The Programs (which include both the software and documentation) contain proprietary information; they are provided under a license agreement containing restrictions on use and disclosure and are also protected by copyright, patent, and other intellectual and industrial property laws. Reverse engineering, disassembly, or decompilation of the Programs, except to the extent required to obtain interoperability with other independently created software or as specified by law, is prohibited.

The information contained in this document is subject to change without notice. If you find any problems in the documentation, please report them to us in writing. This document is not warranted to be error-free. Except as may be expressly permitted in your license agreement for these Programs, no part of these Programs may be reproduced or transmitted in any form or by any means, electronic or mechanical, for any purpose.

If the Programs are delivered to the United States Government or anyone licensing or using the Programs on behalf of the United States Government, the following notice is applicable:

U.S. GOVERNMENT RIGHTS Programs, software, databases, and related documentation and technical data delivered to U.S. Government customers are “commercial computer software” or “commercial technical data” pursuant to the applicable Federal Acquisition Regulation and agency-specific supplemental regulations. As such, use, duplication, disclosure, modification, and adaptation of the Programs, including documentation and technical data, shall be subject to the licensing restrictions set forth in the applicable Oracle license agreement, and, to the extent applicable, the additional rights set forth in FAR 52.227-19, Commercial Computer Software—Restricted Rights (June 1987). Oracle USA, Inc., 500 Oracle Parkway, Redwood City, CA 94065

The Programs are not intended for use in any nuclear, aviation, mass transit, medical, or other inherently dangerous applications. It shall be the licensee’s responsibility to take all appropriate fail-safe, backup, redundancy and other measures to ensure the safe use of such applications if the Programs are used for such purposes, and we disclaim liability for any damages caused by such use of the Programs.

Oracle, JD Edwards, PeopleSoft, and Siebel are registered trademarks of Oracle Corporation and/or its affiliates. Other names may be trademarks of their respective owners.

The Programs may provide links to Web sites and access to content, products, and services from third parties. Oracle is not responsible for the availability of, or any content provided on, third-party Web sites. You bear all risks associated with the use of such content. If you choose to purchase any products or services from a third party, the relationship is directly between you and the third party. Oracle is not responsible for: (a) the quality of third-party products or services; or (b) fulfilling any of the terms of the agreement with the third party, including delivery of products or services and warranty obligations related to purchased products or services. Oracle is not responsible for any loss or damage of any sort that you may incur from dealing with any third party.
## Contents

### Preface
- Audience ................................................................. vii
- Documentation Accessibility ....................................... vii
- Related Documentation ............................................... viii
- Conventions ............................................................ viii

### 1 What’s New in OPMN?
- 1.1 Grouping Mechanism for OC4J Groups .................. 1-1
- 1.2 New Output for opmnctl status command ............... 1-2
- 1.3 New opmnctl Option ............................................. 1-2

### 2 OPMN: Overview
- 2.1 What is OPMN? ................................................... 2-1
- 2.2 How OPMN Works ............................................... 2-2
  - 2.2.1 Oracle Notification Server ............................... 2-3
  - 2.2.2 Oracle Process Manager ................................. 2-3
  - 2.2.3 PM Modules .................................................. 2-4
- 2.3 What Oracle Application Server Components Does OPMN Manage? ......................... 2-5
  - 2.3.1 Oracle Enterprise Manager 10g Application Server Control Console .................. 2-5
  - 2.3.2 Grid Computing and OPMN ......................... 2-5
  - 2.3.3 OPMN for Cluster Discovery ......................... 2-5

### 3 The opmn.xml File
- 3.1 opmn.xml .......................................................... 3-1
- 3.2 OC4J Groups .................................................... 3-2
- 3.3 Dynamic Discovery in opmn.xml .......................... 3-3
  - 3.3.1 Multi-Cast Configuration ............................... 3-4
  - 3.3.2 Discovery Server Configuration ...................... 3-4
  - 3.3.3 Gateway Configuration ................................. 3-5
- 3.4 Dynamic Resource Management .......................... 3-5
  - 3.4.1 Resource Management Directives .................... 3-7
  - 3.4.2 RMD Configuration ...................................... 3-12
    - 3.4.2.1 RMD Conditionals ................................. 3-12
    - 3.4.2.2 RMD Actions ........................................ 3-15
    - 3.4.2.3 RMD Exceptions ................................. 3-16
4 opmnctl Commands

