/instance/connectors directory.

Redeploying or undeploying a standalone RAR does not require a restart of the default application.

The RAR-specific syntax follows:

```
java -jar admin_client.jar uri adminId adminPassword -deploy -file path/filename -deploymentName connectorName [-nativePathLib path] [-grantAllPermissions] [-removeArchive]
```

The following command deploys the acme-rar.rar module to all OC4J instances that belong to default_group within a cluster.

```
java -jar admin_client.jar deployer:cluster:opmn://node1.company.com/default_group oc4jadmin password -deploy -file /dev/acme-rar.rar -deploymentName acme-rar -grantAllPermissions -removeArchive
```

### Table 6–7 -deploy Command Parameters for RAR Deployment

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-file</td>
<td>Required. The path and file name of the RAR file to deploy.</td>
</tr>
<tr>
<td>-deploymentName</td>
<td>Required. The user-defined connector name, used to identify the connector within OC4J.</td>
</tr>
<tr>
<td>-nativeLibPath</td>
<td>Optional. The path to the directory containing native libraries (such as DLLs) within the RAR file.</td>
</tr>
<tr>
<td>-grantAllPermissions</td>
<td>Optional. Include this parameter to grant all runtime permissions requested by the resource adapter, if required.</td>
</tr>
<tr>
<td>-removeArchive</td>
<td>Optional. Include this parameter to delete the RAR file from the server's file system after deployment.</td>
</tr>
</tbody>
</table>

For more information, see "Deploying Resource Adapters" in the *Oracle Containers for J2EE Deployment Guide*.

Using a Script File for Batch Deployment

You can specify a script file that contains deployment commands on the admin_client.jar command line. If you specify a file in the -script command, admin_client.jar can do a list of commands with only one connection to the deployment manager. The syntax for batch deployment follows:

```
java -jar admin_client.jar uri adminId adminPassword -script filename
```

The script file, filename, contains multiple lines, like the lines in this example:

```
-deploy -file /scratch/rpan/apps/hello-planet.ear -deploymentName hello-planet
-bindWebApp -appName hello-planet -webModuleName hello-planet-web
-stop hello-planet
-start hello-planet
-redeploy -file /scratch/rpan/apps/hello-planet.ear
-deploymentName hello-planet -bindAllWebApps
-undeploy hello-planet
-validateURI
```
You can convert to batch mode by looking at the script or logs from an installation and extracting the relevant lines used by an existing configuration assistant.

**Binding Web Modules to a Web Site After Deployment**

Every Web module deployed to OC4J must be bound to a Web site through which it will be accessed.

Typically, you will bind Web modules packaged as WAR files within an EAR at the time the EAR is deployed using the `-bindAllWebApps` parameter on the `-deploy` command. However, if the `-bindAllWebApps` parameter was not specified when the EAR was deployed, you can bind modules to a Web site after deployment, as the following topics describe:

- **Binding All Web Modules to a Single Web Site**
- **Binding a Specific Web Module to a Web Site and Setting the Context Root**

**Binding All Web Modules to a Single Web Site**

Use the `-bindAllWebApps` command to bind all Web modules within a J2EE application to the same Web site, or to `default-web-site` by default. The syntax for this command follows:

```
java -jar admin_client.jar uri adminId adminPassword -bindAllWebApps
  -appName appName -webSiteName siteName
```

**Table 6–8 -bindAllWebApps Command Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>-appName</code></td>
<td>Required. The name of the parent application as specified at deployment time.</td>
</tr>
<tr>
<td><code>-webSiteName</code></td>
<td>Optional. The name portion of the <code>name_web-site.xml</code> file that contains the Web site configuration. If this parameter is omitted, all Web modules are bound to the default Web site.</td>
</tr>
</tbody>
</table>

**Binding a Specific Web Module to a Web Site and Setting the Context Root**

Use the `-bindWebApp` command to bind a specific Web module within a J2EE application to a Web site you specify or to the `default` Web site. You can also set the context root that will be used to access the Web module.

The syntax of this command follows:

```
java -jar admin_client.jar uri adminId adminPassword -bindWebApp
  -appName appName -webModuleName moduleName -webSiteName siteName
  -contextRoot contextRoot
```

**Table 6–9 -bindWebApp Command Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>-appName</code></td>
<td>Required. The name of the parent application as specified at deployment time.</td>
</tr>
<tr>
<td><code>-webModuleName</code></td>
<td>Required. The name of the Web module to be bound. This should be the name of the WAR file contained within the EAR file, without the <code>.war</code> extension.</td>
</tr>
</tbody>
</table>
Redeploying an Archive

Use the `-redeploy` command to redeploy a previously deployed archive.

This operation performs a graceful redeployment because it stops the application if it is running and then undeploys the archive. It then deploys and restarts the application. Redeploying an archive with the `-deploy` command, in contrast, does not stop the application but simply undeploys, redeploys, and then restarts it.

The syntax of this command follows:

```
java -jar admin_client.jar uri adminId adminPassword -redeploy -file path/filename -deploymentName appName [-bindAllWebApps] [-isConnector] [-keepSettings] [-sequential [waitsec]] [-removeArchive]
```

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>-file</code></td>
<td>Required. The path and file name of an EAR, WAR, or RAR file to redeploy.</td>
</tr>
<tr>
<td><code>-deploymentName</code></td>
<td>Required. The user-defined application deployment name, used to identify the application within OC4J. This value must match the name of the existing application on the server.</td>
</tr>
<tr>
<td><code>-isConnector</code></td>
<td>Required for redeploying a standalone RAR.</td>
</tr>
<tr>
<td><code>-bindAllWebApps</code></td>
<td>Optional. Binds all Web modules in an EAR to the specified Web site or, if none is specified, to the default Web site.</td>
</tr>
</tbody>
</table>

You can supply a value for `webSiteName`, which is the name portion of the `name_web-site.xml` file that contains the Web site configuration.

Alternatively, you can bind all Web modules to a Web site later, as described in “Binding Web Modules to a Web Site After Deployment” on page 6-13.

| `-keepSettings` | Optional. If this parameter is specified, the redeployed application will fetch and use the deployment plan from the previous deployment. Values set in deployment descriptors packaged within the archive will be ignored. |

If this parameter is not specified, values will be set to those in the deployment descriptors packaged with the archive.
Specifying a Delay Between Sequential Redeployments in a Cluster

When an application is redeployed to a group with the -sequential parameter of the admin_client.jar -redeploy command, the redeployment operation is serialized, with redeployment done to one OC4J instance at a time so that the target application is never entirely in a stopped state. In a sequential redeployment, the deployment manager immediately commences redeployment on the next OC4J instance that is running a member of an application cluster as soon as the redeployment operation completes on the current OC4J instance. The result is that the system might not be able to stabilize itself so that the new application instance is fully active before the next redeployment commences, which introduces these possible side effects:

- The application can become inaccessible while it is stopped on one OC4J instance and before mod_oc4j is notified that the application is available on another instance.
- Session replication activities might not have had an opportunity to execute.

In some circumstances, the session state of an application might be lost when you redeploy an application to a cluster with the admin_client.jar -redeploy command, even if you specify the -sequential and -keepsettings parameters.

In OC4J 10g (10.1.3.4.0), you can use the waitsec option of the -sequential parameter to specify a number of seconds between redeployments to different OC4J instances that are running an application cluster. This delay can provide enough time for replication of session state.

If you specify the optional waitsec value, the deployment manager waits the specified number of seconds between redeployment operations on OC4J instances within a group. This delay enables the system to stabilize as redeployment operations occur across the group, reducing the opportunities for applications to be inaccessible or session state to be lost.

For example, the following admin_client.jar -redeploy command specifies a delay of 15 seconds between redeployments to different OC4J instances:

```
java -jar admin_client.jar deployer:cluster:opmn://host:port/home oc4jadmin
password -redeploy -file "myapp.ear" -deploymentName rolling -sequential 15
   -keepsettings
```
The new `waitsec` option also applies to the `-sequential` parameter of the `admin_client.jar -deploy` command.

**Redeploying an Application with Scheduled Jobs**

If you redeploy an application that has scheduled jobs, the jobs will not run as scheduled unless you remove all the jobs before the redeployment and resubmit them after it.

**To redeploy an application with scheduled jobs:**

1. Remove all scheduled jobs.
2. Redeploy the application.
3. Resubmit all the jobs.

**Undeploying an Archive**

The `-undeploy` command removes an application or standalone Web or connector module from the target OC4J instances, as the following topics describe:

- **Undeploying an EAR or Standalone WAR**
- **Undeploying a Standalone RAR**

**Undeploying an EAR or Standalone WAR**

Undeploying an EAR or standalone Web module removes it from the OC4J runtime. Existing Web site bindings are also deleted.

The syntax for undeploying an EAR or standalone WAR follows. The name of the application or module must be supplied.

```java
java -jar admin_client.jar uri adminId adminPassword -undeploy appName
```

**Undeploying a Standalone RAR**

The syntax for undeploying a standalone RAR follows. The `-isConnector` parameter must be included along with name of the connector.

```java
java -jar admin_client.jar uri adminId adminPassword -undeploy connectorName -isConnector
```

Undeploying a standalone RAR does not require a restart of the default application.

**Updating Modified Classes in a Deployed EJB Module**

The `-updateEJBModule` command performs incremental or partial redeployment of EJB modules within an application running in an OC4J instance or in a group of OC4J instances. This feature makes it possible to redeploy only those beans within an EJB JAR that have changed.
The syntax for updating modified classes in a deployed EJB module follows. The name of the application the EJB JAR is part of must be supplied. If updating a standalone EJB module, specify the default application.

```java
java -jar admin_client.jar uri adminId adminPassword -updateEJBModule
    -appName appName -ejbModuleName ejbJarName -file path/ejbJarName
```

For example:

```java
java -jar admin_client.jar deployer:cluster:openm://node1.company.com/default_group
oc4jadmin password -updateEJBModule -appName petstore
    -ejbModuleName customerEjb.jar -file build/customerEjb.jar
```

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-appName</td>
<td>Required. The name of the application that the EJB module is part of. If you are updating a standalone EJB module, specify the default application.</td>
</tr>
<tr>
<td>-ejbModuleName</td>
<td>Required. The name of the EJB JAR file to be updated, as defined in application.xml.</td>
</tr>
<tr>
<td>-file</td>
<td>Required. The path and file name of the updated EJB JAR.</td>
</tr>
</tbody>
</table>

### Creating and Managing Shared Libraries

You can use the `admin_client.jar` utility to create and manage shared libraries in an OC4J instance or in a group of OC4J instances, as the following topics describe:

- Installing a Shared Library
- Modifying an Existing Shared Library
- Viewing the Contents of a Shared Library
- Listing All Shared Libraries
- Removing a Shared Library

### Installing a Shared Library

You can use the `-publishSharedLibrary` command to create the shared library directory structure and install the binaries that compose the library within it in a specific OC4J instance or in a group of OC4J instances. The shared library will be created in the `ORACLE_HOME/j2ee-instance/shared-lib` directory of each OC4J instance.

The command will also declare the shared library within a `<shared-library>` element in the `server.xml` file on each OC4J instance, making it available to applications.
The syntax for installing a shared library follows. The path and file names for multiple code sources, binaries that will compose the shared library, can be specified, each separated from the next by a space.

```
java -jar admin_client.jar uri adminId adminPassword -publishSharedLibrary
-name libName -version libVersion [-parentName parentLibName]
[-parentVersion parentLibVersion] [-installCodeSources path [path ...]]
[-addCodeSources path [path ...]] [-imports sharedLibName
:[min-version][,max-version]] [sharedLibName ...]
```

The following command deploys the `acme.common:2.5` shared library to a group of OC4J instances (all the members of `default_group`) within a cluster.

```
java -jar admin_client.jar
deployer:cluster:opmn://server.company.com:6004/default_group
oc4jadmin password -publishSharedLibrary -name acme.common -version 2.5
-installCodeSources /myserver/tmp/acme-apis.jar /myserver/tmp/acmeImpl.jar
```

The resulting directory structure within a target OC4J server would be as follows:

```
ORACLE_HOME/j2ee/home/shared-lib
/acme.common
  /2.5
    acme-apis.jar
    acmeImpl.jar
```

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-name</td>
<td>Required. The name of the shared library. Where common APIs are implemented by multiple vendors, the name should include both the vendor name and the name of the technology; for example, <code>oracle.jdbc</code> or <code>xerces.xml</code>.</td>
</tr>
<tr>
<td>-version</td>
<td>Required. The version number of the shared library. This value should ideally reflect the code implementation version.</td>
</tr>
<tr>
<td>-parentName</td>
<td>Optional. The name of the parent shared library, if applicable.</td>
</tr>
<tr>
<td>-parentVersion</td>
<td>Optional. The version number of the parent shared library, if applicable.</td>
</tr>
<tr>
<td>-installCodeSources</td>
<td>The path and file names for one or more JAR or ZIP files to be uploaded to the OC4J instance or instances and installed as part of the shared library. Separate each path/file name string from the next with a space.</td>
</tr>
<tr>
<td>-addCodeSources</td>
<td>Optional. The path and file names for JAR or ZIP files that have already been uploaded to the OC4J instance or instances to add to the shared library. Separate each path/file name string from the next with a space.</td>
</tr>
<tr>
<td>-imports</td>
<td>Optional. The name of one or more existing shared libraries to import into this shared library. Separate each name string from the next with a space. You can specify the maximum or minimum version, or both, of the library to import.</td>
</tr>
</tbody>
</table>

### Modifying an Existing Shared Library

You can use the `-modifySharedLibrary` command to modify the contents of an existing shared library. The command will also update the shared library definition within the `server.xml` file on each OC4J instance.
The syntax for modifying an existing shared library follows. The path and file names for multiple code sources, binaries that will compose the shared library, can be specified, each separated from the next by a space.

```
java -jar admin_client.jar uri adminId adminPassword -modifySharedLibrary
-name libName -version libVersion [-installCodeSources path [path ...]]
[-addCodeSources path [path ...]] [-removeCodeSources path [path ...]]
[-addImports sharedLibName[:min-version][,max-version] [sharedLibName ...]]
[-removeImports sharedLibName[:min-version][,max-version] [sharedLibName ...]]
```

The following command updates the `acme.common:2.5` shared library.

```
java -jar admin_client.jar
deployer:cluster:opmn://server.company.com:6004/default_group
oc4jadmin password -modifySharedLibrary -name acme.common -version 2.5
-addCodeSources /myserver/tmp/acme-helpers.jar
```

### Table 6–13 -modifySharedLibrary Command Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-name</td>
<td>Required. The name of the shared library to update.</td>
</tr>
<tr>
<td>-version</td>
<td>Required. The version number of the shared library to update.</td>
</tr>
<tr>
<td>-installCodeSources</td>
<td>Optional. The path and file name to a JAR or ZIP file to be uploaded to the OC4J instance or instances and installed as part of the shared library. Separate each path/file name string from the next with a space.</td>
</tr>
<tr>
<td>-addCodeSources</td>
<td>Optional. The path and file name for one or more JAR or ZIP files that have already been uploaded to the OC4J instance or instances to add to the shared library. Separate each path/file name string from the next with a space.</td>
</tr>
<tr>
<td>-removeCodeSources</td>
<td>Optional. The path and file name for one or more JAR or ZIP files to remove from the shared library. Separate each path/file name string from the next with a space.</td>
</tr>
<tr>
<td>-addImports</td>
<td>Optional. The name of one or more existing shared libraries to import into this shared library. Separate each name string from the next with a space. You can specify the maximum or minimum version, or both, of the library to import.</td>
</tr>
<tr>
<td>-removeImports</td>
<td>Optional. The name of one or more existing shared libraries to remove from this shared library. You can specify the maximum or minimum version, or both, of the library to remove.</td>
</tr>
</tbody>
</table>

### Viewing the Contents of a Shared Library

Use the `-describeSharedLibrary` command to view the code sources and imported shared libraries that compose the specified shared library. The syntax follows:

```
java -jar admin_client.jar uri adminId adminPassword -describeSharedLibrary
-name libName -version libVersion
```

### Table 6–14 -describeSharedLibrary Command Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-name</td>
<td>Required. The name of the shared library.</td>
</tr>
<tr>
<td>-version</td>
<td>Required. The version number of the shared library.</td>
</tr>
</tbody>
</table>
Listing All Shared Libraries

Use the `-listSharedLibraries` command to output a list of all shared libraries defined in the target OC4J instance or instances. The syntax follows:

```
java -jar admin_client.jar uri adminId adminPassword -listSharedLibraries
```

**Note:** If you are using JDK1.4, Oracle Application Server 10g Release 3 (10.1.3.4.0) does not support using the Xalan library shipped with the JDK as a shared library. To use the Xalan library, you have two alternatives:

- Use JDK 5.0 (JDK 1.5) or JDK 6, in which the embedded Xalan library *is* supported as a shared library.
- With JDK1.4, use a standalone distribution of the Xalan library instead of the embedded version.

Removing a Shared Library

Use the `-removeSharedLibrary` command to remove a shared library from the OC4J target. The syntax of this command follows:

```
java -jar admin_client.jar uri adminId adminPassword -removeSharedLibrary
-name libName -version libVersion
```

**Table 6-15 -removeSharedLibrary Command Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>-name</code></td>
<td>Required. The name of the shared library to remove.</td>
</tr>
<tr>
<td><code>-version</code></td>
<td>Required. The version number of the shared library to remove.</td>
</tr>
</tbody>
</table>

Starting, Restarting, and Stopping Applications

You can use the `admin_client.jar` utility to start, restart, or stop an application and its child applications in a specific OC4J instance or in a group of OC4J instances. If a file within the application has been modified, the application will be automatically redeployed at startup.

You can even stop and start Application Server Control (`ascontrol`) with these commands.

The syntax of this command follows:

```
java -jar admin_client.jar uri adminId adminPassword -start|-stop appName
```

The following example stops the `ascontrol` application on `node2` within the cluster:

```
```

Restarting and Stopping OC4J Instances

You can use the `admin_client.jar` utility to stop a standalone OC4J server, a specific OC4J instance in a managed environment, or a group of OC4J instances. The `-shutdown` command shuts down the specified OC4J instance or instances and for any OPMN-managed instance, notifies OPMN that it is being shut down. The `-restart` command restarts the specified instance or instances.
Managing Data Sources

The following topics provide the syntax and examples for these commands:

- Restarting an OC4J Instance or Group of Instances
- Stopping an OC4J Instance or Instances

**Restarting an OC4J Instance or Group of Instances**

Use the `admin_client.jar -restart` command, as follows, to restart an OC4J instance or group of OC4J instances:

```java
java -jar admin_client.jar uri adminId adminPassword -restart
```

For example, the following command restarts a standalone OC4J server:

```java
java -jar admin_client.jar deployer:oc4j:localhost oc4jadmin password -restart
```

The following command restarts all of the OC4J instances that are members of `default_group` in each Oracle Application Server within the cluster topology:

```java
java -jar admin_client.jar deployer:cluster:opmn://node1.company.com/default_group oc4jadmin password -restart
```

**Stopping an OC4J Instance or Instances**

Use the `admin_client.jar -shutdown` command, as follows, to stop an OC4J instance or group of OC4J instances:

```java
java -jar admin_client.jar uri adminId adminPassword -shutdown
```

For example, the following command stops a standalone OC4J server:

```java
java -jar admin_client.jar deployer:oc4j:localhost oc4jadmin password -shutdown
```

This command shuts down the entire OC4J server, terminating all threads immediately, as if the host machine were unplugged. If you use this command, the current state for clustered applications will not be replicated.

The following command stops the specified OC4J instance in an OPMN-managed Oracle Application Server environment:

```java
java -jar admin_client.jar deployer:oc4j:opmn://localhost/home oc4jadmin password -shutdown
```

The next command stops all of the OC4J instances that are members of `default_group` in each Oracle Application Server within the cluster topology:

```java
java -jar admin_client.jar deployer:cluster:opmn://node1.company.com/default_group oc4jadmin password -shutdown
```

These commands shut down the specified instance or instances and terminate all threads immediately. If you use the `-shutdown` command, the current state for clustered applications will not be replicated. For each OPMN-managed OC4J instance, `admin_client.jar` notifies OPMN that the server is being shut down on purpose, to prevent OPMN from attempting to restart it.

**Managing Data Sources**

You can use the `admin_client.jar` utility to manage data sources in an OC4J instance or in a group of OC4J instances, as the following topics describe:

- Adding, Testing, and Removing Data Source Connection Pools
Adding, Testing, and Removing Data Sources

Adding, Testing, and Removing Data Source Connection Pools

You can use the `admin_client.jar` utility to add, test, and remove data source connection pools in an OC4J instance or in a group of OC4J instances, as the following topics describe:

- Adding a Data Source Connection Pool
- Testing a Data Source Connection Pool
- Removing a Data Source Connection Pool

Adding a Data Source Connection Pool

Use the `-addDataSourceConnectionPool` command to add a data source connection pool for an application in an OC4J instance or in each OC4J instance of a group within a cluster.

The syntax for adding a data source connection pool follows:

```
java -jar admin_client.jar uri adminId adminPassword -addDataSourceConnectionPool
  -applicationName applicationName -name name -factoryClass factoryClass
  -dbUser dbUser -dbPassword dbPassword -url url
  [-factoryProperties name1 value1 [name2 value2 [...]]]
```

For example:

```
java -jar admin_client.jar deployer:oc4j:localhost oc4jadmin welcome1
  -addDataSourceConnectionPool -applicationName default -name ScottConnectionPool
  -factoryClass oracle.jdbc.pool.OracleDataSource
  -dbUser scott -dbPassword tiger -url jdbc:oracle:thin:@localhost:1521:xe
```

<table>
<thead>
<tr>
<th>Table 6-16 -addDataSourceConnectionPool Command Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>-applicationName</td>
</tr>
<tr>
<td>-name</td>
</tr>
<tr>
<td>-factoryClass</td>
</tr>
<tr>
<td>-dbUser</td>
</tr>
<tr>
<td>-dbPassword</td>
</tr>
<tr>
<td>-url</td>
</tr>
<tr>
<td>-factoryProperties</td>
</tr>
</tbody>
</table>

Testing a Data Source Connection Pool

Use the `-testDataSourceConnectionPool` command to test an application’s connection to a data source connection pool in an OC4J instance or in each OC4J instance of a group within a cluster.

The syntax for testing a connection to a data source connection pool follows:

```
java -jar admin_client.jar uri adminId adminPassword -testDataSourceConnectionPool
  -name name -sqlStatement sqlStatement [-applicationName applicationName]
  [-dbUser dbUser] [-dbPassword dbPassword]
```
For example:

```java
java -jar admin_client.jar deployer:oc4j:localhost oc4jadmin welcome1
-testDataSourceConnectionPool -sqlStatement "select * from dual"
-applicationName default -name ScottConnectionPool
```

### Table 6–17  -testDataSourceConnectionPool Command Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>-name</code></td>
<td>Required. The name of the connection pool.</td>
</tr>
<tr>
<td><code>-sqlStatement</code></td>
<td>Required. The SQL statement to use to test the connection</td>
</tr>
<tr>
<td><code>-applicationName</code></td>
<td>Optional. The name of the application for which to test the data source connection pool.</td>
</tr>
<tr>
<td><code>-dbUser</code></td>
<td>Optional. The default user name to use to get connections.</td>
</tr>
<tr>
<td><code>-dbPassword</code></td>
<td>Optional. The default password to use to get connections.</td>
</tr>
</tbody>
</table>

### Removing a Data Source Connection Pool

Use the `-removeDataSourceConnectionPool` command to remove a data source connection pool from an application in an OC4J instance or in each OC4J instance of a group within a cluster. The syntax for removing a data source connection pool follows:

```java
java -jar admin_client.jar uri adminId adminPassword
-removeDataSourceConnectionPool -name name [-applicationName applicationName]
```

For example:

```java
java -jar admin_client.jar deployer:oc4j:localhost oc4jadmin welcome1
-removeDataSourceConnectionPool -name ScottConnectionPool -applicationName default
```

### Table 6–18  -removeDataSourceConnectionPool Command Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>-name</code></td>
<td>Required. The name of the connection pool.</td>
</tr>
<tr>
<td><code>-applicationName</code></td>
<td>Optional. The name of the application from which to remove the data source connection pool.</td>
</tr>
</tbody>
</table>

### Adding, Testing, and Removing Data Sources

You can use the `admin_client.jar` utility to add, test, and remove data sources in an OC4J instance or in a group of OC4J instances, as the following topics describe:

- Adding a Managed Data Source
- Removing a Managed Data Source
- Adding a Native Data Source
- Removing a Native Data Source
- Testing a Database Connection
- Testing a Data Source
- Getting the Data Sources Descriptor for an Application
Adding a Managed Data Source

Use the \texttt{-addManagedDataSource} command to add a managed data source for an application in an OC4J instance or in each OC4J instance of a group within a cluster. The syntax for adding a managed data source follows:

\begin{verbatim}
java -jar admin_client.jar uri adminId adminPassword -addManagedDataSource
-applicationName applicationName -name name 
-jndiLocation jndiLocation -connectionPoolName connectionPoolName
[-dbUser dbUser] [-dbPassword dbPassword] [-loginTimeout loginTimeout]
[-txLevel txLevel] [-dbSchema dbSchema] [-manageLocalTransactions true|false]
\end{verbatim}

For example:

\begin{verbatim}
java -jar admin_client.jar deployer:oc4j:localhost oc4jadmin welcome1
-addManagedDataSource -applicationName default -name ScottDataSource
-jndiLocation jdbc/ScottDataSource -connectionPoolName ScottConnectionPool
\end{verbatim}

\textbf{Table 6–19 -addManagedDataSource Command Parameters}

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-applicationName</td>
<td>Required. The name of the application for which to add the data source.</td>
</tr>
<tr>
<td>-name</td>
<td>Required. The name of the data source.</td>
</tr>
<tr>
<td>-jndiLocation</td>
<td>Required. The location to use to bind the new data source into JNDI.</td>
</tr>
<tr>
<td>-connectionPoolName</td>
<td>Required. The name of the connection pool with which the data source interacts.</td>
</tr>
<tr>
<td>-dbUser</td>
<td>Optional. The default user for the new data source.</td>
</tr>
<tr>
<td>-dbPassword</td>
<td>Optional. The default password for the new data source.</td>
</tr>
<tr>
<td>-loginTimeout</td>
<td>Optional. The login timeout for the new data source.</td>
</tr>
<tr>
<td>-txLevel</td>
<td>Optional. The transaction level (local or global).</td>
</tr>
<tr>
<td>-dbSchema</td>
<td>Optional. The database schema to use if the EJB CMP implementation being used is Orion CMP. (TopLink CMP is the default.)</td>
</tr>
<tr>
<td>-manageLocalTransactions</td>
<td>Optional. Indicates whether or not OC4J should manage local transactions. The default value is true.</td>
</tr>
</tbody>
</table>

Removing a Managed Data Source

Use the \texttt{-removeManagedDataSource} command to remove a managed data source from an application in an OC4J instance or in each OC4J instance of a group within a cluster. The syntax for removing a managed data source follows:

\begin{verbatim}
java -jar admin_client.jar uri adminId adminPassword -removeManagedDataSource
-name name [-applicationName applicationName]
\end{verbatim}

For example:

\begin{verbatim}
java -jar admin_client.jar deployer:oc4j:localhost oc4jadmin welcome1
-removeManagedDataSource -name ScottDataSource -applicationName default
\end{verbatim}

\textbf{Table 6–20 -removeManagedDataSource Command Parameters}

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-name</td>
<td>Required. The name of the data source to remove.</td>
</tr>
</tbody>
</table>
### Adding a Native Data Source

Use the `-addNativeDataSource` command to add a native data source for an application in an OC4J instance or in each OC4J instance of a group within a cluster. The syntax for adding a native data source follows:

```java
java -jar admin_client.jar uri adminId adminPassword
   -addNativeDataSource -name name -dbUser dbUser -dbPassword dbPassword
   -jndiLocation jndiLocation -loginTimeout loginTimeout
   -dataSourceClass dataSourceClass -url url [-applicationName applicationName]
   [-properties name1 value1 [name2 value2 ]...]
```

For example:

```java
java -jar admin_client.jar deployer:oc4j:localhost oc4jadmin welcome1
   -addNativeDataSource -name ScottDataSource -dbUser scott -dbPassword tiger
   -jndiLocation jdbc/ScottNativeDataSource -loginTimeout 5
```

### Removing a Native Data Source

Use the `-removeNativeDataSource` command to remove a native data source from an application in an OC4J instance or in each OC4J instance of a group within a cluster. The syntax for removing a native data source follows:

```java
java -jar admin_client.jar uri adminId adminPassword
   -removeNativeDataSource -name name [-applicationName applicationName]
```

For example:

```java
java -jar admin_client.jar deployer:oc4j:localhost oc4jadmin welcome1
   -removeNativeDataSource -name ScottDataSource
```

### Table 6–21 -addNativeDataSource Command Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>-name</code></td>
<td>Required. The name of the new data source.</td>
</tr>
<tr>
<td><code>-dbUser</code></td>
<td>Required. The default user for the new data source.</td>
</tr>
<tr>
<td><code>-dbPassword</code></td>
<td>Required. The default password for the new data source.</td>
</tr>
<tr>
<td><code>-jndiLocation</code></td>
<td>Required. The location to use to bind the new data source into JNDI.</td>
</tr>
<tr>
<td><code>-loginTimeout</code></td>
<td>Required. The login timeout for the new data source.</td>
</tr>
<tr>
<td><code>-dataSourceClass</code></td>
<td>Required. The fully qualified class of the new data source.</td>
</tr>
<tr>
<td><code>-url</code></td>
<td>Required. The url used by the new data source to connect to the database.</td>
</tr>
<tr>
<td><code>-applicationName</code></td>
<td>Optional. The name of the application for which to add the data source.</td>
</tr>
<tr>
<td><code>-properties</code></td>
<td>Optional. The property or properties for the new data source.</td>
</tr>
</tbody>
</table>

### Table 6–20 (Cont.) -removeManagedDataSource Command Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>-applicationName</code></td>
<td>Optional. The name of the application from which to remove the data source.</td>
</tr>
</tbody>
</table>
**Testing a Database Connection**

Use the `-testDatabaseConnection` command to test an application’s connection to a database in an OC4J instance or in each OC4J instance of a group within a cluster.

The syntax for testing a database connection follows:

```shell
java -jar admin_client.jar uri adminId adminPassword -testDatabaseConnection -sqlStatement sqlStatement -factoryClass factoryClass -dbUser dbUser -dbPassword dbPassword -url url [-applicationName applicationName]
```

For example:

```shell
```

**Table 6–23 -testDatabaseConnection Command Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>-sqlStatement</code></td>
<td>Required. The SQL statement to use to test the connection.</td>
</tr>
<tr>
<td><code>-factoryClass</code></td>
<td>Required. The JDBC factory to test (instance of Driver, DataSource, ConnectionPoolDataSource, or XADataSource).</td>
</tr>
<tr>
<td><code>-dbUser</code></td>
<td>Required. The user name to use to test the connection.</td>
</tr>
<tr>
<td><code>-dbPassword</code></td>
<td>Required. The password to use to test the connection.</td>
</tr>
<tr>
<td><code>-url</code></td>
<td>Required. The URL to set on the JDBC factory.</td>
</tr>
<tr>
<td><code>-applicationName</code></td>
<td>Optional. The name of the application.</td>
</tr>
</tbody>
</table>

**Testing a Data Source**

Use the `-testDataSource` command to test an application’s connection to a data source in an OC4J instance or in each OC4J instance of a group within a cluster.

The syntax for testing a data source follows:

```shell
java -jar admin_client.jar uri adminId adminPassword -testDataSource -name name -sqlStatement sqlStatement [-applicationName applicationName] [-dbUser dbUser] [-dbPassword dbPassword]
```

For example:

```shell
java -jar admin_client.jar deployer:oc4j:localhost oc4jadmin welcome1 -testDataSource -name ScottDataSource -sqlStatement "select * from dual" -applicationName default -dbUser scott -dbPassword tiger
```
Managing JMS Resources

You can use the admin_client.jar utility to manage JMS resources in an OC4J instance or in a group of OC4J instances, as the following topics describe:

- Managing JMS Connection Factories
- Managing JMS Destinations

Managing JMS Connection Factories

You can use the admin_client.jar utility to manage the OC4J JMS connection factories, as the following topics describe:

- Adding a JMS Connection Factory
- Removing a JMS Connection Factory
- Getting Information About JMS Connection Factories

Adding a JMS Connection Factory

Use the -addJMSConnectionFactory command to add a JMS connection factory to an OC4J instance or to each instance of a group within a cluster. The syntax for this command follows:

```
java -jar admin_client.jar uri adminId adminPassword -addJMSConnectionFactory
-domain domain -jndiLocation jndiLocation [-host host] [-port port]
[-username username] [-password password] [-clientID clientID] [-isXA true|false]
```

For example:

```
java -jar admin_client.jar deployer:oc4j:localhost oc4jadmin welcome1
-addJMSConnectionFactory -domain Queue -jndiLocation jms/ExampleQueueCF
```
Removing a JMS Connection Factory

Use the `-removeJMSConnectionFactory` command to remove a JMS connection factory from an OC4J instance or instances. The syntax for this command follows:

```
java -jar admin_client.jar uri adminId adminPassword -removeJMSConnectionFactory -jndiLocation jndiLocation
```

For example:

```
java -jar admin_client.jar deployer:oc4j:localhost oc4jadmin welcome1 -removeJMSConnectionFactory -jndiLocation jms/ExampleQueueCF
```

Getting Information About JMS Connection Factories

Use the `-getJMSConnectionFactory` command to return the attributes for each of the JMS connection factories in an OC4J instance or in a group of OC4J instances within a cluster. The syntax for this command follows:

```
java -jar admin_client.jar uri adminId adminPassword -getJMSConnectionFactory
```

For example:

```
java -jar admin_client.jar deployer:oc4j:localhost oc4jadmin welcome1 -getJMSConnectionFactory
```

Managing JMS Destinations

You can use the `admin_client.jar` utility to manage the OC4J JMS destinations, as the following topics describe:

- Adding a JMS Destination
- Removing a JMS Destination
- Getting Information About JMS Destinations

Adding a JMS Destination
Use the -addDestination command to add a JMS destination. The syntax for this command follows:

```java
java -jar admin_client.jar uri adminId adminPassword -addDestination
   -domain domain -name name -jndiLocation jndiLocation [-persistenceFile persistenceFile] [-description description]
```

For example:

```java
java -jar admin_client.jar deployer:oc4j:localhost oc4jadmin welcome1
   -addDestination -domain Queue -name ExampleQueue -jndiLocation jms/ExampleQueue
```

**Table 6–28  -addDestination Command Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-domain</td>
<td>Required. The JMS domain of this destination (&quot;QUEUE&quot; or &quot;TOPIC&quot;).</td>
</tr>
<tr>
<td>-name</td>
<td>Required. The OC4J JMS provider-specific name of the destination.</td>
</tr>
<tr>
<td>-jndiLocation</td>
<td>Required. The JNDI location to which this destination will be bound.</td>
</tr>
<tr>
<td>-persistenceFile</td>
<td>Optional. The persistence file associated with this destination</td>
</tr>
<tr>
<td></td>
<td>(defaults to null).</td>
</tr>
<tr>
<td>-description</td>
<td>Optional. A textual description of this destination (defaults to null).</td>
</tr>
</tbody>
</table>

Removing a JMS Destination
Use the -removeDestination command to remove a JMS destination from an OC4J instance or from each OC4J instance in a group. The syntax for this command follows:

```java
java -jar admin_client.jar uri adminId adminPassword -removeDestination
   -name name [-force true|false] [-removePFile true|false]
```

For example:

```java
java -jar admin_client.jar deployer:oc4j:localhost oc4jadmin welcome1
   -removeDestination -name ExampleQueue -removePFile true
```

**Table 6–29  -removeDestination Command Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-name</td>
<td>Required. The OC4J JMS provider-specific name of the destination to remove.</td>
</tr>
<tr>
<td>-force</td>
<td>Optional. Removes the destination regardless of whether messages or consumers exist on it (defaults to false).</td>
</tr>
<tr>
<td>-removePFile</td>
<td>Optional. Removes the persistence file from the file system (defaults to false).</td>
</tr>
</tbody>
</table>
Getting Information About JMS Destinations
Use the \texttt{-getDestinations} command to return the attributes for each of the OC4J JMS destinations from an OC4J instance or from each OC4J instance in a group. The syntax for this command follows:

\texttt{java -jar admin\_client.jar uri adminId adminPassword -getDestinations}

For example:

\texttt{java -jar admin\_client.jar deployer:oc4j:localhost oc4jadmin welcome1 -getDestinations}

Managing OC4J Through a Remote Client
You can use a remote client to manage OC4J after you install the files from the remote Administrative Client Utility, as described in "Downloading and Extracting the Remote Administration Client" on page 6-5. Then you can use \texttt{admin\_client.jar} through the command-line tool or the JMX Remote API.

Using \texttt{admin\_client.jar} Commands Remotely
After you connect to an OC4J application server target, as explained in "Downloading and Extracting the Remote Administration Client" on page 6-5, you can issue \texttt{admin\_client.jar} commands from a remote client. Use the same syntax that you would use from within an OC4J instance.

Connecting to a Remote Oracle Application Server Instance Using JConsole
JConsole is a JMX GUI console included in JDK 5.0. JConsole can connect to any JVM and hook into its running MBeanServer, displaying a series of pages on which various system details such as Thread and Memory usage of the JVM are displayed. JConsole can connect to a local JVM, or it can use the JMX Remote API and connect to a remote JVM.

The Administrative Client Utility distribution contains the libraries required to enable JConsole to connect to a remote OC4J or Oracle Application Server instance. To connect to the target instance, the JConsole utility (which is provided as a native executable in a Windows environment) needs to be configured with the relevant details of the Administrative Client Utility distribution.