4.1 opmnctl............................................................................................................. 4-1
    4.1.1 opmnctl Syntax......................................................................................... 4-2
4.2 opmnctl Command Quick Reference.............................................................. 4-2
4.3 opmnctl Detailed Command Description......................................................... 4-2
    4.3.1 Command Definitions............................................................................... 4-3
    4.3.1.1 Scope.................................................................................................. 4-3
    4.3.1.2 Attributes............................................................................................ 4-3
    4.3.1.3 Verbose................................................................................................. 4-5
4.3.2 Server Control Commands............................................................................ 4-6
    4.3.2.1 Server Control Commands on Microsoft Windows............................... 4-6
    4.3.2.2 opmnctl start....................................................................................... 4-6
    4.3.2.3 opmnctl startall ................................................................................. 4-6
    4.3.2.4 opmnctl stopall ................................................................................. 4-7
    4.3.2.5 opmnctl shutdown............................................................................. 4-7
    4.3.2.6 opmnctl reload .................................................................................. 4-8
4.3.3 Process Control Commands......................................................................... 4-9
    4.3.3.1 opmnctl startproc, opmnctl restartproc and opmnctl stopproc........... 4-9
    4.3.3.2 Progressive Request Reports............................................................... 4-11
    4.3.3.3 Sequential Requests........................................................................... 4-12
    4.3.3.4 opmnctl config ............................................................................... 4-13
    4.3.3.5 Starting a Specific J2EE Application.................................................... 4-14
    4.3.3.6 Starting an OC4J group..................................................................... 4-15
4.3.4 Status Commands....................................................................................... 4-15
    4.3.4.1 opmnctl status.................................................................................... 4-16
        4.3.4.1.1 Options for the Status Command of opmnctl.............................. 4-17
        4.3.4.1.2 opmnctl status -port................................................................. 4-18
        4.3.4.1.3 opmnctl status -app.................................................................. 4-19
    4.3.4.2 opmnctl status for OC4J Groups.......................................................... 4-19
    4.3.4.3 opmnctl dmsdump............................................................................ 4-20
    4.3.4.4 opmnctl ping..................................................................................... 4-20
    4.3.4.5 opmnctl set......................................................................................... 4-20
    4.3.4.5.1 The comp Attribute...................................................................... 4-21
    4.3.4.6 opmnctl query.................................................................................... 4-22
4.3.5 Help Commands.......................................................................................... 4-23
    4.3.5.1 opmnctl help..................................................................................... 4-23

3.4.2.4 RMD Configuration in the opmn.xml file................................................ 3-16
3.4.2.5 RMD Evaluation...................................................................................... 3-17
3.5 Service Failover............................................................................................ 3-18
3.6 Automatic Restart......................................................................................... 3-19
3.7 Event Scripts................................................................................................. 3-19
3.8 Start Order Dependencies............................................................................ 3-20
3.9 OPMN Log Files......................................................................................... 3-20
3.10 Security........................................................................................................ 3-20
    3.10.1 Remote Security.................................................................................. 3-22
3.11 IPv6 Support............................................................................................... 3-22
5 Using OPMN

5.1 Starting OPMN.................................................................................................................. 5-1
5.2 Starting and Stopping OPMN-Managed Processes for a Local Oracle Application Server Instance 5-1
5.3 Starting and Stopping all OPMN Managed Processes for a Remote Oracle Application Server Instance 5-2
5.4 Starting and Stopping an Oracle Application Server Component in a Local Oracle Application Server Instance 5-2
5.5 Starting and Stopping an Oracle Application Server Process Type in a Local Oracle Application Server Instance 5-2
5.6 Starting and Stopping a Multi-Oracle Application Server Instance Environment ........... 5-2
5.7 Starting a Component on an Oracle Application Server Cluster........................................ 5-3
5.8 Starting an OC4J Group ........................................................................................................ 5-3

6 opmn.xml Common Configuration

6.1 Example of opmn.xml Elements and Attributes ............................................................... 6-1
6.2 opmn.xml Element and Attribute Descriptions ................................................................. 6-3

7 Configuring Oracle HTTP Server

7.1 Oracle HTTP Server Process Module Configuration....................................................... 7-1
7.2 Oracle HTTP Server Minimum Configuration................................................................. 7-2
7.3 Oracle HTTP Server Complete Configuration............................................................... 7-2
7.4 Oracle HTTP Server Attribute Descriptions .................................................................... 7-2
7.5 Oracle HTTP Server 2....................................................................................................... 7-6
7.6 Generic Apache (Linux only) ............................................................................................ 7-6

8 Configuring OC4J

8.1 OC4J Process Module Configuration............................................................................... 8-1
8.2 OC4J Minimum Configuration.......................................................................................... 8-1
8.3 OC4J Complete Configuration........................................................................................ 8-1
8.4 OC4J Group Configuration ............................................................................................. 8-2
8.5 OC4J Attribute Descriptions............................................................................................ 8-3

9 Configuring Oracle Application Server Port Tunnel

9.1 OracleAS Port Tunnel Process Module Configuration .................................................. 9-1
9.2 OracleAS Port Tunnel Minimum Configuration............................................................. 9-1
9.3 OracleAS Port Tunnel Complete Configuration............................................................ 9-1
9.4 OracleAS Port Tunnel Attribute Descriptions................................................................. 9-2

10 Configuring Custom Process

10.1 Custom Process Module Configuration ....................................................................... 10-1
10.2 Custom Process Minimum Configuration .................................................................... 10-1
A OPMN Troubleshooting