To connect to an Oracle Application Server instance:
\begin{enumerate}
\item Add \texttt{/j2ee/instance/admin\_client.jar} to the \texttt{CLASSPATH} environment variable:
  \begin{verbatim}
  set CLASSPATH=j2ee/home/admin\_client.jar
  \end{verbatim}
\item Add the JConsole libraries to the \texttt{CLASSPATH} environment variable:
  \begin{verbatim}
  set CLASSPATH=\%CLASSPATH\%;\JAVA\_HOME\%\lib\jconsole.jar
  set CLASSPATH=\%CLASSPATH\%;\JAVA\_HOME\%\lib\tools.jar
  \end{verbatim}
\item Configure the JMX connector to use the OC4J ORMI protocol:
  \begin{verbatim}
  set PROPS=jmx.remote.protocol.provider.pkgs=oracle.oc4j.admin.jmx.remote
  \end{verbatim}
\item Run \texttt{jconsole}:
  \begin{verbatim}
  %JAVA\_HOME\%\bin\jconsole
  -J-Djava.class.path=\%CLASSPATH\%
  \end{verbatim}
\end{enumerate}
Managing OC4J Through a Remote Client

Using the admin_client.jar Utility

5. On the Advanced tab of the Connect to Agent screen, enter the connect string for the OC4J or Oracle Application Server target as well as the administration user name and password for the target.

The pattern of the JMX URL is different for OC4J targets from the pattern for Oracle Application Server targets. Table 6–30 shows examples of these URL patterns.

<table>
<thead>
<tr>
<th>Target</th>
<th>JMX URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>OC4J Instance on Oracle Application Server</td>
<td>service:jmx:ormi://opmn://test-cycle.oracle.com:6010/test1</td>
</tr>
<tr>
<td>Oracle Application Server Cluster</td>
<td>service:jmx:rmis:///opmn://stadp69:6003/cluster/as101/admin</td>
</tr>
</tbody>
</table>

6. The JConsole utility will show the OC4J MBeans from the target instance. These MBeans can be used to view and manage the configuration of the OC4J instance.

In a Windows environment, the environment used by JConsole can be modified by using a special System property form:

```
-J-Dname=value
```

A sample command script follows:

```
setlocal

set URL=service:jmx:rmi://test-cycle.oracle.com:6010/testunit
set JAVA_HOME=C:\java\jdk150_07
set JCONSOLE_CP
set JCONSOLE_CP=\%JCONSOLE_CP%;\%JAVA_HOME%\lib\jconsole.jar
set JCONSOLE_CP=\%JCONSOLE_CP%;\%JAVA_HOME%\lib\tools.jar

set ORACLE_HOME=D:\oc4j_admin_client
set ORACLE_CP=
set ORACLE_CP=\%ORACLE_CP%;\%ORACLE_HOME%\j2ee\home\admin_client.jar;

set CLASSPATH=\%JCONSOLE_CP%;\%ORACLE_CP%
set PROPS=
set PROPS=\%PROPS% -J-Djmx.remote.protocol.provider.pkgs=oracle.oc4j.admin.jmx.remote

set PROPS=\%PROPS% -J-Djava.class.path=\%CLASSPATH%

jconsole \%PROPS% %URL%
```
endlocal

Using a JMX Programmatic Client to Manage OC4J Remotely

The Administrative Client Utility distribution provides a full client environment for JMX client applications to connect to remote OC4J instances. You can use a JMX programmatic client to manage OC4J remotely through the JMX Remote API (JSR160), which can establish a connection to the MBeanServer. The only JAR files you need to run with JDK 5.0 are oc4jclient.jar and admin_client.jar, which the Administrative Client Utility distribution provides.

The following example uses these JAR files with the JMX API:

```java
// A URL is of the form "service:jmx:rmi://127.0.0.1:23791"
JMXServiceURL serviceURL = new JMXServiceURL(_url);

Hashtable credentials = new Hashtable();
credentials.put("login", _username);
credentials.put("password", _password);

// Properties required to use the OC4J ORMI protocol
Hashtable env = new Hashtable();
env.put(JMXConnectorFactory.PROTOCOL_PROVIDER_PACKAGES,
"oracle.oc4j.admin.jmx.remote");
env.put(JMXConnectorFactory.CREDENTIALS, credentials);
JMXConnector jmxCon =
JMXConnectorFactory.newJMXConnector(serviceURL, env);
jmxCon.connect();

MBeanServerConnection mbeanServer =
jmxCon.getMBeanServerConnection();
```

In JDK 5.0 this code compiles with no Oracle libraries required, just the libraries provided by the JDK:

clear
@echo off
@setlocal

set J2EE_HOME=c:\java\oc4j-1013-prod\j2ee\home
set JAVA_HOME=c:\java\jdk50
set CLASSPATH=.

rem
rem Uncomment below if using JDK14
rem set CLASSPATH=%CLASSPATH%;%J2EE_HOME%\lib\jmxri.jar
rem set CLASSPATH=%CLASSPATH%;%J2EE_HOME%\lib\jmx_remote_api.jar
rem set CLASSPATH=%CLASSPATH%;%J2EE_HOME%\lib\javax77.jar
rem

%JAVA_HOME%\bin\javac -classpath %CLASSPATH% -d . *.java
@endlocal

To run the code with the oc4j_admin_client_101340.zip distribution:

1. Create a runnable JAR file.
2. Drop the JAR file into the j2ee/home directory of the Administrative Client Utility distribution.
3. Connect to a remote OC4J instance.
The code runs in JDK 5.0 with $ORACLE_HOME/j2ee/home/oc4jclient.jar and
$ORACLE_HOME/j2ee/home/admin_client.jar:

```
@echo off
@setlocal
clear
set J2EE_HOME=c:\java\oc4j-1013-prod\j2ee\home
set JAVA_HOME=c:\java\jdk50

rem Runtime classpath
set CLASSPATH=.  
set CLASSPATH=%CLASSPATH%;%J2EE_HOME%\oc4jclient.jar;
set CLASSPATH=%CLASSPATH%;%J2EE_HOME%\admin_client.jar;

rem
rem Uncomment if using JDK14
rem set CLASSPATH=%CLASSPATH%;%J2EE_HOME%\lib\jmxri.jar
rem set CLASSPATH=%CLASSPATH%;%J2EE_HOME%\lib\jmx_remote_api.jar
rem set CLASSPATH=%CLASSPATH%;%J2EE_HOME%\lib\javax77.jar
@endlocal
```

The connection URL in the main method of the example is set to connect to a local
OC4J instance. If you want to connect to Oracle Application Server through an ORMI
port, use a Service URL of the following form:

```
service:jmx:rmi|ormi:///opmn://stadp57.us.oracle.com:6003/home
```

A service URL will obtain the ORMI port from the OPMN daemon. The ORMI port is
assigned at runtime. Using the OPMN connection string path will connect you to the
specified OC4J instance.

For more information about how to use a JMX client to manage OC4J instances
remotely, see "Remote Management Using the JMX Remote API (JSR-160)" in the
Oracle Containers for J2EE Developer's Guide.
OC4J provides a command-line utility called *admin.jar* that can be used to perform operations on an active OC4J instance in a standalone OC4J installation. Among other things, you can use this utility to stop and restart OC4J, deploy applications, and gather information on current resource usage.

This chapter includes the following topics:

- **Overview of *admin.jar* Usage**
- **Managing a Standalone OC4J Instance**
- **Deploying or Undeploying Applications**
- **Managing Applications**
- **Managing Data Sources**
- **Deploying or Undeploying Connectors**

### Overview of *admin.jar* Usage

The *admin.jar* utility is installed by default in `ORACLE_HOME/j2ee/home` in a standalone OC4J instance.

OC4J must be started before this utility can be used, except for converting data sources, as "Converting Existing Data Sources to the New Configuration" on page 7-10 describes. Also, the utility cannot be used to start OC4J, although it can be used to stop and then restart an instance, as "Stopping and Restarting OC4J in a Standalone Environment" on page 7-3 describes.

This section covers the following topics:

- **Understanding the *admin.jar* Syntax**
- **Printing Help Text to the Console**
**Overview of admin.jar Usage**

Understanding the admin.jar Syntax

The admin.jar utility uses the following syntax. The parameters are described in Table 7–1.

```
java -jar admin.jar ormi://oc4jHost:oc4jOrmiPort adminId adminPassword options
```

As an example, the following command will force a graceful shutdown of the OC4J server. The value supplied for `oc4jOrmiPort` is the default, 23791. The user name supplied for `adminId` is the user name for the default administrator account, `oc4jadmin`.

```
java -jar admin.jar ormi://localhost:23791 oc4jadmin password -shutdown
```

Some of these commands include an `-application` parameter that takes the name of the application to affect. The value is the name of the specific application to affect, as defined within the appropriate `<application>` element in the server.xml configuration file.

Table 7–1 Setting the Host and Login Information

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>oc4jHost:oc4jOrmiPort</code></td>
<td>The host name and port number for the OC4J server on which you are invoking admin.jar.</td>
</tr>
<tr>
<td></td>
<td>The admin.jar tool uses the OC4J Remote Method Invocation (ORMI) protocol to communicate with the OC4J server. Therefore, the host and port identified by these variables are defined in the rmi.xml file for the OC4J server to which you are directing the request.</td>
</tr>
<tr>
<td></td>
<td>The OC4J default port for the ORMI protocol is 23791. This value can be omitted if not changed. Configure both the host name and port number, if not using the default, in the rmi.xml file in the <code>&lt;rmi-server&gt;</code> element, as follows:</td>
</tr>
<tr>
<td></td>
<td><code>&lt;rmi-server port=&quot;oc4jOrmiPort&quot; host=&quot;oc4jHost&quot; /&gt;</code></td>
</tr>
<tr>
<td><code>adminId</code> <code>adminPassword</code></td>
<td>The OC4J administration user name and password. The user name for the default administrator account is <code>oc4jadmin</code>.</td>
</tr>
</tbody>
</table>

Printing Help Text to the Console

To print the online help text for the admin.jar commands to the console, simply type `-help` after `oc4jHost:oc4jOrmiPort adminId adminPassword`. For example:

```
java -jar admin.jar ormi://localhost:23791 oc4jadmin password -help
```
Managing a Standalone OC4J Instance

This section outlines the functionality provided by admin.jar for managing an OC4J server. It includes the following sections:

- Stopping and Restarting OC4J in a Standalone Environment
- Forcing OC4J to Check for Modified Files

Stopping and Restarting OC4J in a Standalone Environment

You can use admin.jar to shut down a standalone instance of the OC4J server and then restart it.

The following command forces a shutdown of the OC4J server, which terminates all threads immediately. The string entered as the reason for the shutdown is written to the server log file, ORACLE_HOME/j2ee/home/log/server.log.

```
java -jar admin.jar ormi://localhost:23791 oc4jadmin password -shutdown force need_to_reboot_host_machine
```

Forcing OC4J to Check for Modified Files

You can force OC4J to check the server directory structure for modified files and reload any that have changed, using the -updateConfig option.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-shutdown</td>
<td>Shuts down the OC4J server.</td>
</tr>
<tr>
<td>[ordinary</td>
<td>force]:</td>
</tr>
<tr>
<td>[reason]:</td>
<td>You can optionally specify a reason for the shutdown as a string that is written to the ORACLE_HOME/j2ee/home/log/server.log file. Spaces are not allowed in the string.</td>
</tr>
<tr>
<td>-restart</td>
<td>Restarts the OC4J server. The container must have been started with oc4j.jar.</td>
</tr>
<tr>
<td>[reason]:</td>
<td>You can optionally specify a reason for the restart as a string that is written to the ORACLE_HOME/j2ee/home/log/server.log file. Spaces are not allowed in the string.</td>
</tr>
<tr>
<td>-version</td>
<td>Prints the installed version of OC4J to the console, then exits.</td>
</tr>
</tbody>
</table>

Note: The value of the checkForUpdates flag must be set to either all or adminClientOnly (the default setting) to use this feature. See Oracle Containers for J2EE Deployment Guide for details on the checkForUpdates flag.
Deploying or Undeploying Applications

You can use admin.jar to deploy or undeploy J2EE applications to or from a standalone OC4J instance.

### Notes:
- admin.jar cannot be used to deploy applications to an OPMN-managed OC4J instance.
- admin.jar supports deployment of EAR files only. It does not allow deployment of standalone modules, such as a Web module packaged in a WAR file.
- admin.jar does not accept a deployment plan. Any archive deployed using this utility must include the required OC4J-specific deployment descriptor files, such as orion-application.xml or orion-web.xml.

Deploying an application is a two-step process: You must first deploy the archive to OC4J, then bind the Web module to the Web site that will be used to access the application.

The -deploy command is first used to deploy the application:

```
java -jar admin.jar ormi://oc4jHost:oc4jOrmiPort adminId adminPassword
-deploy -file path/filename -deploymentName appName -targetPath deploy_dir
```

Once the archive is deployed, the -bindWebApp command is used to bind a Web application to the Web site it will be accessed through:

```
java -jar admin.jar ormi://oc4jHost:oc4jOrmiPort adminId adminPassword
-bindWebApp appName webAppName webSiteName contextRoot
```

For example, the following command deploys the utility application to OC4J:

```
java -jar admin.jar ormi://localhost:23791 oc4jadmin password -deploy
-file utility.ear -deploymentName utility
```

Next, the following example binds the utility application and its utility-web Web module to the default OC4J Web site:

```
java -jar admin.jar ormi://localhost:23791 oc4jadmin password
-bindwebapp utility utility-web default-web-site /utility
```
### Options for Application Deployment

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>-deploy</code></td>
<td>Deploys an application. Supply relevant information using the following parameters:</td>
</tr>
<tr>
<td><code>-file filename</code></td>
<td>Required. The path and file name of the EAR file to deploy.</td>
</tr>
<tr>
<td><code>-deploymentName appName</code></td>
<td>Required. The user-defined application deployment name. This same name is used to identify the application within OC4J. It is also provided when you want to undeploy the application.</td>
</tr>
<tr>
<td><code>-targetPath path</code></td>
<td>Optional. The path on the server node to deploy the EAR to. If not specified, the EAR is deployed to the <code>ORACLE_HOME/j2ee/instance/applications</code> directory by default. The deployed EAR file is also copied to this directory. Each successive deployment will cause this EAR file to be overwritten.</td>
</tr>
<tr>
<td><code>-parent appName</code></td>
<td>Optional. The parent application of this application. When deployed, any method within the child application can invoke any method within the parent application. In no parent is specified, the default application serves as the default parent.</td>
</tr>
<tr>
<td><code>-deploymentDirectory path</code></td>
<td>Optional. The directory containing the OC4J-specific deployment descriptors and generated files, such as compiled JSP classes and EJB wrapper classes. The default directory is <code>ORACLE_HOME/j2ee/instance/application-deployments</code>.</td>
</tr>
<tr>
<td><code>-iiopClientJar path/filename</code></td>
<td>Optional. Include to generate IIOP stubs for the home, remote and local interfaces packaged within each EJB JAR included in the EAR. You can optionally specify the path and file name of the JAR to output the generated stubs to. Otherwise, copies of the stubs will be output to an archive named <code>_iiopClient.jar</code> in a new subdirectory with the same name as the deployed EJB JAR in <code>ORACLE_HOME/j2ee/home/app-name/application-deployments/</code>. Note that the <code>GenerateIIOP</code> system property must be enabled at OC4J startup to use this feature. For example: <code>java -DGenerateIIOP=true -jar oc4j.jar</code></td>
</tr>
</tbody>
</table>
Managing Applications

This section outlines the functionality provided by admin.jar for managing applications in a standalone OC4J instance. It includes the following sections:

- Starting, Stopping, or Restarting an Application
- Updating an EJB Module Within an Application

Starting, Stopping, or Restarting an Application

You can use admin.jar to start, stop, or restart an application that has been stopped in a standalone OC4J instance.

The following example restarts a specific application running on OC4J. If a file within the application has been modified, the application or module will be automatically redeployed.

```
java -jar admin.jar ormi://localhost:23791 oc4jadmin password -application myapplication -restart
```

Table 7–4 (Cont.) Options for Application Deployment

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-bindWebApp</td>
<td>Binds a Web application to the specified Web site and context root.</td>
</tr>
<tr>
<td></td>
<td>- appName:</td>
</tr>
<tr>
<td></td>
<td>The application name, which is the same name set as the value for -deploymentName in the -deploy option.</td>
</tr>
<tr>
<td></td>
<td>- webAppName:</td>
</tr>
<tr>
<td></td>
<td>The name of the Web module. This should be the name of the WAR file contained within the EAR file, without the .WAR extension.</td>
</tr>
<tr>
<td></td>
<td>- webSiteName:</td>
</tr>
<tr>
<td></td>
<td>The name of the name_web-site.xml file that denotes the Web site that this Web application should be bound to.</td>
</tr>
<tr>
<td></td>
<td>- contextRoot:</td>
</tr>
<tr>
<td></td>
<td>The context root for the Web module. This value will be appended to the URL used to access the application through a Web browser; for example <a href="http://localhost:8888/utility">http://localhost:8888/utility</a>.</td>
</tr>
<tr>
<td>-undeploy appName</td>
<td>Removes the deployed J2EE application from the OC4J instance. The value of appName is the name of the application within OC4J, as defined in an application element within ORACLE_HOME/j2ee/home/config/server.xml.</td>
</tr>
<tr>
<td></td>
<td>Undeploying an application results in the following:</td>
</tr>
<tr>
<td></td>
<td>- The application is removed from the OC4J runtime and the server.xml file.</td>
</tr>
<tr>
<td></td>
<td>- Bindings for all the application’s Web modules are removed from all the Web sites to which the Web modules were bound.</td>
</tr>
<tr>
<td></td>
<td>- Application files are removed from both the applications and application-deployments directories.</td>
</tr>
<tr>
<td></td>
<td>The optional -keepFiles parameter is deprecated in OC4J 10g (10.1.3.4.0).</td>
</tr>
</tbody>
</table>

Managing Applications

This section outlines the functionality provided by admin.jar for managing applications in a standalone OC4J instance. It includes the following sections:

- Starting, Stopping, or Restarting an Application
- Updating an EJB Module Within an Application
Managing Applications

Using the admin.jar Utility

Updating an EJB Module Within an Application

The admin.jar utility includes an -updateEJBModule option that enables incremental or partial redeployment of EJB modules within an application running in an OC4J instance. This option is primarily intended to be used by an application developer to redeploy the JAR file directly from a development environment.

The syntax follows:

```
java -jar admin.jar ormi://oc4jHost:oc4jOrmiPort adminId adminPassword
    -application appName -updateEJBModule relativePath [-file path/ ejbJarName]
```

For example, the following commands can be used to update the customerEjb.jar module of the petstore application. Assume the following directory structure on the developer's machine:

```
/work
    /src  - application source code
    /build - compiled class files
    /dist  - assembled EAR and JAR files
```

If the updated EJB JAR is in the /dist directory, in a location matching the relative path defined in the application's application.xml J2EE standard deployment descriptor, the following command could be issued from the /dist directory:

```
java -jar $ORACLE_HOME/admin.jar ormi://myoc4jserver:23791 oc4jadmin password
    -application petstore -updateEJBModule customerEjb.jar
```

If the updated file is located within the /build directory, the following command specifying the JAR location in the -file option can be issued from the /dist directory:

```
java -jar admin.jar ormi://myoc4jserver:23791 oc4jadmin password
    -application petstore -updateEJBModule customerEjb.jar -file build/customerEjb.jar
```

Table 7–5 Options for Application Restart

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-application</td>
<td>Starts the specified application and any child applications.</td>
</tr>
<tr>
<td>appName - start</td>
<td></td>
</tr>
<tr>
<td>-application</td>
<td>Stops the specified application and any child applications.</td>
</tr>
<tr>
<td>appName - stop</td>
<td></td>
</tr>
<tr>
<td>-application</td>
<td>Restarts the specified application and any child applications.</td>
</tr>
<tr>
<td>appName - restart</td>
<td>If OC4J polling is enabled and a file within the application has been modified, the application will be redeployed.</td>
</tr>
</tbody>
</table>

Note: Incremental redeployment may be more efficient than redeploying the entire application for CMP or BMP entity beans but not for session beans, message-driven beans, or EJB 3.0 JPA entities. For details about whether to use this feature, see "Incremental Redeployment of Updated EJB Modules" in the Oracle Containers for J2EE Deployment Guide.
Managing Data Sources

Use `admin.jar` to create, remove, list or test data sources for a specific application. You can also convert a pre-10.1.3 `data-sources.xml` file to the new file format.

Creating an Application-Specific Data Source

The syntax of the `-installDataSource` option, which configures a new application-specific data source, is as follows:

```
java -jar admin.jar ormi://oc4jHost:oc4jOrmiPort adminId adminPassword -application appName -installDataSource -jar path -url url -location jndiName [-pooledLocation jndiName] [-xaLocation jndiName] [-ejbLocation jndiName] -username name -password password [-connectionDriver className] -className className [-sourceLocation jndiName][-xaSourceLocation jndiName]
```

An example follows:

```
```
Managing Data Sources

Using the admin.jar Utility

7-9

Listing, Testing, and Removing Existing Data Sources

You can use admin.jar to list, test or even delete data sources tied to a specific application.

Table 7–7 Options for Data Source Management

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-application appName</td>
<td>Installs a new data source for the specified application. Supply data source information within the following parameters:</td>
</tr>
<tr>
<td>-installDataSource</td>
<td>Required. The path to the JAR file containing the JDBC driver that is to be added to the OC4J server.</td>
</tr>
<tr>
<td>-url url:</td>
<td>Required. The JDBC database URL.</td>
</tr>
<tr>
<td>-location jndiName:</td>
<td>Required. The JNDI name for the raw data source. For example, &quot;jdbc/DefaultPooledDS&quot;.</td>
</tr>
<tr>
<td>-pooledLocation jndiName:</td>
<td>Optional. The JNDI name for the pooled data source. For example, &quot;jdbc/DefaultPooledDS&quot;.</td>
</tr>
<tr>
<td>-xaLocation jndiName:</td>
<td>Optional. The JNDI name for the XA source. For example, &quot;jdbc/xa/DefaultXADS&quot;. Required if -ejbLocation is specified.</td>
</tr>
<tr>
<td>-ejbLocation jndiName:</td>
<td>Optional. The JNDI name for the container-managed transactional data source. This is the only data source that can perform global JTA transactions. For example, &quot;jdbc/DefaultDS&quot;.</td>
</tr>
<tr>
<td>-username name:</td>
<td>Required. The user name to log in to the database.</td>
</tr>
<tr>
<td>-password password:</td>
<td>Required. The password to log in to the database.</td>
</tr>
<tr>
<td>-connectionDriver className:</td>
<td>Optional. The JDBC database driver class.</td>
</tr>
<tr>
<td>-className className</td>
<td>Required. The data source class name, such as oracle.jdbc.pool.OracleDataSource.</td>
</tr>
<tr>
<td>-sourceLocation jndiName:</td>
<td>Optional. The JNDI name of the underlying data source of this special special data source.</td>
</tr>
<tr>
<td>-xaSourceLocation jndiName:</td>
<td>Optional. The JNDI name of the underlying XA data source of this special special data source.</td>
</tr>
</tbody>
</table>

Table 7–8 Options for Application and Data Source Management

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-application appName</td>
<td>Retrieves the statically configured information about each installed data source object.</td>
</tr>
</tbody>
</table>
The OC4J 10\textsuperscript{g} (10.1.3.4.0) implementation understands the 10.1.3 and the pre-10.1.3 (10.1.2 and 9.0.4) formats of the data-sources.xml file. For an application that was used in a pre-10.1.3 OC4J implementation and contains its own data-sources.xml file, the OC4J 10\textsuperscript{g} (10.1.3.4.0) implementation automatically converts the data-sources.xml file from the pre-10.1.3 format to the 10.1.3 format when you use Application Server Control to change anything in the data-sources.xml file, such as modifying an existing data source or creating or deleting a data source.

Converting a data-sources.xml File with Standalone OC4J Running or Not Running

The \texttt{-convertDataSourceConfiguration} option of the admin.jar command converts a pre-10.1.3 data-sources.xml file to the new file format.

With an active OC4J instance in a standalone environment, you can use admin.jar with the following syntax to manually convert a pre-10.1.3 data-sources.xml file to the 10.1.3 format.

\begin{verbatim}
java -jar admin.jar ormi://oc4jHost:oc4jOrmiPort adminId adminPassword
    -convertDataSourceConfiguration old-data-sources.xml new-data-sources.xml
\end{verbatim}

For example, the following command converts an existing configuration and writes it to a new file:

\begin{verbatim}
java -jar admin.jar ormi://localhost:23791 oc4jadmin password
    -convertDataSourceConfiguration C:\oc4j\j2ee\home\config\data-sources.xml
    C:\new\data-sources.xml
\end{verbatim}

Ideally, you should rename the old data-sources.xml after the conversion, rather than delete it, as it contains information that might be needed for reference. After the new file has been generated, copy it into the directory containing the legacy file.

In the syntax, the ORMI URL is optional. You can specify an ORMI URL only when OC4J is running.

You can also convert a data-sources.xml file before deployment, without a running OC4J instance. The syntax for this offline conversion is as follows:

\begin{verbatim}
java -jar admin.jar -convertDataSourceConfiguration
    old-data-sources.xml new-data-sources.xml
\end{verbatim}

### Converting Existing Data Sources to the New Configuration

Table 7–8 (Cont.) Options for Application and Data Source Management

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>\texttt{-application_appName}</td>
<td>Tests an existing data source. Supply information with the following parameters:</td>
</tr>
<tr>
<td>\texttt{-testDataSource}</td>
<td>\texttt{-location _jndiName:} The namespace location for the data source. For example, jdbc/DefaultDS. Required.</td>
</tr>
<tr>
<td>\texttt{-application_appName}</td>
<td>\texttt{-username _name:} The user name you use to log in along with a password. Optional.</td>
</tr>
<tr>
<td>\texttt{-testDataSource}</td>
<td>\texttt{-password _password:} The password to log in with. Optional.</td>
</tr>
<tr>
<td>\texttt{-application_appName}</td>
<td>\texttt{-removeDataSource} Removes an existing data source. Supply information with the following parameter:</td>
</tr>
<tr>
<td>\texttt{-location _jndiName:}</td>
<td>The namespace location for the data source. For example, jdbc/DefaultDS. Required.</td>
</tr>
</tbody>
</table>

Tests an existing data source. Supply information with the following parameters:

- \texttt{-location \_jndiName:} The namespace location for the data source. For example, jdbc/DefaultDS. Required.
- \texttt{-username \_name:} The user name you use to log in along with a password. Optional.
- \texttt{-password \_password:} The password to log in with. Optional.

Removes an existing data source. Supply information with the following parameter:

- \texttt{-location \_jndiName:} The namespace location for the data source. For example, jdbc/DefaultDS. Required.

Converting Existing Data Sources to the New Configuration

The OC4J 10\textsuperscript{g} (10.1.3.4.0) implementation understands the 10.1.3 and the pre-10.1.3 (10.1.2 and 9.0.4) formats of the data-sources.xml file. For an application that was used in a pre-10.1.3 OC4J implementation and contains its own data-sources.xml file, the OC4J 10\textsuperscript{g} (10.1.3.4.0) implementation automatically converts the data-sources.xml file from the pre-10.1.3 format to the 10.1.3 format when you use Application Server Control to change anything in the data-sources.xml file, such as modifying an existing data source or creating or deleting a data source.
Checking Consistency Between the Application and the New data-sources.xml File

After conversion, whether manual or automatic, visually inspect the new data-sources.xml file to confirm that there is consistency between your application and the new file regarding the JNDI location used to refer to a data source.

This consistency check is advisable because the new file may contain data source definitions that are not used, which happens because the old format uses multiple location attributes (such as location, ejb-location, and xa-location). The conversion to the new 10.1.3 format creates a separate data source in the new data-sources.xml file corresponding to each location attribute specified in the old data-sources.xml file. In most cases, client applications will use only the data source defined by either the location or ejb-location attribute. The converted data-sources.xml file may have definitions that are not used by the applications and can be removed from the file.

For examples of the new data-sources.xml format, see the "Data Sources" chapter of the Oracle Containers for J2EE Services Guide.

Deploying or Undeploying Connectors

You can use one of the following commands to deploy or undeploy a Java Connector Architecture-compliant resource adapter packaged in a RAR file.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-deployconnector</td>
<td>Deploys a connector. Supply application information in the following parameters:</td>
</tr>
<tr>
<td></td>
<td>-file path: Required. The path and file name of the RAR file to deploy.</td>
</tr>
<tr>
<td></td>
<td>-name name: The name of the resource adapter.</td>
</tr>
<tr>
<td></td>
<td>-nativeLibPath path: The path to the directory containing native libraries (such as DLLs) within the RAR file.</td>
</tr>
<tr>
<td></td>
<td>-grantAllPermissions: Include to grant all runtime permissions requested by the resource adapter, if required.</td>
</tr>
</tbody>
</table>
### Table 7–9 (Cont.) Options for Application Deployment

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-undeployconnector</td>
<td>Undeploys the specified connector.</td>
</tr>
<tr>
<td>name name</td>
<td>The name of the connector to undeploy.</td>
</tr>
<tr>
<td></td>
<td>Undeploying a standalone RAR does not require a restart of the default application.</td>
</tr>
</tbody>
</table>
This chapter explains how to configure and manage cluster topologies in an Oracle Application Server environment and groups of OC4J instances within Oracle Application Server clusters. It includes the following topics:

- Clustering Overview
- Creating and Managing OC4J Groups Within Oracle Application Server Clusters
- Configuring a Cluster
- Viewing the Status of a Cluster
- Configuring Routing and Load Balancing with Oracle HTTP Server
- Configuring Application Mount Points
- Running an OC4J Instance on Multiple JVMs

Application clustering, the clustering of applications deployed to Oracle Application Server nodes for the purpose of session or state replication, is covered in Chapter 9, "Application Clustering in OC4J".

**Clustering Overview**

This section provides an overview of the clustering mechanisms supported in Oracle Application Server 10g Release 3 (10.1.3.4.0) and notes the significant changes in functionality between the 10.1.3 release and previous releases. It includes the following topics:

- How Clustering Works
- Supported Clustering Models
- Changes in Clustering

**How Clustering Works**

In the current release, a cluster topology is defined as two or more loosely connected Oracle Application Server nodes.

The connectivity provided within a cluster is a function of Oracle Notification Server (ONS), which manages communications between Oracle Application Server components, including OC4J and Oracle HTTP Server. The ONS server is a component of Oracle Process Manager and Notification Server (OPMN), which is installed by default on every Oracle Application Server host. When configuring a cluster topology,
you are actually connecting the ONS servers running on each Oracle Application Server node.

Previous releases of Oracle Application Server supported clustering of a fully connected set of server nodes only, which meant that each node had to be explicitly specified in the ONS configuration file (ons.conf). When a node was added or removed from the cluster, the configuration had to be updated on each server node and the server restarted.

The current release supports a new **dynamic discovery** mechanism, enabling the cluster to essentially manage itself. In this framework, each ONS maintains a map of the current cluster topology. When a new ONS is added to the cluster, each existing ONS adds the new node and its connection information to its map. At the same time, the new ONS adds all of the existing nodes to its map. Alternatively, when an ONS is removed from the cluster, the maps for the remaining nodes are updated with this change.

As of Oracle Application Server Release 3 (10.1.3.0.0), the ONS configuration file (ons.conf) is no longer used. Instead, ONS configuration data is set in the <notification-server> element within opmn.xml, the OPMN configuration file located in the ORACLE_HOME/opmn/conf directory on each node. Clustering configuration in turn is set within a <topology> subelement. Only one <topology> subelement is allowed within a <notification-server> element.

The following example illustrates a cluster topology configuration in opmn.xml:

```xml
<notification-server>
  <topology>
    <discover list="**225.0.0.20:8001"/>
  </topology>
  ...
</notification-server>
```

The clustering configuration specified in the <topology> element applies to all instances of Oracle Application Server components, including Oracle HTTP Server and OC4J, installed on the node. All nodes within a cluster topology must have the same configuration specified in the opmn.xml file.

**Supported Clustering Models**

The following clustering models are supported:

- **Dynamic node discovery**

  In this configuration, each ONS node within the same subnet announces its presence with a multicast message. The cluster topology map for each node is automatically updated as nodes are added or removed, enabling the cluster to be self-managing.

  See "Configuring Dynamic Node Discovery Using Multicast" on page 8-13 for configuration instructions.

- **Static hubs as discovery servers**

  Specific nodes within a cluster are configured to serve as discovery servers, which maintain the topology map for the cluster. The remaining nodes then connect with one another through a discovery server. A discovery server hub in one topology can be connected to hubs in other topologies.

  See "Configuring Static Discovery Servers" on page 8-16.

- **Connection of isolated topologies via gateways**
This configuration is used to connect topologies separated by firewalls or on different subnets using specified gateway nodes.

See "Configuring Cross-Topology Gateways" on page 8-18 for details.

- Manual node configuration

In this configuration, the host address and port for each node in the cluster are manually specified in the configuration. This is the same clustering mechanism supported in Oracle Application Server 10g Release 3 (10.1.2) and is supported primarily to provide backward compatibility.

See "Configuring Static Node-to-Node Communication" on page 8-20 for instructions.

Changes in Clustering

The following are changes in cluster configuration in Oracle Application Server 10g Release 3 (10.1.3) from previous releases.

- As of Oracle Application Server 10g (10.1.3.1.0), OC4J instances belong to groups within the cluster topology, enabling you to perform group deployment, configuration, and administration operations across an Oracle Application Server cluster.

In Oracle Application Server 10g (10.1.3.4.0), groups are explicitly created by administrators using any desired name. Once a group has been created, it can be populated with any of the OC4J instances that are resident within the cluster topology.

Note: The procedures for creating and managing groups have changed since Oracle Application Server 10g (10.1.3.0.0). If you have been using the 10.1.3.0.0 release, be sure to review the new procedures for creating and managing groups in the 10.1.3.4.0 release, described in "Creating and Managing OC4J Groups Within Oracle Application Server Clusters" on page 8-4.

- The Distributed Configuration Management (DCM) framework, used in prior releases of Oracle Application Server to replicate common configuration information across a cluster, is not included in the current release. This means that:
  - Configuration using the dcmctl command-line utility or Application Server Control is no longer supported.
  - Cluster configurations must now be manually replicated in the opmn.xml file installed on each node within the cluster.

- The ONS configuration file (ons.conf) is no longer used. ONS connection data is now set in the <notification-server> element within opmn.xml, the OPMN configuration file located in the ORACLE_HOME/opmn/conf directory on each node containing an OC4J or Oracle HTTP Server instance.

- Each node is no longer required to be manually configured to connect to every other node in the cluster.
Creating and Managing OC4J Groups Within Oracle Application Server Clusters

All OC4J instances in an OPMN-managed environment must be part of a **group**, which is a set of OC4J instances that belong to the same cluster topology. Groups enable you to perform some common configuration, administration, and deployment tasks simultaneously on all OC4J instances in a group.

---

**Note:** All OC4J instances in a group within an Oracle Application Server cluster must have the same version, such as 10.1.3.4.0.

---

With Application Server Control, you can create additional groups and, from the Group page, perform the following tasks on a group of OC4J instances:

- Process management operations, such as start, stop, and restart
- Deployment operations, such as deploy, undeploy, and redeploy
- JDBC management operations, such as creating, modifying, or removing JDBC data sources and connection pools
- JMS Provider operations, such as creating and removing JMS destinations, and creating, modifying, or removing JMS connection factories

To display the Group page, click the name of the group in the Groups section of the Cluster Topology page.
The default OC4J group (default_group) is created automatically when you install an application server instance. When you install Oracle Application Server 10g (10.1.3.4.0), the installer creates a default OC4J instance that resides in the default group. Later, you can add OC4J instances and organize them into groups.

For example, you can create a new group for the deployment of a particular application to all OC4J instances of the group across the Oracle Application Server cluster. Then you can use the Group page in Application Server Control to make application-specific configuration changes to all instances of the application in the OC4J group, across the cluster.

In the following topics, this section describes how to create and manage groups of OC4J instances for group operations on applications replicated across one or more Oracle Application Server clusters:

- Creating Groups of OC4J Instances
- Managing OC4J Instances in a Group
- Replicating Changes Across a Cluster
- Running an OC4J Instance on Multiple JVMs

**Creating Groups of OC4J Instances**

With groups, you can perform each of the following tasks once across multiple OC4J instances:
Modify the OC4J server properties for all OC4J instances in a group
Start or stop all the OC4J instances in a group
Deploy, undeploy, or redeploy applications on all OC4J instances in a group
Perform JDBC management operations, such as creating, modifying, or removing JDBC data sources or connection pools
Perform JMS Provider operations, such as creating or removing JMS destinations and creating, modifying, or removing JMS connection factories

To administer a group with Application Server Control:
1. In the Cluster Topology page, under Groups, choose the group.
2. Select the Administration tab.
3. The Administration page provides administration features for the group as a whole. These features do not include Security Provider administration.

To create a new OC4J group with Application Server Control:
1. In the Cluster Topology page, under Groups, choose Create.
2. In the Create Group page:
   a. Specify a name for the group.
      A group name can contain only alphanumeric characters and underscores and cannot contain any special characters, such as parentheses, periods, dollar signs ($), asterisks (*), or commas. The name must start with a letter or an underscore.
      Table 8-1 lists some examples of valid and invalid names for OC4J instances and groups.

   b. Select the OC4J instances to move to the group.
      When you move an OC4J instance into the new group, the instance is removed from its previous group. The instance must be stopped before it can be moved.
   c. Choose Create.

   Table 8-1 OC4J Instance and Group Names

<table>
<thead>
<tr>
<th>Valid Instance or Group Name</th>
<th>Invalid Instance or Group Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>OC4J1</td>
<td>$OC4J_2</td>
</tr>
<tr>
<td>_production_apps</td>
<td>32_PROD_test</td>
</tr>
<tr>
<td>test_environment_42</td>
<td>!deployGroup2</td>
</tr>
<tr>
<td>Deployment_Group3</td>
<td>deployment_(group3)</td>
</tr>
</tbody>
</table>

b. Select the OC4J instances to move to the group.
When you move an OC4J instance into the new group, the instance is removed from its previous group. The instance must be stopped before it can be moved.
c. Choose Create.

Note: You can also move an OC4J instance into a group after the group is created, as follows:
1. In the Cluster Topology page, under Groups, select the group.
2. In the Group: groupname page, choose Add.
After you create a group, it appears in the list of groups on the Cluster Topology page. You can later add OC4J instances to the group or remove instances from the group, as “Managing OC4J Instances in a Group” on page 8-7 describes.

You can also create a group during the following operations:

- Creating a new OC4J instance
  When you create a new OC4J instance, you can create a new group or identify an existing group for the instance. If you do not specify a group, the new instance is assigned to default_group.

- Removing an OC4J instance from a group
  When you remove an OC4J instance from a group, you create a new group or identify an existing group for the instance.

---

**Notes:** The following restrictions apply to moving OC4J instances between groups:

- An OC4J instance must be stopped before you can move it into or out of a group.
- At least one OC4J instance in a group must be running when you move an instance out of the group.
- If a group has only one OC4J instance, before you can move that instance, you must stop it, create another instance, and start the new instance.

Consider the following examples of using multiple OC4J instances and groups to manage your Oracle Application Server environment:

- Create OC4J instances for specific purposes. For example, use the default OC4J instance as your administration OC4J and be sure you use it exclusively for deploying Application Server Control. Create another OC4J instance to deploy your production applications.
- Create additional OC4J instances to improve performance and provide load balancing for your production applications.
- Group OC4J instances on which you deploy the same application so you can make application-specific modifications to the group instead of to individual OC4J instances. You can also deploy an application to the group once instead of multiple times to the individual OC4J instances.

---

**Managing OC4J Instances in a Group**

OC4J includes tools for creating additional OC4J instances in a group and removing instances from a group within an Oracle Application Server cluster. Once created, new OC4J instances can be accessed and managed with Application Server Control.

This section includes the following topics:

- Creating an Additional OC4J Instance
- Accessing and Managing a New Instance
- Removing an OC4J Instance from a Group
Creating an Additional OC4J Instance

You can add an OC4J instance to a group in the following ways:

- Through an Application Server page in Application Server Control
- With the `createinstance` utility, which is installed in the `ORACLE_HOME/bin` directory

Creating an OC4J Instance Through Application Server Control

To create an OC4J instance through Application Server Control:

1. On the Cluster Topology page, click the name of an Oracle Application Server instance to navigate to an Application Server: `instance_name` page.
2. Click Create OC4J Instance.
3. On the Create OC4J Instance page, enter the following information:
   - **OC4J Instance Name**: Enter a name for the instance.
     
     **Note**: You cannot enter `home` as the instance name because `home` is reserved for the name of the default OC4J instance.
   - **Select one of the following items**:
     - **Add to an existing group with name**: Select a group from Existing Group Name.
     - **Add to a new group with name**: In the New Group Name field, enter a name for the new group.
   - **Select Start this OC4J instance after creation**.
4. Click Create.

A confirmation screen is displayed after the instance has been created. The password for this OC4J instance is the same as the password used for the `oc4jadmin` user for the installation.

Creating an OC4J Instance with the `createinstance` Utility

The `createinstance` utility enables you to create additional OC4J instances in a group with the following syntax:

```
createinstance -instanceName instanceName [-port httpPort] [-groupName group]
```

**Note**: You cannot specify `home` for `instanceName` because `home` is reserved for the name of the default OC4J instance.

You must supply an HTTP listener port as the value for `httpPort` when creating a new instance in a standalone OPMN-managed OC4J instance (J2EE Server and Process Management install type). This HTTP listener port will be set in the `default-web-site.xml` Web site configuration file created for the instance.

Every new OC4J instance is assigned to a group. If the specified group does not exist, it is created. If the `-groupName` parameter is not provided, the instance goes into the default_group group.

As part of the creation process, you will be asked to enter a password. This password will be tied to the `oc4jadmin` user for this instance. Oracle recommends that you
enter the same password used by the oc4jadmin user to access Application Server Control in the administration instance to prevent problems with OPMN.

As part of the creation operation, the new instance is added to the existing opmn.xml file. To ensure that OPMN is aware of the new instance, an OPMN reload is performed at the end of the create operation. For this reload, the createinstance utility must connect to the MBeanServer used to configure OPMN. The password of the new OC4J instance is used for authentication. If the password of the new instance is not the same as the instance running the MBeanServer, an error is returned. This does not prevent the instance from being created, but it does cause problems when OPMN or other components need to connect to the new instance. Therefore, Oracle recommends that you create all OC4J instances in the target Oracle Application Server cluster with the same password.

You also need to specify the same password for the oc4jadmin user in each OC4J instance of a group within an Oracle Application Server cluster so the user can perform group operations.

---

**Notes:**

- You can use the createinstance utility regardless of whether the Oracle Application Server instance is in a running state or stopped state.
- If the new OC4J instance will be required to accept ORMI over SSL (ORMIS) requests, you must configure ORMIS in the instance-specific rmi.xml file and update opmn.xml with the ORMIS port information, as described in the Oracle Containers for J2EE Security Guide.

---

You can supply an HTTP port for the value of -port. This feature is required when the Oracle Application Server instance does not include Oracle HTTP Server. Setting an HTTP port makes it possible to access the OC4J instance’s home page directly.

The new instance will be created within a new ORACLE_HOME/j2ee/instance directory, the same location as the default home OC4J instance. A new <process-type> element containing the instance configuration will also be added to the opmn.xml configuration file.

The <process-type> element for the home instance serves as a template for the new OC4J instance, which is created with the same settings as the home instance. You can change the configuration for the new instance by changing settings such as the heapsize, numprocs, and timeout attribute values of the <process-type> element for the instance in the opmn.xml file. If you change the configuration for an OC4J instance, you need to restart it for the changes to take effect.

The following directories and files are generated in the new ORACLE_HOME/j2ee/instance directory structure:

applib/
applications/
config/
  contains default versions of all server-level configuration files
config/database-schemas/
  contains all database schema XML files packaged with OC4J
connectors/
  contains RAR files packaged with OC4J
log/
persistence/
The new instance does not include the OC4J binary libraries; instead, the instance will utilize the libraries installed in the home instance. The default application is deployed to the new instance; however, binaries and configuration files for other deployed applications, including Application Server Control, are not copied to the instance.

### Accessing and Managing a New Instance

Once the new instance is started by OPMN, you can access it through the Cluster Topology page in Application Server Control.

Log in as the `oc4jadmin` user and supply the password set when the instance was created using the `createinstance` utility.

Once logged in, you can perform the full range of administrator tasks on the instance, including deploying applications to it.

### Removing an OC4J Instance from a Group

You can remove an OC4J instance from a group by moving it to another group, as described in “Creating Groups of OC4J Instances” on page 8-5, or by deleting it. You can delete an OC4J instance in the following ways:

- In Application Server Control, through the Application Server Page for Oracle Application Server on which the OC4J instance is installed
- With the `removeinstance` utility, which is installed in the `ORACLE_HOME/bin` directory

Both methods delete the directory created for the instance from the `j2ee` directory structure and remove configuration data for the instance from `opmn.xml`. The following guidelines apply to deleting an OC4J instance.

- You cannot delete the OC4J home instance that was created by Oracle Application Server during installation.
- You can delete OC4J instances that were created by a user after installation.
- The OC4J instance to be deleted must be in a stopped state (which Application Server Control does for you).
- If OPMN is running when the `removeinstance` tool is in use, you must invoke `opmnctl reload` to reload the updated `opmn.xml` into the runtime.

### Deleting an OC4J Instance Through Application Server Control

To delete an OC4J instance through Application Server Control:

1. On the Cluster Topology page, click the name of the Oracle Application Server instance where the OC4J instance is running to navigate to the Application Server: `instance_name` page.
2. Click the **Delete** icon for the instance you want to delete.
3. On the confirmation page, click **Yes**.

A confirmation screen is displayed after the instance has been deleted.

### Deleting an OC4J Instance with the `removeinstance` Utility

You can delete an OC4J instance by using the `removeinstance` utility, which deletes the directory created for the instance from the `ORACLE_HOME/j2ee` directory structure and removes configuration data for the instance from `opmn.xml`. 
The `removeinstance` utility is installed in the `ORACLE_HOME/bin` directory. The syntax is as follows:

```
removeinstance -instanceName instanceName
```

To delete an instance with the utility, take the following steps:

1. Stop the instance:
   ```
   ORACLE_HOME/opmn/bin/opmnctl stopproc process-type=oc4J_instanceName
   ```

2. Delete the instance:
   ```
   ORACLE_HOME/bin/removeinstance -instanceName oc4J_instanceName
   ```

### Replicating Changes Across a Cluster

Because the Distributed Configuration Management (DCM) framework is not provided in Oracle Application Server Release 3 (10.1.3), configuration file synchronization within a cluster has changed in Oracle Application Server 10.1.3. Table 8–2 summarizes the files that might need to be replicated.

Using the OC4J grouping feature introduced in release 10.1.3.1.0 (described in "Creating Groups of OC4J Instances" on page 8-5), it is possible to deploy EARs, WARs, RARs, and shared libraries consistently across groups of OC4J instances using Application Server Control, the `admin_client.jar` command-line utility, or OC4J Ant tasks. This ensures consistent configuration at a module level within groups of OC4J instances. For information about deploying to groups of OC4J instances using these tools, see Chapter 6, "Using the `admin_client.jar` Utility," and the Oracle Containers for J2EE Deployment Guide.

For specific configuration files, the group feature also enables administrators to configure data sources, connection pools, and JMS resources across groups of OC4J instances from Application Server Control, the `admin_client.jar` command-line utility, and OC4J Ant tasks. Specifically, the configuration files that support this are `data-sources.xml` and `jms.xml`.

To achieve consistent configuration across multiple OC4J processes, you can use the multiple JVM feature of Oracle Application Server. This feature enables you to set the number of JVM instances, \( n \), on which a single OC4J configuration will run simultaneously. The result is that from a single consistent configuration set, \( n \) OC4J processes running the same OC4J instance will be started. Changing any file in that single configuration set will update all the OC4J processes that started, corresponding to the number of JVMs set. Configuring the number of JVMs per OC4J instance is covered in "Running an OC4J Instance on Multiple JVMs" on page 8-31.

Beyond these specific features, Table 8–2 summarizes the complete set of configuration files and their usage in case manual configuration across a cluster is determined to be necessary for an application configuration change.
### Table 8–2 Configuration Files to Replicate Across a Cluster

<table>
<thead>
<tr>
<th>File</th>
<th>Location in <code>ORACLE_HOME</code></th>
<th>Data to Replicate or Manage</th>
</tr>
</thead>
<tbody>
<tr>
<td>application.xml</td>
<td>/j2ee/instance/config</td>
<td>▪ Changes made to configuration data applied by default to all deployed applications.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ References to data sources or other shared resources.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Shared library definitions within the <code>&lt;imported-shared-libraries&gt;</code> element.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Code sources for custom shared libraries must be installed on the OC4J host, and the libraries must be referenced in the <code>server.xml</code> file for the OC4J instance.</td>
</tr>
<tr>
<td>data-sources.xml</td>
<td>/j2ee/instance/config</td>
<td>▪ Configuration data for custom data sources that must be made available to deployed applications.</td>
</tr>
<tr>
<td>default-web-site.xml</td>
<td>/j2ee/instance/config</td>
<td>▪ Secure Web site (HTTPS) configuration, if applicable.</td>
</tr>
<tr>
<td>*-web-site.xml</td>
<td>/j2ee/instance/config</td>
<td>▪ Copy the configuration files for any additional Web sites that will be utilized on the OC4J instance to the specified location.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Note that references to Web site configuration files must be added to <code>opmn.xml</code> or <code>server.xml</code>, as outlined in &quot;Creating a New Web Site in OC4J&quot; on page 13-6.</td>
</tr>
<tr>
<td>global-web-application.xml</td>
<td>/j2ee/instance/config</td>
<td>▪ Any new servlet definitions or servlet configuration changes, such as <code>&lt;init-param&gt;</code> modifications.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Any modified JSP container properties. See the Oracle Containers for J2EE Support for JavaServer Pages Developer’s Guide for details.</td>
</tr>
<tr>
<td>j2ee-logging.xml</td>
<td>/j2ee/instance/config</td>
<td>▪ Any logging configuration changes.</td>
</tr>
<tr>
<td>javacache.xml</td>
<td>/j2ee/instance/config</td>
<td>▪ Any Java cache configuration changes.</td>
</tr>
<tr>
<td>jazn.xml</td>
<td>/j2ee/instance/config</td>
<td>▪ Configuration for either XML-based or LDAP-based security providers. For more information about the <code>jazn.xml</code> file, see the Oracle Containers for J2EE Security Guide.</td>
</tr>
<tr>
<td>jazn-data.xml</td>
<td>/j2ee/instance/config</td>
<td>▪ Replicate the XML-based provider configuration to the specified location for all applications using this provider. Not required for applications using an LDAP-based provider. For more information about the <code>jazn-data.xml</code> file, see the Oracle Containers for J2EE Security Guide.</td>
</tr>
<tr>
<td>jms.xml</td>
<td>/j2ee/instance/config</td>
<td>▪ Any destination or connection factory additions.</td>
</tr>
</tbody>
</table>
Configuring a Cluster

This section contains instructions on configuring the following clustering models:

- Configuring Dynamic Node Discovery Using Multicast
- Configuring Static Discovery Servers
- Configuring Cross-Topology Gateways
- Configuring Static Node-to-Node Communication

Configuring Dynamic Node Discovery Using Multicast

Dynamic node discovery is the most straightforward clustering configuration. In this model, each ONS node broadcasts a simple multicast message announcing its presence, enabling nodes within the cluster to dynamically discover one another.

The following tools can be used to add OC4J instances to a cluster using multicast discovery:

- **opmnctl**
  
  This utility includes commands for updating `opmn.xml` with the multicast `port:address` and Web site configuration data needed to add an instance to a cluster. See “Configuring Multicast Discovery with opmnctl” on page 8-15 for details.

- **opmnassociate**
  
  This utility provides a one-step solution for adding an OC4J instance to a cluster. See "Configuring Multicast Discovery with opmnassociate" on page 8-16 for details.

**Note:** An Oracle Application Server instance can be added to a cluster at installation time.

Each ONS maintains its own map of the cluster topology. When a new ONS is added to the cluster, each existing ONS adds the new node and its connection information to its map. At the same time, the new ONS adds all of the existing nodes to its map. Alternatively, when an ONS is removed from the cluster, the maps for the remaining nodes are updated with this change.
Because multicast messages may be restricted by different network configurations, dynamic node discovery might be an option only for ONS nodes that are on the same subnet. However, multiple subnets using dynamic node discovery may be connected using gateway servers. See "Configuring Cross-Topology Gateways" on page 8-18 for details.

Notes:

- All nodes within the topology must be configured to use the same multicast address and port.
- The multicast address must be within the valid address range, which is 224.0.1.0 to 239.255.255.255.

Ideally, multicast address and port assignments should be managed by your systems administration staff to avoid potential conflicts with other applications.

The dynamic discovery configuration is set within a `<discover>` subelement of the `<topology>` element in the `opmn.xml` file on each Oracle Application Server instance in the topology. To add a new node to the cluster, simply add this element to its `opmn.xml` file. To remove a node from the cluster, remove this element.

Set the multicast IP address and port as the value for the `list` attribute. The asterisk (*) preceding the IP address is critical because it informs OPMN that the value specified is a multicast address. Multiple values can be specified, each separated from the next by a comma.

```xml
<opmn>
  <notification-server>
    <port ... />
    <ssl ... />
    <topology>
      <discover list="*225.0.0.20:8001"/>
    </topology>
  </notification-server>
</opmn>
```
Configuring Multicast Discovery with opmnctl

The OPMN command-line tool, opmnctl, supports a new config topology command that enables you to specify, update, or delete the multicast <discover> entry within opmn.xml.

The opmnctl tool is installed in the ORACLE_HOME/opmn/bin directory on each node. The tool must be run individually on each node and will update only the opmn.xml file on that node.

Note: The opmn.xml file must be reloaded for changes made to take effect. Run the following command on the affected node to reload opmn.xml:

```
opmnctl reload
```

This command will not affect OPMN-managed components, including Oracle HTTP Server, OC4J, and deployed applications.

Inserting or Updating Discovery Data

The update command inserts or updates the <discover> element with the specified values. The syntax is as follows:

```
opmnctl config topology update discover="multicastAddress:multicastPort"
```

For example:

```
opmnctl config topology update discover="225.0.0.20:8001"
```

opmnctl reload

Deleting Discovery Data

The delete command removes the <discover> element from opmn.xml, effectively removing the node from the cluster. If the <topology> element contains no other subelements, it will be removed as well.

Note for Adding OPMN-Managed Standalone OC4J Instances:

An OPMN-managed OC4J instance does not include Oracle HTTP Server (J2EE Server and Process Management install type). The default Web site is configured to listen for HTTP requests by default.

When adding the instance to a cluster, you must configure the Web site to use the Apache JServ Protocol (AJP). This modification is necessary to enable the OC4J instance to receive and respond to requests from Oracle HTTP Server.

The protocol and ports used by the default Web site can be configured using the Runtime Ports page in Application Server Control. The opmnctl config port update command can also be used to modify the default Web site configuration defined in opmn.xml. For details, see “Configuring Web Sites with opmnctl” on page 13-5.
Configuring a Cluster

opmnctl config topology delete discover

opmnctl reload

Configuring Multicast Discovery with opmnassociate

The opmnassociate utility adds the default home OC4J instance to a cluster using multicast discovery. This utility performs the following steps:

1. Inserts or updates the <discover> element in opmn.xml with the specified multicast address and port.
2. Configures the default Web site to receive and respond to requests from Oracle HTTP Server using the Apache JServ Protocol (AJP), by modifying the corresponding <port> element in opmn.xml.
3. Restarts OPMN to load the new configuration into the runtime environment.

The opmnassociate tool is installed in the ORACLE_HOME/bin directory on each OC4J instance. The tool must be run individually on each instance and will update only the opmn.xml file on that instance.

In a Linux or UNIX environment, the syntax is as follows:

opmnassociate.sh "*multicastAddress:multicastPort" [-restart]

For example:

opmnassociate.sh "*225.0.0.20:8001" -restart

In a Windows environment, the syntax is as follows:

opmnassociate "*multicastAddress:multicastPort" [-restart]

For example:

opmnassociate "*225.0.0.20:8001" -restart

The asterisk (*) preceding the IP address is required.

---

**Note:** You can use the opmnassociate utility only to add the default home OC4J instance to a cluster. If you want to add another OC4J instance, such as home2, use the opmnctl utility, as described in "Configuring Multicast Discovery with opmnctl" on page 8-15. In general, opmnassociate is a simplified form of the more complete opmnctl command set for configuring multicast discovery. Using opmnctl for configuring multicast discovery is the recommended approach.

---

Configuring Static Discovery Servers

This configuration is similar to a peer-to-peer clustering model, with one or more ONS nodes within the same cluster configured to serve as static hubs, or discovery servers.

Each ONS node in the cluster establishes a connection with a discovery server, which maintains the topology map for the cluster. The discovery server provides the connecting node with the current topology map, enabling the connecting node to communicate with the other ONS nodes within the cluster.
You can use opmnctl to configure the connection to a static discovery server. See "Configuring a Static Discovery Server Connection with opmnctl" on page 8-18 for details.

**Figure 8–3  Static Discovery Server Model**

![Static Discovery Model Diagram]

Set the TCP/IP connection information for the discovery server within the `<discover>` element in the `opmn.xml` file on each static hub node within the cluster. For example:

```xml
<opmn>
  <notification-server>
    <port ... />
    <ssl ... />
    <topology>
      <discover list="node1.company.com:6200"/>
    </topology>
  </notification-server>
  ...
</opmn>
```

The required information is as follows:

- The host name or IP address of the static discovery server
- The OPMN remote port, which is defined in the `<port>` element within the `opmn.xml` file installed on the static server, as follows:

```xml
<port local="6100" remote="6200" request="6003"/>
```

**Note:** The `opmn.xml` file must be reloaded for changes to take effect in the OPMN runtime. Run the following command on the affected node to reload `opmn.xml`:

```shell
opmnctl reload
```

This command will not affect OPMN-managed components, including Oracle HTTP Server, OC4J, and deployed applications.
Configuring a Static Discovery Server Connection with opmnctl

The OPMN command line tool, opmnctl, supports a new `config topology` command which allows you to specify, update or delete the `<discover>` entry within `opmn.xml`.

The `opmnctl` tool is installed in the `ORACLE_HOME/opmn/bin` directory on each node. The tool must be run individually on each node, and will only update the `opmn.xml` file on that node.

Inserting or Updating Discovery Data

The `update` command inserts or updates the `<discover>` element with the specified values. The syntax is as follows:

```
opmnctl config topology update discover="serverHost:opmnRemotePort"
```

For example:

```
opmnctl config topology update discover="node.company.com:6200"
```

```
opmnctl reload
```

Deleting Discovery Data

The `delete` command removes the `<discover>` element from `opmn.xml`, effectively removing the node from the cluster. If the `<topology>` element contains no other subelements, it will be removed as well.

```
opmnctl config topology delete discover

```

Configuring Cross-Topology Gateways

For situations in which cluster topologies are on different subnets or are isolated by firewalls or physical locations, specific ONS nodes can be configured as gateways, enabling ONS notifications to be sent across the disparate topologies.
In this model, an ONS node within each isolated topology is configured as a gateway server, which serves as an entry point into the cluster. The gateway configuration is specified within a `<gateway>` subelement of the `<topology>` element.

Set the host and port for the source gateway node and each target node it will connect to as the value for the `list` attribute. The order in which the nodes are listed does not matter.

- For each node, specify the host name or IP address of the server and the OPMN remote port, which is defined in the `<port>` element within the `opmn.xml` file installed on the static server, as follows:

  `<port local="6100" remote="6200" request="6003"/>

- Separate the data for each node with an ampersand (`&`).
- Include a `/` at the end of the list of nodes.

The following example shows the `opmn.xml` configuration for `node1`, which will connect with gateway nodes `node2` and `node3`. This same configuration can be set on each of these gateway nodes. Note the `/` at the end of the list:

```
<opmn>
  <notification-server>
    <port ...
    <ssl ...
  </notification-server>
</opmn>
```
In addition to the <gateway> element, the <topology> element includes the <discover> element, which contains the multicast address and port used for dynamic discovery within the node's own cluster.

Alternatively, the entire <topology> element in the preceding example can be copied to the opmn.xml file on every node within the cluster topology. Only node1 will utilize the <gateway> configuration; it will be ignored by the other nodes.

To simplify configuration, you can set the connection data for all gateway nodes - sources and targets - in the <gateway> subelement and then copy this element to the opmn.xml file on each gateway node. Again, the order of the nodes does not matter; each node will simply ignore its own entry in the list.

---

**Note:** The opmn.xml file must be reloaded for changes to take effect in the OPMN runtime. Run the following command on the affected node to reload opmn.xml:

```
opmnctl reload
```

This command will not affect OPMN-managed components, including Oracle HTTP Server, OC4J, and deployed applications.

---

**Configuring a Machine to Work With and Without a Network Connection**

When you work on a single machine using localhost, add the IP address in the <ipaddr> subelement of the <notification-server> element and explicitly set up a discover list in the <discover> element to refer to the localhost OPMN remote port, as defined in the cluster <port> element. An example of this configuration follows:

```
<notification-server>
  <ipaddr remote="127.0.0.1" request="127.0.0.1"/>
  <port local="6101" remote="6201" request="6004"/>
  <ssl enabled="true">
    wallet-file="$ORACLE_HOME\opmn\conf\ssl.wlt\default"/
  </ssl>
</notification-server>
<topology>
  <discover list="localhost:6201"/>
</topology>
```

If you supply the localhost IP address, 127.0.0.1, the machine can work with or without a network.

**Configuring Static Node-to-Node Communication**

The static configuration model is essentially the same mechanism used in Oracle Application Server 10.1.2 and 9.0.4. It continues to be supported primarily to provide backward compatibility with these earlier releases.
In this configuration, a **node list** containing the host address and ONS remote listener port for each node in the cluster is supplied. Prior to Oracle Application Server Release 3 (10.1.3.0.0), when ONS configuration data was integrated into `opmn.xml`, this configuration would have been set in the `ons.conf` configuration file.

Define the host address and the ONS remote listener port, specified within the `<port>` subelement of `<notification-server>`, for each node in the cluster within the `<nodes>` subelement. Separate each node from the next with a comma.

For example:

```xml
<opmn>
  <notification-server>
    <port local="6101" remote="6202" request="6004"/>
    <ssl ... />
  <topology>
    <nodes list="node1-sun:6201, node2-sun:6202"/>
  </topology>
</notification-server>
```

Supply the same list for each node in the cluster; each ONS instance will identify itself in the list and ignore that entry.

---

**Note:** The `opmn.xml` file must be reloaded for changes to take effect in the OPMN runtime. Run the following command on the affected node to reload `opmn.xml`:

```
opmnctl reload
```

This command will not affect OPMN-managed components, including Oracle HTTP Server, OC4J, and deployed applications.
Viewing the Status of a Cluster

You can view the current status of the Oracle Application Server components within a cluster, using either opmnctl or Application Server Control.

- Viewing Cluster Status with opmnctl
- Viewing Cluster Status in Application Server Control

Viewing Cluster Status with opmnctl

You can check the status of the cluster using opmnctl on any Oracle Application Server node within the cluster.

```bash
opmnctl @cluster status
```

The output shows the status of the components installed in each active Oracle Application Server instance within the cluster:

```
Processes in Instance: AppSrv1.com1.yourcompany.com
---------------------------------------------------
ias-component | process-type | pid | status
---------------|-------------|-----|-------
OC4JGroup:COLORS | OC4J:home | 26880 | Alive
OC4JGroup:COLORS | OC4J:oc4j_soa | 26256 | Alive
HTTP_Server | HTTP_Server | 26879 | Alive

Processes in Instance: AppSrv2.com2.yourcompany.com
---------------------------------------------------
ias-component | process-type | pid | status
---------------|-------------|-----|-------
OC4JGroup:COLORS | OC4J:home | 26094 | Alive
OC4JGroup:COLORS | OC4J:oc4j_soa | N/A | Down
HTTP_Server | HTTP_Server | 26093 | Alive
```

Viewing Cluster Status in Application Server Control

Click the Cluster Topology link in the upper left corner of the Application Server Control home page.

The resulting page displays each Oracle Application Server instance that is active within the cluster, as well as the active applications on each instance. You can access an instance or a deployed application within the cluster through this page.

Configuring Routing and Load Balancing with Oracle HTTP Server

The term load balancing refers to the process of distributing incoming service requests over server instances within a cluster. Load balancing in an Oracle Application Server cluster is managed by the `mod_oc4j` module of Oracle HTTP Server. In this configuration, the Oracle HTTP Server instance acts as a front-end listener for incoming HTTP and HTTPS requests; `mod_oc4j` then routes each request to an OC4J instance serving the requested application.

In Oracle Application Server Release 3 (10.1.3), load balancing is completely dynamic for Oracle Application Server instances that belong to the same cluster. No additional Oracle HTTP Server or `mod_oc4j` configuration is required.

- Dynamic OC4J instance discovery
Oracle HTTP Server instances are dynamically updated with information on each OC4J instance in the cluster and the applications deployed to it, enabling Oracle HTTP Server to route requests to the appropriate instance.

See "Enabling Dynamic Configuration of Application Mount Points" on page 8-28 for details.

- **Dynamic routing**

  The new release supports a **routing ID** mechanism that enables you, optionally, to control which OC4J instances to which an Oracle HTTP Server instance forwards requests, essentially enabling you to control the set of OC4J instances that will service requests from specific Oracle HTTP Server instances. All Oracle HTTP Server and OC4J instances are configured to use a default routing ID upon installation; as such, no configuration is required.

  See "Using Web Server Routing IDs to Control OC4J Request Routing" on page 8-23 for details.

The only requirement is that the ONS servers within the various Oracle HTTP Server and OC4J instances within the cluster be connected using one of the clustering configuration mechanisms outlined in this chapter. See “Configuring a Cluster” on page 8-13 for details.

### Using Web Server Routing IDs to Control OC4J Request Routing

Every Oracle HTTP Server and OC4J instance in an OPMN-managed installation is assigned a **routing ID** that is defined in `opmn.xml`. An Oracle HTTP Server instance will route incoming Web requests only to OC4J instances that share its routing ID. This means that you can effectively define the set of OC4J instances to which a specific Oracle HTTP Server instance will route requests.

A default routing ID is assigned to all component instances, so that upon installation, every Oracle HTTP Server instance in a cluster can route requests to any OC4J instance within the cluster.

In a typical Oracle Application Server cluster, one or more Oracle HTTP Server instances receives requests from users and then routes those requests to the applications deployed within the cluster. The routing ID of each application server, each OC4J instance, each group, and each deployed application determines where the Oracle HTTP Server routes each request.

**Caution:** Changing the routing ID for an application server, component, or individual applications can prevent HTTP requests from being sent to your deployed applications. Unless other instances of the application are available in the cluster and have the same routing ID, this action can make the application unavailable to your users.

The rest of this section describes how to change routing IDs, in the following topics:

- **Changing Routing IDs Through Application Server Control**
- **Changing Routing IDs in the opmn.xml file**

For information on how Web sites are configured to listen for AJP requests, see Configuring Web Site Connection Data on page 13-2.
Changing Routing IDs Through Application Server Control

To change or view the routing ID assigned to each application and component of your cluster through Application Server Control:

1. Navigate to the Cluster Topology page
2. Scroll to the Administration section of the page and click **Routing ID Configuration**.

The Routing ID Configuration page is designed to show the hierarchy of components and applications within your cluster topology. For example, if you click the **Expand** icon for an application server, then you see the groups within the application server instance. Within each group, you see the OC4J instances that are part of that group. And finally, if you expand a specific OC4J instance, you see the applications deployed to the OC4J instance.

By default, the application server instance is assigned a routing ID, and the groups, OC4J instances, and applications inherit the routing ID of the application server. If you enter a different routing ID for a specific group, OC4J instance, or application, then that new routing ID will override the routing ID inherited from the application server.

If you are managing multiple application server instances within a cluster, notice that the same group appears multiple times in the hierarchy, once for each application server that contains an OC4J instance that is a member of the group. This is because the hierarchy of the Routing ID Configuration page is based on the Oracle Process Management and Notification (OPMN) software configuration file (`opmn.xml`), which is stored in the Oracle home directory of each application server. As result, use caution when modifying the routing ID of a group. Be sure to assign the same routing ID to all instances of the group on the Routing ID Configuration page, unless you want specific Oracle HTTP Server requests to be routed to only some of the OC4J instances in the group.

Changing Routing IDs in the `opmn.xml` file

The routing ID is defined in `opmn.xml` in a `<data>` element where the `id` attribute equals `routing-id`. The `<data>` element entry is a subelement of `<category id="start-parameters">`, which specifies parameters passed to the instance at startup. The default `routing-id` value set for each instance is `g_rt_id`.

```xml
<category id="start-parameters">
    <data id="routing-id" value="g_rt_id"/>
</category>
```

The `<data>` element containing the default routing ID is set within the `<ias-instance>` element, which contains the OPMN configuration data for the Oracle Application Server instance. Because the routing ID is set at this level, the `routing-id` value set in this `<data>` element is applied to all instances of the Oracle HTTP Server and OC4J components installed within the Oracle Application Server instance.

```xml
<opmn>
    <process-manager>
        ...
        <ias-instance id="instance1" name="instance1">
            ...
            <environment>
                ...
            </environment>
            <module-data>
                <category id="start-parameters">
                    <data id="routing-id" value="g_rt_id"/>
                </category>
            </module-data>
        </ias-instance>
        ...
    </process-manager>
</opmn>
```
However, the routing ID can be set at the individual Oracle HTTP Server or OC4J instance level by adding a `<data>` element within the `<category id="start-parameters">` element for the component. This value overrides the routing ID assigned at the Oracle Application Server instance level.

You can specify any string as the value of the `routing-id` attribute. There is no required format for this identifier. The following entry in `opmn.xml` sets the routing ID for an Oracle HTTP Server instance:

```
<opmn>
  <process-manager>...
  <ias-instance id='instance1' name='instance1'>...
    <ias-component id="HTTP_Server">
      <environment>...
        <process-type id="HTTP_Server" module-id="OHS">
          <module-data>
            <category id="start-parameters">
              <data id="start-mode" value="ssl-enabled"/>
              <data id="routing-id" value="group_b_id"/>
            </category>
          </module-data>
          <process-set id="HTTP_Server" numprocs="1"/>
        </process-type>
      </environment>
    </ias-component>
  </ias-instance>
  </process-manager>
</opmn>
```

The following entry in `opmn.xml` sets the routing ID for the OC4J home instance:

```
<process-manager>...
  <ias-instance id='instance1' name='instance1'>...
    <ias-component id="default_group">
      <environment>...
        <process-type id="home" module-id="OC4J" status="enabled">
          <module-data>
            <category id="start-parameters">
              <data id="java-options" ... />
              <data id="routing-id" value="group_b_id"/>
            </category>
          </module-data>
```
Setting mod_oc4j Load Balancing Options

The mod_oc4j module within Oracle HTTP Server delegates requests to OC4J processes. Whenever Oracle HTTP Server receives a request for a URL that is intended for OC4J, Oracle HTTP Server routes the request to the mod_oc4j module, which then routes the request to an OC4J process. If an OC4J process fails, OPMN detects the failure and mod_oc4j does not send requests to the failed OC4J process until the OC4J process is restarted.

You can configure mod_oc4j to load balance requests to OC4J processes. Oracle HTTP Server, through mod_oc4j, supports different load balancing policies. Load balancing policies provide performance benefits along with failover and high availability, depending on the network topology and host machine capabilities.

You can specify different load balancing routing algorithms for mod_oc4j depending on the type and complexity of routing you need. Stateless requests are routed to any destination available based on the algorithm specified in mod_oc4j.conf. Stateful HTTP requests are forwarded to the OC4J process that served the previous request using session identifiers, unless mod_oc4j determines through communication with OPMN that the process is not available. In this case, mod_oc4j forwards the request to an available OC4J process following the specified load-balancing protocol.

By default, all OC4J instances have the same weight (all instances have a weight of 1), and mod_oc4j uses the round robin method to select an OC4J instance to forward a request to. An OC4J instance’s weight is taken as a ratio compared to the weights of the other available OC4J instances in the topology to define the number of requests the instance should service. If the request belongs to an established session, mod_oc4j forwards the request to the same OC4J instance and the same OC4J process that started the session.

The mod_oc4j load balancing options do not take into account the number of OC4J processes running on an OC4J instance when determining which OC4J instance to send a request to. OC4J instance selection is based on the configured weight for the instance, and its availability.

To modify the mod_oc4j load balancing policy, set the Oc4jSelectMethod and the Oc4jRoutingWeight directives in the ORACLE_HOME/Apache/Apache/conf/mod_oc4j.conf file:

1. In the mod_oc4j.conf file on each Oracle Application Server instance, within the <IfModule mod_oc4j.c> section, set the Oc4jSelectMethod directive to one of the values shown in Table 8–3.

   If you set the Oc4jSelectMethod directive to either roundrobin:weighted or random:weighted, you may also need to set the Oc4jRoutingWeight directive to specify the weight (see the next step).
See "Choosing a mod_oc4j Load Balancing Algorithm" on page 8-28 for tips on choosing a routing algorithm.

### Table 8–3 Values for Oc4jSelectMethod

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>roundrobin (default)</td>
<td>mod_oc4j places all the OC4J processes in the topology in a list, and it selects processes in order from the list.</td>
</tr>
<tr>
<td>roundrobin:local</td>
<td>Similar to roundrobin, but the list includes only local OC4J processes. If no local OC4J processes are available, then it selects a remote OC4J process.</td>
</tr>
<tr>
<td>roundrobin:weighted</td>
<td>mod_oc4j distributes the total request load to each OC4J instance based on routing weight configured on each instance. It then selects OC4J processes from the local instance in a round robin manner. You configure the weight using the Oc4jRoutingWeight directive.</td>
</tr>
<tr>
<td>random</td>
<td>mod_oc4j randomly selects an OC4J process from a list of all OC4J processes in the topology.</td>
</tr>
<tr>
<td>random:local</td>
<td>Similar to random, but mod_oc4j gives preference to local OC4J processes. If no local OC4J processes are available, then it selects a remote OC4J process.</td>
</tr>
<tr>
<td>random:weighted</td>
<td>mod_oc4j selects an OC4J process based on the weight configured for each instance in the topology. You configure the weight using the Oc4jRoutingWeight directive.</td>
</tr>
<tr>
<td>metric</td>
<td>mod_oc4j routes requests based on runtime metrics that indicate how busy a process is.</td>
</tr>
<tr>
<td>metric:local</td>
<td>Similar to metric, but mod_oc4j gives preference to local OC4J processes. If no local OC4J processes are available, then it routes to a remote OC4J process.</td>
</tr>
</tbody>
</table>

Example:

```
Oc4jSelectMethod random:local
```

For information on how to set up metric-based load balancing, see Oracle HTTP Server Administrator's Guide.

2. If you set the Oc4jSelectMethod directive to a weight-based method (that is, roundrobin:weighted or random:weighted), you may also need to set the Oc4jRoutingWeight directive to specify the weight.

```
Oc4jRoutingWeight has the following syntax:
Oc4jRoutingWeight hostname weight
```

If you do not set the Oc4jRoutingWeight directive, it uses a default weight of 1.

Example: If you have a topology that consists of three instances (A, B, and C), and you want B and C to get twice as many requests as A, set the following directives for B and C:

```
Oc4jSelectMethod roundrobin:weighted
Oc4jRoutingMethod hostB 2
Oc4jRoutingMethod hostC 2
```

Setting Oc4jRoutingMethod for hostA is optional because the default value is 1.
3. Restart Oracle HTTP Server on all instances in the topology for the changes to take effect.

   > opmnctl @cluster restartproc ias-component=HTTP_Server

Choosing a mod_oc4j Load Balancing Algorithm

Use the following guidelines to help determine which mod_oc4j load balancing option to use:

- In a topology with identical machines running Oracle HTTP Server and OC4J in the same Oracle home, the round robin with local affinity algorithm is preferred. In this case Oracle HTTP Server gains little by using mod_oc4j to route requests to other machines, except in the extreme case that all OC4J processes on the same machine are not available.