A.1 Problems and Solutions ................................................................. A-1
A.1.1 Oracle Application Server Process Does Not Start .................. A-1
A.1.2 Determining if Oracle Application Server Processes are Dying or Unresponsive... A-2
A.1.3 opmnctl Command Execution Times Out................................. A-2
A.1.4 Oracle Application Server Component Automatically Restarted by OPMN .......... A-3
A.1.5 Unexpected opmnctl start Behavior ....................................... A-3
A.1.6 Disabled Element in the opmn.xml File ................................. A-4
A.1.7 Unable to Start OC4J ............................................................... A-4
A.1.8 Unable to Stop Component ..................................................... A-5
A.1.9 globalInitNLS Error .............................................................. A-5
A.1.10 Start Remote Hosts of a Cluster Independently ...................... A-5
A.1.11 OPMN Start Up Consumes CPU Processing Capability ............ A-6
A.1.12 Error Messages During Start-up of OPMN ............................. A-6
A.1.13 Disable, or Reconfigure, Firewall When Creating Topology Using Multi-Cast Address Configuration A-6
A.1.14 Increasing Size of opmn.log File ............................................ A-7
A.2 Diagnosing OPMN Problems ...................................................... A-7
A.2.1 OPMN log Files ...................................................................... A-7
A.2.1.1 opmn.log and opmn.dbg File Rotation ................................ A-8
A.2.1.2 Process Console log File Rotation ...................................... A-9
A.2.2 opmnctl debug ....................................................................... A-9
A.2.3 Oracle Enterprise Manager 10g Application Server Control Console .......... A-9
A.2.4 Troubleshooting with Event Scripts ...................................... A-10
A.2.5 opmn.xml Environment Variables ........................................ A-11
A.3 Need More Help? ..................................................................... A-11

Index
Preface

This guide describes how to administer Oracle Process Manager and Notification Server (OPMN) for management of Oracle Application Server components.

This preface contains these topics:

- Audience
- Documentation Accessibility
- Related Documentation
- Conventions

Audience

The Oracle Process Manager and Notification Server Administrator’s Guide is intended for administrators of Oracle Application Server.

Documentation Accessibility

Our goal is to make Oracle products, services, and supporting documentation accessible, with good usability, to the disabled community. To that end, our documentation includes features that make information available to users of assistive technology. This documentation is available in HTML format, and contains markup to facilitate access by the disabled community. Accessibility standards will continue to evolve over time, and Oracle is actively engaged with other market-leading technology vendors to address technical obstacles so that our documentation can be accessible to all of our customers. For more information, visit the Oracle Accessibility Program Web site at

http://www.oracle.com/accessibility/

Accessibility of Code Examples in Documentation

Screen readers may not always correctly read the code examples in this document. The conventions for writing code require that closing braces should appear on an otherwise empty line; however, some screen readers may not always read a line of text that consists solely of a bracket or brace.

Accessibility of Links to External Web Sites in Documentation

This documentation may contain links to Web sites of other companies or organizations that Oracle does not own or control. Oracle neither evaluates nor makes any representations regarding the accessibility of these Web sites.
TTY Access to Oracle Support Services

Oracle provides dedicated Text Telephone (TTY) access to Oracle Support Services within the United States of America 24 hours a day, seven days a week. For TTY support, call 800.446.2398.

Related Documentation

For more information, see these Oracle resources:

- Oracle Application Server Documentation Library
- Oracle Application Server Platform-Specific Documentation on Oracle Application Server Disk 1

Conventions

The following text conventions are used in this document:

<table>
<thead>
<tr>
<th>Convention</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>boldface</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>italic</td>
<td>Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.</td>
</tr>
<tr>
<td>monospace</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>
What's New in OPMN?

This chapter describes the new features of Oracle Process Manager and Notification Server (OPMN) available in Oracle Application Server 10g Release 3 (10.1.3.1.0).

This chapter includes the following topics:

- Section 1.1, “Grouping Mechanism for OC4J Groups”
- Section 1.2, “New Output for opmnctl status command”
- Section 1.3, “New opmnctl Option”

1.1 Grouping Mechanism for OC4J Groups

In Oracle Application Server 10g Release 3 (10.1.3) and earlier releases, you could not place OC4J instances into groups. Each OC4J instance was a single entity as shown in the following 10.1.3 opmn.xml file code example:

Example 1–1 10.1.3 and Earlier Release OC4J Instance opmn.xml

```xml
<ias-component id="OC4J">
  <process-type id="home" module-id="OC4J">
    <port id="ajp" range="3301-3400" />
    <port id="rmi" range="3101-3200" />
    <port id="jms" range="3201-3300" />
  </process-type>
  <process-set id="default-group" numprocs="1"/>
</ias-component>
```

In 10g Release 3 (10.1.3.1.0), you can group OC4J instances. The <ias-component> element in the opmn.xml file can be used as a grouping mechanism. For example, an OC4J group called COLORS can be configured as follows:

Example 1–2 10.1.3.1.0 OC4J Instance opmn.xml

```xml
<ias-component id="COLORS">
  <process-type id="home" module-id="OC4J">
    <port id="ajp" range="3301-3400" />
    <port id="rmi" range="3101-3200" />
    <port id="jms" range="3201-3300" />
  </process-type>
  <process-type id="oc4j_soa" module-id="OC4J">
    <port id="ajp" range="3301-3400" />
    <port id="rmi" range="3101-3200" />
    <port id="jms" range="3201-3300" />
  </process-type>
  <ias-component>
```

What’s New in OPMN? 1-1
In the example shown in Example 1–2, the COLORS group represents a synchronized collection of OC4J instances. This functionality enables simultaneous configuration to all OC4J instances in the Group.

You can select specific OC4J instances and move them to a group. You can also create an empty group and then populate it later by editing the group using Groups View through Oracle Enterprise Manager 10g Application Server Control Console (Application Server Control Console).

Refer to Section 3.2, "OC4J Groups" and the Oracle Application Server Administrator’s Guide for more information.