- For a distributed deployment, where one set of machines runs Oracle HTTP Server and another set runs OC4J instances that handle requests, the preferred algorithms are simple round robin and simple metric-based. To determine which of these two works better in a specific setup, you may need to experiment with each and compare the results. This is required because the results are dependent on system behavior and incoming request distribution.

- For a heterogeneous deployment, where the different Oracle Application Server instances run on nodes that have different characteristics, the weighted round robin algorithm is preferred. In addition to setting the weight for each instance, remember to tune the number of OC4J processes running on each Oracle Application Server instance to achieve the maximum benefit. For example, a machine with a weight of 4 gets four times as many requests as a machine with a weight of 1, but you need to ensure that the system with a weight of 4 is running four times as many OC4J processes.

- Metric-based load balancing is useful when there are only a few metrics that dominate the performance of an application, for example, CPU or number of database connections.

Configuring Application Mount Points

To route incoming requests, Oracle HTTP Server utilizes a list of application-specific mount points, which map the URLs supplied in requests with the OC4J instances that will service the requests. This section includes the following topics on mount point creation:

- Enabling Dynamic Configuration of Application Mount Points
- Changing the Mount Point Configuration Algorithm
- Viewing Mount Point Configuration Data

See the Oracle HTTP Server Administrator’s Guide for additional details on mount point configuration.

Enabling Dynamic Configuration of Application Mount Points

In previous releases of Oracle Application Server the list of application mount points had to be managed manually in the mod_oc4j configuration file, mod_oc4j.conf.

In the current release the list of mount points is dynamically updated as new nodes and applications are added to, or removed from, the cluster. Using ONS notifications, every OC4J instance within the cluster sends mount point data for each of its deployed applications to mod_oc4j, which adds this information to its internal routing table.
This dynamic discovery mechanism is enabled by default for clustered Oracle Application Server instances and requires no additional configuration.

The mount point information sent by each OC4J instance to Oracle HTTP Server includes these items:

- The OC4J host address
- OC4J port information, including the Apache JServ Protocol (AJP) listener port
  This value is the lowest available port assigned to AJP in the opmn.xml file on the node.
- The Web module name
  This value is defined as the value of the name attribute in the <web-app> element defined for the module in the *-web-site.xml configuration file the module is bound to.
- The Web context, or root context, defined for the application
  This value is set in the root attribute of the <web-app> element defined for the module *-web-site.xml configuration file.

Note: Dynamically configured mount points are not written to the mod_oc4j configuration file, mod_oc4j.conf.

When a new application is deployed to an OC4J instance, its mount point information is transmitted to Oracle HTTP Server, enabling mod_oc4j to dynamically discover the application and begin routing requests to it.

Conversely, when an application is stopped or removed from an OC4J instance, the mod_oc4j routing table is updated to reflect the application’s absence, causing mod_oc4j to stop routing requests to the application instance.

You can still configure application mount points manually, as "Changing the Mount Point Configuration Algorithm" on page 8-29 describes. For information about viewing the mount point list, see "Viewing Mount Point Configuration Data" on page 8-30. For additional information about configuring mount points, see Oracle HTTP Server Administrator’s Guide.

Changing the Mount Point Configuration Algorithm

Although dynamic mount point creation is enabled by default, you do have the option of continuing to use manually configured mount points, which is the default mechanism supported in previous releases of Oracle Application Server.

Static mount points are defined in the mod_oc4j configuration file, mod_oc4j.conf, which is installed in the ORACLE_HOME/Apache/Apache/conf directory. By default, Oracle HTTP Server will create dynamic mount points as applications are deployed; however, static mount points defined in mod_oc4j.conf will also be honored.

The mount point configuration mechanism to use is specified in the Oc4jRoutingMode parameter in mod_oc4j.conf. Table 8–4 lists the values for this variable. See the Oracle HTTP Server Administrator’s Guide for details on mount point configuration and using mod_oc4j.conf.
The following mod_oc4j.conf example enables the DynamicOverride mode, in which the dynamic mount points specified will take precedence over static mount points in the event of a conflict:

```
#########################################################
# Oracle iAS mod_oc4j configuration file: mod_oc4j.conf  #
#########################################################
LoadModule oc4j_module libexec/mod_oc4j.so
Oc4jRoutingMode DynamicOverride
<IfModule mod_oc4j.c>
  <Location /oc4j-service>
    SetHandler oc4j-service-handler
  </Location>
  Oc4jMount /j2ee/*
  Oc4jMount /webapp home
  Oc4jMount /webapp/* home
  Oc4jMount /cabo home
  Oc4jMount /cabo/* home
  Oc4jMount /stressH home
  Oc4jMount /stressH/* home
</IfModule>
```

Table 8–4 Oc4jRoutingMode Values

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dynamic</td>
<td>Dynamically configured mount points are used exclusively. Static mount points will be ignored.</td>
</tr>
<tr>
<td>Static</td>
<td>Static, manually configured mount points defined in mod_oc4j.conf are used exclusively. Dynamic mount points will not be created for new applications.</td>
</tr>
<tr>
<td>DynamicOverride</td>
<td>Both dynamic and static mount points are used. In the event of a conflict, the dynamically configured mount point will be used.</td>
</tr>
<tr>
<td>StaticOverride</td>
<td>Both dynamic and static mount points are used; however, in the event of a conflict, the static, manually configured mount point will be used. This is the default mode used, although it is not defined in mod_oc4j.conf by default.</td>
</tr>
</tbody>
</table>

The following mod_oc4j.conf example enables the DynamicOverride mode, in which the dynamic mount points specified will take precedence over static mount points in the event of a conflict:

```
LoadModule oc4j_module libexec/mod_oc4j.so
Oc4jRoutingMode DynamicOverride
<IfModule mod_oc4j.c>
  <Location /oc4j-service>
    SetHandler oc4j-service-handler
  </Location>
  Oc4jMount /j2ee/*
  Oc4jMount /webapp home
  Oc4jMount /webapp/* home
  Oc4jMount /cabo home
  Oc4jMount /cabo/* home
  Oc4jMount /stressH home
  Oc4jMount /stressH/* home
</IfModule>
```

Viewing Mount Point Configuration Data

You can configure Oracle HTTP Server to output mount point configuration data to a Web page generated on the Oracle HTTP Server host.

Add the following entry to the Oracle HTTP Server configuration file, httpd.conf, on the Oracle HTTP Server host machine. This file is installed in ORACLE_HOME/Apache/Apache/conf.
Configuring and Managing Clusters and OC4J Groups

Running an OC4J Instance on Multiple JVMs

OC4J executes on the Java Virtual Machine (JVM) of the standard Java Development Kit (JDK). By default, each OC4J instance uses one JVM; however, you can configure an OC4J instance so it runs on multiple JVMs, as Figure 8–6 shows. When you configure an OC4J instance to run on multiple JVMs, the instance essentially runs on multiple processes, which can improve performance and provide a level of fault tolerance for your deployed applications.

```
<IfModule mod_oc4j.c>
  Oc4jSet StatusUri /oc4j-status
</IfModule>

You will now be able to view mount point data by appending the /oc4j-status context URI to the Oracle HTTP Server server URL:

http://ohsHost:ajpPort/oc4j-status

For example:

http://node1.company.com:7777/oc4j-status

The following is sample output displayed in the resulting Web page, with comments:

hostname          : node1.company.com
local instance    : node1.company.com
select method     : Round-Robin
select affinity   : None
# OHS routing configuration
routing mode      : Static-Dynamic
routing ID        : g_rt_id

OC4J Dynamic routing
# Applications using dynamic routing

# 'ascontrol' application
application       : ascontrol
  context         : /em
  process (Jgroup): 0

# 'demos' application
application       : demos
  context         : /ojspdemos/jstl, /ojspdemos
  process (Jgroup): 0 (demos)

OC4J Process List

  process,ias instance,host,port,status
  0 : home.node1.company.com, node1.company.com, 12502, ALIVE
  1 : home.node1.company.com, node1.company.com, 12501, ALIVE
  2 : home.node1.company.com, node1.company.com, 12503, ALIVE
```
Running an OC4J Instance on Multiple JVMs

Figure 8–6  OC4J Instance Running on Multiple JVMs

This figure shows four processes that are configured to run from an OC4J instance, named OC4J_home, in one of the Oracle Application Server instances within a cluster.

Notes:  The OC4J instance named home typically cannot be configured to run with multiple processes because it hosts the Application Server Control application, ascontrol, which is not suitable for running in the multiple-process model.

You cannot run an application that uses an EJB timer in an OC4J instance that runs on multiple processes. EJB timers are supported only in an OC4J instance that runs on a single JVM (where numprocs=1 in the <process-set> element of the opmn.xml configuration file).

Multiple JVMs, however, require additional hardware resources to run efficiently. Also, if multiple processes run on the same host and the host goes down, all the JVM processes will go down.

If you install and manage multiple application server instances, you can install those application server instances on multiple hosts. By clustering the application servers and creating OC4J groups from the Cluster Topology page (or from the command line or API), you can also take advantage of application clustering and load balancing. Application clustering, described in Chapter 9, "Application Clustering in OC4J", ensures that state information is replicated to the different instances of your application running in each JVM.

In addition, Oracle Application Server clusters and OC4J groups provide added protection against hardware or network outages. If one host goes down, the applications deployed on the other hosts are still available.

Note:  Application Server Control (represented by the ascontrol application) cannot run on an OC4J instance that is running on multiple JVMs. Make sure that you do not configure multiple JVMs for the OC4J instance that is hosting the active Application Server Control instance.
Creating Additional JVMs for an OC4J Instance

By default, each OC4J instance uses one JVM. However, you can configure the OC4J instance so it runs on multiple JVMs, with a copy of the instance on each JVM. You can create additional JVMs for an OC4J instance on the Server Properties page in Application Server Control or by setting the `numprocs` attribute for an OC4J instance directly in the `opmn.xml` file.

---

**Note:** When the `numprocs` attribute for an OC4J instance is greater than 1 \((n)\) in the `opmn.xml` file, whether you set it with Application Server Control or by editing the file, Oracle Application Server starts \(n\) separate, physical JVM processes, each dedicated to run a copy of the related OC4J instance (including any deployed applications). Be sure to take the physical hardware resources into account when you set this value.

---

**How to Create Additional JVMs for an OC4J instance with Application Server Control**

You can add one or more JVMs for an OC4J instance on the Server Properties page in Application Server Control.

**To create additional JVMs for an OC4J instance with Application Server Control:**

1. Navigate to the OC4J Home page and then click **Administration** to display the OC4J Administration page, which contains a table listing the various administration tasks you can perform for the OC4J instance.
2. On the Administration page, select **Server Properties** to display the OC4J Server Properties page.
3. Enter the number of JVMs to configure for the OC4J instance in the Number of VM Processes field.
4. Click **Apply**.
5. Restart the OC4J instance from the Cluster Topology page or the OC4J Home page.

**How to Create Additional JVMs for an OC4J instance in the opmn.xml File**

By default, each OC4J instance uses one JVM. However, you can configure an OC4J instance so that it runs on multiple JVMs. You can add one or more JVMs by setting the `numprocs` attribute of the `<process-set>` element in the configuration for an OC4J instance in the `opmn.xml` file.

**To create additional JVMs for an OC4J instance in the opmn.xml file:**

1. Edit the `opmn.xml` file.
2. In the `<process-set>` element of the OC4J configuration, change the value of the `numprocs` attribute to the number of JVMs on which you want OC4J to run.

   **Example 8–1** shows the `numprocs` setting in `opmn.xml`.

**Example 8–1  numprocs Attribute for OC4J in opmn.xml**

```xml
<opmn>
  ...
  <ias-component id="default_group"
  <process-type id="home" module-id="OC4J" status="enabled">
  <module-data>
```
Monitoring Multiple JVMs

When you use multiple JVMs, it is important to monitor the performance of the JVMs to be sure the current hardware resources can handle the configuration. From Application Server Control, you can monitor and compare the performance of JVMs associated with the OC4J instance.

The following topics describe how to monitor JVM metrics with Application Server Control:

- Monitoring Dynamic Monitoring Service JVM Metrics
- Setting the jmxremote System Property for Monitoring J2SE JVM 5.0 Metrics
- Monitoring J2SE 5.0 JVM Metrics in an Oracle Application Server Environment
- Monitoring J2SE 5.0 JVM Metrics in a Standalone OC4J Environment

Before you can monitor the J2SE 5.0 JVM metrics with Application Server Control, you must be running OC4J on JDK 5.0 (1.5) and set the jmxremote system property for each OC4J instance to enable this monitoring.

Monitoring Dynamic Monitoring Service JVM Metrics

If you are running OC4J in an Oracle Application Server environment, then you can monitor a set of Dynamic Monitoring Service (DMS) metrics for each JVM. These metrics are unavailable in the standalone OC4J environment.

To view the DMS JVM Metrics in an Oracle Application Server environment with Application Server Control:

1. Navigate to the OC4J Home page.
2. Locate the Virtual Machines field in the General section of the OC4J Home page.
3. Click the number that indicates how many JVMs are configured for the OC4J instance.
The JVM Metrics page displays a summary of key metrics for all the JVMs configured for the selected OC4J instance. You can use this table to compare the performance of multiple JVMs.

4. For more detailed information, click the name of a JVM. The OC4J JVM page displays a set of charts and numeric metrics that give you a detailed picture of how the JVM is performing. Select a refresh interval from the View Data list. You can then view the changes in the performance charts over a period of time.

Setting the jmxremote System Property for Monitoring J2SE JVM 5.0 Metrics
You can set the jmxremote System Property for monitoring J2SE JVM 5.0 metrics with Application Server Control, with an OC4J startup option, or for an OPMN-managed environment, in the opmn.xml file.

Using Application Server Control to Set the jmxremote System Property
To enable the monitoring of JVM J2SE 5.0 metrics for each OC4J instance with Application Server Control:

1. Navigate to the OC4J Home page and then click Administration to display the OC4J Administration page, which contains a table listing the various administration tasks you can perform for the OC4J instance.
3. Scroll down to the Command Line Options section of the page and select Enable J2SE 5.0 Platform MBeans.
4. Click Apply to apply the changes.
5. Navigate to the Cluster Topology page, select the OC4J instance, and then click Restart.

Setting the jmxremote System Property in an OC4J Startup Option
You can also enable monitoring of JVM J2SE 5.0 metrics by including the following string as an OC4J runtime startup option:

```
java -Dcom.sun.management.jmxremote -jar oc4j.jar
```

Setting the jmxremote System Property in the opmn.xml File
If you are running OC4J in an OPMN-managed, Oracle Application Server environment, include -Dcom.sun.management.jmxremote in the the in the opmn.xml file, as follows:

```
<ias-component id="default_group">
    <process-type id="home" module-id="OC4J" status="enabled">
        <module-data>
            <category id="start-parameters">
               <data id="java-options" value="/Dcom.sun.management.jmxremote"/>
            ...
```

...
Using Application Server Control to enable the J2SE 5.0 Platform MBeans results in the `jmxremote` system property being set in the `opmn.xml` file. If you use this approach, then there is no need to set the property manually in the `opmn.xml` file.

**Monitoring J2SE 5.0 JVM Metrics in an Oracle Application Server Environment**

To view the J2SE 5.0 JVM Metrics in an Oracle Application Server environment with Application Server Control:

1. On the OC4J Home page, locate the **Virtual Machines** field in the General section.
2. Click the number that indicates how many JVMs are configured for the OC4J instance.
   
   Enterprise Manager displays the JVM Metrics page.
3. Click the name of a JVM.
   
   Enterprise Manager displays the OC4J JVM page.
4. Scroll to the Related Links section of the page and click **J2SE 5.0 Metrics**.

**Monitoring J2SE 5.0 JVM Metrics in a Standalone OC4J Environment**

To view the J2SE 5.0 JVM Metrics in a standalone OC4J environment with Application Server Control:

1. On the OC4J Home page, click **Performance** to display the OC4J Performance page.
2. Scroll to the Related Links section of the page and click **J2SE 5.0 Metrics**.
This chapter discusses the application clustering framework provided in OC4J 10g (10.1.3.4.0). It includes these topics:

- Overview of Application Clustering in OC4J
- How Application Clustering Differs from Previous OC4J Releases
- Configuring Application Clustering

**Overview of Application Clustering in OC4J**

OC4J provides a flexible framework for creating a clustered environment for development and production purposes. An application cluster is the same set of applications hosted by two or more OC4J instances. The OC4J application clustering framework supports:

- Replication of objects and values contained in an HTTP session or a stateful session Enterprise JavaBeans (SFSB) instance.
- In-memory replication using multicast or peer-to-peer communication, or persistence of state data to a database.
- Load balancing of incoming requests across OC4J instances.
- Transparent failover across applications within an application cluster.
- Configuration within an OC4J instance at either the global server or application level.

A new `<cluster>` element, which contains a number of new subelements, has been added to the XML schema definition for these files to provide a single mechanism for management of application clustering. See "Specifying the `<cluster>` Element" on page 9-11 for descriptions of this element and its subelements.

**How Application Clustering Differs from Previous OC4J Releases**

The following features are no longer included in the application clustering framework in OC4J 10g (10.1.3).

**Islands No Longer Supported**

The notion of islands, part of the clustering framework in previous OC4J releases, is no longer supported in OC4J.

In previous releases, an island was essentially a group of OC4J instances within an Oracle Application Server cluster across which HTTP session data was replicated.
Although islands reduced overhead by not replicating data across the entire cluster, they increased configuration and management overhead. In addition, islands were applicable only to Web applications; EJB applications could not utilize the island configuration.

In OC4J 10g (10.1.3), you can still effectively limit the number of nodes to which to replicate data by using the write-quota attribute of the <cluster> element. This attribute makes it possible to control the extent of state replication.

See "Managing the Number of JVMs to Which Application State Data Is Replicated" on page 9-5 and "Specifying the <cluster> Element" on page 9-11 for details on the write-quota attribute.

loadbalancer.jar No Longer Used

The loadbalancer.jar archive, which provided load-balancing functionality in previous OC4J releases, was deprecated in the previous release of OC4J and has been removed from the current release.

Application-Clustering-Specific XML Elements Deprecated

The following XML elements are deprecated in OC4J 10g (10.1.3.4.0) and should no longer be used to configure clustering:

- The <cluster-config> element in server.xml, the OC4J configuration file
- The cluster-island attribute of the <web-site> element in a *-web-site.xml Web site configuration file

The new <cluster> element is now used for all application cluster management.

Configuring Application Clustering

Application clustering is enabled by adding the <cluster> element to the orion-application.xml file of each application to be clustered in an OC4J instance. For deployed applications, this file is located in the ORACLE_HOME/j2ee/instance/application-deployments/applicationName directory. See "Specifying the <cluster> Element" on page 9-11 for descriptions of this element and its subelements.

This section includes the following topics:

- Enabling Application Clustering
- Setting Replication Policies
- Managing the Number of JVMs to Which Application State Data Is Replicated
- Using Synchronous or Asynchronous Replication
- Configuring Multicast Replication
- Configuring Peer-to-Peer Replication
- Specifying Ports for State Replication in OPMN
- Configuring Database Replication
- Disabling Clustering
- Specifying the <cluster> Element
Enabling Application Clustering

Application clustering can be enabled globally for all applications running within an OC4J instance, as well as on a per-application basis.

- Enabling clustering for all applications

  Application clustering can be enabled by default for all applications deployed to an OC4J instance, through `ORACLE_HOME/j2ee/instance/config/application.xml`, the configuration file for the default application. All other applications deployed into the OC4J instance inherit default properties from this application, including the application clustering configuration.

- Enabling clustering for a specific application

  Application clustering is defined in the application-specific `ORACLE_HOME/j2ee/instance/application-deployments/app_name/orion-application.xml` file. Settings in this file override the global configuration, as well as the configuration inherited from a parent application.

  **Note:** Application clustering can also be configured at the time the application is deployed by using Oracle Enterprise Manager 10g Application Server Control, through either the deployment tasks or the deployment plan editor.

  See the [Oracle Containers for J2EE Deployment Guide](#) for details.

Any changes made to a particular application's `orion-application.xml` file in one OC4J instance must be replicated to the corresponding XML files in other OC4J instances for all applications within an Oracle Application Server cluster. For more information, see "Replicating Changes Across a Cluster" on page 8-11.

At the application level, application clustering can be configured at the time the application is deployed into an OC4J instance by using the deployment plan editor, which sets values in each application's `orion-application.xml` file. See the [Oracle Containers for J2EE Deployment Guide](#) for details on using the deployment plan editor.

**Important:** An empty `<distributable />` tag must be added to the `web.xml` file for all Web modules that are part of an application configured to use application clustering. After deployment, this J2EE standard Web module descriptor is in the `ORACLE_HOME/j2ee/instance/applications/app_name/web_module/WEB-INF` directory within OC4J.

Setting Replication Policies

A replication policy defines when replication of HttpSession or a stateful session bean state occurs, and whether all attributes and variable values or only changed values are replicated. Replication can be an expensive process, and replicating data too frequently can affect server performance; however, replicating data too infrequently can result in lost data in the event of server failure.

The replication policy applied to all Web modules and EJB modules within an application is specified in the `<replication-policy>` element within the application's `orion-application.xml` configuration file. The syntax of this element is as follows:
The `trigger` attribute specifies when replication occurs. By default, the `onRequestEnd` policy is applied, as it provides frequent replication of data while ensuring that data is not lost if the JVM terminates unexpectedly.

See Table 9–1 for an overview of `trigger` attribute values.

The `scope` attribute defines what data is replicated: Either all attribute or variable values, or only changed values. By default, only modified HTTP session attributes are replicated; for stateful session beans, all member variables are replicated.

See Table 9–2 for an overview of `scope` attribute values.

### Table 9–1 `<replication-policy>` `trigger` Attribute Values

<table>
<thead>
<tr>
<th><code>trigger</code> Value</th>
<th>HttpSession</th>
<th>Stateful Session Bean</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>onSetAttribute</code></td>
<td>Replicate each change made to an HTTP session attribute at the time the value is modified. From a programmatic standpoint, replication occurs each time <code>setAttribute()</code> is called on the <code>HttpSession</code> object. This option can be resource intensive in cases where the session is being extensively modified.</td>
<td>Not applicable.</td>
</tr>
<tr>
<td><code>onRequestEnd</code> (default)</td>
<td>Queue all changes made to HTTP session attributes, then replicate all changes just before the HTTP response is sent.</td>
<td>Replicate the current state of the bean after each EJB method call. The state is replicated frequently, but offers higher reliance.</td>
</tr>
<tr>
<td><code>onShutdown</code></td>
<td>Replicate the current state of the HTTP session whenever the JVM is terminated gracefully, such as with Ctrl-C. State is not replicated if the host is terminated unexpectedly, as in the case of a system crash. Because session state was not previously replicated, all session data is sent across the network at once upon JVM termination, which can impact network performance. This option can also significantly increase the amount of time needed for the JVM to shut down.</td>
<td>Replicate the current state of the bean whenever the JVM is terminated gracefully. State is not replicated if the host is terminated unexpectedly, as in the case of a system crash. Because bean state was not previously replicated, all state data is sent across the network at once upon JVM termination, which can impact network performance. This option may also significantly increase the amount of time needed for the JVM to shut down.</td>
</tr>
</tbody>
</table>
Configuring Application Clustering

Application Clustering in OC4J

The `<replication-policy>` element in `orion-application.xml` does not allow you to distinguish between Web and EJB modules within an application. However, you can specify a different replication policy for an EJB module in the `replication` attribute of the `<session-deployment>` element within the component-specific `orion-ejb-jar.xml` configuration file.

See Table 9–3 for valid values for the `replication` attribute. For example:

```
<session-deployment name="MyStatefulVM" replication="onShutdown" />
<session-deployment name="MyEntity2" replication="onRequestEnd" />
```

The values in this file override the corresponding settings in `orion-application.xml`, effectively enabling you to set the replication policy for an EJB module in `orion-ejb-jar.xml` and the policy for Web components in `orion-application.xml`.

<table>
<thead>
<tr>
<th><code>replication-policy</code> scope Attribute Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>scope Value</td>
</tr>
<tr>
<td>--------------</td>
</tr>
<tr>
<td>modifiedAttributes (default)</td>
</tr>
<tr>
<td>allAttributes</td>
</tr>
</tbody>
</table>

Managing the Number of JVMs to Which Application State Data Is Replicated

You can effectively limit the number of JVMs to which state data is replicated by using the `write-quota` attribute of the `<cluster>` element. This functionality makes it possible to reduce network traffic and related overhead by controlling the extent of state replication.

The default value for `write-quota` is 1, indicating that state will be replicated to one other JVM within an Oracle Application Server cluster.

An application group member actually runs on a JVM, not an Oracle Application Server node. It is possible to construct architectures and configurations in which multiple JVMs are running per node as components of the cluster.

To force state replicas to be stored on separate physical nodes, which provides failover protection for hardware outages, set the `allow-colocation` attribute to `false`. This will require the state replication manager to select a peer (or peers if `write-quota` is
greater than 1) running on a separate physical node (or nodes) to store its state replicas.

To replicate state to all JVMs within the Oracle Application Server cluster, you must specify the total number of JVMs within the cluster as the value of write-quota.

**Using Synchronous or Asynchronous Replication**

By default, OC4J instances will replicate data to other instances asynchronously. However, you can enable synchronous replication by including the `<synchronous-replication>` subelement within the `<cluster>` element. This will force a replicating OC4J instance to wait for an acknowledgement that the data was received from at least one other peer instance before continuing with replication.

**Configuring Multicast Replication**

Multicast IP replication is the default replication protocol used in a standalone OC4J installation. In this mode, OC4J uses multicast packages to send and receive HTTP session and stateful session bean state changes. These packages are sent over the network to be picked up by other OC4J processes using the same multicast address and port. Lost messages are identified and retransmitted, providing a reliable transmission service.

The configuration must specify the same multicast address and port on all OC4J instances. The default values used by OC4J multicast are 230.230.0.1 for the address and 45566 for the port. These values can be changed in the appropriate XML configuration file, if necessary.

Multicast replication can be enabled between multiple application instances simply by adding an empty `<cluster>` element to `orion-application.xml` file for each instance:

```xml
<orion-application ...>
  ...
  <cluster/>
</orion-application>
```

The next example specifies a new multicast address and port, using the `ip` and `port` attributes. The optional `bind_addr` attribute can be used to specify which Network Interface Card (NIC) to bind to. This is useful if you have OC4J host machines with multiple network cards, each with a specific IP address, and you want to define which NIC is used to send and receive the multicast messages.

```xml
<orion-application ...>
  ...
  <cluster allow-colocation="false">
    <replication-policy trigger="onShutdown" scope="allAttributes" />
    <protocol>
      <multicast ip='225.130.0.0' port='45577' bind_addr='226.83.24.10' />
    </protocol>
  </cluster>
</orion-application>
```

**Using an Existing JavaGroups Configuration for Multicast Replication**

The multicast-based and peer-to-peer-based replication mechanisms provided by OC4J are built on the JavaGroups communication protocol stack. Ideally, you should use one of these OC4J mechanisms to provide in-memory replication of state data, as they utilize OC4J-specific configurations.
However, you do have the option of utilizing your own JavaGroups configuration within the OC4J clustering framework. This feature is enabled by specifying one of the following items in the <property-config> subelement within the <cluster> element:

- A string containing the JavaGroups configuration properties
- A URL to an XML configuration file containing this information

See “Specifying the <cluster> Element” on page 9-11 for details.

Configuring Peer-to-Peer Replication

OC4J supports replication in a peer-to-peer (P2P) topology, using TCP to establish connections between instances within an Oracle Application Server cluster. The state data held in each application instance is then unicast to each OC4J instance.

Two peer-to-peer configurations are supported:

- Dynamic peer-to-peer, in which Oracle Process Manager and Notification Server (OPMN) is used to enable peer nodes to dynamically discover and communicate with one another. This configuration is the default used in an Oracle Application Server environment where OPMN is used to manage the various components, including OC4J.

  See “Configuring Dynamic OPMN-Managed Peer-to-Peer Replication” for details.

- Static peer-to-peer, in which each node in the cluster is explicitly configured to recognize at least one other peer node. This configuration is supported only in a standalone OC4J environment, with a relatively small number of standalone OC4J instances clustered together.

  See "Configuring Static Peer-to-Peer Replication” for details.

Configuring Dynamic OPMN-Managed Peer-to-Peer Replication

In an Oracle Application Server environment, Oracle Process Manager and Notification Server (OPMN) is utilized to provide dynamic peer-to-peer replication. In this replication model, each Oracle Application Server node registers itself with OPMN. The node then queries OPMN for the list of available nodes, enabling it to dynamically discover and communicate with other nodes within the cluster.

Each node sends periodic ONS (heartbeat) messages to OPMN to inform OPMN of current status, enabling OPMN to maintain a real-time list of available peer nodes and to notify nodes when one has failed. In the event that a node is lost, another node is able to service its requests.

```xml
<orion-application ...
...
<cluster>
    <protocol>
        <peer>
            <opmn-discovery />
        </peer>
    </protocol>
</cluster>
```
Configuring Static Peer-to-Peer Replication

In this configuration, the host address and port of at least one other peer node are supplied to enable peer-to-peer communication. As a node becomes aware of each of its peers, it also becomes aware each peer's peer(s) - with the end result that all of the nodes in the cluster become aware of one another.

The key challenge in this configuration is in ensuring that host and port definitions are kept up to date, which may present a significant management effort. The following elements and attributes affect the configuration:

- The `start-port` attribute of the `<peer>` element specifies the initial port on the host that the local OC4J process will try to bind to for peer communication. If this port is not available, OC4J will continue to increment this port until an available port is found.
- The `<node>` element specifies a peer node. The `host` and `port` attributes of the element define the name of the node address and the port that will be used for peer communication.
- The `range` attribute of the `<peer>` element applies to the ports specified in each `<node>` element, not to the value of the `start-port` attribute. The `range` attribute defines the number of times to increment the `port` value if the specified port is not available on a node.

The following example illustrates static peer-to-peer configurations, as specified in the `orion-application.xml` application deployment descriptor deployed with the sample application to three cluster nodes.

In this configuration, each node specifies one other node as its peer. The result is that all of the nodes within the cluster are able to establish connections with one another. This scenario will work only if each node is started in succession; that is, `www3.company.com` must be started before `www2.company.com`. Otherwise, `www2.company.com` will not be able to "see" `www3.company.com`.

1. **First**, `www1.company.com` specifies `www2.company.com` as its peer:

   ```xml
   <orion-application ...>
   ...
   <cluster>
   <protocol>
   <peer start-port="7900" range="10" timeout="6000">
   <node host="www2.company.com" port="7900" />
   </peer>
   </protocol>
   </cluster>
   </orion-application>
   ```

2. **Next**, `www2.company.com` specifies `www3.company.com` as its peer:

   ```xml
   <orion-application ...>
   ...
   <cluster>
   <protocol>
   <peer start-port="7900" range="10" timeout="6000">
   <node host="www3.company.com" port="7900" />
   </peer>
   </protocol>
   </cluster>
   </orion-application>
   ```
3. Finally, www3.company.com specifies www1.company.com as its peer:

```xml
<orion-application ...
...
<cluster>
  <protocol>
    <peer start-port="7900" range="10" timeout="6000">
      <node host="www1.company.com" port="7900" />
    </peer>
  </protocol>
</cluster>
</orion-application>
```

An alternative configuration could have all of the nodes specifying the same node as a peer. For example, you could have the www1.company.com and www3.company.com nodes both specify www2.company.com as a peer. In this configuration, www2.company.com would have to be the first node started; the other nodes would then connect to this node, and establish connections with one another.

### Specifying Ports for State Replication in OPMN

When you deploy an application utilizing state replication in an OPMN-managed Oracle Application Server environment, OPMN dynamically allocates the ports that are used to propagate state across the cluster. You can restrict this allocation to a range of ports for an application that has peer-to-peer replication enabled. Specifying ports for state replication might be necessary in an installation with a firewall or network that uses a well-defined port range.

**To specify a range of ports for peer-to-peer state replication:**

1. Add a `<port>` element to an OC4J instance configuration in the `opmn.xml` file.
2. Specify the name of an application that has peer-to-peer replication enabled as the value of the `id` attribute of the `<port>` element.
3. Specify a range of ports in the `range` attribute of the `<port>` element.

For example, for deployment of an application named `rac-web` that is set up for peer-to-peer replication, the line labeled `<port id="rac-web" .../>` in the following OC4J instance configuration tells OPMN to use ports 15213 to 15214 for state replication:

```xml
<port id="default-web-site" range="80-100" protocol="http"/>
<port id="rmi" range="12401-12500"/>
<port id="rmis" range="12701-12800"/>
<port id="jms" range="12601-12700"/>
<port id="rac-web" range="15213-15214"/>
```

### Configuring Database Replication

The new clustering framework provides the ability to replicate an HTTP session and stateful session bean state to a database. Data is persisted outside of the clustered OC4J framework, enabling the entire session to be recovered in the event of a catastrophic failure of all of the OC4J instances within the cluster. The full HTTP session or stateful session bean object is replicated to the database.
Configuring Application Clustering

The connection to the database is created using a data source, which is specified in the data-source attribute of the <database> subelement of <protocol>. Set the value of the data-source attribute to the data source's jndi-name as specified in data-sources.xml.

The data source specified must already exist within the OC4J instance. See the Oracle Containers for J2EE Services Guide for details on creating and using data sources.

The following example configures the application to replicate data to the database accessed through the MyOracleDS data source.

```xml
<orion-application ...>

...<cluster>
  <protocol>
    <database data-source="jdbc/MyOracleDS"/>
  </protocol>
</cluster>
</orion-application>
```

Session data is persisted to the following tables in the database:

- **OC4J_HTTP_SESSION**, which stores metadata for an HTTP session
- **OC4J_HTTP_SESSION_VALUE**, which stores the values set by the application user on the HTTP session
- **OC4J_EJB_SESSION**, which stores the current state of a stateful session bean

The tables are created by OC4J the first time database replication is invoked. See Appendix C, "Overview of the Session State Tables" for details on the table schema.

The length of time session data is stored in the database is based on the session's time-to-live (TTL) value. A session is considered expired when the difference between the current database time and the time the session was last accessed is greater than the session timeout value. The actual equation for determining a session’s TTL is:

\[(\text{Current Database Time} - \text{Last Accessed Time}) > \text{Max Inactive Time}\]

Expired sessions are removed from the database on the next execution of the OC4J task manager. See “Configuring the OC4J Task Manager” on page 10-1 for instructions on setting the task manager interval.

In the event that the OC4J server terminates without proper session termination, orphan records will be created in the database. These records will also be deleted the next time the task manager runs.

**Determining an Application’s JVM, OC4J Instance, and Application Server Instance**

You can use system properties to determine the JVM, OC4J instance, and application server instance in which an application instance runs within a cluster. This information is useful for debugging as well as for building management utilities on top of Oracle Application Server.

To obtain information about the environment of an application instance running in a cluster, you can access several properties through System.getProperty() calls. In a Java process running on OC4J, you can use system properties to print information about the JVM, OC4J instance, and application server instance to the system console, as Example 9–1 shows.
**Example 9–1 System.getProperty() Calls to Print System Property Values**

```java
System.out.println("Oracle home name: " + System.getProperty("oracle.home"));
System.out.println("OC4J instance name: " + System.getProperty("oracle.oc4j.instancename"));
System.out.println("AS instance name: " + System.getProperty("oracle.ons.instancename"));
System.out.println("Instance:Group:JVM PID: " + System.getProperty("oracle.ons.indexid"));
```

Table 9–4 describes the system properties that specify the JVM, group, OC4J instance, Oracle home, and Oracle Application Server instance for an application.

Table 9–4 System Properties for JVM, OC4J Instance, and Application Server Instance

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>oracle.home</td>
<td>A string containing the name of the physical directory in which Oracle Application Server is installed</td>
</tr>
<tr>
<td>oracle.ons.instancename</td>
<td>A string containing the name of the Oracle Application Server instance</td>
</tr>
<tr>
<td>oracle.oc4j.instancename</td>
<td>A string containing the name of the OC4J instance</td>
</tr>
<tr>
<td>oracle.ons.indexid</td>
<td>A string containing a combination of the OC4J instance name, the group to which the instance belongs, and the JVM executing the application instance, in the following format: OC4J_INSTANCE.oc4j_groupname.jvm_number</td>
</tr>
</tbody>
</table>

For example: java_eel.javaee_group.2

**Disabling Clustering**

Clustering can be disabled globally or for a specific application using the Boolean enabled attribute of the `<cluster>` element. Setting this attribute to `false` in an application's `orion-application.xml` file effectively removes the application from the cluster.

**Specifying the `<cluster>` Element**

The `<cluster>` element serves as the single mechanism for application clustering configuration. It is used exclusively in the `ORACLE_HOME/j2ee/instance/config/application.xml` file to configure application clustering at the global level, and in application-specific `orion-application.xml` files for application-level clustering configuration.

`<cluster>`

Contains the application clustering configuration for an enterprise application running within an OC4J instance.

**Subelements of `<cluster>`:**

- `<property-config>`
- `<flow-control-policy>`
- `<replication-policy>`
- `<protocol>`
- `<synchronous-replication>`

**Attributes:**
enabled: Whether clustering is enabled for the application. The default is true. Setting this value at the application level overrides the value inherited from the parent application, including the default application.

- group-name: The name to use when establishing the replication group channels. If not supplied, the application name as defined in server.xml, the OC4J server configuration file, is used by default, and new group channels are created for each enterprise application.

If a value is specified, the application and all child applications will use the channels associated with this group name.

This attribute is ignored if the <database> tag is included.

- allow-colocation: Whether to allow application state to be replicated to a node residing on the same host machine. The default is true. However, this attribute should be set to false if multiple hosts are available.

If multiple OC4J instances are instantiated on the same machine, different listener ports must be specified for each instance in the default-web-site.xml, jms.xml, and rmi.xml configuration files.

- write-quota: The number of other application group members (JVMs) to which the application state should be replicated. This attribute makes it possible to reduce overhead by limiting the number of JVMs to which state is written, similar to the islands concept used in previous OC4J releases.