## 1.2 New Output for opmnctl status command

The output for the opmnctl status command has changed with 10.1.3.1.0. For example, the following output is displayed when executing the opmnctl status command on a 10.1.3 release Oracle Application Server instance:

**Example 1–3  opmnctl Status Output for 10.1.3**

```
prompt > opmnctl status

Processes in Instance: AppSrv1.comp1.yourcompany.com

<table>
<thead>
<tr>
<th>ias-component</th>
<th>process-type</th>
<th>pid</th>
<th>status</th>
</tr>
</thead>
<tbody>
<tr>
<td>OC4J</td>
<td>OC4J_Demos</td>
<td>N/A</td>
<td>Down</td>
</tr>
<tr>
<td>OC4J</td>
<td>home</td>
<td>29268</td>
<td>Init</td>
</tr>
<tr>
<td>HTTP_Server</td>
<td>HTTP_Server</td>
<td>29099</td>
<td>Alive</td>
</tr>
</tbody>
</table>
```

The output of opmnctl status command for 10.1.3.1.0 labels OC4J Groups and OC4J processes as follows:

**Example 1–4  opmnctl Status Output for 10.1.3.1.0**

```
prompt > opmnctl status

<table>
<thead>
<tr>
<th>ias-component</th>
<th>process-type</th>
<th>pid</th>
<th>status</th>
</tr>
</thead>
<tbody>
<tr>
<td>OC4JGroup:COLORS</td>
<td>OC4J:home</td>
<td>16301</td>
<td>Alive</td>
</tr>
<tr>
<td>OC4JGroup:COLORS</td>
<td>OC4J:oc4j_soa</td>
<td>16256</td>
<td>Alive</td>
</tr>
</tbody>
</table>
```

## 1.3 New opmnctl Option

In 10g Release 3 (10.1.3.1.0), there is a new opmnctl option that enables you to execute control and monitor your OC4J groups. The new opmnctl option for OC4J groups is similar to the commands applicable to the `<ias-component>` element in the opmn.xml file but applies to OC4J components.

For example, using the OC4J group COLORS as shown in Example 1–2 and Example 1–4:

To obtain the status of the OC4J group COLORS:

```
prompt > opmnctl @cluster status oc4j-group=COLORS
```

To start all of the processes in the OC4J group COLORS:

```
prompt > opmnctl @cluster startproc oc4j-group=COLORS
```
This chapter provides an overview of OPMN for Oracle Application Server. It features the following topics:

- Section 2.1, "What is OPMN?"
- Section 2.2, "How OPMN Works"
- Section 2.3, "What Oracle Application Server Components Does OPMN Manage?"

### 2.1 What is OPMN?

OPMN is installed and configured with every Oracle Application Server installation type and is essential for running Oracle Application Server.

OPMN features the following functionality:

- Provides a command-line interface for process control and monitoring for single or multiple Oracle Application Server components and instances.
- Provides an integrated way to manage Oracle Application Server components.
- Enables management of Oracle Application Server subcomponents and sub-subcomponents.
- Channels all events from different Oracle Application Server component instances to all Oracle Application Server components that can utilize them.
- Solves interdependency issues between Oracle Application Server components by enabling you to start and stop components in order.
- Enables customizing of enterprise functionality by using event scripts.
- Enables gathering of host and Oracle Application Server process statistics and tasks.
- Provides automatic restart of Oracle Application Server processes when they become unresponsive, terminate unexpectedly, or become unreachable as determined by ping and notification operations.
- Provides automatic death detection of Oracle Application Server processes.
- Does not depend on any other Oracle Application Server component being up and running before it can be started and used.
- Enables you to control an OC4J instance through modifications to the `opmn.xml` file.
- Enables grouping of OC4J instances to allow simultaneous configuration for all OC4J instances in a Group.
OPMN enables you manage your Oracle Application Server instance in an hierarchical fashion as part of a cluster topology. After you install an Oracle Application Server instance, you can use the Cluster Topology page to see installed components, such as OC4J and Oracle HTTP Server.

The OPMN server should be started as soon as possible after turning on the computer. OPMN must be running whenever OPMN-managed components are turned on or off.

**Note:** On the Microsoft Windows operating system, OPMN is installed as a Windows service (Oracle<OracleHomenname>ProcessManager). It starts up automatically when you start or restart your computer. Refer to Section 4.3.2.3, "opmnctl startall" for more information.

Oracle Application Server components managed by OPMN should never be started or stopped manually. Do not use command line scripts or utilities from previous versions of Oracle Application Server for starting and stopping Oracle Application Server components. OPMN must be the last service turned off whenever you restart or turn off your computer.

Use the Application Server Control Console and the opmnctl command line utility to start or stop Oracle Application Server components.

**Note:** Refer to Chapter 4, "opmnctl Commands" for more information about the opmnctl command.

### 2.2 How OPMN Works

OPMN consists of a core grouping of three components that interpret and convey notification information sent between Oracle Application Server processes within the same or different OPMN servers.

The core of OPMN consists of the following three components:

- [Section 2.2.1, "Oracle Notification Server"
- [Section 2.2.2, "Oracle Process Manager"
- [Section 2.2.3, "PM Modules"

Figure 2–1 shows the architecture of the core of OPMN.
2.2.1 Oracle Notification Server

Oracle Notification Server (ONS) is the transport mechanism for failure, recovery, startup, and other related notifications between components in Oracle Application Server. It operates according to a publish-subscribe model: an Oracle Application Server component receives a notification of a certain type for each subscription to ONS. When such a notification is published, ONS sends it to the appropriate subscribers.

2.2.2 Oracle Process Manager

Oracle Process Manager (PM) is the centralized process management mechanism in Oracle Application Server and is used to manage Oracle Application Server processes. The PM is responsible for starting, restarting, stopping, and monitoring every process it manages. The PM handles all requests sent to OPMN associated with controlling a process or obtaining status about a process. The PM is also responsible for performing death-detection and automatic restart of the processes it manages. The Oracle Application Server processes that PM is configured to manage are specified in the opmn.xml file.

The PM waits for a user command to start a specific, or all Oracle Application Server processes. When a process is stopped, the PM receives a request as specified by the request parameters.

The OPMN server consists of 2 processes. The first OPMN server process has only one purpose: to start the second OPMN server process when necessary. The second OPMN server process handles all request traffic and does all the work. If the second OPMN server process goes down as part of an opmnctl reload command or an unexpected crash it will be restarted by the first OPMN server process.
On Microsoft Windows, the second OPMN server process will not be restarted if it is deliberately terminated. Instead, the first OPMN server process will exit as well. Recovering from this situation is accomplished by restarting the OPMN server from the command line or service manager.

The Application Server Control Console also uses PM to manage processes. The PM uses the ONS to:

- detect that a process has completed initialization and is ready to receive requests
- determine what ports are in use
- obtain component specific runtime information

Figure 2–2 shows ONS communication across two nodes. ONS transports notifications between the 2 nodes and sends out notifications to subscribers.

Figure 2–2  Process Management on Two Nodes

ONS uses dynamic discovery to announce new servers and join them into the ONS topology dynamically. With dynamic discovery the ONS network topology includes all of the application server instances that have been configured with the same discovery information.

OPMN automatically determines which set of ONS servers to connect to at runtime based on the topology of the ONS network. The set of ONS servers insures delivery of messages throughout the ONS network, offers protection from individual link failures, and minimizes the number of connections required between servers. The number and choice of which servers each ONS server is connected to is adjusted as servers join and leave the grid. Refer to Section 3.3, "Dynamic Discovery in opmn.xml" for more information.

2.2.3 PM Modules

The Oracle Process Manager Modules (PM Modules) implement Oracle Application Server component-specific process management functionality. The PM Modules pass notification information returned by other Oracle Application Server component PM Modules within the same or different OPMN servers.

The PM Modules:
2.3 What Oracle Application Server Components Does OPMN Manage?

OPMN manages all Oracle Application Server components including Application Server Control Console.

OPMN enables you to explicitly manage Oracle HTTP Server and Oracle Containers for J2EE (OC4J).

You can also configure OPMN to manage other processes (including Oracle and other third-party products) using the Custom PM Module. See Chapter 10, "Configuring Custom Process" for more information.

Because of the extensible design of OPMN, add-on components are managed by OPMN without having to update OPMN.

OPMN also enables you to manage all of the Oracle Application Server instances in your grid environment.

2.3.1 Oracle Enterprise Manager 10g Application Server Control Console

In addition to OPMN, you can also manage your enterprise using the Application Server Control Console. The Application Server Control Console leverages the functionality of OPMN to manage your Oracle Application Server enterprise. Using a Web browser, Application Server Control Console provides a graphical interface that enables management of all Oracle Application Server components in your network and enterprise.

See Also: Oracle Application Server Administrator’s Guide

2.3.2 Grid Computing and OPMN

Grid computing is a software architecture designed to effectively pool together large groups of modular servers to create a virtual computing resource across which work can be transparently distributed. Grid computing enables computing capacity to be used effectively, at low cost, and with high availability.

With the new configurations and functionality of OPMN in 10.1.3, you can effectively utilize the possibilities inherent in the grid computing model. You can manage all of the computers in the grid using available OPMN commands.

See Also: Oracle Application Server Administrator’s Guide

Oracle Containers for J2EE Configuration and Administration Guide

2.3.3 OPMN for Cluster Discovery

OPMN can be used for discovery of other Oracle Application Server installations and OC4J instances. Figure 2–3 shows the use of Application Server Control Console to discovery the topology through the use of OPMN on each instance of the cluster. The Application Server Control Console on Host 1 manages the entire cluster.
It is desirable to have one instance of Application Server Control Console running within a cluster topology. Application Server Control Console makes remote Java Management Extensions (JMX) connections to the other Oracle Application Server instances within an enterprise and presents them as manageable entities on the Application Server Control Console Cluster Topology page. The Cluster Topology page is not available on Application Server Control Console when you install OC4J in a standalone configuration.

The limitation of OPMN for Cluster Topology Discovery occurs when OPMN is unresponsive on an Oracle Application Server instance in a cluster. As shown in Figure 2–4, the OPMN instance on Host 3 is unresponsive and therefore will not be detectable on the Application Server Control Console.

The reliance on OPMN by Application Server Control Console for discovering cluster topology means that if OPMN is down on an instance, Application Server Control Console assumes the instance is not part of the cluster.