The default is 1 JVM.

This attribute is ignored if the <database> tag is included.

- cache-miss-delay: The length of time, in milliseconds, to wait in-process for another group member to respond with a session if the session cannot be found locally. If the session cannot be found, the request will pause for the entire length of time specified.

The default is 1000 milliseconds. In installations where heavy request loads are expected, this value should be increased; for example, to 5000. Setting this value higher also prevents the OC4J instance from creating a replica of session data within itself if allow-colocation is set to true.

This attribute is ignored if the <database> tag is included.

<property-config>
Contains data required to use the JavaGroups group communication protocol to replicate session state across nodes in the cluster.

Attributes:

- url: A link to a JavaGroups XML configuration file.

- property-string: A string containing the properties that define how the JavaGroups JChannel should be created.

<replication-policy>
The replication policy to apply, which defines when replication of data occurs and what data is replicated.

Attributes:

- trigger: The frequency at which replication occurs. See Table 9–1 on page 9-4 for the values for this attribute.
- **scope**: What data is replicated. See Table 9–2 on page 9-5 for the values for this attribute.

**<protocol>**
Defines the mechanism to use for data replication. Only one mechanism can be specified.

Subelements:
- `<multicast>`
- `<peer>`
- `<database>`

**<multicast>**
Contains the configuration required to use multicast communication for replication. This is the default protocol used.

Attributes:
- **ip**: The multicast address to use. The OC4J default is 230.230.0.1.
- **port**: The multicast port to use. The OC4J default is port 45566.
- **bind_addr**: The Network Interface Card (NIC) to bind to. This is useful if you have OC4J host machines with multiple network cards, each with a specific IP address.

**<peer>**
Contains the configuration required to use peer-to-peer (P2P) communication for replication.

Subelements:
- `<opmn-discovery>`
- `<node>`

Attributes:
- **start-port**: The initial port on the node to attempt to allocate for peer communication. OC4J will continue to increment this value until an available port is found. The default is port 7800. Valid only for configuring static peer-to-peer replication in a standalone OC4J installation.
- **range**: The number of times to increment the port value specified in each `<node>` subelement while looking for a potential peer node. The default is 5 increments. Valid only for configuring static peer-to-peer replication in a standalone OC4J installation.
- **timeout**: The length of time, in milliseconds, to wait for a response from a peer while looking for a potential peer node. The default is 3000 milliseconds. Valid only for configuring static peer-to-peer replication in a standalone OC4J installation.
- **bind_addr**: The Network Interface Card (NIC) to bind to. This is useful if you have OC4J host machines with multiple network cards, each with a specific IP address.

**<opmn-discovery>**
Configures OC4J to use *dynamic* peer-to-peer replication in an Oracle Application Server environment.
<node>
Contains the host name and port of a node to poll if using static peer-to-peer communication. One or more instances of this element can be supplied within a <peer> element.

Attributes:
- host: The host name of the peer node as a URL.
- port: The port on the node to use for peer-to-peer communication. The default is port 7800.

(database>
Contains the connection information required to persist state data to a database.

Attribute:
- data-source: The name of a data source containing the database connection information. This must be the value of the data source's jndi-name attribute, as specified in data-sources.xml.

<flow-control-policy>
Controls the amount of memory to allocate to the handling of clustering messages during replication. This element is intended to prevent out-of-memory errors by gating the amount of data (bytes) sent from one node to another during replication.

Attributes:
- enabled: Whether flow control is enabled. The default is true.
- max-bytes: The maximum number of bytes the receiving node can accept. After this value is reached, the sending node must wait for an acknowledgement from the receiver before additional messages can be sent. The default value is 500000.
- min-bytes: The minimum number of bytes the receiving node can accept without triggering an acknowledgement that more bytes should be sent. If the number of bytes received is less than this value, the receiver will acknowledge that it can accept more bytes from the sender. The default is 0.
- threshold: If min-bytes is not specified, this factor value is applied to incoming requests to determine the value of that attribute. The default value is 0.25.

<synchronous-replication>
If included, a node that is replicating application data will wait for an acknowledgement that the data update was received from at least one other peer node before continuing with replication. This element is optional; the default behavior is for nodes to continue replicating data to other nodes asynchronously.

Attributes:
- timeout: The length of time, in milliseconds, to wait for a response from a peer node. If this value is exceeded, replication should continue, although no acknowledgement was received. The default value is 10000 milliseconds (10 seconds).
This chapter provides guidelines for configuring the task manager for an OC4J instance and configuring thread pools for OC4J instances and Web site applications. It contains the following sections:

- Configuring the OC4J Task Manager
- Configuring OC4J Thread Pools

### Configuring the OC4J Task Manager

The *task manager* is a background process that executes all pending tasks, such as timing out HTTP sessions and checking for changed configuration files. By default, it executes every second (1000 milliseconds).

The interval at which the task manager executes is specified in milliseconds in the `taskmanager-granularity` attribute of the `<application-server>` element in the `server.xml` configuration file. This is an OC4J container-level parameter. The default is 1000 milliseconds.

For example, the following entry in `server.xml` configures the task manager to execute every minute (60000 milliseconds):

```xml
<application-server ... taskmanager-granularity="60000" ...>
```

You must restart OC4J after making modifications to `server.xml`.

---

**Note:** You can also set this parameter through the `granularity` attribute in the `TaskManager` MBean, which is accessible through the JMX Browser in Application Server Control. See Chapter 12, "Using MBeans in OC4J" for details on accessing and using MBeans to manage OC4J processes.

---

### Configuring OC4J Thread Pools

*Thread pools* create and store threads for use and reuse by an OC4J process and applications deployed to the OC4J instance. Reusing existing threads rather than creating new threads on demand improves performance and reduces the burden on the JVM and underlying operating system.

*Table 10–1* lists the thread pools available in OC4J 10g (10.1.3.4.0).
Table 10–1  OC4J Thread Pools

<table>
<thead>
<tr>
<th>Thread Pool</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>system</td>
<td>For the OC4J runtime to use. The threads from this pool do not run any applications deployed on an OC4J instance. You should not change the configuration of this thread pool.</td>
</tr>
<tr>
<td>http</td>
<td>Serves HTTP and AJP requests. If no rmi request thread pool exists, the http thread pool serves RMI requests. If no rmi connection thread pool exists, the http thread pool handles RMI connections.</td>
</tr>
<tr>
<td>jca</td>
<td>Serves work management requests from resource adapters. If needed by a resource adapter deployed to an OC4J instance, a work management thread pool containing worker threads used by resource adapters, such as the JMS connector, is created within the OC4J process.</td>
</tr>
<tr>
<td>rmi request</td>
<td>Serves RMI requests. This optional thread pool provides more control over allocation of thread resources.</td>
</tr>
<tr>
<td>rmi connection</td>
<td>Handles RMI connections. This optional thread pool provides threads that block-read on the RMI connection. The rmi connection pool is used not only for RMI connections but also for RMI listener threads and a JMS server thread.</td>
</tr>
<tr>
<td>Custom</td>
<td>For use by one or more applications. Separate, custom thread pools for applications reduce contention for thread resources. A set of applications in a cluster can share a custom thread pool.</td>
</tr>
</tbody>
</table>

By default, three of these thread pools are created at OC4J startup:

- system
- http
- jca

In each thread pool, idle threads are reused before a new thread is spawned, unless the number of requests exceeds the number of available threads. After 10 minutes of inactivity, an idle thread is automatically destroyed.

A <thread-pool> or <custom-thread-pool> element in the server.xml file defines each thread pool. Table 10–2 summarizes the attributes of these elements and gives the default attribute values.

You can use the default thread pool configuration or change it. For each OC4J instance, you can change the attribute values for any of the thread pools except system, and you can add rmi request, rmi connection, and one or more custom thread pools. The following topics describe how to configure thread pools:

- Changing the Thread Pool Configuration
- Configuring Custom Thread Pools for Applications
<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
</table>
| **name**  | The name attribute specifies the thread pool name and has no default value.  
For a custom thread pool, the name can be any string value.  
In the `<thread-pool>` element, the name must be one of these values:  
- **system**  
  A thread pool for the OC4J runtime to use  
- **http**  
  A thread pool that serves HTTP and AJP requests and possibly RMI requests (if an rmi request thread pool is not configured) and RMI connections (if an rmi connection thread pool is not configured).  
- **jca**  
  The work management thread pool, for the J2CA work manager to serve resource adapter requests  
- **rmi request**  
  A thread pool that serves RMI requests  
- **rmi connection**  
  A thread pool whose threads block-read on the RMI connection  
  The names of the threads in these named pools are prefixed with `SystemThreadGroup_`, `HTTPThreadGroup_`, `WorkManager_`, `RMIRequestThreadGroup_`, and `RMICloneThreadGroup_`, respectively, and suffixed with an incrementing counter. |
| **min**    | The minimum number of threads to create in the pool. The default value is 0.  
The minimum number of threads for a jca thread pool should be a multiple of the number of CPUs installed on your machine. However, this number should be small; the more threads you have, the more burden you put on the operating system and the garbage collector.  
The value of min for an rmi connection thread pool is relative to the number of physical connections you have at any point in time. The queue value handles bursts in connection traffic. |
Configuring OC4J Thread Pools

Changing the Thread Pool Configuration

You can change the thread pool configuration for an OC4J instance with Application Server Control or by editing the server.xml file, in the following ways:

- Change attribute values for thread pools on the Thread Pool Configuration page in Application Server Control.
- Change the attributes of thread pool MBeans through the System MBean Browser in Application Server Control.

See "Using the System MBean Browser" on page 12-5 for details on accessing and using MBeans to manage OC4J.

- Configure an rmi request or rmi connection thread pool, or both, by adding a <thread-pool> element for each to server.xml.

You must restart OC4J after making modifications to server.xml.

Table 10–2 (Cont.) Attributes of <thread-pool> and <custom-thread-pool>

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>max</td>
<td>The maximum number of threads that can be created in the pool. New threads are spawned if the maximum size is not reached and if there are no idle threads. Idle threads are used first before a new thread is spawned. The default value is 1024. The rmi connection thread pool usually creates three threads for internal use as RMI and JMS listeners, so you need to set the value of max to your required maximum number of threads plus 3. For example, if you specify max=&quot;16&quot;, then only 13 threads are available to service requests. Similarly, if the max value is 20, then only 17 threads are available. The value of max for an rmi connection thread pool is also relative to the number of the physical connections you have at any point in time. The queue value handles bursts in connection traffic. The maximum number of threads for a jca thread pool should be a multiple of the number of CPUs installed on your machine. However, this number should be small; the more threads you have, the more burden you put on the operating system and the garbage collector.</td>
</tr>
<tr>
<td>queue</td>
<td>The maximum number of requests that can be kept in the queue. The default value is 0. The queue value should be at least twice the size of the maximum number of threads.</td>
</tr>
<tr>
<td>keepAlive</td>
<td>The length of time, in milliseconds, to keep a thread alive (idle) while waiting for a new request. After the timeout is reached, the thread is destroyed. The default value is 600000. To never destroy threads, set to -1. The default value, 600000 milliseconds (10 minutes), is also the minimum value allowed if the value is not -1. Setting keepAlive to 0 (zero) will cause high CPU usage due to active polling.</td>
</tr>
<tr>
<td>stackSize</td>
<td>The size of the thread pool stack. The default value is 0.</td>
</tr>
<tr>
<td>debug</td>
<td>A value of true specifies printing the thread pool information for the application server to the console at startup. The default is false. If debug is false, the thread pool information is not printed.</td>
</tr>
</tbody>
</table>
Changing the Thread Pool Configuration with Application Server Control

To change the thread pool configuration for an OC4J instance with Application Server Control:

1. Navigate to the OC4J Home page and then click Administration to display the OC4J Administration page, which contains a table listing the various administration tasks you can perform for the OC4J instance.

2. Under Properties on the Administration page, select Thread Pool Configuration to display the OC4J Thread Pool Configuration page.

3. Change the value of one or more attributes for any thread pool displayed on this page.

   For information about attribute values, see Table 10–2 on page 10-3 or "<thread-pool>" on page B-17.

4. Click Apply.

5. Restart the OC4J instance from the Cluster Topology page or the OC4J Home page.

You can also configure thread pools in Application Server Control through MBeans, as "Changing the Thread Pool Configuration Through MBeans" describes in the following text.

Changing the Thread Pool Configuration Through MBeans

To change the attributes of thread pool MBeans with Application Server Control:

1. Navigate to the OC4J Home page and then click Administration to display the OC4J Administration page, which contains a table listing the various administration tasks you can perform for the OC4J instance.

2. Under JMX on the Administration page, select System MBean Browser to display the OC4J System MBean Browser page, which displays the system MBeans exposed by the OC4J instance.

3. Expand the navigation tree on the left of the page and select a thread pool for the OC4J instance under ThreadPool.

4. Change any attributes of the thread pool that have edit boxes.

   For information about attribute values, see Table 10–2 on page 10-3 or "<thread-pool>" on page B-17.

5. Click Apply.

Adding <thread-pool> Elements to server.xml

The following example uses the <thread-pool> element to configure an rmi request thread pool in the server.xml file:

```
<thread-pool
    name='rmi request'
    min='50'
    max='50'
    queue='2560'
    keepAlive='-1'
```

Note: Configuring thread pools or modifying the default configuration are expert-mode tasks. Oracle recommends that you use the default thread pool configuration unless you need to change it.
With this configuration, OC4J will create a separate thread pool to serve RMI requests. The thread pool will have these attributes:

- A minimum of 5 threads
- A maximum of 50 threads
- A maximum of 2560 requests in the queue
- A `keepAlive` value of -1 (no timeout)
- A `stackSize` value of 0 (let the JVM decide)
- The `debug` attribute set to true

The following example shows `<thread-pool>` elements that configure separate thread pools in `server.xml`, one to serve RMI requests, one to handle RMI connections, and one to serve HTTP and AJP requests:

```xml
<thread-pool
    name="rmi request"
    min="50"
    max="50"
    queue="2560"
    keepAlive="-1"
    stackSize="0"/>

<thread-pool
    name="rmi connection"
    min="44"
    max="44"
    queue="2560"
    keepAlive="-1"
    stackSize="0"/>

<thread-pool
    name="http"
    min="40"
    max="40"
    queue="2560"
    keepAlive="-1"
    stackSize="0"/>
```

The HTTP thread pool is created by default when an OC4J instance starts up, with the default attribute values in Table 10–2 on page 10-3. In addition to serving HTTP and AJP requests, this thread pool can serve RMI requests and handle RMI connections in the absence of separate rmi-* thread pools.

---

**Note:** You must restart OC4J after making modifications to `server.xml`.

---

### Configuring Custom Thread Pools for Applications

You can create a separate, custom thread pool for your applications to use in an OC4J instance by adding a `<custom-thread-pool>` element to the `server.xml` file. Then you can make the custom thread pool available to an application by referring to the thread pool in the `custom-thread-pool` attribute of the `<web-site>` element in the `*-web-site.xml` file for the application. A `server-xml` file can include more
than one <custom-thread-pool> element, and you can configure more than one application to use each custom thread pool.

In server.xml, the <custom-thread-pool> element is a subelement of the <application-server> element and has the same attributes as the <thread-pool> element, except that the value of name is not restricted. For example:

<custom-thread-pool name="mypool" min="3" />

The name attribute is required, and all other attributes are optional. For a complete description of this element, see "<custom-thread-pool>" on page B-9.

For information about the <thread-pool> element, see "Changing the Thread Pool Configuration" on page 10-4 and "<thread-pool>" on page B-17.

For information about the *-web-site.xml file, see "Overview of the Web Site Configuration File (*-web-site.xml)" on page B-20. The custom-thread-pool attribute is described in Table B–24 on page B-20.

The following example configures an HTTP Web site to use a nondefault thread pool by adding the custom-thread-pool attribute to the <web-site> element in the default-web-site.xml file for the HTTP Web site:

    protocol="http"
    port="8888"
    custom-thread-pool="mypool1"
    display-name="OC4J 10g (10.1.3) Default Web Site"
    schema-major-version="10"
    schema-minor-version="0"
/>

Converting from the Older Thread Pool Format

The <global-thread-pool> and <work-manager-thread-pool> elements in server.xml configure thread pools in an older format. These elements are deprecated in OC4J 10g (10.1.3.4.0). Table B–7 on page B-10 and Table B–23 on page B-19 describe the attributes of these elements.

If a server.xml file contains a <global-thread-pool> or <work-manager-thread-pool> element, OC4J 10g (10.1.3.4.0) updates the older element format to the new format in server.xml. For example, suppose a server.xml file contains the following elements:

<global-thread-pool
    min="60"
    max="60"
    queue="20000"
    keepAlive="-1" />

<work-manager-thread-pool
    min="23"
    max="24"
    queue="5000"
    keepAlive="-1" />

After OC4J startup, instead of the <global-thread-pool> and <work-manager-thread-pool> elements, the server.xml file will contain the following <thread-pool> elements:
<thread-pool
  name="http"
  min="60"
  max="60"
  queue="20000"
  keepAlive="-1"
  stackSize="0" />

<thread-pool
  name="jca"
  min="23"
  max="24"
  queue="5000"
  keepAlive="-1" />

Table 10–3 shows how the attributes of <global-thread-pool> and <work-manager-thread-pool> map to the new thread pools introduced in OC4J 10g (10.1.3.1.0).

Table 10–3  Mapping of Old Thread Pool Configuration to New Thread Pools

<table>
<thead>
<tr>
<th>Old Thread Pool Attributes</th>
<th>Value of name Attribute in &lt;thread-pool&gt;</th>
<th>New Thread Pool Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>min, max, queue, keepAlive, and debug attributes of &lt;global-thread-pool&gt;</td>
<td>http</td>
<td>min, max, queue, keepAlive, and debug attributes of &lt;thread-pool&gt;</td>
</tr>
<tr>
<td>min, max, queue, keepAlive, and debug attributes of &lt;work-manager-thread-pool&gt;</td>
<td>jca</td>
<td>min, max, queue, keepAlive, and debug attributes of &lt;thread-pool&gt;</td>
</tr>
<tr>
<td>cx-min, cx-max, cx-queue, cx-keepAlive, and cx-debug attributes of &lt;global-thread-pool&gt;</td>
<td>rmi request</td>
<td>min, max, queue, keepAlive, and debug attributes of &lt;thread-pool&gt;</td>
</tr>
<tr>
<td>rmiRequest-min, rmiRequest-max, rmiRequest-queue, rmiRequest-keepAlive, and rmiRequest-debug attributes of &lt;global-thread-pool&gt;</td>
<td>rmi connection</td>
<td>min, max, queue, keepAlive, and debug attributes of &lt;thread-pool&gt;</td>
</tr>
</tbody>
</table>

For example, OC4J would generate new <thread-pool> elements from the following <global-thread-pool> element:

<global-thread-pool
  keepAlive="-1"
  debug="false"
  cx-keepAlive="-1"
  cx-debug="false"
  rmiRequest-keepAlive="-1"
  rmiRequest-debug="false"
  min="40"
  max="40"
  queue="2560"
  cx-min="44"
  cx-max="44"/>
cx=queue="2560"
rmirequest-min="50"
rmirequest-max="50"
rmirequest-queue="2560"/>

The equivalent <thread-pool> elements follow:

<thread-pool
  name="rmi request"
  min="50"
  max="50"
  queue="2560"
  keepAlive="-1"
  stackSize="0"/>

<thread-pool
  name="rmi connection"
  min="44"
  max="44"
  queue="2560"
  keepAlive="-1"
  stackSize="0"/>

<thread-pool
  name="http"
  min="40"
  max="40"
  queue="2560"
  keepAlive="-1"
  stackSize="0"/>
This chapter provides instructions on using the system and application logging features available in OC4J. It covers the following topics:

- Overview of Log Files Generated by OC4J
- Using Plain Text File Logging
- Using Oracle Diagnostic Logging (ODL)
- Configuring OC4J Logging
- Viewing Application Messages in the OC4J Log with LogViewer
- Configuring Application Loggers with Application Server Control
- Redirecting log4j Messages for an Application to the OC4J Log

Overview of Log Files Generated by OC4J

Each OC4J process generates a number of log files to aid in troubleshooting. If multiple processes are running for an OC4J instance, multiple sets of log files are generated.

OC4J can generate two types of log files:

- **Plain text log files**
  
  Plain text logs are the default log files used for OC4J components, and are ideal for use in a development environment. The messages logged in these text files can be read with any editor or with Oracle Enterprise Manager 10g Application Server Control.

- **Oracle Diagnostic Logging (ODL) log files**
  
  The messages logged in these files use an XML format that is viewable with Application Server Control. ODL supports log file rotation.

Log files are generated in different locations, depending on the component or application that data is being recorded for. The logging configuration for each component or application is defined in component-specific XML configuration files.

Table 11–1 lists the names and locations of the various log files generated, as well as the XML configuration file containing the logging configuration for each component. Unless otherwise indicated, all paths indicated are within ORACLE_HOME/j2ee/home for standalone OC4J or ORACLE_HOME/j2ee/instance for OPMN-managed OC4J instances.
### Table 11–1 List of Log Files Generated for OC4J

<table>
<thead>
<tr>
<th>Component</th>
<th>Configuration File</th>
<th>Default Log File Name and Location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>OPMN-managed OC4J: /log/instance_default_group_1/oc4j/log.xml</td>
</tr>
<tr>
<td>Application Server Control</td>
<td>/application-deployments/ascontrol/orion-application.xml</td>
<td>Standalone OC4J: /log/ascontrol-application.log</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OPMN-managed OC4J: /log/instance_default_group_1/ ascontrol-application.log</td>
</tr>
<tr>
<td>Application deployed to OC4J</td>
<td>/application-deployments/app_name/orion-application.xml</td>
<td>Standalone OC4J: /application-deployments/app_name/application.log</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OPMN-managed OC4J: /application-deployments/app_name/ instance_default_group_1/application.log</td>
</tr>
<tr>
<td>Global (default) application</td>
<td>/config/application.xml</td>
<td>Standalone OC4J: /log/global-application.log</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OPMN-managed OC4J: /log/instance_default_group_1/global-application.log</td>
</tr>
<tr>
<td>Default Web site access logging</td>
<td>/config/default-web-site.xml</td>
<td>Standalone OC4J: /log/default-web-access.log</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OPMN-managed OC4J: /log/instance_default_group_1/default-web-access.log</td>
</tr>
<tr>
<td>OC4J server</td>
<td>/config/server.xml</td>
<td>Standalone OC4J: /log/server.log</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OPMN-managed OC4J: /log/instance_default_group_1/server.log</td>
</tr>
</tbody>
</table>
Using Plain Text File Logging

Plain text logging is the default format used in OC4J.

This mechanism separates messages in alignment with the XML files. However, instead of writing to multiple log files of the same size, all messages for that component are written into a single log file. The following topics describe how to use text logging:

- **Enabling or Disabling Text File Logging**
- **Managing Text Log Files**
- **Viewing Text Log Files**

### Enabling or Disabling Text File Logging

Text logging is enabled or disabled through elements in the XML configuration files listed in Table 11–1, except for the `default-web-site.xml` file. (See “Configuring Web Site Access Logging” on page 13-13 for details on configuring Web site access logging.)

Logging is enabled via the `<file>` subelement of the `<log>` element of the XML configuration file for each component. The element contains a single `path` attribute which specifies the name and optionally the location of the log file generated:

```xml
<log>
  <file path="application.log" />
</log>
```

To turn off text logging for a component, remove or comment out the `<file>` element from the appropriate configuration file. If you do not remove this line and you enable ODL, both logging options will be enabled.

### Managing Text Log Files

### Viewing Text Log Files

<table>
<thead>
<tr>
<th>Component</th>
<th>Configuration File</th>
<th>Default Log File Name and Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>JMS</td>
<td>/config/jms.xml</td>
<td>Standalone OC4J: /log/jms.log</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OPMN-managed OC4J: /log/instance_default_group_1/jms.log</td>
</tr>
<tr>
<td>RMI</td>
<td>/config/rmi.xml</td>
<td>Standalone OC4J: /log/rmi.log</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OPMN-managed OC4J: /log/instance_default_group_1/rmi.log</td>
</tr>
<tr>
<td>OPMN</td>
<td>ORACLE_HOME/opmn/conf/opmn.xml</td>
<td>ORACLE_HOME/opmn/logs</td>
</tr>
</tbody>
</table>

Through the `oc4j.properties` file, you can configure an OC4J instance to generate trace files to a specific debug destination instead of the default destination. Oracle Application Server does not support the configuration of two different OC4J instances to generate trace output to the same destination, even if the instances are in the same group. Each OC4J instance manages its own trace files.
For example, to disable text logging for an application, comment out the following `<file>` element in the application's `orion-application.xml` file:

```xml
<log>
  <!-- <file path="application.log" /> -->
</log>
```

Although both ODL and text logging can be enabled simultaneously, one of these options should be disabled to save disk space.

**Managing Text Log Files**

It is important to monitor your log files, as text logging does not have any imposed size limits or log rotation capability. If left unchecked, log files will continue to grow and can overrun the disk.

The only way to manage these files is to stop OC4J, remove the files, and then restart OC4J to start the log files over.

**Viewing Text Log Files**

All text log files are generated by default in the locations listed in Table 11–1 on page 11-2. Text log files are identified by the `log` extension.

Text log files generated for OC4J components can be viewed with Application Server Control, as follows:

1. Click the **Logs** link at the bottom of any Application Server Control page.
2. Expand **OC4J**.
3. Expand `<instanceName>`. The default instance name is `home`.

Text log files for deployed J2EE applications cannot be viewed with Application Server Control.

**Using Oracle Diagnostic Logging (ODL)**

The **Oracle Diagnostic Logging** framework, or ODL, provides plug-in components that complement the standard Java framework to automatically integrate log data with Oracle log analysis tools.

In the ODL framework, log files are formatted as XML documents, enabling logs to be parsed and reused by other Oracle Application Server and custom-developed components, including Application Server Control. In ODL, unlike in text-based logging, log file rotation is supported.

- **Enabling or Disabling ODL**
- **Managing ODL Log Files**
- **Viewing ODL Log Files**

**Enabling or Disabling ODL**

ODL is enabled by adding the `<odl>` element within the `<log>` element in any of the XML files listed in Table 11–1.
The `<odl>` element has the following attributes. All are required.

- **path**: The path to the directory where the `log.xml` files for this component will be generated.

**Important:**

Specify the path as `../log/appName`, as the next example shows. This path is required for viewing log files with Application Server Control.

- **max-file-size**: The maximum size, in kilobytes, that an individual log file is allowed to grow to. When this limit is reached, a new log file is generated.

- **max-directory-size**: Sets the maximum size, in kilobytes, allowed for the log file directory. When this limit is exceeded, log files are purged, beginning with the oldest files.

For example, the following entry in the `petstore` application's `orion-application.xml` file will cause `log.xml` files to be generated for this application. It will also set log files to a maximum of 1,000 KB and the directory maximum to 10,000 KB.

```xml
<log>
    <odl path="../log/petstore/" max-file-size="1000" max-directory-size="10000" />
</log>
```

Using this configuration, `petstore` log files will be generated in the following locations, depending on your OC4J installation.

- **Standalone OC4J:**
  
  Log files will be generated in `ORACLE_HOME/j2ee/home/application-deployments/log/petstore`.

- **OPMN-managed OC4J:**
  
  Files will be generated in an OC4J instance-specific directory named `ORACLE_HOME/j2ee/instance/application-deployments/log/instance_default_group_1/petstore`.

**Notes:**

- You can enable ODL for an application at the time the application is deployed by setting values for `odls` in the `log` property through the deployment plan editor.

  See the Oracle Containers for J2EE Deployment Guide for details on configuring an application using the deployment plan editor.

- ODL for Web sites uses a different configuration. For more information about this configuration, see "Configuring Web Site Access Logging" on page 13-13.

- Both ODL and text file logging can be enabled simultaneously. However, you should disable one of these options to save disk space.

**Important:**

Specify the path as `../log/appName`, as the next example shows. This path is required for viewing log files with Application Server Control.
Managing ODL Log Files

The ODL framework provides support for managing log files, including log file rotation. The maximum log file size and the maximum size of log directories can also be defined. In addition, using ODL provides these benefits:

- You can limit the total amount of diagnostic information saved.
- Older segment files are removed and newer segment files are saved in chronological fashion.
- Components can remain active and do not need to be shut down when diagnostic logging files are cleaned.

An ODL log is a set of log files that includes the current log file, log.xml, and zero or more ODL Archives (segment files), which contain older messages. After you enable ODL, each new message is added to the end of log.xml. When this log file reaches the rotation point, it is renamed and a new log.xml file is created.

Segment files are created when the current log file reaches the rotation point, specified by the maximum ODL segment size, and for some OC4J logs, the rotation time and rotation frequency. The log.xml file is renamed to logn.xml, in which n is an integer, starting at 1. The new log.xml file is created when the component generates new diagnostic messages.

When the last log file is full, the following procedure occurs:

1. The oldest log file is erased to provide space in the directory.
2. The log.xml file is written to the latest logn.xml file, in which n increments by one over the most recent log file.

Size-Based Log Rotation

To limit the size of an ODL log for an application or component, you can use a configuration option specifying the maximum size of the logging directory. Whenever the sum of the sizes of all of the files in the directory reaches the maximum, the oldest archive is deleted to keep the total size under the specified limit.

Note: The most recent segment file is never deleted.

For example, when the maximum directory size is reached, with the starting segment file named log9872, the following files could be present in the log file directory:

<table>
<thead>
<tr>
<th>File</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>log.xml</td>
<td>10002</td>
</tr>
<tr>
<td>log9872.xml</td>
<td>15000</td>
</tr>
<tr>
<td>log9873.xml</td>
<td>15000</td>
</tr>
<tr>
<td>log9874.xml</td>
<td>15000</td>
</tr>
<tr>
<td>log9875.xml</td>
<td>15000</td>
</tr>
<tr>
<td>log9876.xml</td>
<td>15000</td>
</tr>
</tbody>
</table>

In this case, when log.xml fills up, log9872.xml is removed and log.xml is moved to the new file log9877.xml. New diagnostic messages are then written to a new log.xml file.

For example, to specify the maximum ODL segment size and maximum directory size for an OC4J application named petstore, you would add the following entry to the file ORACLE_HOME/j2ee/instance_name/application-deployments/petstore/orion-application.xml:

```xml
<property name="log.config" value="" />
```
Logging in OC4J

For OC4J components that are configured in the j2ee-logging.xml file, you can specify a rotation time and rotation frequency, in addition to a maximum segment size and directory size.

### Time-Based Log Rotation

For time-based log rotation, you can specify the following properties in a `<log_handler>` subelement of the `<log-handlers>` element of the `<logging-configuration>` root element:

- **baseRotationTime:** (Optional.) The base time for the rotation. The format for the base time can be any of the following:
  - `hh:mm`, for example, 04:20. This format uses the local time zone.
  - `yyyy-MM-dd`, for example, 2006-08-01. This format uses the local time zone.
  - `yyyy-MM-ddThh:mm`, for example 2006-08-01T04:20. This format uses the local time zone.
  - `yyyy-MM-ddThh:mm:ss.sTZD`, where TZD is the timezone indicator. TZD can be `Z`, indicating UTC, or `{+|-}hh:mm`. For example, 2006-03-01T04:20:00-08:00 represents March 1, 2006 4:20:00 in US Pacific Standard Time zone.

  If you do not specify `baseRotationTime`, the default value is Jan. 1, 1970, 00:00 UTC.

- **rotationFrequency:** The frequency of the rotation, in minutes. In addition, you can specify one of the following values: `hourly`, `daily`, or `weekly`.

You specify these properties in the following file:

```
ORACLE_HOME/j2ee/instance_name/config/j2ee-logging.xml
```

For example, to specify that the log files are rotated every day at 4:00AM local time, or when they reach 200000 bytes in size, use the following:

```
<log_handler name="h1" class="oracle.core.ojdl.logging.ODLHandlerFactory">
  <property name="path" value="/log"/>
  <property name="baseRotationTime" value="04:00"/>
  <property name="rotationFrequency" value="daily"/>
  <property name="maxFileSize" value="200000"/>
</log_handler>
```

### Viewing ODL Log Files

ODL-formatted log files can be viewed by clicking the **Logs** link in Application Server Control, enabling administrators to aggregate and view the logging output generated by all components and applications running within OC4J from one centralized location.

ODL log files are identified in the Log Files page by the `.xml` extension.

1. Click the **Logs** link at the bottom of any Application Server Control page.
2. Expand **OC4J**.
3. Expand `<instanceName>`. In both standalone OC4J and OAS, the default instance name is **home**.
To view the OC4J log files, expand **Diagnostic Message Logs**, then open `log.xml`.

To view ODL logs for a specific J2EE application:
- Expand **Application <applicationName>**.
- Expand **Diagnostic Message Logs**. Open and view the `log.xml` file generated within this director.

---

## Configuring OC4J Logging

The various components of OC4J utilize Java loggers that write to the OC4J log file. The OC4J log file is generated in XML format using the Oracle Diagnostic Logging framework and can be viewed with Application Server Control.

The section covers the following topics:
- **Using and Configuring the OC4J Component Loggers**
- **Viewing the OC4J Log File**
- **Configuring the oracle Logger**

### Using and Configuring the OC4J Component Loggers

OC4J provides a number of component loggers that write to the OC4J log file (`log.xml`). You can view and configure the available component loggers on the Logger Configuration page of Application Server Control.

The Java log level can be set for each individual component logger. If set to NULL, a logger inherits the log level set for its parent.

Therefore, the default level for all loggers is INFO, which maps to the NOTIFICATION Java log level, as that is the default value inherited from the oracle logger. See "Configuring the oracle Logger" on page 11-9 for details on changing this default value.

The log level set on a logger through the Logger Configuration page is not persisted, but is applied to the OC4J runtime only. When OC4J is restarted, the log level reverts back to the default setting inherited from the parent logger.

Table 11–2 illustrates the log levels that you can set with Application Server Control as well as the ODL `message type:log level` that each Java log level maps to.

<table>
<thead>
<tr>
<th>Java Log Level</th>
<th>ODL Message Type:Log Level</th>
<th>ODL Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NULL</td>
<td></td>
<td>The logger will inherit the log level set for its parent.</td>
</tr>
<tr>
<td>SEVERE</td>
<td>ERROR:1</td>
<td>Log system errors requiring attention from the system administrator.</td>
</tr>
<tr>
<td>WARNING</td>
<td>WARNING:1</td>
<td>Log actions or conditions discovered that should be reviewed and may require action before an error occurs.</td>
</tr>
</tbody>
</table>

---

11-8 Configuration and Administration Guide
Configuring OC4J Logging

**To configure OC4J component loggers with Application Server Control:**

1. Click the Administration link.
2. Click Logger Configuration.
3. Set Log Level to a value listed in the left-hand column of Table 11–2.
4. Click Apply to apply your changes to the OC4J runtime.

**Viewing the OC4J Log File**

The OC4J log file can be viewed with Application Server Control. To view the file:

1. Click the Logs link at the bottom of any Application Server Control page.
2. Expand OC4J.
3. Expand <instanceName>.
4. Expand Diagnostic Message Logs.

As with all ODL log files, each new message goes into the current log file, named log.xml. Once the maximum size is reached, the log is copied to an archival log file, named logn.xml, in which \( n \) is an integer starting at 1.

**Configuring the oracle Logger**

The configuration for the oracle logger is defined in j2ee-logging.xml, which is installed in the ORACLE_HOME/j2ee/instance/config directory.

**To configure the oracle logger with Application Server Control:**

1. On the OC4J Home page, click Administration.
2. From the administration tasks, select Logger Configuration to display the Logger Configuration page.
3. Click Expand All to view the entire list of loggers currently loaded for the OC4J instance.
4. Select a log level for any of the loggers shown on the page.

---

**Table 11–2 (Cont.) Log Levels for OC4J Component Loggers**

<table>
<thead>
<tr>
<th>Java Log Level</th>
<th>ODL Message Type:Log Level</th>
<th>ODL Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFO</td>
<td>NOTIFICATION:1</td>
<td>Log normal actions or events. This could be a user operation, such as login completed, or an automatic operation, such as a log file rotation.</td>
</tr>
<tr>
<td>CONFIG</td>
<td>NOTIFICATION:16</td>
<td>Log configuration-related messages or problems.</td>
</tr>
<tr>
<td>FINE</td>
<td>TRACE:1</td>
<td>Log trace or debug messages used for debugging or performance monitoring. Typically contains detailed event data.</td>
</tr>
<tr>
<td>FINER</td>
<td>TRACE:16</td>
<td>Log fairly detailed trace or debug messages.</td>
</tr>
<tr>
<td>FINEST</td>
<td>TRACE:32</td>
<td>Log highly detailed trace or debug messages.</td>
</tr>
</tbody>
</table>
To configure the oracle logger in j2ee-logging.xml:

You can also edit the j2ee-logging.xml configuration file by hand. Restart OC4J after making any changes to this file.

The configuration file contains two elements within the <logging-configuration> root element:

- <log_handlers>
  This element includes <log_handler> elements defining three different log handlers:
  - oc4j-handler
    This is the log handler for the oracle logger.
  - oracle-webservices-management-auditing-handler
    This is the log handler for the oracle.webservices.management.auditing logger.
  - oracle-webservices-management-logging-handler
    This is the log handler for the oracle.webservices.management.logging logger.
  The following properties are specified in <property> subelements for each log handler:
  - path: Specifies the directory in which the handler will generate log files. Do not modify this value.
  - maxFileSize: Sets the maximum size, in bytes, that any log file in the directory will be allowed to grow to. When a file exceeds this limit, a new file is generated.
  - maxLogSize: Sets the maximum size, in bytes, allowed for the log file directory. When this limit is exceeded, log files are purged, beginning with the oldest files.

- <loggers>
  This element includes a <logger> element defining the following:
  - name: The logger name. Do not modify this value.
  - level: The minimum log level that this logger acts upon. This level is set by default to the ODL NOTIFICATION:1 value, which maps to the INFO Java log level displayed on the Logger Configuration page in Application Server Control.
    You can set this value to either a Java logging level (FINE) or an ODL Message Type:Log Level (TRACE:1).
  - useParentHandlers: Indicates whether or not the logger should use its parent handlers. Because this value is set to false by default, the oracle logger does not inherit the log level set for its parent, the root logger.
  - <handler>: The name of the handler to use. Do not modify this value.