Section 3.2, "OC4J Groups" describes OC4J groups which enable you to common administrative tasks automatically across multiple OC4J instances.
See Also: Oracle Containers for J2EE Configuration and Administration Guide for more information about creating and configuring Oracle Application Server clusters.
This chapter provides an overview of the opmn.xml file for Oracle Application Server. It features the following topics:

- Section 3.1, "opmn.xml"
- Section 3.2, "OC4J Groups"
- Section 3.3, "Dynamic Discovery in opmn.xml"
- Section 3.4, "Dynamic Resource Management"
- Section 3.5, "Service Failover"
- Section 3.6, "Automatic Restart"
- Section 3.7, "Event Scripts"
- Section 3.8, "Start Order Dependencies"
- Section 3.9, "OPMN Log Files"
- Section 3.10, "Security"
- Section 3.11, "IPv6 Support"

3.1 opmn.xml

The ORACLE_HOME/opmn/conf/opmn.xml file is the main configuration file for OPMN. The opmn.xml file contains information for PM and Oracle Application Server component specific configuration. The opmn.xml file shows you which Oracle Application Server components OPMN is managing on your system.

The opmn.xml file does not contain component-specific element names. Component specific management code is located in the PM modules which are loaded by OPMN at startup according to what has been specified in the modules section of the opmn.xml file.

Each level has a specific set of configurations. In addition, there are several configuration elements that are accepted at more than one level to provide the flexibility of applying a configuration across an entire Oracle Application Server component or just part of a component.

<i>ias-component>
  <process-type>
  <process-set>

<i>ias-component>: This entry represents the Oracle Application Server component. It enables management of the component for processes such as starting and stopping.
<process-type>: This subcomponent of the <ias-component> entry declares the type of process to run by association with a specific PM module.

<process-set>: This sub-subcomponent of the <ias-component> entry enables you to declare different sets of optional runtime arguments and environments for the Oracle Application Server component.

The opmn.xml file contains Oracle Application Server component entries arranged in the hierarchical structure shown in Example 3–1.

Example 3–1 Element Entries in opmn.xml File

```xml
<ias-component id="OC4J">
  <process-type id="home">
    <process-set id="default_group">....
  </process-set>
</ias-component>
```

ONS can be configured from the opmn.xml file. Example 3–2 is an example of the ons.conf element in the opmn.xml file:

Example 3–2 ons.conf Element in opmn.xml File

```xml
<notification-server>
  <topology>
    <nodes list="node-list"/>
    <discover list="discover-list"/>
    <gateway list="gateway-list"/>
  </topology>
</notification-server>
```

### 3.2 OC4J Groups

In Oracle Application Server 10g Release 3 (10.1.3.1.0), you can group OC4J instances. The <ias-component> element in the opmn.xml file can be used as a grouping mechanism.

OC4J groups allow you to perform common administrative tasks automatically across multiple OC4J instances. A group is a loosely synchronized set of like-named OC4J instances that belong to the same cluster topology.

For example, an OC4J group called COLORS can be configured as follows:

Example 3–3 10.1.3.1.0 OC4J Instance opmn.xml

```xml
<ias-component id="COLORS">
  <process-type id="home" module-id="OC4J">
    <port id="ajp" range="3301-3400" />
    <port id="rmi" range="3101-3200" />
    <port id="jms" range="3201-3300" />
  </process-type>
  <process-type id="oc4J_soa" module-id="OC4J">
    <port id="ajp" range="3301-3400" />
    <port id="rmi" range="3101-3200" />
    <port id="jms" range="3201-3300" />
  </process-type>
</ias-component>
```

In the example shown in Example 3–3, the COLORS group represents a synchronized collection of OC4J instances. OC4J groups allow you to perform common administrative tasks automatically across multiple OC4J instances. This functionality enables simultaneous configuration to all OC4J instances in the Group.
Specifically, with groups, you can, in one step, perform each of the following tasks across multiple OC4J instances:

- Modify the OC4J server properties for all OC4J instances in the group
- Start or stop all the OC4J instances in the group
- Deploy, undeploy, and redeploy applications on all OC4J instances in the group
- Perform JDBC management operations, such as creating, modifying, or removing JDBC data sources and connection pools
- Perform JMS Provider operations, such as creating and removing JMS destinations, and creating, modifying, or removing JMS connection factories

Group membership is implicitly defined by the names assigned to OC4J instances. OC4J instances with the same name are considered to be part of the same group.

To manage a group of OC4J instances using Application Server Control Console, all OC4J instances in the group must be configured to have the same oc4jadmin password as that of the Administration OC4J instance.

### 3.3 Dynamic Discovery in opmn.xml

OPMN uses dynamic discovery to contact other ONS servers in a cluster environment. The opmn.xml file contains a multicast address or list of discovery servers that is used by OPMN. ONS uses the discovery mechanism to announce new servers to a cluster and join them into the ONS topology dynamically.

The ONS network topology includes all of the Oracle Application Server instances that have been configured with the same discovery information.

The information is configured under the notification-server element in the opmn.xml file. Example 3–4 shows the notification-server element in the opmn.xml file:

**Example 3–4 Notification Server element**

```xml
<notification-server interface="type">
  <ipaddr remote="ip" request="ip"/>
  <port local="port" remote="port" request="port"/>
  <ssl enabled="boolean" wallet-file="path" wallet-password="password" openssl-certfile="path" openssl-keyfile="path" openssl-password="password" openssl-lib="path"/>
  <tune io-timeout="timeout" io-idle="interval" timeout="timeout"/>
  <topology>
    <nodes list="nodes"/>
    <discover list="nodes"/>
    <gateway list="nodes"/>
  </topology>
</notification-server>
```

The following sections describe the three configuration types for dynamic discovery:

- Section 3.3.1, "Multi-Cast Configuration"
- Section 3.3.2, "Discovery Server Configuration"
- Section 3.3.3, "Gateway Configuration"
3.3.1 Multi-Cast Configuration

For multi-cast configuration of dynamic discovery, you configure a multi-cast address for all ONS servers in the `opmn.xml` file. ONS uses this address to discover all other Oracle Application Server instances in the cluster.

Figure 3–1, "Multi-cast Configuration" shows diagrammatically what occurs in the multi-cast configuration.

Any new Oracle Application Server instance in the cluster is announced using the configured multi-cast address. ONS then automatically manages the connection topology as instances are added or removed.

Figure 3–1 Multi-cast Configuration

More than one multi-cast address may be configured, but typically these would be used to isolate subnets from one another, and then gateways configured to connect them.

Refer to Chapter 6, "opmn.xml Common Configuration" for information on how to implement multi-cast configuration.

3.3.2 Discovery Server Configuration

For the discovery server configuration of dynamic discovery one Oracle Application Server instance acts as a discovery server for all instances. ONS uses the discovery server to discover all of the other Oracle Application Server instances in the cluster.

Figure 3–2, "Discovery Server Configuration" shows diagrammatically what occurs in the discover server configuration.

A new Oracle Application Server instance in the cluster contacts the configured discover server to announce itself. ONS then automatically manages the connection topology as instances are added or removed. More than one discovery server may be configured.
Figure 3–2 Discovery Server Configuration

For more information on discovery server configuration refer to Chapter 6, "opmn.xml Common Configuration".

3.3.3 Gateway Configuration

For the gateway configuration of dynamic discovery, a gateway is used to interconnect multiple discovered topology rings.

Figure 3–3, "Gateway Configuration" shows diagrammatically what occurs in the gateway server configuration.

Gateway is used to interconnect multiple discovered topology rings.

Figure 3–3 Gateway Configuration

The gateway configuration is used when a network topology has nodes in different subnets or physical locations.

For more information on gateway configuration refer to Chapter 6, "opmn.xml Common Configuration"

3.4 Dynamic Resource Management

Dynamic Resource Management (DRM) is an OPMN capability designed to describe a set of desired behaviors and take actions to achieve the desired results. DRM functionality provides a way for you to customize the management of your processes through configuration changes only. The DRM enables you to have process
management commands issued based on system conditions according to a set of user-configured directives.

DRM is designed to operate on an Oracle Application Server instance. In a cluster environment, DRM functionality is available on each separate local instance.

The system conditions that can be taken into account include Dynamic Monitoring Service (DMS) metrics that are recognized by OPMN. During runtime DMS collects performance information, DMS metrics, that you can use to analyze system performance or monitor system status. This includes preset metrics that are always present as well as metrics that you define and implement. For more information about DMS refer to the Oracle Application Server Performance Guide.

DRM enables you to specify a set of conditions that will trigger process management commands to be automatically issued. This is accomplished using Resource Management Directives (RMDs). RMDs are a set of conditions that specify:

- A set of information that should be examined prior to performing an action
- The values of the set information that trigger an action
- The action that should be performed after the set of information is examined and analyzed.

RMDs enable you to configure OPMN to monitor the state of your system on a periodic basis and take action if conditions exceed the scope specified in the RMD.

For example, in the DRM graphic shown in Figure 3–4, the RMDs might be:

- At 17:00 hours every day, start two OC4J processes in anticipation of a peak load.
- If the Java Virtual Machine (JVM) heap size grow beyond 500 MB, start a second OC4J process.
- If the average response time rises above 500 milliseconds, then start an OC4J instance.
### 3.4.1 Resource Management Directives

A RMD describes a set of information that should be examined, a description of the values of this information that should trigger an action, and an action that should be performed. RMDs are comprised of seven features:

- **Metrics**: what information should be used to decide what action to take?

  For example:
  - memory usage
  - CPU utilization
  - average response time
  - request queue length
  - availability of database connections

- **Frequency**: how often should the metric values specified be examined?

  This setting enables you to control the evaluation of the RMD to be fast acting enough to react to changing system conditions but not so frequent that it will cause needless oscillation in system performance or unnecessary polling of metric values.

- **Conditional**: what rules should be applied to the metrics being examined?

  For example:
  - a comparison of a single metric with a fixed value. For example, checking if CPU utilization is above 75%.
Dynamic Resource Management

- a combination of values. For example, if CPU utilization is above 75%, memory usage is above 50 MB, and average response time is above 0.1 seconds.

- **Duration**: how many times or over what time period a condition must be met in order to trigger an action?

  This is used to avoid unnecessary actions when conditions are marginal. For example, the administrator may only want to take an action if CPU utilization is above 75% for more than 2 minutes to avoid allocating more resources due to a small spike in activity.

- **Action**: what action should be performed when the state described by the first four items (metrics, frequency, conditional, and duration) are met?

  The action could include starting, stopping, or restarting a component. The action could also include requesting additional resources such as starting additional processes, or requesting the starting of an application on another node.

- **Exception**: what should be done if execution of the desired action fails?

  The exception could include alternative actions to perform or a message to be sent to a monitor such as Oracle Enterprise Manager 10g.