The following example sets the default log level to FINEST by specifying TRACE:32 as the ODL Message Type:Log Level.

```xml
<logging_configuration>
  <log_handlers>
    <log_handler name='oc4j-handler'
      class='oracle.core.ojdl.logging.ODLHandlerFactory'>
      <property name='path' value='%ORACLE_HOME%/j2ee/%OPMN_PROC_TYPE%/log/%OPMN_PROC_TYPE%_%OPMN_PROC_SET%_%OPMN_PROC_INDEX%/oc4j'/>
```

11-10  Configuration and Administration Guide
Viewing Application Messages in the OC4J Log with LogViewer

You can direct application log messages into the OC4J logging system and view them in Application Server Control with LogViewer. If you use the standard JDK logging API, you can configure logging handlers and log levels to direct the log entries from an application into `ORACLE_HOME/j2ee/instance/log/oc4j/log.xml`, the main OC4J log. LogViewer lists this log in Application Server Control as Diagnostic Logs.

To view application messages in the OC4J log with LogViewer:

1. In an application, set up a logger to issue log messages at different levels, using a logger naming hierarchy, as follows.

   **Example 11–1 Application Logger to Set Up Different Log Levels**

   ```java
   Logger logger = Logger.getLogger("emp.app.web.EmployeeFrontEnd");
   public void doGet(HttpServletRequest request,
    HttpServletResponse response) throws ServletException,
    IOException {
      response.setContentType(CONTENT_TYPE);
      logger.fine(
        String.format("Handling web request for %s", request.getRequestURL()));
      PrintWriter out = response.getWriter();
      out.println("<html>");
      out.println("<head><title>EmployeeFrontEnd</title></head>");
      out.println("<body>");
      Employee test = Employee.getInstance();
      logger.finest(
        String.format("Test Employee Instance: %s", test));
      logger.finest(
        String.format("Calling %s to locate office for %s", 
          employeeManager.toString(),
          test.identifier(test.ID_SHORT)));
      String location = employeeManager.locateEmployeeOffice(test);
      logger.finest(
        String.format("bean returned %s for %s ",
          location, test.identifier(test.ID_SHORT)));
      out.printf("<p>Employee: %s</br>Office: %s</p>", 
          test.identifier(test.ID_SHORT),
          location);
      logger.fine(String.format("Employee currently earns $%s", test.getSalary()));
      test.raiseSalary(15D);
      out.printf("<p>Give employee 15percent raise, now earns %s", test.getSalary());
      out.println("</body></html>");
      out.close();
    }
   ```

2. In the `<logging_configuration>` element of the `j2ee-config.xml` file, add a new `<logger>` element that specifies the application logger name and logging level and declares the logger to use `oc4j-handler`, as in the following example:
Any messages written to the oracle root logger will be directed to oc4j-handler, which writes messages out in XML format to the ORACLE_HOME/j2ee/instance/log/oc4j/log.xml file.

3. Click the Logs link at the bottom of any Application Server Control page to list all of the available logs, as Figure 11–1 shows.
4. On the Log Files page, click Diagnostic Logs to have LogViewer display messages from the OC4J log.

As Figure 11–2 shows, the Diagnostic Logs page displays log entries for the OC4J server plus log entries from the application. Each log message shows the component that generated the log entry, such as web_EmployeeFrontEnd or ejb_EmployeeManagerBean.
5. To view all the log entries for an individual request in sequence, click the Execution Context ID (ECID) link for a log entry.

Based on an ECID assigned to every log message, the Oracle logging framework can correlate various log entries from different components in the same execution path. As Figure 11–3 shows, LogViewer displays all the log entries for the selected ECID in timestamp order.
6. Use the LogViewer search facilities to search for items of interest in the OC4J log.

Configuring Application Loggers with Application Server Control

After an application has run and its loggers have registered themselves, or after you have configured them in the j2ee-config.xml file, you can use Application Server Control to configure the application loggers. The Logger Configuration page enables you to customize application logging quickly.

To configure application loggers with Application Server Control:

1. On the OC4J Home page, click Administration.

2. From the administration tasks, select Logger Configuration to display the Logger Configuration page.

3. Click Expand All to view the entire list of loggers currently loaded for the OC4J instance.
The OC4J loggers and application loggers are listed, along with a select list that enables you to specify the level for each logger.

4. Select a log level for any of the loggers listed on the page.

Redirecting log4j Messages for an Application to the OC4J Log

The Oracle Application Server distribution includes a JAR file, ORACLE_HOME/diagnostics/lib/ojdl-log4j.jar, that contains an OracleAppender class. This class is the Oracle log4j appender, which transforms log4j messages into the Oracle Diagnostic Logging (ODL) XML format. Before an application can use this appender, you need to configure it and make the log4j class libraries available to the application.

A log4j.properties file can configure the appropriate log4j settings and the Java log level you want to enable. You can capture and route your log4j entries into the OC4J log system with OracleAppender, as Example 11–2 shows:

Example 11–2 Configuration File for the Oracle log4j Appender

```properties
log4j.rootLogger=TRACE,OJDL
log4j.appender.OJDL=oracle.core.ojdl.log4j.OracleAppender
log4j.appender.OJDL.LogDirectory=${oracle.j2ee.home}/log/oc4j
#log4j.appender.APP1.MaxSize=1000000
#log4j.appender.APP1.MaxSegmentSize=200000
#log4j.appender.APP1.Encoding=iso-8859-1
log4j.appender.OJDL.ComponentId=OracleProd
```

This configuration directs log4j messages into the ORACLE_HOME/j2ee/home/log/oc4j/log.xml file, which LogViewer reads and then displays in Application Server Control as Diagnostics Logs.

After you configure the Oracle log4j appender, you can use the OC4J shared-library mechanism to publish the log4j class libraries to OC4J and then import the libraries into the application.

Configuring the Oracle log4j Appender for an Application

You can configure the Oracle log4j appender for an application by using the OracleAppender class in the log4j.properties file. Then you can import the configuration into the application during deployment.

To inject the log4j.properties file into an application when you deploy it, you can use the OC4J shared-library mechanism. OC4J reads the properties file from the class path. Importing a shared library that contains the log4j.properties file into an application makes the file accessible to configure log4j for the application.

You can even publish a set of shared libraries that contain different log4j.properties files to OC4J, such as for enabling different log levels, and then choose between the files when the application is deployed. After deployment, you can change the log4j.properties file that the application uses to switch between different logging settings.

To configure the Oracle log4j appender for an application:

1. Put the log4j.properties file into a JAR file, using a file name that indicates the configured log level, such as log4j.config.info.jar.

2. Create an OC4J shared library that contains the JAR file.
Figure 11–4 shows how to create a shared library in an OC4J instance with Application Server Control.

**Figure 11–4  OC4J Shared Library Containing log4j.properties File**

Figure 11–5 shows that two different shared libraries containing a log4j.properties file are available for importing into an application.
3. Import a shared library that contains the log4j.properties file, such as log4j.config.info, into the application during deployment.

   a. Select **Configure Class Loading** on the Deployment Tasks page, as Figure 11–6 shows.

   ![Figure 11–6 Configure Class Loading Deployment Task](image)

   b. In the Import Shared Libraries area of the Configure Class Loading page, select a shared library, as Figure 11–7 shows.
The log4j.info shared library dictates how the log4j log entries for the application will be handled. In this case, the root logger is set to the INFO level, and the OracleAppender class is being employed to direct the log entries into the OC4J log system.

Ultimately, the customized shared-library settings for the application are written to its orion-application.xml configuration file, as Figure 11–8 shows.

If you want to change an application to use a lower log level, such as DEBUG or TRACE, then you can modify the <import-shared-library> element in orion-application.xml and restart the application to import the shared library.
that has the relevant log4j.properties file. Using the OC4J shared-library mechanism and a consistent naming convention should enable you to have as many reusable log4j configurations as you need for your applications.

After you configure the Oracle log4j appender, a single log.xml file will contain any log messages from log4j as well as log entries from OC4J.

Making log4j Class Libraries Available to an Application

Before an application can use the Oracle log4j appender, you need to make the log4j classes available to the application. These classes are in the log4j and ojdl-log4j libraries. You can make the classes available to an application in one of these ways:

- Include the libraries in the application.
  
  For a Java EE 5 application, you can use the <library-directory> feature to specify a directory within an EAR file to hold shared libraries and then put the log4j and ojdl-log4j libraries in that directory. In the <library-directory> element of the application.xml file, you specify shared libraries for an application. Then OC4J scans the directories that you specified for archives to include at startup.

- Create a shared library in OC4J that contains the log4j and ojdl-log4j libraries and then import the shared library into the application when it is being deployed. After deployment, the libraries will be available to the application.

- If you have a Web application, you can put the log4j and ojdl-log4j libraries in the WEB-INF/lib directory for the application to use them.

  The ojdl-log4j library has a dependency on the log4j library, so they both have to be accessible at the same class-loader level.
This chapter describes how to use the system MBeans provided with OC4J to manage deployed applications, services and other resources within an OC4J instance. It includes the following topics:

- MBeans and Java Management Extensions (JMX) Support in OC4J
- Using the System MBean Browser
- Subscribing to JMX Notifications

**MBeans and Java Management Extensions (JMX) Support in OC4J**

OC4J provides support for the *Java Management Extensions (JMX)* 1.2 specification, which allows standard interfaces to be created for managing resources, such as services, applications and resources, in a J2EE environment.

The Oracle Enterprise Manager 10g Application Server Control user interface is built on a JMX-compliant client that can be used to completely manage and monitor an OC4J instance. The JMX functionality provided with Application Server Control is enabled through Java components known as *MBeans*, which are discussed in the next section.

JMX manageable resources within OC4J include:

- The OC4J server
- Applications and Web modules running within an OC4J instance
- J2EE services, such as JTA and JMS
- OC4J processes, such as Task Manager
- Data source and security configuration

This section discusses the following topics:

- Overview of MBeans
- Overview of the Top-Level OC4J System MBeans
- When Changes Made Through MBeans Take Effect
- How MBean Data Is Persisted

**Overview of MBeans**

An *MBean*, or *managed bean*, is a Java object that represents a JMX manageable resource. MBeans are defined in the *J2EE Management Specification (JSR-77)*, which is part of the J2EE 1.4 specification as published by Sun Microsystems.
Each manageable resource within OC4J is managed through an instance of the appropriate MBean. For example, an instance of the J2EESWebSite MBean is created at OC4J startup to represent each Web site configured within the server.

Each system MBean provided with OC4J exposes a management interface that is accessible through the System MBean Browser. An MBean's interface is composed of these items:

- **Attributes**, name and value pairs of any type that the JMX client can get or set remotely. Attributes are analogous to properties set on an Enterprise JavaBeans (EJB) module. For example, the `state` attribute of the J2EEApplication:petstore MBean indicates whether or not the application is currently running.

- **Operations**, methods that the JMX client can invoke on the MBean. For example, the `stop` operation can be used to stop the petstore application and all of its child applications.

- **Notifications** that can be generated to broadcast errors or specific events, such as when a new account is created. For example, a notification can be sent to alert you that the petstore application has stopped.

As noted earlier, the Application Server Control application is built on top of the system MBeans. When you set a property or perform a task in the user interface, you are actually setting an attribute or invoking an operation on an underlying MBean.

To provide you with greater flexibility, Application Server Control also provides direct access to the system MBeans provided with OC4J through the **System MBean Browser** component. See "Using the System MBean Browser" on page 12-5 for details on using this management tool.

### Overview of the Top-Level OC4J System MBeans

The following table provides an overview of the top-level OC4J system MBeans exposed through the System MBean Browser interface.

<table>
<thead>
<tr>
<th><strong>MBean</strong></th>
<th><strong>Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>J2EEDomain</td>
<td>Represents a management domain. This is the top-level management object. All other MBeans bound to the domain are visible beneath this node in the System MBean Browser.</td>
</tr>
<tr>
<td>J2EEEServer</td>
<td>Represents a single OC4J instance.</td>
</tr>
<tr>
<td>ClassLoading</td>
<td>Provides access to all class-loading-related states in an OC4J instance. Includes an operation to execute the more than 15 built-in queries provided to aid in troubleshooting class-loading issues on a running OC4J instance. This MBean lazily creates instances of the ClassLoader MBean, each representing an instantiated class loader.</td>
</tr>
<tr>
<td>EJBCompiler</td>
<td>Configures the OC4J instance to generate client-side IIOP stubs during EJB deployment. Also used to specify the compiler to use for compiling EJB modules.</td>
</tr>
</tbody>
</table>
### MBeans and Java Management Extensions (JMX) Support in OC4J

<table>
<thead>
<tr>
<th>MBean</th>
<th>Description</th>
</tr>
</thead>
</table>
| J2EEApplication               | Represents a J2EE application deployed into the OC4J instance. Additional MBean instances are visible as child nodes representing the various components of the application:  
  - OC4JWebModule: Represents the properties set through the OC4J-specific `orion-web.xml` deployment descriptor generated for a Web module deployed as part of the J2EE application.  
  - WebModule: Represents the properties set through the J2EE `web.xml` deployment descriptor packaged with a WAR file. Instances of the JSP and Servlet MBeans are created for active JSPs and servlets within the Web module. |
| J2EELogging                   | Represents a Java Logger component defined in the `j2ee-logging.xml` file. For an overview of the Java logging framework, including log levels, visit Sun's site at http://java.sun.com/j2se/1.4.2/docs/guide/util/logging/overview.html.          |
| J2EEWebSite                   | Represents a Web site defined within the OC4J server. See Chapter 13, "Managing Web Sites in OC4J" for details on Web site configuration.                                                                        |
| JDBC_DRIVER                   | Represents a specific JDBC driver.                                                                                                                                                                          |
| JMSAdministratorResource      | Represents the OC4J JMS server used by the OC4J instance. Includes operations for managing the OC4J JMS server and JMS connection factories, as well as adding/removing destinations.            |
| JMSResource                   | Displays statistics on messages (by type), active handlers, and active connections from the JMS server. Child MBeans contain statistics on connection, destination, and durable subscriber resources. |
| JNDINamespace                 | Returns an XML document containing all JNDI bindings for all applications deployed into the OC4J instance.                                                                                                       |
| JNDIResource                  | Returns all JNDI bindings for a specific application.                                                                                                                                                         |
| JSPConfig                     | Configures the OC4J JSP container. See the Oracle Containers for J2EE Support for JavaServer Pages Developer's Guide for documentation of the various configuration values. Any changes made to MBean attributes require an OC4J server restart to take effect. |
| JTAResource                   | Represents a transaction manager instance. Invoking the `configureCoordinator` operation on this MBean requires an OC4J server restart for the new two-phase-commit-coordinator configuration to take effect. |
| JVM                           | Describes a Java virtual machine that an OC4J instance is running within. Includes an operation to get/set system properties and force garbage collection to start.                                             |
| SecurityProvider              | Used to manage security for a specific application. A restart of the corresponding application or the OC4J server is required for some attributes and operations to take effect.                             |
| TaskManager                   | Describes an OC4J task manager instance. This MBean can be used to set task manager granularity.                                                                                                           |
| ThreadPool                    | Represents a single instantiated thread pool. Use to set the maximum and minimum number of threads in the pool.                                                                                                 |
| TimerService                  | Represents an instance of the EJB timer. See the Oracle Container for J2EE Enterprise JavaBeans Developer's Guide for details.                                                                                 |
When Changes Made Through MBeans Take Effect

Changes can be made to a managed component via an MBean while the component is either stopped or running.

In general, changes made to a managed component - values set in an attribute or the results of an operation - are available immediately in the OC4J runtime.

In some cases, however, new attribute values or operation results will require a restart of the OC4J server, of the affected application, or even of the MBean before becoming available in the OC4J runtime. In these cases, the MBean and Application Server Control will display the new value; however, the old value will continue to be used in the OC4J runtime until the required restart is completed.

For example, suppose you change the value of the timeout attribute of the JSPConfig MBean from 30 to 15. The new value of 15 will be displayed both in the MBean and in the JSP Container Properties page in Application Server Control. However, because all changes to JSPConfig attributes require a restart of the OC4J server, the old value of 30 will continue to be used until the server is restarted.

If a restart is required, the System MBean Browser displays a Required Restart property noting the required actions. Table 12–2 lists the values for this property.

<table>
<thead>
<tr>
<th>Value</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>OC4J Restart</td>
<td>Indicates that the OC4J instance must be restarted.</td>
</tr>
<tr>
<td>Application Restart</td>
<td>Indicates that the J2EE application under which the MBean is registered must be restarted. MBeans that belong to this category are displayed under the J2EEApplication node in the navigation pane to the left of the console.</td>
</tr>
<tr>
<td>MBean Restart</td>
<td>Indicates that the affected MBean must be restarted.</td>
</tr>
</tbody>
</table>

Change is managed at the individual attribute/operation level, rather than at the MBean level. This means that an MBean might contain attributes that require a restart before a new value is available in the runtime, and other attributes that become available immediately.

How MBean Data Is Persisted

Persistent data set via an MBean is written to the appropriate XML configuration file(s). For example, new values set in attributes of the JSPConfig MBean are written to the global-web-application.xml configuration file.

Whether an MBean persists data is indicated by the Persist Policy property displayed in the System MBean Browser.

<table>
<thead>
<tr>
<th>Value</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>OnUpdate</td>
<td>Any persistent data set on the MBean is written immediately to the appropriate configuration file(s) at the time the attribute change is applied or the operation is invoked.</td>
</tr>
<tr>
<td>Never</td>
<td>Data set on the MBean is not persisted but exists only in runtime memory.</td>
</tr>
</tbody>
</table>
Using the System MBean Browser

The System MBean Browser is a component of the Web-based Application Server Control user interface, which is relatively simple to use. To use this feature:

1. Launch Application Server Control.
2. Click the Administration link.
3. Click System MBean Browser.
4. Specific MBean instances are accessed through the navigation pane to the left of the console. Expand a node in the navigation pane and drill down to the MBean you wish to access.
5. Click the Attributes tab in the right-hand pane to access the selected MBean’s attributes. If you modify any attribute values, click the Apply Changes button to apply your changes to the OC4J runtime.

---

**Note:** The Apply Changes button will be visible only if the browser page contains at least one attribute with a modifiable value.

6. Click the Operations tab to access the MBean’s operations. After selecting a specific operation, click the Invoke button to call it.

Subscribing to JMX Notifications

Many of the system MBeans provided with OC4J include the ability to generate notifications triggered by a state change registered by the MBean. This section describes how to subscribe to and view MBean-generated notifications.

Not all MBeans generate notifications.

You can subscribe to notifications either through the System MBean Browser or the Notification Subscriptions page.

To subscribe to one or more of an MBean’s notifications through the System MBean Browser:

1. Click the Administration link in Application Server Control.
2. Click System MBean Browser.
3. Specific MBean instances are accessed through the navigation pane to the left of the console. Expand a node in the navigation pane and drill down to the MBean you wish to access.
4. Click the Notifications tab in the right-hand pane to access the selected MBean’s notifications. If this tab is not present, the MBean does not generate notifications.
5. Check the Subscribe box.
6. Click the Apply button.

To subscribe to notifications generated by multiple MBeans through the Notification Subscriptions page:

1. Click the Administration link in Application Server Control.
2. Click the Notification Subscription icon. All MBeans that generate notifications are displayed.
3. Check the Subscribe box for each notification you wish to subscribe to.
4. Click the **Apply** button.

### Using Application-Specific MBeans

Vendor-supplied MBeans deployed with a J2EE application to OC4J can be accessed through the application's *home page* in the Application Server Control user interface. Through the user interface, you can view and set attributes and invoke operations on application-specific MBeans, just as you can with the OC4J system MBeans.

1. Click the **Applications** link in Application Server Control.

2. Click the name of the application the MBeans belong to. This opens the home page for the application.

3. Click the **Application Defined MBeans** link. The MBeans defined by the application are listed on the page displayed.

4. Click the **Attributes** tab in the right-hand pane to access the selected MBean's attributes. If you modify any attribute values, click the **Apply Changes** button to apply your changes to the OC4J runtime.

**Note:** The **Apply Changes** button will only be visible if the browser page contains at least one attribute with a modifiable value.

5. Click the **Operations** tab to access the MBean's operations. After selecting a specific operation, click the **Invoke** button to execute.
Managing Web Sites in OC4J

This chapter explains how additional Web sites can be configured to provide access to Web applications deployed into the OC4J instance. It also explains how to configure and enable a secure Web site utilizing Secure Socket Layer (SSL) communication between the client and OC4J using HTTPS.

The following sections are included:

- Overview of a Web Site in OC4J
- Configuring Web Site Connection Data
- Creating a New Web Site in OC4J
- Configuring a Secure Web Site in OC4J
- Starting and Stopping Web Sites
- Configuring Web Site Access Logging

Overview of a Web Site in OC4J

In the context of OC4J, Web requests sent to applications deployed to an OC4J instance are received by a Web site, a listener configured to accept requests on a specific protocol and port (or range of ports). Every Web module deployed into an OC4J instance must be bound to a Web site through which it will be accessed. This binding is typically performed as part of the application deployment process.

A default Web site is created in each OC4J instance upon installation. The configuration for the default Web site is defined in a configuration file, default-web-site.xml, installed by default in the ORACLE_HOME/j2ee/instance/config directory. See "Configuring Web Site Connection Data" on page 13-2 to gain an understanding of Web site configuration.

- Standalone OC4J
  
  In a standalone OC4J configuration, the default Web site is configured to receive HTTP requests directly on a specific port, which is 8888 by default. The site can alternatively be configured to receive secure HTTPS requests.

- Single OPMN-managed OC4J instance
  
  In a single OPMN-managed OC4J installation, the default Web site can be similarly configured to receive HTTP or HTTPS requests directly. A specific listener port can be specified in default-web-site.xml, or a range of ports can be set in the OPMN configuration file (opmn.xml). See "Configuring Web Site Data in OPMN-Managed OC4J Instances" on page 13-3 for details.

- Multiple OPMN-managed OC4J instances
In a cluster of two or more OPMN-managed OC4J instances, the default Web site is configured to receive requests forwarded from Oracle HTTP Server through Apache JServ Protocol (AJP).

The site can alternatively be configured to receive secure AJPS requests. A specific listener port can be specified, or a range of ports can be set in the OPMN configuration file. See "Configuring Web Site Data in OPMN-Managed OC4J Instances" on page 13-3 for details on OPMN configuration.

---

**Note:** In the current release, an OC4J instance supports only one AJP Web site at a time.

If you want to use both AJP and AJPS in Oracle Application Server, you need to configure them on different OC4J instances and use two Oracle HTTP Server (OHS) instances, one for routing AJP requests and the other for routing AJPS requests.

---

In addition to the default site, you can configure a new Web sites on each OC4J instance, as needed. (A Web site cannot listen on more than one protocol at a time.) You might want to create a new Web site for one of these reasons:

- **Separating management and general Web access**
  
  By default, the Application Server Control application is accessed via the `/em` context through the default Web site. However, you can create a new Web site specifically for the Application Server Control application to separate management access from general application access, if desired.

- **Utilizing secure and nonsecure Web sites**
  
  You can configure the default Web site to utilize SSL to create secure connections, or can create an additional site and bind it to Web applications that require a secure connection.

For more information about creating and configuring additional Web sites, see "Creating a New Web Site in OC4J" on page 13-6.

### Configuring Web Site Connection Data

The protocol and listener ports used by a Web site are configured differently in standalone OC4J and Oracle Application Server environments, as these topics describe:

- Configuring Web Site Data in a Standalone OC4J Installation
- Configuring Web Site Data in OPMN-Managed OC4J Instances

### Configuring Web Site Data in a Standalone OC4J Installation

In a standalone OC4J installation, the protocol and listener ports used by a Web site must be explicitly defined in the corresponding `-web-site.xml` configuration file. See "Creating the Web Site Configuration File" on page 13-7 for an overview of these files.

The default Web site is configured to listen for requests received via the HTTP protocol on port 8888 by default.
Configuring Web Site Data in OPMN-Managed OC4J Instances

In an Oracle Application Server installation, in which Oracle Process Manager and Notification Server (OPMN) is used to manage OC4J instances, you can use OPMN for efficient management of Web site protocol and port configurations. When OPMN is started, it selects a port value starting at the bottom of the specified range and increments the value by 1 until a free port is found. Allowing OPMN to select from a range of ports in this manner avoids potential conflicts among OC4J processes.

You can change the OC4J port ranges with Application Server Control, with an opmnctl command, or in the opmn.xml file.

Changing Port Ranges with Application Server Control

To change port ranges with Application Server Control:

1. From the Cluster Topology page, click Runtime Ports.
2. Click the Configure Port icon for the port you want to change.
3. In the Ports section of the Server Properties page, change the port range for the port you want to change.
4. Click Apply.
5. Navigate to the Cluster Topology page, select the OC4J instance that you modified, and click Restart.
6. Click Yes on the confirmation page.

ChangingProtocols and Port Ranges in opmn.xml

In this model, the protocol a Web site will use is specified within a <port> element defined for the Web site in opmn.xml, the OPMN configuration file. A range of listener ports the Web site will use can also be specified within this element.

The protocol and port values specified in opmn.xml override any corresponding values set in the corresponding Web site configuration file. Using OPMN to manage Web site protocol and port settings is not required in an Oracle Application Server environment. You can opt to not set these values in opmn.xml and instead set the values directly in the appropriate Web site configuration file.

The <port> element is defined in the opmn.xml configuration file, which is located in the ORACLE_HOME/opmn/conf directory. The syntax of the element follows:

```xml
<port id="webSiteName" protocol="http|https|ajp|ajps" range="startPort-endPort"/>
```

Table 13–1 describes the attributes of the <port> element.
Table 13–1 Attributes of the <port> Element

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>id</td>
<td>Required. Defines the name of the Web site, which is the name of the Web site configuration file minus the .xml extension.</td>
</tr>
<tr>
<td>protocol</td>
<td>Optional. Specifies the protocol through which the Web site will receive requests. Valid values follow:</td>
</tr>
<tr>
<td></td>
<td>- http</td>
</tr>
<tr>
<td></td>
<td>- https</td>
</tr>
<tr>
<td></td>
<td>- ajp</td>
</tr>
<tr>
<td></td>
<td>- ajps</td>
</tr>
<tr>
<td>range</td>
<td>Optional. Specifies the start and end ports for the range of ports available for assignment by OPMN. The default listener port ranges used are:</td>
</tr>
<tr>
<td></td>
<td>- HTTP: 8888-8987</td>
</tr>
<tr>
<td></td>
<td>- AJP: 12501-12600</td>
</tr>
<tr>
<td></td>
<td>You can specify a single port instead of a range by setting the start and end ports to the same port number.</td>
</tr>
<tr>
<td></td>
<td>Changing the value of the protocol attribute does not reset the port range to the default range for the protocol you specify. To change the port range, you can use the range attribute.</td>
</tr>
<tr>
<td></td>
<td>If you want to use both ajp and ajps in Oracle Application Server, you need to configure them on different OC4J instances and use two Oracle HTTP Server (OHS) instances, one for routing AJP requests and the other for routing AJPS requests.</td>
</tr>
</tbody>
</table>

All <port> elements defining connection protocols are set in the <process-type> element defining the OC4J instance. The <process-type> element is a subelement of the <ias-component> element, in which the id attribute equals default_group.

For example, the <port> element in the following example configures the default Web site on the OC4J home instance to listen for AJP requests on ports 12501 through 12600.

```xml
<ias-component id="default_group">
  <process-type id="home" module-id="OC4J" status="enabled">
    ...
    <port id="default-web-site" protocol="ajp" range="12501-12600"/>
    <port id="rmi" range="12401-12500"/>
    <port id="jms" range="12601-12700"/>
    <process-set id="default" numprocs="1"/>
  </process-type>
</ias-component>
```
Configuring Web Sites with `opmnctl`

The OPMN command-line tool, `opmnctl`, provides a `config port` command that enables you to specify, update, or delete a Web site configuration defined in `opmn.xml`.

The `opmnctl` tool is installed in the `ORACLE_HOME/opmn/bin` directory on each node. The tool must be run individually on each node and will update only the `opmn.xml` file on that node.

**Inserting or Updating Web Site Configuration Data in `opmn.xml`**

The `config port update` command sets the specified data in a new or existing `<port>` element. The syntax of this command follows:

```
opmnctl config port update ias-component=componentName
   process-type=instanceName portid=webSiteName [range=startPort-endPort]
   [protocol=http|https|ajp|ajps]
```

For example, the `default` Web site for an OC4J instance is currently configured to listen for HTTP requests. The following command modifies the configuration for the `default` Web site so that it will receive and respond to Apache JServ Protocol (AJP) requests from Oracle HTTP Server.

```
opmnctl config port update ias-component=default_group process-type=home
   portid=default-web-site protocol=ajp

opmnctl reload
```

The `opmnctl reload` command is invoked to reload the updated `opmn.xml` file into the OC4J runtime.

Changing the protocol for a Web site does not reset the port range to the default range for the specified protocol. To change the port range, you can use the `range` parameter in the `config port update` command.

If you want to use both AJP and AJPS in Oracle Application Server, you need to configure them on different OC4J instances and use two Oracle HTTP Server (OHS) instances, one for routing AJP requests and the other for routing AJPS requests.

**Deleting Web Site Configuration Data from `opmn.xml`**

The `delete` command removes the `<port>` element defined for the specified Web site. The syntax is as follows:

```
opmnctl config port delete ias-component=componentName
   process-type=instanceName portid=webSiteName
```

For example, the following removes the `<port>` element defined for the `default` Web site from `opmn.xml`:

```
opmnctl config port update ias-component=default_group process-type=home
```

---

**Note:** The `opmn.xml` file must be reloaded for changes made to take effect. Run the following command on the affected node to reload `opmn.xml`:

```
opmnctl reload
```

This command will not affect OPMN-managed components, including Oracle HTTP Server, OC4J, and deployed applications.
portid=default-web-site

opmnctl reload

Table 13–2 describes the options that can be set on the opmnctl config port command line.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ias-component</td>
<td>Set to default_group to update the OC4J configuration in opmn.xml.</td>
</tr>
<tr>
<td>process-type</td>
<td>Set to the identifier of the OC4J instance to update; for example, home.</td>
</tr>
<tr>
<td>portid</td>
<td>Set to the name of the Web site, which is the name of the Web site configuration file minus the .xml extension.</td>
</tr>
<tr>
<td>protocol</td>
<td>Specifies the protocol the Web site will receive requests through. Valid only for the update operation. Valid values are:</td>
</tr>
<tr>
<td></td>
<td>■  http</td>
</tr>
<tr>
<td></td>
<td>■  https</td>
</tr>
<tr>
<td></td>
<td>■  ajp</td>
</tr>
<tr>
<td></td>
<td>■  ajps</td>
</tr>
<tr>
<td></td>
<td>If either https or ajps is specified, the value of the secure attribute of the root &lt;web-site&gt; element in the *-web-site.xml configuration file defined for the Web site will be overridden.</td>
</tr>
<tr>
<td></td>
<td>Changing the protocol for a Web site does not reset the port range to the default range for the specified protocol. To change the port range, you can use the range parameter.</td>
</tr>
<tr>
<td>range</td>
<td>Sets the start and end ports for the range of ports available for assignment by OPMN. Valid only for the update operation. The default port ranges follow:</td>
</tr>
<tr>
<td></td>
<td>■  HTTP:  8888–8987</td>
</tr>
<tr>
<td></td>
<td>■  AJP:  12501–12600</td>
</tr>
<tr>
<td></td>
<td>You can specify a single port instead of a range by setting the start and end ports to the same port number.</td>
</tr>
<tr>
<td></td>
<td>Changing the protocol for a Web site does not reset the port range to the default range for the specified protocol. To change the port range, you can use the range parameter.</td>
</tr>
</tbody>
</table>

Creating a New Web Site in OC4J

Bringing a new Web site to life in an OC4J instance is essentially a two- or optionally three-step process:

1. Create the XML configuration file for the Web site within the OC4J installed directory structure.

2. Add a reference to the new Web site configuration file in server.xml, the OC4J configuration file.

3. For OPMN-managed OC4J instances, add a <port> element defining the Web site's protocol and port range to opmn.xml.

After these steps are completed, the Web site will be available for binding with applications. The following topics provide details on Web site configuration.
Creating a New Web Site in OC4J

Managing Web Sites in OC4J

- Creating the Web Site Configuration File
- Referencing the Web Site Configuration File in server.xml
- Defining the Web Site Connection Data in opmn.xml
- Sharing Web Applications Between Web Sites
- Specifying the Cookie Domain

Creating the Web Site Configuration File

The key information defined in a Web site configuration file includes the following:

- The Web context for each application bound to the site, which is appended to the URL used to access the site (for example, /em).
- The protocol the site uses. In an OPMN-managed environment, this value will be overridden by the protocol specified in opmn.xml.
- The port the site listens on. In an OPMN-managed environment, this value will be overridden by the port range specified in opmn.xml.
- The location of the access log file, which tracks user access to the site.

The most straightforward way to create a new configuration file is to make a copy of the default Web site configuration file, default-web-site.xml, which is located in the ORACLE_HOME/j2ee/instance/config directory. Name the file according to the following convention:

`webSiteName-web-site.xml`

The typical configuration file includes a root `<web-site>` element containing attributes that specify the following:

- `host`: The host for this Web site, as either a DNS host name or an IP address. If a server has multiple IP addresses, you can use the ALL setting to listen to all the IP addresses.
- `port`: The Web site listener port.
- `display-name`: The for-display name of the Web site.
- `virtual-hosts`: Any additional domains bound to this Web site.

The `<web-site>` element also typically contains the following subelements:

- A `<default-web-app>` element defining the Web application accessed by default through the Web site. When a single application is bound to the Web site, such as Application Server Control, specify the application within this element.
- One or more `<web-app>` subelements for each Web module bound to the Web site. These elements are added by OC4J when each application is bound to the Web site; however, they can be added to the file manually if desired. At a minimum, each `<web-app>` element has the following:
  - An `application` attribute to specify the name of the J2EE application to which the Web module belongs (the same as the EAR file name without the `.ear` extension)
  - A `name` attribute to specify the name of the Web module (the same as the WAR file name without the `.war` extension)
  - A `root` attribute to specify the context path, or context root, on this Web site to which the Web module is to be bound
An `<access-log>` element specifying the log file to which requests sent to the site are logged

As an example, assume that you will create a configuration file named `ascontrol-web-site.xml`, which defines a Web site that will be used exclusively to provide management access to Application Server Control. The root `<web-site>` element within this file will contain all of the required configuration data, as follows:

```xml
<web-site xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLocation="http://xmlns.oracle.com/oracleas/schema/web-site-10_0.xsd" port="1810" display-name="Application Server Control Web Site">
    <default-web-app application="ascontrol" name="ascontrol" access-log="true" />
    <access-log path="../log/ascontrol-web-access.log" />
</web-site>
```

For details on the structure of this element, see the `<web-site>` element description on page B-20.

---

**Note:** If you are creating a Web site exclusively for use by Application Server Control, as illustrated in this example, you must also update the Launch Application Server Control link on the OC4J home page, accessed through `ORACLE_HOME/j2ee/`, with the correct URL.

---

**Referencing the Web Site Configuration File in server.xml**

The location of every Web site configuration file must be referenced in a `<web-site>` element in `server.xml`, the OC4J configuration file, located in the `J2EE_HOME/config` directory. Applications will not be able to bind to the Web site unless this declaration exists in `server.xml`.

Each `<web-site>` element specifies the path and file name for the corresponding Web site XML file, as in the following sample `server.xml` entries:

```xml
<application-server ... >
    <web-site path="./default-web-site.xml" />
    <web-site path="./ascontrol-web-site.xml" />
</application-server>
```

In this example, the locations of all of the Web site configuration files are relative to the location of `server.xml`.

---

**Note:** If OC4J polling is disabled, OC4J must be restarted for changes to `server.xml` to take effect.

---

**Defining the Web Site Connection Data in opmn.xml**

In an Oracle Application Server installation, in which Oracle Process Manager and Notification Server (OPMN) is used to manage OC4J instances, you can use OPMN to manage Web site protocol and port configuration efficiently. Use the `opmnctl config port` command to add a new `<port>` element for the Web site to the OC4J instance definition in `opmn.xml`.

The following example sets the protocol (HTTP) and port (1810) for the `ascontrol` Web site:

```
opmnctl config port update ias-component="default_group" id="ascontrol-web-site"
```
The example command adds the new `<port>` element to the OC4J home instance definition in the opmn.xml file on the host machine. This OC4J instance is now configured with two Web sites: the default site and the new ascontrol site.

```xml
<ias-component id="default_group">
  <process-type id="home" module-id="OC4J" status="enabled">
    ...
    <port id="default-web-site" protocol="ajp" range="12501-12600"/>
    <port id="ascontrol-web-site" protocol="http" range="1810"/>
    <port id="rmi" range="12401-12500"/>
    <port id="jms" range="12601-12700"/>
    <process-set id="default" numprocs="1"/>
  </process-type>
</ias-component>
```

**Sharing Web Applications Between Web Sites**

*Sharing* a Web application implies the sharing of everything that makes up the application, including sessions, servlet instances, and context values.

A typical use for this mode is to share a Web application between an HTTP site and an HTTPS site on the same context path - essentially *binding* the application to the two different Web sites. This results in improved performance because only sensitive information is encrypted as needed, rather than requiring that all information in a request be encrypted.

Another benefit is that the cookie, rather than the SSL certificate, is used to track the session. The SSL certificate uses 50 KB to store each certificate when tracking it, which sometimes results in an out-of-memory problem for the session before the session times out. This could possibly make the Web application less secure, but might be necessary to work around issues such as SSL session timeouts not being properly supported in some browsers.

You can set an application as shared by setting the `shared` attribute of the `<web-app>` element to `true` in the `-web-site.xml` file defining each Web site to which the application is bound. This attribute is `false` by default.

For example, the sample petstore application is shared between both the default OC4J Web site, which listens on port 8888, and a new secure Web site listening on port 4443 by adding or modifying the following `<web-app>` elements in each Web site configuration file. This configuration will enable the application to accept both HTTP and HTTPS connections.

The `<web-app>` entry in `default-web-site.xml` follows:

```xml
<web-site xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:noNamespaceSchemaLocation="http://xmlns.oracle.com/oracleas/schema/web-site-10_0.xsd" port="8888" display-name="OC4J 10g (10.1.3) HTTP Web Site">
  <web-app application="petstore" name="petstore" load-on-startup="true"
    root="/petstore" shared="true" access-log="true"/>
  <access-log path="/petstore/log/http-web-access.log" />
</web-site>
```

A similar entry in `secure-web-site.xml` follows:

```xml
<web-site xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:noNamespaceSchemaLocation="http://xmlns.oracle.com/oracleas/schema/web-site-10_0.xsd" port="4443" secure="true" display-name="My Secure Web Site">
  <web-app application="petstore" name="petstore" load-on-startup="true"
    root="/petstore" shared="true" access-log="true"/>
  <access-log path="/petstore/log/http-web-access.log" />
</web-site>
```
Specifying the Cookie Domain

You can set the cookie domain to a specific value. This causes the domain to be set to the specified value at the time a cookie is created, resulting in a cookie that can be sent by a Web browser to any Web site within the domain.

If the domain is not specified, the browser defaults to the domain of the fully qualified server name, such as site1.acme.com. In this case, the browser would not be able to forward the cookie to site2.acme.com. However, if the cookie domain is explicitly set to acme.com, the cookie could be sent to either server.

Set the cookie-domain attribute in the <session-tracking> element in the J2EE standard orion-web.xml file for the application. The cookie-domain attribute contains the DNS domain with at least two components of the domain name provided. For example:

```xml
<session-tracking cookie-domain=".oracle.com" />
```

Configuring a Secure Web Site in OC4J

OC4J supports Secure Socket Layer (SSL) communication between the client and OC4J using HTTPS and AJPS. You can modify the configuration file for the default Web site to utilize SSL to create secure connections, or can create an additional site and bind it to Web applications requiring a secure connection.

For details on SSL keys and certificates, see the Oracle Containers for J2EE Security Guide.

This section covers the following topics

- Creating the Secure Web Site Configuration File

Creating the Secure Web Site Configuration File

Specify the appropriate SSL settings under the <web-site> element, as illustrated in the following example.

```xml
<web-site xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    web-site-10_0.xsd" port="4443" secure="true" display-name="My Secure Web Site">
    <access-log path='../log/secure-web-access.log' />
    <ssl-config keystore="../../server.keystore" keystore-password="welcome" 
        provider="com.sun.net.ssl.internal.ssl.Provider" />
</web-site>
```

Note the additions to <web-site>, shown in **bold**:

- Add a secure attribute with the value set to true. Setting secure="true" specifies that the HTTP protocol is to use an SSL socket.
- Set the port attribute to an available port. The default for SSL ports is 443; in the preceding example, the port attribute is set to 4443.
- Add the <ssl-config> element. This element is required whenever the secure flag is set to true. This element takes the following attributes and elements:
The optional factory attribute is used to specify the third-party SSLServerSocketFactory implementation to use if the application is not using JSSE.

If the application uses a third-party SSLServerSocketFactory implementation, you can use <property> subelements of <ssl-config> to send parameters to the factory.

---

**Note:** The factory attribute and its parameters are deprecated in OC4J 10g (10.1.3.4.0).

---

The keystore and keystore-password attributes specify the directory path and password for the keystore. The specified keystore must contain the certificates of any clients that are authorized to connect to OC4J through HTTPS. The value of keystore can indicate either an absolute or relative directory path and includes the file name.

The optional provider attribute can be used to specify a security provider to use.

By default, the Sun Microsystems implementation - com.sun.net.ssl.internal.ssl.Provider - is used. (Although the example shows the default implementation, it is implicit and does not need to be specified.)

One or more <property> elements containing parameters to pass to the SSLServerSocketFactory. Each element contains a name attribute and a value attribute, enabling you to specify parameters as name and value pairs.

---

**Note:** Parameters for the SSLServerSocketFactory are deprecated in OC4J 10g (10.1.3.4.0).

---

When the Web site configuration file is ready, add a <web-site> element referencing server.xml, the OC4J configuration file located in the J2EE_HOME/config directory. Applications will not be able to bind to the Web site unless this notation exists in server.xml. For example:

```xml
<application-server ...
  <web-site path="./default-web-site.xml" />
  <web-site path="./mycustom-web-site.xml" />
  <web-site path="./secure-web-site.xml" />
</application-server>
```

When configuration is complete, OC4J listens for SSL HTTP requests on one port and non-SSL HTTP requests on another. You can disable either SSL requests or non-SSL requests by commenting out the appropriate *-web-site.xml in the server.xml configuration file.

```xml
<!--  <web-site path="./secure-web-site.xml" /> commented out to remove SSL -->
```

For more information about elements and attributes of the <web-site>, <web-app>, and <session-tracking> elements, see Oracle Containers for J2EE Servlet Developer's Guide.
Requiring Client Authentication

You can require that clients be authenticated by the server by setting the needs-client-auth attribute of the <ssl-config> element to true. For example:

```xml
<web-site ... secure='true' ... >
  <ssl-config keystore='../../server.keystore' keystore-password='welcome'
          needs-client-auth='true' />
</web-site>
```

This step sets up a mode where OC4J accepts or rejects a client entity for secure communication, depending on its identity. The needs-client-auth attribute instructs OC4J to request the client certificate chain upon connection. If the root certificate of the client is recognized, then the client is accepted.

The keystore specified in the <ssl-config> element must contain the certificates of any clients that are authorized to connect to OC4J through HTTPS.

Requesting Client Authentication with OC4J

OC4J supports a client-authentication mode, in which the server explicitly requests authentication from the client before the server will communicate with the client. In this case, the client must have its own certificate. The client authenticates itself by sending a certificate and a certificate chain that ends with a root certificate. OC4J can be configured to accept only root certificates from a specified list in establishing a chain of trust back to the client.

A certificate that OC4J trusts is called a trust point. This is the first certificate that OC4J encounters in the chain from the client that matches one in its own keystore. There are three ways to configure trust:

- The client certificate is in the keystore.
- One of the intermediate certificate authority certificates in the client’s chain is in the keystore.
- The root certificate authority certificate in the client’s chain is in the keystore.

OC4J verifies that the entire certificate chain up to and including the trust point is valid to prevent any forged certificates.

If you request client authentication with the needs-client-auth attribute, perform the following:

1. Decide which of the certificates in the client’s chain is to be your trust point. Ensure either that you have control of the issue of certificates using this trust point or that you trust the certificate authority as an issuer.
2. Import the intermediate or root certificate in the server keystore as a trust point for authentication of the client certificate.
3. If you do not want OC4J to have access to certain trust points, make sure that these trust points are not in the keystore.
4. Execute the preceding steps to create the client certificate, which includes the intermediate or root certificate installed in the server. If you want to trust another certificate authority, obtain a certificate from that authority.
5. Save the certificate in a file on the client.
6. Provide the certificate on the client initiation of the HTTPS connection.
   - If the client is a browser, set the certificate in the client browser security area.
b. If the client is a Java client, you must programmatically present the client certificate and the certificate chain when initiating the HTTPS connection.

Starting and Stopping Web Sites

A Web site is available by default once it has been configured on an OC4J instance. However, Application Server Control provides the ability to stop and start individual Web sites through the Administration>J2EE Websites pages. These pages also display the configuration for each Web site, and provide access to the Web modules bound to each site.

Note: Because Application Server Control uses ascontrol-web-site, you cannot stop it through the user interface.

1. Click the Administration link in Application Server Control.
2. Click the J2EE Websites icon under Administration Tasks>Properties. The Web sites configured on the OC4J instance are listed on the page displayed.
3. Click the name of the desired Web site.

Configuring Web Site Access Logging

OC4J provides the ability to generate an access log for each Web site, which records requests submitted by clients to the Web site.

Access logs can be generated as either text-based log files or as Oracle Diagnostic Logging (ODL) files, which are generated in XML format that is viewable with Application Server Control. Only one type of access logging may be configured for a Web site.

Access logging is configured for a Web site in the Web site configuration file (*-web-site.xml) using either the <access-log> or <odl-access-log> element. If neither element is included in the configuration file, access logs are not generated for the Web site.

This section covers the following topics:

- Configuring Text-Based Access Logging
- Viewing Text Access Log Files
- Configuring ODL Access Logging
- Viewing ODL Access Log Files
- Enabling or Disabling Access Logging for a Web Module or Application

Configuring Text-Based Access Logging

Text-based access logging is configured through the <access-log> subelement of the root <web-site> element in the corresponding Web site's configuration file (*-web-site.xml).

Note: It is important to monitor text-based access log files, as this logging format does not support log rotation. If left unchecked, access-log files will continue to grow and can overrun the disk.
This `<access-log>` element has the following attributes:

- **path**: Specifies the path and file name of the access log. This is the only required attribute; specifying it alone will cause access logs to be generated.

  The path must be relative to the `ORACLE_HOME/j2ee/instance/config` directory to enable the log to be viewed with Application Server Control, as illustrated by the following entry in `default-web-site.xml`:

  ```xml
  <access-log path="../log/default-web-access.log" />
  ```

- **format**: Specifies one or more of several supported variables that result in information being prepended to log entries. Supported variables are `$time`, `$timeUsed`, `$request`, `$ip`, `$host`, `$path`, `$size`, `$method`, `$protocol`, `$user`, `$status`, `$referer`, `$agent`, `$cookie:[name]`, `$header:[name]`, and `$mime`. Between variables, you can type in any separator characters that you want to appear between values in the log message. The default setting is as follows:

  "$ip - $user - [$time] '$request' $status $size"

  This default configuration results in log messages such as the following, with the second message wrapping around to a second line:

  ```
  ```

  In this example, the user is null, the time is in brackets (as specified in the format setting), the request is in single quotation marks (as specified), and the status and size in the first message are 200 and 2929, respectively.

  The `$timeUsed` variable measures in seconds the time used for processing an HTTP transaction. The name of this variable is case sensitive.

- **split**: Specifies how often to begin a new access log. Supported values are `none` (equivalent to `never`, which is the default value), `hour`, `day`, `week`, and `month`. If `split` is specified, the `suffix` attribute (documented in the following text) can be used to specify timestamp data to append to the file name.

- **suffix**: Specifies timestamp information to append to the base file name of the logs if the `split` attribute is specified.

  The default `suffix` value is `-yyyy-mm-dd`.

  As an example, assume the following `<access-log>` element with `split` specified, using the default `suffix` value:

  ```xml
  <access-log path="../log/mysite-web-access.log" split="day" />
  ```

  The log file generated will be named as follows:

  `mysite-web-access-2004-11-17.log`

  The format used is that of `java.text.SimpleDateFormat`, and symbols used in `suffix` settings are according to the symbology of that class. Characters are case sensitive, as described in the `SimpleDateFormat` documentation. For information about `SimpleDateFormat` and the format symbols it uses, refer to the current Sun Microsystems Javadoc at the following location:

  `http://java.sun.com/j2se/`

  The following entry in `default-web-site.xml` will generate a file named `default-web-access.log` file:
<web-site>
...<access-log path="../log/default-web-access.log" />
</web-site>

The files will be generated in the following locations, depending on your OC4J installation:
- Standalone OC4J:
  Log files will be generated in $ORACLE_HOME/j2ee/home/log/.
- Oracle Application Server:
  Files will be generated in an OC4J instance-specific directory named $ORACLE_HOME/j2ee/instance/application-deployments/log/instance_default_group_1.

Viewing Text Access Log Files
Access log text files can be viewed by clicking the Logs link in Application Server Control. ODL log files are identified in the Log Files page by the .log extension.
1. Click the Logs link at the bottom of any Application Server Control page.
2. Expand OC4J.
3. Expand <instanceName>. The default instance name is home.

Configuring ODL Access Logging
In the ODL framework, log files are formatted as XML documents. A key benefit of ODL access logging is that unlike text-based logging, log file rotation is supported.

ODL access logging is configured through the <odl-access-log> subelement of the root <web-site> element in a Web site's configuration file. This element has the following attributes, all of which are required:
- path: The path to the directory where the log.xml files for the Web site will be generated.
  The path must be relative to the *-web-site.xml configuration file to enable the log files to be viewed with Application Server Control.
  For easier management, include the name of the Web site in the path.
- max-file-size: The maximum size, in kilobytes, that an individual log file is allowed to grow to. When this limit is reached, a new log file is generated.
- max-directory-size: Sets the maximum size, in kilobytes, allowed for the log file directory. When this limit is exceeded, log files are purged, beginning with the oldest files.

New files named log.xml are generated within the directory specified in the path attribute until the maximum directory size is reached. Each log file is equal to or less than the maximum size specified in the attributes.

For example, the following entry in default-web-site.xml will cause log.xml files to be generated. It will also set log files to a maximum of 1,000 KB and the directory maximum to 10,000 KB in a /default-web-access directory within $ORACLE_HOME/j2ee/home/log/.
<web-site>
Configuring Web Site Access Logging

The log files will be generated in the following locations, depending on your OC4J installation.

- **Standalone OC4J:**
  
  Log files will be generated in ORACLE_HOME/j2ee/home/log/default-web-access/.

- **Oracle Application Server:**
  
  Files will be generated in an OC4J instance-specific directory named ORACLE_HOME/j2ee/instance/application-deployments/log/instance_instance_default_group_1/default-web-access.

For more information about ODL access logging, see "Managing ODL Log Files" on page 11-6.

**Viewing ODL Access Log Files**

ODL-formatted log files can be viewed by clicking the Logs link in Application Server Control, enabling administrators to aggregate and view the logging output generated by all components and applications running within OC4J from one centralized location.

ODL log files are identified in the Log Files page by the .xml extension.

1. Click the Logs link at the bottom of any Application Server Control page.
2. Expand OC4J.
3. Expand <instanceName>. In both standalone OC4J and OAS, the default instance name is home.
4. Expand the Default Web Site node.
5. Expand Diagnostic Message Logs.

**Enabling or Disabling Access Logging for a Web Module or Application**

If either the <access-log> or <odl-access-log> element is defined in a Web site configuration file, access logging is not enabled by default for the Web modules within applications bound to the Web site. As of OC4J 10g 10.1.3.1.0, the default value of the access-log attribute of any application-specific <web-app> elements in the configuration file is false.

However, it is possible to enable access logging for a specific module by setting the access-log attribute to true for the module.

It may be desirable to leave access logging disabled in situations where a Web module submits such a massive number of requests that text-based access log files will quickly become bloated. If access-log is set to true in the Web site configuration file or for the module, you can disable access logging for the module by setting its access-log attribute to false.

For example, the following entry in default-web-site.xml disables access logging for the default application's DMS Web component, but enables text-based access logging for the admin_web module:
<web-site ...>
  <web-app application="default" name="dms0" root="/dmsoc4j" access-log="false" />
  <web-app application="default" name="admin_web" root="/adminoc4j" />
  <access-log path="../log/http-web-access.log" access-log="true" />
</web-site>
This chapter describes the process for registering new entities - specifically any vendor-specific DTDs and XSDs used to define the format of XML deployment descriptors - within OC4J, which is required if XML file validation will be performed. It contains the following topics:

- Validating XSDs to Be Registered
- Registering a DTD or XSD

**Validating XSDs to Be Registered**

OC4J provides the ability to validate XML deployment descriptors defined by an XSD at the time the files are read. This feature is enabled by passing the `-validateXML` argument on the `oc4j.jar` command line at OC4J startup. See Chapter 4, "OC4J Runtime Configuration" for details on command-line options.

Validation requires that the XSD defining an XML document be registered with the OC4J server. If this entity is not registered, XML validation may not occur.

When an XML document is read, the parser passes one or more keys identifying the XSD declared in the document to an OC4J component known as the *Entity Resolver*. The Entity Resolver resolves the location of the registered entity and returns it to the parser, enabling the XML document to be validated.

Two types of keys are used to reference an entity: A *public identifier* and a *system identifier*, both of which are declared in the XML document

- The *public identifier* is a string
- The *system identifier* is a URL

To enable the Entity Resolver to locate the entity, one or both of these identifiers must be registered with OC4J through entries in the `entity-resolver-config.xml` file. The entity's location must also be specified in this file.

By default, `entity-resolver-config.xml` already contains registration entries for the standard J2EE XSDs as well as for all OC4J-specific XSDs. As such, you are only required to add entries for non-J2EE or non-OC4J entities.

**Registering a DTD or XSD**

To register a DTD or XSD with OC4J, you must add it to the `entity-resolver-config.xml` file, which is located in the `ORACLE_HOME/j2ee/instance/config` directory on the OC4J host machine.
Each entity is declared in an `<entity>` element, which includes the following subelements:

- `<description>`: Contains an optional description of the entity.
- `<public-id>`: Contains the entity's public identifier.
- `<system-id>`: Contains the entity's system identifier.

Either `<public-id>` or `<system-id>` must be specified; however, you are not required to specify both.

- `<location>`: Points to the entity's location. The location can be either the fully qualified path to the entity or a URL that can be resolved locally.

The following `<entity>` element will register `acme-web.dtd` with OC4J. Both the public and system identifiers, which are declared in the `<!DOCTYPE>` element within an XML document, are registered.

```
<entity>
  <description>acme-web-2_0.dtd</description>
  <public-id>-//Acme//Acme web Descriptor 2.0//EN</public-id>
  <system-id>http://xmlns.acme.com/dtd/acme-web-2_0.dtd</system-id>
  <location>META-INF/acme-web-2_0.dtd</location>
</entity>
```

The next example will register `acme-application.xsd` with OC4J. The system identifier is declared in either the `xsi:schemaLocation` or the `xsi:noNamespaceSchemaLocation` attribute of the root element within an XML document.

```
<entity>
  <description>acme-application-1_0.xsd</description>
  <public-id />
  <system-id>http://xmlns.acme.com/schema/acme-application-1_0.xsd</system-id>
  <location>META-INF/acme-application-1_0.xsd</location>
</entity>
```

**Note:** The OC4J server must be restarted after you make changes to `entity-resolver-config.xml`. 
This appendix describes common problems that you may encounter when using OC4J and explains how to resolve them. It includes the following topics:

- Problems and Solutions
- Additional Help

Problems and Solutions

This section describes common problems and solutions. It contains the following topics:

- java.lang.OutOfMemory Errors
- Application Performance Impacted by Garbage Collection Pauses
- Invalid or Unneeded Library Elements Degrading Performance
- ClassCastException and ClassNotFound Errors
- OC4J Fails to Start: Unable to Find Java Compiler
- Error When Clustering an Application
- Error When Downgrading from JDK 5.0 to JDK 1.4.2
- OC4J Hanging When Starting Applications in Oracle Application Server

Warning Regarding Maximum Concurrent Timers

Problem

A warning such as the following example can occur when the number of concurrent timers exceeds the maximum:

WARNING J2EE OJR-10002

The number of concurrent Timers has reached the maximum limit

By default, OC4J 10g (10.1.3.4.0) allows only eight concurrent timers. (A timer can be triggered through an EJB timer, the timer service, or the scheduler.) This limit is low by default because each timer is expected to be of short duration. When the number of timers is at the limit, such as if timers are running longer for any reason, timers are no longer executed. When a new timer occurs, OC4J logs a warning message.

Solution

To work around this problem, you can use either of two OC4J system properties:
### Problems and Solutions

**timer.service.debug**

This property determines whether to log additional diagnostic information for the timer service, including information about the current number of running timers. For example:

```
-Dtimer.service.debug=true
```

**executor.concurrent.tasks**

This property specifies the number of concurrent tasks for the Executor Service. Through this property you can increase the maximum number of concurrent timers allowed by OC4J. For example:

```
-Dexecutor.concurrent.tasks=12
```

---

**Note:** Each timer executes in a separate thread. If the maximum number of timers is set too high, resulting in numerous timers executing, then OC4J uses many threads. Oracle recommends that you recycle threads once they finish executing.

---

For information about setting system properties, see Chapter 4, "OC4J Runtime Configuration."

### java.lang.OutOfMemory Errors

**Problem**

Out-of-memory errors indicate that the heap size of the Java instance is lower than the memory required by applications running within OC4J.

**Solution**

Increase the heap size for the OC4J process to the desired amount of memory at OC4J startup:

```
java -Xms512m -Xmx512m -jar oc4j.jar
```

If your application is running in an OPMN-managed environment, these JVM settings are defined within a `<data id="java-options">` element in the `opmn.xml` configuration file. For example:

```
<ias-component id="default_group">
  <process-type id="home" module-id="OC4J" status="enabled">
    <module-data>
      <category id="start-parameters">
        <data id="java-options" value="-Xms512m -Xmx512m -Djava.awt.headless=true -Dhttp.webdir.enable=false"/>
        ...
      </category>
    </module-data>
  </process-type>
</ias-component>
```

If your application is running in a Linux or UNIX environment, verify that `ulimit` settings allow the JVM process to allocate this much memory.
Application Performance Impacted by Garbage Collection Pauses

**Problem**
An application running on OC4J appears unresponsive, with simple requests experiencing noticeable delays. The cause is that the JVM has crossed the low memory threshold and is running a full garbage collection to free up memory.

**Solution**
Consider using the incremental low pause collector, which avoids long major garbage collection pauses by doing portions of the major collection work at each minor collection. This collector (also known as the train collector) collects portions of the tenured generation - a memory pool holding objects that are typically collected in a major collection - at each minor collection. The result is shorter pauses spread over many minor collections.

The incremental collector is even slower than the default tenured generation collector when considering overall throughput.

To use the incremental collector, the `-Xincgc` option must be passed in on the Java command line at application startup. Set the initial and maximum size of the young generation (object pool) to the same value using the `XX:NewSize` and `-XX:MaxNewSize` options. Set the initial and the maximum Java heap sizes to the same value using the `-Xms` and `-Xmx` options.

For example, to use this collector with a server with 1 GB of physical memory:
```
java -server -Xincgc -XX:NewSize=64m -XX:MaxNewSize=64m -Xms512m -Xmx512m
```

For more information on garbage collection tuning, read "Tuning Garbage Collection with the 1.4.2 Java Virtual Machine," which is available at [http://java.sun.com/docs/hotspot/gc1.4.2/](http://java.sun.com/docs/hotspot/gc1.4.2/)

Invalid or Unneeded Library Elements Degrading Performance

**Problem**
If the OC4J process memory is growing consistently during program execution, then you may have references to invalid symbolic links in your global `application.xml` file. This problem is usually characterized by a growth in the C heap and not a growth in Java object memory, as one would see with a more traditional Java object memory leak. OC4J loads all resources using the links in the `application.xml` file. If these links are invalid, then the C heap continues to grow, causing OC4J to run out of memory.

**Solution**
Ensure that all symbolic links are valid, and restart OC4J.

In addition, keep the number of JAR files OC4J is configured to load to a minimum. Eliminate all unused JAR files from the configuration and from the directories OC4J is configured to search. OC4J searches all JAR files for classes and resources, thereby causing the file cache to use extra memory and processor time.
ClassCastExceptions and ClassNotFound Errors

**Problem**
Most class-loading errors are related to class visibility—either too much or not enough. Collisions between classes packaged in multiple JARs or inherited by default from parent applications can be a problem.

**Solution**
Chapter 3, "Utilizing the OC4J Class-Loading Framework" in the Oracle Containers for J2EE Developer’s Guide contains detailed documentation on avoiding and troubleshooting issues related to class loading. It also explains how you can use shared libraries to avoid many of these issues within OC4J.

OC4J Fails to Start: Unable to Find Java Compiler

**Problem**
An error similar to the following one is seen at OC4J startup:

```
05/10/28 13:58:49 Error initializing server: Error initializing ejb-modules: Error generating wrappers for file:/C:/oc4j/j2ee/home/applications/admin_ejb.jar: javac.exe not found under <directory>, please use a valid jdk or specify the location of your java compiler in server.xml using the <java-compiler .../> tag
```

**Solution**
The error indicates that OC4J is unable to locate the required JDK. To resolve this issue, start OC4J from the `javac.exe` location on the command line. This will set the location of the JDK.

For example:

```
C:\ORACLE_HOME\j2ee\home\C:\jdk\bin\java -jar oc4j.jar
```

Error When Clustering an Application

**Problem**
The following error is thrown when clustering is configured for an application:

```
WARNING: The service implementation <classname> does not implement java.io.Serializable. *This class is not suitable for clustered environments* indicated by recoverable=true.
```

**Solution**
This error indicates that the class is not serializable, and therefore cannot utilize the OC4J replication framework.

Error When Downgrading from JDK 5.0 to JDK 1.4.2

**Problem**
The following error occurs when configuring an OPMN-managed OC4J instance installed as a component of Oracle Application Server, which uses the JDK 5.0 by default, to use the JDK 1.4.2.

```
oracle.oc4j.loader.util.AnnotatedLinkageError: MBeanServerEjbHome_StatefulSessionHomeWrapper1 (Unsupported major.minor
```
Solution
An OPMN-managed OC4J instance installed as a component of Oracle Application Server will use the JDK 5.0 by default. This newer version of the JDK is required to utilize EJB 3.0 and offers numerous performance improvements. However, if applications that will be deployed to OC4J require a JDK 1.4.2 release, it may be necessary to downgrade to the earlier version.

Before switching from JDK 5.0 to JDK 1.4.2, you must remove all compiled application files from the OC4J instance:

1. Stop the OC4J instance.
2. Delete the $ORACLE_HOME/j2ee/instance/application-deployments directory.
   Deleting this directory will cause the application files to be recompiled when OC4J is restarted with the JDK 1.4.2.

You can specify the JDK to use for each OC4J instance through manual edits to the opmn.xml configuration file. If you want to use the javac compiler installed with the JDK defined in the $JAVA_HOME environment variable, also remove the <java-compiler> element from server.xml and let OC4J rediscover the default settings.

Unsupported Methods in JMX MBeanServer and MBeanServerConnection Interfaces

Problem
A number of methods from the JMX MBeanServer interface are not available to a J2EE application when it uses an MBeanServer object obtained from the following operation:

```java
MBeanServer mbsrv = MBeanServerFactory.newMBeanServer();
```

The use of any of the following methods on the returned MBeanServer object will throw an UnsupportedOperationException exception:

```java
public final ClassLoader getClassLoaderFor(ObjectName mbeanName)
public final ClassLoader getClassLoader(ObjectName loaderName)
public final ClassLoaderRepository getClassLoaderRepository()
public final Object instantiate(String className)
public final Object instantiate(String className, ObjectName loaderName)
public final Object instantiate(String className, Object[] params, String[] signature)
public final Object instantiate(String className, ObjectName loaderName, Object[] params, String[] signature)
public final ObjectInstance createMBean(String className, ObjectName name)
public final ObjectInstance createMBean(String className, ObjectName name, ObjectName loaderName)
```
A number of methods from the MBeanServerConnection interface are not supported when an application uses the Oracle JMX connectors. The use of any of the following methods on the MBeanServerConnection object that is created will throw an UnsupportedOperationException exception:

```java
public final ObjectInstance createMBean(String className, ObjectName name)
public final ObjectInstance createMBean(String className, ObjectName name, ObjectName loaderName)
public final ObjectInstance createMBean(String className, ObjectName name, Object[] params, String[] signature)
public final ObjectInstance createMBean(String className, ObjectName name, ObjectName loader, Object[] params, String[] signature)
```

**Solution**
If your application uses the JMX MBeanServer or MBeanServerConnection interface, avoid using any of the unsupported methods in the application.

**OC4J Hanging When Starting Applications in Oracle Application Server**

**Problem**
In an OPMN-managed environment, OPMN appears to hang while trying to start OC4J, resulting in an error similar to the following one:

```
ias-component/process-type/process-set:
    default_group/home/default_group/

Error
Process (index=1,uid=2012873812,pid=2988)
time out while waiting for a managed process to start
```

**Solution**
An application that requires significant resources, such as an application that attempts to acquire multiple database connections for its various components, can cause OC4J to fail to start. You can manage this by specifying the maximum amount of time to allow applications to start in the `<start-timeout>` element defined for the OC4J instance in `opmn.xml`. After this value is reached, the application will not be started. This value will be applied to all applications deployed to the instance.

The following example increases the timeout value to 800 seconds for applications deployed to the home OC4J instance:
<ias-component id="default_group">
  ...
  <process-type id="home" module-id="OC4J" status="enabled">
    ...
    <start timeout="800" retry="2"/>
  </process-type>
</ias-component>

**Additional Help**

You can search for additional solutions on the following Oracle support-oriented Web sites:

- Oracle Application Server Release Notes, available on the Oracle Technology Network at

- Oracle MetaLink, available at
  [http://metalink.oracle.com](http://metalink.oracle.com)

If you still cannot find a solution for the problem you are facing, please log a service request.
This chapter provides detailed documentation on the XML files used to store configuration data for the OC4J server and J2EE applications and modules deployed into it.

- **Overview of the XML Configuration Files Used by OC4J**
- **Elements of the OC4J Server Configuration File (server.xml)**
- **Overview of the Web Site Configuration File (*-web-site.xml)**

**Overview of the XML Configuration Files Used by OC4J**

The configuration data for an OC4J instance and the applications and modules deployed into it is persisted in a number of XML files. Figure B–1 provides an overview of these XML files and their respective roles.

Schemas defining the Oracle-proprietary XML files used by OC4J can be viewed at the following link:

Table B–1 describes the role and function for each OC4J server-level XML file as well as the global configuration files displayed in the preceding figure.

Unless otherwise indicated, all of these files are installed in the $ORACLE_HOME/j2ee/instance/config$ directory by default.

### Table B–1 Server-Level and Global Configuration Files

<table>
<thead>
<tr>
<th>XML Configuration File</th>
<th>Features/Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>server.xml</td>
<td>The OC4J server configuration file. Configures the server and points to the XML files that add to this file, such as jms.xml for JMS support. The listing of other XML files enables the services to be configured in separate files, but the server.xml file denotes that they be used for the OC4J configuration.</td>
</tr>
<tr>
<td>data-sources.xml</td>
<td>Contains the OC4J data source configuration for all databases used by applications within OC4J.</td>
</tr>
<tr>
<td>rmi.xml</td>
<td>Contains OC4J RMI port configuration and RMI tunneling over HTTP.</td>
</tr>
<tr>
<td>jms.xml</td>
<td>Contains the OC4J JMS configuration for Destination topics and queues that are used by JMS and MDBs in OC4J.</td>
</tr>
<tr>
<td>system-application.xml</td>
<td>Contains the configuration for the system application, which is the parent of all other applications installed in the OC4J instance. The file provides configuration data used at OC4J startup, such as data needed to load required shared libraries.</td>
</tr>
</tbody>
</table>
Table B–2 describes the roles and functions of the various application-level XML files displayed in the preceding figure.

Unless otherwise indicated, all of these files are installed in the ORACLE_HOME/j2ee/instance/config directory by default.

Table B–2 Application-Level Configuration Files

<table>
<thead>
<tr>
<th>XML Configuration File</th>
<th>Features/Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>application.xml</td>
<td>Contains the configuration for the default application. All user-deployed applications and standalone modules that do not have a designated parent are deployed to this application by default. This file includes common settings that serve as default configuration values applied to deployed applications. This file is completely unrelated to application.xml, the J2EE standard deployment descriptor.</td>
</tr>
<tr>
<td>global-web-application.xml</td>
<td>An Oracle-specific file for configuring the servlet and JSP containers within OC4J.</td>
</tr>
<tr>
<td>oc4j-connectors.xml</td>
<td>Contains global OC4J-specific configuration data for all standalone resource adapters installed in the OC4J instance.</td>
</tr>
<tr>
<td>*-web-site.xml</td>
<td>An OC4J-specific file that contains configuration data for a Web site created within the OC4J instance. It is typically installed in the ORACLE_HOME/j2ee/instance/config directory, but can be installed in a different location. The configuration for the default Web site created within each OC4J instance is defined in default-web-site.xml.</td>
</tr>
</tbody>
</table>
Overview of the XML Configuration Files Used by OC4J

Table B–2 (Cont.) Application-Level Configuration Files

<table>
<thead>
<tr>
<th>XML Configuration File</th>
<th>Features/Components</th>
</tr>
</thead>
</table>
| orion-application.xml | The OC4J-specific deployment descriptor, which contains configuration data for a specific deployed application. In this file, you can use the `<jazn-web-app>` element to configure the OracleAS JAAS Provider and Oracle Single Sign-On properties for servlet execution. You must set these features appropriately to invoke a servlet under the privileges of a particular security subject. When Oracle Identity Management is being used as the security provider for a Web application, with Oracle Single Sign-On for authentication, you can synchronize a servlet session with the Oracle Java Authentication and Authorization Service (JAAS) Provider user context through `<jazn-web-app>`. To synchronize the session with the user context, set the `sso.session.synchronize` property to true, the default. You can do this in a `<property>` subelement under `<jazn-web-app>`:

```xml
<jazn-web-app ...>
  <property name="sso.session.synchronize" value="true"/>
</jazn-web-app>
```

Or you can set the property to false. To take effect, changes to `orion-application.xml` require an application restart (if the changes were made through Application Server Control or the security provider MBean) or an OC4J restart (if the changes were made manually).

For additional information about JAAS and the features described for this element, see the Oracle Containers for J2EE Security Guide. You can also refer to related Sun Microsystems documentation at the following location:

http://java.sun.com/j2se/1.4.2/docs/guide/security/jaas/JAASRefGuide.html

| web.xml | The J2EE Web application deployment descriptor, used to define the Web application deployment parameters that are included in the WAR file. In addition, you can specify the URL pattern for servlets and JSPs in this file. For example, a servlet is defined in the `<servlet>` element, and its URL pattern is defined in the `<servlet-mapping>` element. |

| orion-web.xml | Extends the standard J2EE descriptor with application-level, OC4J-specific configuration data, such as whether or not OC4J features like developer mode and auto-reload of JSPs are enabled. |

| ejb-jar.xml | The J2EE EJB module deployment descriptor, included in the Enterprise JavaBeans (EJB) JAR file. Defines the specific structural characteristics and dependencies of the EJB modules within a JAR and provides instructions for the EJB container about how the beans expect to interact with the container. |
The OC4J configuration file, `server.xml`, is located in the ORACLE_HOME/j2ee/instance/config directory. It is the starting point for configuration of the OC4J server and all J2EE applications, Web applications, and Web sites enabled within the server.

Unless specifically instructed to do so in the OC4J documentation, you should not have to edit `server.xml` manually because notations are added and updated as needed by OC4J.

The `server.xml` file includes references to the application descriptor of each application within the OC4J instance, either directly or indirectly. In the case of a typical J2EE application, this reference points to the extracted EAR top-level directory and, therefore, to the `application.xml` file that the EAR file contains. In the case of the OC4J global application, the `server.xml` file points directly to the OC4J global application descriptor.

The `server.xml` file also points to other XML configuration files. For each XML file, the location can be the full path or a path relative to the location of where the
server.xml file exists. In addition, the name of the XML file can be any name, as long as the contents of the file conform to the appropriate DTD.

- The <rmi-config> element denotes the name and location of the rmi.xml file.
- The <jms-config> element denotes the name and location of the jms.xml file.
- The <global-application> element denotes the name and location of the global application.xml file.
- The <global-web-app-config> element denotes the name and location of the global-web-application.xml file.
- The <web-site> element denotes the name and location of one *-web-site.xml file. Since you can have multiple Web sites, you can have multiple <web-site> entries.

The server.xml file format is described by application-server-10_1.xsd, which can be viewed at the following link:


Example of a server.xml File

An example of the server.xml configuration file for OC4J follows, with <!-- comments --> to describe the various sections:

```xml
<application-server  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" 
  application-server-10_1.xsd" application-directory="../applications"
  deployment-directory="../application-deployments"
  connector-directory="../connectors"
  schema-major-version="10" schema-minor-version="0">
  <!-- Shared library definitions -->
  <shared-library name="global.libraries" version="1.0" library-compatible="true">
    <code-source path="../applib"/>
    <code-source path="../../../sqlj/lib"/>
    <code-source path="../../../lib/dsv2.jar"/>
  </shared-library>
  <shared-library name="global.tag.libraries" version="1.0" 
    library-compatible="true">
    <code-source path="../jsp/lib/taglib/standard.jar"/>
  </shared-library>
  <!-- J2EE services -->
  <rmi-config path="./rmi.xml"/>
  <sep-config path="./internal-settings.xml"/>
  <jms-config path="./jms.xml"/>
  <javacache-config path="../../../javacache/admin/javacache.xml"/>
  <!-- Logging -->
  <j2ee-logging-config path="./j2ee-logging.xml"/>
  <log>
    <file path="../log/server.log"/>
  </log>
  <java-compiler name="javac" in-process="false" encoding="ISO8859_1" 
    extdirs="c:\\sdk\jdk\jre\lib\ext"/>
  <!-- Default application configuration -->
  <global-application name="default" path="application.xml"/>
  <!-- Deployed application configuration -->
  <application name="petstore" path="../applications\petstore.ear" start="true"/>
  <application name="ascontrol" path="../applications\ascontrol.ear" 
    start="true"/>
  <!-- Default Web application configuration file -->
```
<application-server>

**Required?** Required; one only

**Child elements:**
This is the root element of the OC4J configuration file.

**Table B–3 <application-server> Attributes**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>application-directory</td>
<td>Values: string&lt;br&gt;Default: ../applications&lt;br&gt;The target directory for deployed archives.</td>
</tr>
<tr>
<td>application-auto-</td>
<td>Values: string&lt;br&gt;Default: n/a&lt;br&gt;The directory into which EAR files can be copied, triggering automatic deployment/redeployment of the application.</td>
</tr>
<tr>
<td>deploy-directory</td>
<td></td>
</tr>
<tr>
<td>connector-directory</td>
<td>Values: string&lt;br&gt;Default: ../connectors&lt;br&gt;The target directory for standalone resource adapters.</td>
</tr>
<tr>
<td>deployment-directory</td>
<td>Values: string&lt;br&gt;Default: ../application-deployments&lt;br&gt;The directory containing the OC4J-specific deployment descriptors and generated files, such as compiled JSP classes and EJB wrapper classes.</td>
</tr>
<tr>
<td>check-for-updates</td>
<td>Values: all</td>
</tr>
<tr>
<td>localhostIsAdmin</td>
<td>Values: Boolean&lt;br&gt;Default: true&lt;br&gt;If true, allows easier access if the process initiating the administrative operation is a process local to the OC4J host machine.</td>
</tr>
<tr>
<td>taskmanager-granularity</td>
<td>Values: int&lt;br&gt;Default: 1000&lt;br&gt;The interval at which the task manager performs its duties, specified in milliseconds. The default is every second (1000 milliseconds).</td>
</tr>
</tbody>
</table>
<application>

**Parent element:** <application-server>

**Required?** Optional; multiple allowed

**Child elements:**
Defines a J2EE application deployed to the OC4J instance. The <application> element defining an application is added to server.xml by OC4J at the time the application is deployed. As such, there is generally no need to manually modify this element.

**Table B–4 <application> Attributes**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| name | Values: string  
Default: n/a  
The application name; typically the same as the EAR file name without the .ear extension. |
| path | Values: string  
Default: n/a  
The location of the EAR file or the extracted EAR top-level directory. As such, the path indirectly points to the J2EE standard application.xml descriptor packaged with the application. |
| start | Values: Boolean  
Default: true  
If true, the application is started with OC4J and is available to serve requests or for configuration through JMX MBeans. If false, the application is not started with OC4J, meaning it is not available to serve requests. However, it is available for configuration through JMX. |

<code-source>

**Parent element:** <shared-library>

**Required?** Required; multiple allowed

Specifies the path to a JAR or ZIP file included in the shared library definition.

**Table B–5 <code-source> Attributes**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| path | Values: string  
Default: n/a  
The path to a JAR or ZIP file included in a shared library.  
Paths may be absolute if outside of the /shared-lib directory, or can be relative to the subdirectory containing the JAR files within the /shared-lib/library_name directory. If relative, only the archive file name needs to be supplied as the value of the path attribute.  
You can optionally set path="***" to force OC4J to consume all of the archives within the shared library subdirectory. |
**<custom-thread-pool>**

**Parent element:**  
<application-server>

**Required?**  
Optional; multiple allowed

**Child elements:**

Contains the configuration for a single thread pool with the specified name within an OC4J process. One or more applications can be configured to use the thread pool. See "Configuring OC4J Thread Pools" on page 10-1 for details.

**Table B–6  <custom-thread-pool> Attributes**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| name      | Values: string  
Default: required  
The thread pool name. |
| min       | Values: string  
Default: 0  
The minimum number of threads that OC4J can simultaneously execute. |
| max       | Values: string  
Default: 1024  
The maximum number of threads that OC4J can simultaneously execute. |
| queue     | Values: string  
Default: 0  
The maximum number of requests that can be kept in the queue. |
| keepAlive | Values: string  
Default: 600000  
The length of time, in milliseconds, to keep a thread alive (idle) while waiting for a new request. This timeout designates how long an idle thread remains alive. If the timeout is reached, the thread is destroyed.  
To never destroy threads, set to -1.  
The default value, 600000 milliseconds (10 minutes), is also the minimum value allowed if not -1. |
| stackSize | Values: string  
Default: 0  
The size of the thread pool stack. |
| debug     | Values: Boolean  
Default: false  
If true, prints thread pool information to the console at startup. If false, the thread pool information is not printed. |

**<execution-order>**

**Parent element:**  
<startup-class>,<shutdown-class>

**Required?**  
Optional; one only

**Child elements:**
Elements of the OC4J Server Configuration File (server.xml)

Specifies the order of execution for each startup class. Specify an integer that designates the order in which the classes are executed.

<global-application>

Parent element:  <application-server>

Required?  Required; one only

Child elements:

Specifies the OC4J global application, known as the default application. The name attribute defines its name; the path attribute specifies what to use as the OC4J global application descriptor.

Table B–7  <global-application> Attributes

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| name | Values: string  
       Default: default  
       The global application name. |
| path | Values: string  
       Default: application.xml  
       The file name and path for the global application descriptor file.  
       The default descriptor is ORACLE_HOME/j2ee/instance/config/application.xml. |

<global-thread-pool>

Parent element:  <application-server>

Required?  Optional; one only

Child elements:

Contains the old configuration format for thread pools within an OC4J process. If the server.xml file contains the <global-thread-pool> element, the min, max, keep-alive, and queue attribute values apply to the http thread pool, which is created at OC4J startup. The cx-* attributes apply to the rmi connection thread pool, and the rmiRequest-* attributes apply to the rmi request thread pool. See "Configuring OC4J Thread Pools" on page 10-1 for details.

The <global-thread-pool> element is deprecated in OC4J 10g (10.1.3.4.0). If the server.xml file contains this element, OC4J changes it to equivalent <thread-pool> elements that define thread pools in the new configuration format.

Table B–8  <global-thread-pool> Attributes

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| min | Values: string  
     Default: n/a  
     The minimum number of threads that OC4J can simultaneously execute. |
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| **max**    | Values: string  
Default: n/a  
The maximum number of threads that OC4J can simultaneously execute. |
| **queue**  | Values: string  
Default: n/a  
The maximum number of requests that can be kept in the queue. |
| **debug**  | Values: Boolean  
Default: false  
If *true*, prints thread pool information to the console at startup.  
If *false*, the thread pool information is not printed. |
| **keep-alive** | Values: string  
Default: 600000  
The length of time, in milliseconds, to keep a thread alive (idle) while waiting for a new request. This timeout designates how long an idle thread remains alive. If the timeout is reached, the thread is destroyed.  
A value of -1 specifies never to destroy the thread.  
The default value, 600000 milliseconds (10 minutes), is also the minimum value allowed if not -1. |
| **cx-max** | Values: string  
Default: n/a  
The minimum number of connection threads that OC4J can simultaneously execute. |
| **cx-min** | Values: string  
Default: n/a  
The maximum number of connection threads that OC4J can simultaneously execute. |
| **cx-queue** | Values: string  
Default: n/a  
The maximum number of requests that can be kept in the queue. |
| **cx-debug** | Values: Boolean  
Default: false  
If *true*, prints thread pool information to the console at startup.  
If *false*, the thread pool information is not printed. |
| **cx-keep-alive** | Values: string  
Default: 600000  
The length of time, in milliseconds, to keep a thread alive (idle) while waiting for a new request. This timeout designates how long an idle thread remains alive. If the timeout is reached, the thread is destroyed.  
A value of -1 specifies never to destroy the thread.  
The default value, 600000 milliseconds (10 minutes), is also the minimum value allowed if not -1. |
| **rmiRequest-max** | Values: string  
Default: n/a  
The minimum number of connection threads that OC4J can simultaneously execute. |
Elements of the OC4J Server Configuration File (server.xml)

**Table B–8** (Cont.) <global-thread-pool> Attributes

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>rmiRequest-min</td>
<td>Values: string</td>
</tr>
<tr>
<td></td>
<td>Default: n/a</td>
</tr>
<tr>
<td></td>
<td>The maximum number of connection threads that OC4J can simultaneously execute.</td>
</tr>
<tr>
<td>rmiRequest-queue</td>
<td>Values: string</td>
</tr>
<tr>
<td></td>
<td>Default: n/a</td>
</tr>
<tr>
<td></td>
<td>The maximum number of requests that can be kept in the queue.</td>
</tr>
<tr>
<td>rmiRequest-debug</td>
<td>Values: Boolean</td>
</tr>
<tr>
<td></td>
<td>Default: false</td>
</tr>
<tr>
<td></td>
<td>If true, prints thread pool information to the console at startup.</td>
</tr>
<tr>
<td></td>
<td>If rmiRequest-debug is false, the thread pool information is not printed.</td>
</tr>
<tr>
<td>rmiRequest-keep-alive</td>
<td>Values: string</td>
</tr>
<tr>
<td></td>
<td>Default: 600000</td>
</tr>
<tr>
<td></td>
<td>The length of time, in milliseconds, to keep a thread alive (idle)</td>
</tr>
<tr>
<td></td>
<td>while waiting for a new request. This timeout designates how long an idle</td>
</tr>
<tr>
<td></td>
<td>thread remains alive. If the timeout is reached, the thread is destroyed.</td>
</tr>
<tr>
<td></td>
<td>A value of -1 specifies never to destroy the thread.</td>
</tr>
<tr>
<td></td>
<td>The default value, 600000 milliseconds (10 minutes), is also the minimum</td>
</tr>
<tr>
<td></td>
<td>value allowed if not -1.</td>
</tr>
</tbody>
</table>

**<global-web-app-config>**

**Parent element:**  <application-server>

**Required?**  Required; one only

**Child elements:**

Identifies the configuration file for the OC4J global web application, which by default is the parent of all other Web applications.

The name and root directory path, or context root, of the default Web application are specified in the global application descriptor, and the default Web application is bound to a Web site through the default-web-site.xml file. In standalone OC4J, the default context root for the default Web application is "/".

**Table B–9**  <global-web-app-config> Attributes

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>path</td>
<td>Values: string</td>
</tr>
<tr>
<td></td>
<td>Default: global-web-application.xml</td>
</tr>
<tr>
<td></td>
<td>The file name and path of the global Web application descriptor file. The</td>
</tr>
<tr>
<td></td>
<td>default descriptor is ORACLE_HOME/j2ee/instance/config/global-web-application.xml.</td>
</tr>
</tbody>
</table>

**<import-shared-library>**

**Parent element:**  <shared-library>
Elements of the OC4J Server Configuration File (server.xml)

**Required?** Optional; multiple allowed

Identifies a shared library to be imported by a shared library defined in the enclosing `<shared-library>` element. For additional information on configuring and using shared libraries, see the Oracle Containers for J2EE Developer’s Guide.

**Table B–10  <import-shared-library> Attributes**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
<td>Values: string</td>
</tr>
<tr>
<td></td>
<td>Default: required</td>
</tr>
<tr>
<td></td>
<td>The name of the shared library to import.</td>
</tr>
<tr>
<td>version</td>
<td>Values: string</td>
</tr>
<tr>
<td></td>
<td>Default: required</td>
</tr>
<tr>
<td></td>
<td>The version number to import.</td>
</tr>
</tbody>
</table>

**<init-param>**

**Parent element:** `<startup-class>, <shutdown-class>`

**Required?** Optional; multiple allowed

**Child elements:** `<param-name>, <param-value>`

Specifies initialization parameters within a `<startup-class>` or `<shutdown-class>` element. Contains key and value pairs, of type String, which OC4J takes, which are provided within the input Hashtable argument. The names for the key-value pairs must be unique, as JNDI is used to bind each value to its name.

**Table B–11  <init-param> Attributes**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>path</td>
<td>Values: string</td>
</tr>
<tr>
<td></td>
<td>Default: global-web-application.xml</td>
</tr>
<tr>
<td></td>
<td>The file name and path of the global Web application descriptor file. The default descriptor is ORACLE_HOME/j2ee/instance/config/global-web-application.xml.</td>
</tr>
</tbody>
</table>

**<j2ee-logging-config>**

**Parent element:** `<application-server>`

**Required?** Optional; only one allowed

**Child elements:**

Defines the file to use as the J2EE logging configuration file.

**Table B–12  <j2ee-logging-config> Attributes**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>path</td>
<td>Values: string</td>
</tr>
<tr>
<td></td>
<td>Default: ../j2ee-logging.xml</td>
</tr>
<tr>
<td></td>
<td>The file name and path of the logger configuration file.</td>
</tr>
</tbody>
</table>
<java-compiler>

**Parent element:**  &lt;application-server&gt;

**Required?**  Optional; one only

**Child elements:**

Specifies configuration parameters for the Java compiler to use to compile EJB modules. By default, the `javac` compiler installed with the JDK defined in the `JAVA_HOME` environment variable will be used.

**Table B–13  &lt;java-compiler&gt; Attributes**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| name      | Values: string  
Default: javac  
modern|classic|javac|ojc|jikes  
The name of the Java compiler to use. |
| in-process | Values: Boolean  
Default: false  
Specifies whether to run the compiler in-process or out-of-process.  
If set to false, a separate JVM process is spawned for the compiler to execute within. This is the default compiler execution mode used by OC4J, as it offers better management of memory resources.  
If set to true, the compiler executes within the same JVM process as OC4J. |
| encoding | Values: string  
Default: ISO-8859-1  
The source file encoding to use. |
| bindir | Values: string  
Default: n/a  
The absolute path to the directory containing the compiler executable. This attribute does not need to be specified to use the default javac compiler. |
| extdir | Values: string  
Default: n/a  
The compiler extension library location, if applicable. |
| debug | Values: Boolean  
Default: false  
Set to true to generate compilation-time debugging output. |

&lt;javacache-config&gt;

**Parent element:**  &lt;application-server&gt;

**Required?**  Optional; only one allowed

**Child elements:**  None

Specifies the path to javacache.xml, the Java Object Cache configuration file.
Table B–14  &lt;javacache-config&gt; Attributes

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>path</td>
<td>Values: string&lt;br&gt;Default: ../../../javacache/admin/javacache.xml&lt;br&gt;The path to the javacache.xml file.</td>
</tr>
</tbody>
</table>

&lt;jms-config&gt;

Parent element: &lt;application-server&gt;

Required?  Optional; only one allowed

Child elements:
Specifies the file to use as the OC4J JMS configuration file.

Table B–15  &lt;jms-config&gt; Attributes

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>path</td>
<td>Values: string&lt;br&gt;Default: jms.xml&lt;br&gt;The file name and path of the OC4J JMS configuration file.</td>
</tr>
</tbody>
</table>

&lt;log&gt;

Parent element: &lt;application-server&gt;

Required?  Optional; only one allowed

Child elements:  &lt;file&gt;
The enclosed &lt;file&gt; element points to the location of the OC4J server log file.

&lt;rmi-config&gt;

Parent element: &lt;application-server&gt;

Required?  Optional; only one allowed

Child elements:
Defines the file to use as the OC4J RMI configuration file.

Table B–16  &lt;rmi-config&gt; Attributes

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>path</td>
<td>Values: string&lt;br&gt;Default: rmi.xml&lt;br&gt;The file name and path of the OC4J RMI configuration file.</td>
</tr>
</tbody>
</table>

&lt;shared-library&gt;

Parent element: &lt;application-server&gt;
Elements of the OC4J Server Configuration File (server.xml)

**Required?**  Optional; multiple allowed

**Child elements:**  `<code-source>, <import-shared-library>`

Declares a shared library installed within the OC4J instance. For additional information on configuring and using shared libraries, see the Oracle Containers for J2EE Developer’s Guide.

**Table B–17  `<shared-library>` Attributes**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| name         | Values: string  
               Default: required  
               The name of the shared library directory created within the `/shared-lib` directory. |
| version      | Values: string  
               Default: required  
               The version number that serves as the name of the subdirectory containing the shared library's archive files in the `/shared-lib/library_name` directory. |
| library-compatible | Values: Boolean  
                     Default: false  
                     This attribute is intended for internal use only. |

**<shutdown-class>**

**Parent element:**  `<shutdown-classes>`

**Required?**  Optional; multiple allowed

**Child elements:**  `<execution-order>, <init-param>`

Defines a shutdown class to execute before OC4J terminates, within the `<shutdown-classes>` element.

**Table B–18  `<shutdown-class>` Attributes**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| classname | Values: string  
               Default: required  
               The name of the class that implements the `oracle.j2ee.server.OC4JShutdown` interface. |

**<startup-class>**

**Parent element:**  `<startup-classes>`

**Required?**  Optional; multiple allowed

**Child elements:**  `<execution-order>, <init-param>`

Defines a startup class to execute on OC4J initialization, within the `<startup-classes>` element.
Table B–19  <startup-class> Attributes

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| classname| Values: string  
|          | Default: required  
|          | The name of the class that implements the oracle.j2ee.server.OC4JStartup interface.  |
| failure-is-fatal| Values: Boolean  
|          | Default: false  
|          | If true, OC4J logs an exception and exits when an exception is thrown. If false, OC4J logs the exception and continues.  |

<thread-pool>

Parent element:  <application-server>

Required?  Optional; multiple allowed

Child elements:

Contains the configuration for a single system, http, jca, rmi request, or rmi connection thread pool within an OC4J process. See “Configuring OC4J Thread Pools” on page 10-1 for details.

Table B–20  <thread-pool> Attributes

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| name | Values: string  
|      | Default: required  
|      | system|rmi request|rmi connection|http|jca  
|      | The thread pool name, which must be one of these values:  
|      |   | system  
|      | A hidden thread pool that was not exposed in the older format.  
|      |   | rmi request  
|      | A thread pool that serves RMI requests.  
|      |   | rmi connection  
|      | A thread pool whose threads block-read on the RMI connection.  
|      |   | http  
|      | A thread pool serving HTTP and AJP requests and possibly RMI requests (if an rmi request thread pool is not configured) and RMI connections (if an rmi connection thread pool is not configured).  
|      |   | jca  
|      | The work management thread pool, for the J2CA work manager.  

The names of the threads in these pools are prefixed with SystemThreadGroup_, RMIRequestThreadGroup_, RMIConnectionThreadGroup_, HTTPThreadGroup_, and WorkManager_, respectively, and suffixed with an incrementing counter.
**Table B–20** *(Cont.)* `<thread-pool>` Attributes

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| min    | Values: string  
          Default: 0  
          The minimum number of threads that OC4J can simultaneously execute. |
| max    | Values: string  
          Default: 1024  
          The maximum number of threads that OC4J can simultaneously execute. |
| queue  | Values: string  
          Default: 0  
          The maximum number of requests that can be kept in the queue. |
| keepAlive | Values: string  
            Default: 600000  
            The length of time, in milliseconds, to keep a thread alive (idle) while waiting for a new request. This timeout designates how long an idle thread remains alive. If the timeout is reached, the thread is destroyed.  
            To never destroy threads, set to -1. 
            The default value, 600000 milliseconds (10 minutes), is also the minimum value allowed if not -1. |
| stackSize | Values: string  
              Default: 0  
              The size of the thread pool stack. |
| debug  | Values: Boolean  
          Default: false  
          If true, prints the application server thread pool information to the console at startup. If false, the thread pool information is not printed. |

**<transaction-manager-config>**

**Parent element:** `<application-server>`

**Required?** Optional; only one allowed

**Child elements:**

Specifies the transaction manager configuration file.

**Table B–21** `<transaction-manager-config>` Attributes

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| path   | Values: string  
          Default: transaction-manager.xml  
          The file name and path of the transaction manager configuration file. The default file is ORACLE_HOME/j2ee/instance/config/transaction-manager.xml. |
<web-site>

Parent element:  <application-server>

Required?  Optional; multiple allowed

Child elements:

References the configuration file for a single Web site defined within OC4J. A <web-site> element must be created for each Web site; otherwise, the site will not be enabled within OC4J. See Chapter 13, “Managing Web Sites in OC4J,” for details.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| path | Values: string  
Default: n/a  
The file name and path of the *-web-site.xml configuration file defining the Web site. |

<work-manager-thread-pool>

Parent element:  <application-server>

Required?  Optional; one only

Child elements:

Contains the configuration for a work management thread pool for resource adapters within an OC4J process. See "Configuring OC4J Thread Pools" on page 10-1 for details.

This element is deprecated in OC4J 10g (10.1.3.4.0). If the server.xml file contains this element, OC4J changes it to an equivalent <thread-pool> element that defines a jca thread pool.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
</table>
| min       | Values: string  
Default: n/a  
The minimum number of threads to create in the work management thread pool. To disable the thread pool, set this value to 0. |
| max       | Values: string  
Default: 40  
The maximum number of threads that can be created in the work management thread pool.  
The work management thread pool uses three worker threads for internal use. For example, if you specify max="16", then only 13 worker threads are available to service requests. Similarly, if the max value is 20, then only 17 threads are available. So you need to set this value to your required maximum number of threads plus 3. |
Overview of the Web Site Configuration File (*-web-site.xml)

The element descriptions in this section apply to any OC4J Web site configuration file, including default-web-site.xml.

**<web-site>**

*Required?* Required; one only

**Child elements:**
- `<description>`
- `<frontend>`
- `<web-app>`
- `<default-web-app>`
- `<user-web-apps>`
- `<access-log>`
- `<odl-access-log>`
- `<ssl-config>`

This is the root element for a Web site configuration file.

### Table B–23  <work-manager-thread-pool> Attributes

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
</table>
| queue     | Values: string  
           | Default: 0  
           | The maximum number of threads that can be kept in the queue in the work management thread pool. If you use the default, 0, no queue is maintained to handle a sudden burst of work requests. |
| keepAlive | Values: string  
           | Default: 600000  
           | The length of time, in milliseconds, to keep a thread alive (idle) while waiting for a new request. After the timeout is reached, the thread is destroyed.  
           |  
           | To never destroy threads, set to -1.  
           | The default value, 600000 milliseconds (10 minutes), is also the minimum value allowed if not -1. |
| debug     | Values: Boolean  
           | Default: false  
           | If true, prints the application server work management thread pool information to the console at startup. If false, the thread pool information is not printed. |

### Table B–24  Web Site Configuration File Attributes

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| custom-thread-pool | Values: string  
                     | Default: n/a  
                     | Optionally specifies a custom thread pool to be used by each application bound to this Web site by a <web-app> element in this configuration file. |
| display-name     | Values: string  
                     | Default: n/a  
<pre><code>                 | Optionally defines a user-friendly or informal Web site name. |
</code></pre>
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| **host**        | Values: string  
Default: n/a  
Specifies the host for this Web site, as either a DNS host name or an IP address. If a server is a *multihome* machine (having multiple IP addresses), you can use the `ALL` setting to listen to all IP addresses. |
| **log-request-info** | Values: Boolean  
Default: false  
Specifies whether to write information about the incoming request into the Web site log if an error occurs. The Web site log is enabled through either the `<access-log>` or `<odl-access-log>` element, described later in this section. ("Enabling or Disabling Access Logging for a Web Module or Application" on page 13-16 provides additional information about enabling the Web site log.) |
| **max-request-size** | Values: string  
Default: 15000  
Sets a maximum size, in bytes, for incoming HTTP requests. If a client sends a request that exceeds this maximum, it will receive a "request entity too large" error. The default maximum is 15000. |
| **secure**      | Values: Boolean  
Default: false  
Specifies whether to support Secure Socket Layer (SSL) functionality.  
For a protocol setting of `ajp13` (used in an Oracle Application Server environment), a `true` setting results in secure AJP protocol between Oracle HTTP Server and OC4J. For a protocol setting of `http` (used in standalone OC4J), a `true` setting results in HTTPS protocol between the client and OC4J.  
Also, a `secure="true"` setting requires that you use the `<ssl-config>` element (a subelement under the `<web-site>` element) to specify the keystore path and password. This element is documented later in this section.  
SSL and HTTPS features are also available through Oracle HTTP Server for communication between Oracle HTTP Server and the client. For information, see Oracle Application Server Security Guide. |
| **protocol**    | Values: string  
Default: n/a  
Specifies the protocol that the Web site is using. Possible values are `http` and `ajp13` (for AJP, the default). In a production environment with Oracle Application Server, you should use only the `ajp13` setting. The AJP protocol is for use with Oracle HTTP Server and `mod_oc4j`. Each protocol must have a corresponding port, and each port must have a corresponding protocol.  
To use either an `ajp13` or `http` setting in secure mode (SSL), you must set the `secure` flag to `true` and use the `<ssl-config>` subelement to specify the keystore path and password. This element is documented later in this section.  
Changing the value of the `protocol` attribute does not reset the port range to the default range for the protocol you specify. To change the port range, you can use the `range` attribute. |
Overview of the Web Site Configuration File (*-web-site.xml)

**<description>**
Contains an optional, brief description of the Web site.

**<frontend>**
Specifies a perceived front-end host and port of this Web site as seen by HTTP clients. When the site is behind a load balancer or firewall, the `<frontend>` specification is necessary to provide appropriate information to Web application code for functionality such as **URL rewriting**, a technique for encoding a session ID into the URL.

Using the host and port specified in the `<frontend>` element, the back-end server running the application knows to refer to the front end, instead of to itself, in any URL rewriting. This way, subsequent requests properly come in through the front end again, instead of trying to access the back end directly.

**Table B–25** describes the attributes of `<frontend>`.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| **port**      | Values: string
Default: n/a
Specifies the port number for this Web site. Each port must have a corresponding protocol, and each protocol must have a corresponding port. In standalone OC4J, a port setting of 8888 is used by default for direct access to the OC4J listener, but you can change this as desired.

In an Oracle Application Server environment, this port setting is overridden by OPMN, the Oracle Process Management and Notification system. Oracle Application Server uses port 7777 by default for access through Oracle HTTP Server with Oracle Web Cache enabled.

In a UNIX environment, port numbers less than 1024 require root privileges for access. Also, if there is no port specification from the client browser, port 80 is assumed for HTTP protocol and port 443 for HTTPS.

Changing the value of the `protocol` attribute does not reset the port range to the default range for the protocol you specify. To change the port range, you can use the `range` attribute.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| **use-keep-alive** | Values: Boolean
Default: true
Typical behavior for a servlet container is to close a connection once a request has been completed. With a `use-keep-alive` setting of `true`, however, a connection is maintained across requests. For AJP protocol, connections are always maintained and this attribute is ignored. For other protocols, the default is `true`; disabling it may cause significant performance loss. |

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| **virtual-hosts** | Values: string
Default: n/a
This optional attribute is useful for virtual sites sharing the same IP address. The value is a comma-delimited list of host names tied to this Web site. |
<web-app>

This element binds a particular Web module to this Web site. It specifies the name of a J2EE application archive (EAR file name minus the .ear extension) from the server.xml file, and the name of a Web module within the J2EE application. The Web module is defined in the J2EE application.xml file in the application EAR file (or possibly in the orion-application.xml file in the EAR file). The Web module is bound at the location specified by the <web-app> element’s root attribute.

Mapping to and from Web site XML files, particularly with respect to the application and name attributes, is shown in examples elsewhere in this document. See "Deploying a J2EE Application (EAR)" on page 6-8 (for a typical scenario of deploying a WAR file within an EAR file) and "Deploying a Standalone Web Module (WAR)" on page 6-10 (for the scenario of deploying a WAR file by itself to the OC4J default application).

Table B–26 describes the attributes of <web-app>.

---

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| access-log  | Values: string  
  Default: false  
  Specifies whether OC4J access logging, which logs requests to the Web site, is enabled for the Web module. If you want to enable access logging, set to true. If log file management becomes an issue, set to false to disable access logging for the module.  
  For more on access log configuration, see the descriptions of the <access-log> and <odl-access-log> elements within this section. |
### Table B–26  (Cont.) `<web-app>` Attributes

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| application     | Values: string  
                Default: n/a  
                Specifies the J2EE application archive name, which is the EAR file name without the .ear extension, and which corresponds to the name attribute of an `<application>` element in the server.xml file.  
                If you deploy a WAR file by itself in standalone OC4J, using the OC4J default application as the parent, then the application attribute instead reflects the name of the default application, according to the `<global-application>` element in the server.xml file. |
| load-on-startup | Values: Boolean  
                Default: false  
                Optional. Specifies whether the Web module should be preloaded on application startup. Otherwise, it is loaded upon the first request for it. Supported values are true and false. The default is false; however, this value is explicitly set to true when the module or application is deployed with Oracle Enterprise Manager 10g Application Server Control. |
| max-inactivity-time | Values: string  
                    Default: 0  
                    Optional. Specifies the number of minutes of inactivity after which OC4J will shut down the Web module. By default, a Web module is never shut down due to inactivity. |
| name            | Values: Boolean  
                Default: n/a  
                Specifies the name of a Web module within the specified J2EE application, and corresponds to the `<web-uri>` value (without the .war extension) of a `<web>` subelement of a `<module>` element in the J2EE application.xml file. The J2EE application.xml file is in the EAR file. |
Table B–26  (Cont.) <web-app> Attributes

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| root      | Values: string  
|           | Default: n/a  

Specifies the path to which the Web module is to be bound. This attribute defines the context root portion of the URL used to invoke the module. For example, if the Web module CatalogApp at Web site www.example.com is bound to the context root, /catalog, then the module can be invoked as follows:

http://www.example.com/catalog

The root attribute overrides the <context-root> value of the corresponding <web> element in the J2EE application.xml file. Specifying a slash (/) as the context root will override the OC4J default Web application.

You can use / as the context root when you deploy an application. The following example uses admin_client.jar to deploy a WAR file and bind it to /:

```java
% java -jar admin_client.jar deployer:oc4j:localhost oc4jadmin welcome1 \\ -deploy -file d:my-web-store.war -deploymentName mws_ 2 \\ -bindAllWebApps -contextRoot */*
```

If an EAR file includes an application.xml file that has the context root set to /, such as in the following example, then / will be the default context root when the application is deployed.

```xml
<application>
  <display-name>Web-Store</display-name>
  <module>
  <web>
    <web-uri>my-web-store.war</web-uri>
    <context-root>/</context-root>
  </web>
  </module>
</application>
```

Because the default ping URL for Oracle HTTP Server is also a slash (/), using / as the context root when you deploy an application might result in either or both of the following problems:

- Pings intended for Oracle HTTP Server go directly to OC4J instead.
- Extraneous HEAHEAD requests appear in the *=web-access.log file.

You can avoid these problems by placing an Oc4jMountCopy off directive in the ORACLE_ HOME/Apache/Apache/conf/dms.conf file.
Overview of the Web Site Configuration File (*.web-site.xml)

<default-web-app>

This element creates a reference to the default Web application bound to this Web site. When a single application is bound to the Web site, such as Application Server Control, specify the application within this element.

For users, this element is relevant only in a standalone OC4J environment. In an Oracle Application Server environment, the OC4J default Web application has system-level functionality but is not otherwise meaningful.

The `<default-web-app>` element uses the same attributes as the `<web-app>` element described immediately preceding, but the default setting of load-on-startup is true.

<user-web-apps>

Use this element to support user directories and applications. Each user can have a Web module and associated `web-application.xml` file. User applications are reached at `/username/` from the server root.

Table B–27 describes the attributes of `<user-web-apps>`.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>max-inactivity-time</td>
<td>Values: int, Default: n/a</td>
</tr>
<tr>
<td></td>
<td>Optional integer attribute to specify the number of minutes of inactivity</td>
</tr>
<tr>
<td></td>
<td>after which OC4J will shut down the Web module. By default, a Web module is</td>
</tr>
<tr>
<td></td>
<td>never shut down due to inactivity.</td>
</tr>
<tr>
<td>path</td>
<td>Specifies a path to specify the local directory of the user</td>
</tr>
<tr>
<td></td>
<td>application, including a wildcard for the user name. The default path</td>
</tr>
<tr>
<td></td>
<td>setting in a UNIX environment, for example, is <code>/home/username</code>, in which</td>
</tr>
<tr>
<td></td>
<td><code>username</code> is replaced by the particular user name.</td>
</tr>
</tbody>
</table>

<access-log>

Use this element to enable text-based access logging for this Web site and to specify information about the access log, including the path, file name, and what information is included. The log file is where incoming requests (each access of the Web site) are logged.
See "Configuring Text-Based Access Logging" on page 13-13 for configuration details.

<odl-access-log>

Use this element to enable ODL-based access logging for the Web site and to specify information about the access logs, including the path, and maximum values for the size of each file and the total size of all files in the log directory. The log files are where incoming requests (each access of the Web site) are logged.


<ssl-config>

This element specifies SSL configuration settings, if applicable. You must use it whenever you set the secure attribute of the <web-site> element to true.

Subelement of <ssl-config>:

<property>

Table B–28 describes the attributes of <ssl-config>.

Table B–28  <ssl-config> Attributes

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>keystore</td>
<td>Values: string&lt;br&gt;Default: n/a&lt;br&gt;A relative or absolute path to the keystore database (a binary file) used by this Web site to store certificates and keys for the user base in this installation. The path value includes the file name. A relative path is relative to the location of the Web site XML file.&lt;br&gt;A keystore is a java.security.KeyStore instance and can be created and maintained using the keytool utility, provided with the Sun Microsystems JDK</td>
</tr>
<tr>
<td>keystore-password</td>
<td>Values: string&lt;br&gt;Default: n/a&lt;br&gt;The password required to open the keystore.</td>
</tr>
<tr>
<td>needs-client-auth</td>
<td>Values: string&lt;br&gt;Default: false&lt;br&gt;Indicates whether the entity that is a client to OC4J, such as Oracle HTTP Server, must submit a certificate for authorization so it can communicate with OC4J. Supported values are true for client authentication (certificate required) and false, the default (no certificate required).</td>
</tr>
<tr>
<td>provider</td>
<td>Values: string&lt;br&gt;Default: com.sun.net.ssl.internal.ssl.Provider&lt;br&gt;You can use this attribute to specify a provider if you are using JSSE (Java Secure Socket Extension).&lt;br&gt;By default, OC4J usually employs the Sun Microsystems implementation of SSL. However, OC4J employs the Oracle SSL implementation in some cases, such as for SOAP and http_client.</td>
</tr>
</tbody>
</table>
### Table B–28  (Cont.) <ssl-config> Attributes

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| factory | Values: string  
If you are not using JSSE, use the factory attribute to specify an implementation of SSLServerSocketFactory.  
If you use a third-party SSLServerSocketFactory implementation, you can use <property> subelements of the <ssl-config> element to send parameters to the factory.  
The factory attribute and its parameters are deprecated in OC4J 10g (10.1.3.4.0). |
Overview of the Session State Tables

This appendix documents the schema for the database tables used by the OC4J database persistence mechanism. See "Configuring Database Replication" on page 9-9 for additional information on this mechanism.

**OC4J_HTTP_SESSION**

This table stores metadata for a single HTTP session, including identifiers for the application and user setting properties on the session. The ID is the primary key.

There is a 1:many relationship between an OC4J_HTTP_SESSION table and the OC4J_HTTP_SESSION_VALUE tables. Each entry in the OC4J_HTTP_SESSION table can have 0 or more entries in the OC4J_HTTP_SESSION_VALUE table.

<table>
<thead>
<tr>
<th>Name</th>
<th>Null?</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>NOT_NULL</td>
<td>VARCHAR2(100)</td>
<td>The unique session ID.</td>
</tr>
<tr>
<td>APPLICATION_ID</td>
<td>NULL</td>
<td>VARCHAR2(100)</td>
<td>The OC4J internal ID assigned to the application the session belongs to.</td>
</tr>
<tr>
<td>IP</td>
<td>NULL</td>
<td>NUMBER(38)</td>
<td>The IP address of the machine hosting the application.</td>
</tr>
<tr>
<td>LAST_ACCESSED</td>
<td>NULL</td>
<td>NUMBER(38)</td>
<td>The last time the current record was updated.</td>
</tr>
<tr>
<td>USER_NAME</td>
<td>NULL</td>
<td>VARCHAR2(50)</td>
<td>The user name for the application user setting values on the session.</td>
</tr>
<tr>
<td>MAX_INACTIVE_TIME</td>
<td>NULL</td>
<td>NUMBER(38)</td>
<td>The maximum time the session can remain idle before being expired. Session data will not be persisted after this maximum is exceeded.</td>
</tr>
<tr>
<td>CREATION_TIME</td>
<td>NULL</td>
<td>NUMBER(38)</td>
<td>The time at which the table was created.</td>
</tr>
</tbody>
</table>

**OC4J_HTTP_SESSION_VALUE**

This table stores each HTTP session property and the values set on it by the application user. The values are stored as a BLOB (binary large object). The ID and KEY_FIELD values together compose the primary key.
### Table C–2  OC4J_HTTP_SESSION_VALUE Table Description

<table>
<thead>
<tr>
<th>Name</th>
<th>Null?</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>NOT_NULL</td>
<td>VARCHAR2 (100)</td>
<td>The unique session ID.</td>
</tr>
<tr>
<td>KEY_FIELD</td>
<td>NOT_NULL</td>
<td>VARCHAR2 (100)</td>
<td>The name of a property set by the application user on the session.</td>
</tr>
<tr>
<td>VALUE_FIELD</td>
<td>NULL</td>
<td>BLOB</td>
<td>The value of the property set on the session.</td>
</tr>
</tbody>
</table>

### Table C–3  OC4J_EJB_SESSION Table Description

<table>
<thead>
<tr>
<th>Name</th>
<th>Null?</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>NOT_NULL</td>
<td>VARCHAR2 (100)</td>
<td>The unique session ID.</td>
</tr>
<tr>
<td>VALUE_FIELD</td>
<td>NULL</td>
<td>BLOB</td>
<td>The current state data of the session bean.</td>
</tr>
<tr>
<td>LOCATION</td>
<td>NULL</td>
<td>NUMBER (38)</td>
<td>The JNDI name that the session bean is bound to.</td>
</tr>
<tr>
<td>CHECKSUM</td>
<td>NULL</td>
<td>NUMBER (38)</td>
<td>Used internally to validate that bytes are formatted correctly.</td>
</tr>
<tr>
<td>PASSIVATE</td>
<td>NULL</td>
<td>NUMBER (38)</td>
<td>A Boolean value indicating whether the bean has been passivated. If true, the passivated bean will be retrieved from disk.</td>
</tr>
<tr>
<td>LAST_ACCESSED</td>
<td>NULL</td>
<td>NUMBER (38)</td>
<td>The last time the current record was updated.</td>
</tr>
<tr>
<td>USER_NAME</td>
<td>NULL</td>
<td>VARCHAR2 (50)</td>
<td>The user name for the application user setting values on the session.</td>
</tr>
<tr>
<td>MAX_INACTIVE_TIME</td>
<td>NULL</td>
<td>NUMBER (38)</td>
<td>The maximum time the session can remain idle before being expired. Session data will not be persisted after this maximum is exceeded.</td>
</tr>
<tr>
<td>CREATION_TIME</td>
<td>NULL</td>
<td>NUMBER (38)</td>
<td>The time at which the table was created.</td>
</tr>
</tbody>
</table>

**OC4J_EJB_SESSION**

This table stores the current state of a stateful session bean. The state data is stored as a BLOB (binary large object). The ID is the primary key.
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