- **Interval**: how often should each a process-set, configured for the ias-component, be evaluated?

The DRM evaluates and performs the actions described by the RMDs.

Figure 3–5 shows DRM management on two hosts with two applications on each host, App1 and App2. Each host is sharing the application load. Each host has the capacity to run a maximum of five processes. Figure 3–5 shows that the demand for App1 is more than the demand for App2 so more processes have been started for App1 to handle the load.

**Figure 3–5  DRM on 2 Hosts: App1**

Figure 3–6 shows that as the demand for App2 increases and the demand for App1 decreases, processes servicing App1 are automatically shutdown and more processes are automatically started to service App2. Resource demand determination is made independently on each computer without coordination. Both computers detect the change in demand independently and take similar action to accommodate the change, with the overall effect of the total system adjusting to demand.

The total demand across both computers for each application varies between two and eight processes. The traditional way to provision hardware is to have enough system resources available to handle the peak demand for each application. Such a strategy would indicate having adequate system hardware to run sixteen processes.

Even with three computers capable of each running five processes, the demand on system resources for processing of the applications would not be sufficient. By
adjusting the available resources dynamically between App1 and App2 using DRM, peak load times for each application can be accommodated using only two computers.

**Figure 3–6** DRM on 2 Hosts: App2

Example 3–5 shows the RMD syntax.

**Example 3–5 RMD syntax**

```xml
<rmd name='rmd name'>
  <conditional>
    <![CDATA[conditional]]>
  </conditional>
  <action value='action 1'/>
  <action value='action 2'/>
  ...
  <action value='action N'/>
  <exception value='exception 1'/>
  <exception value='exception 2'/>
  ...
  <exception value='exception N'/>
</rmd>
```

In Example 3–6, the RMD checks if the average request response time for its processes exceeds a maximum threshold for more than a minute, and if so it attempts to start another process if the configuration allows it.

**Note:** The metric values used in Example 3–6 and Example 3–7 are examples and not real metric values. The metrics available to OPMN that can be used in RMD definitions are obtained after running the `opmnctl dmsdump` command. Additional metrics from connected OC4J instances are available by enabling metric based load balancing statistics. Refer to the *Oracle Application Server Performance Guide* for available metrics and the `mod_oc4j` appendix in the *Oracle HTTP Server Administrator’s Guide* for enabling metric based load balancing.

**Example 3–6 RMD Response Time Syntax**

```xml
<rmd name='rampUp'>
  <conditional>
    <![CDATA[([process-set].responseTime > 5000) {duration(60)} &
    ([process-set].numProcs < [process-set].maxProcs)]]>
  </conditional>
  <action value='exec $ORACLE_HOME/scripts/logevent {ias-component} {process}
slow response'/>
  <action value='start (process-set)'/>
</rmd>
```
Figure 3–7, Figure 3–8, Figure 3–9, and Figure 3–10 diagram the actions of an RMD when configured parameters are surpassed.

In Figure 3–7, the average request response time has exceeded the upper threshold, and the number of OC4J processes for the process-set is less than the configured maximum.

**Figure 3–7  RMD-Upper Threshold Exceeded**

In Figure 3–8, the RMD executes the actions, which entail starting another OC4J process for the ShopCart process-set.

**Figure 3–8  Starting of Additional Process**
The directive in Figure 3–8 has a complementary RMD (Example 3–7) to remove excess OC4J processes when the average request response time drops below a minimum threshold for at least five minutes.

Example 3–7  Complimentary RMD

```
<rmd name='rampDown'>
  <conditional>
    <![CDATA[([process-set].responseTime < 2000) {duration(500)} &
               ([process-set].numProcs > [process-set].minProcs)]]>
  </conditional>
  <action value="exec $ORACLE_HOME/scripts/logevent {ias-component} {process}
           fast response"/>
  <action value="stop {process-set}"/>
  <exception value="exec $ORACLE_HOME/scripts/mailadmin {ias-component}
               {process-type} {process-set} could not stop"/>
</rmd>
```

In Figure 3–9, the average request response time has been less than the lower threshold for at least five minutes, and the number of OC4J processes for the ShopCart process-set is more than the configured minimum.

Figure 3–9  Number of Processes exceeds Configured Minimum

In Figure 3–10, the RMD executes the actions, which stop an OC4J process for the ShopCart process-set.
3.4.2 RMD Configuration

RMDs can be configured in two ways. They can either be:

- associated with a specific hierarchy level in the components that are managed by OPMN (for example, a specific ias-component or process-set)
- global entities

RMDs associated with a specific place in the hierarchy can only specify metrics and actions that are associated with the RMD relative to their location in the hierarchy. Each RMD has an evaluation level, which specifies the lowest OPMN component level referenced by the directive, and RMDs which are defined at a higher level (ias-component, for example) will be inherited by any lower level components (process-set, for example) they reference. For example, an RMD defined at the ias-component level that references process-set will be inherited by all process-sets for the ias-component under which it was defined.

Global RMDs are configured in an independent section of the opmn.xml file. They can use metrics from anywhere in the DMS tree and can take action on any components managed by OPMN. For more information about DMS refer to the Oracle Application Server Performance Guide.

3.4.2.1 RMD Conditionals

The RMD conditional describes a state of the system that will trigger an action. The conditional consists of a logical combination of comparisons between values. Like all other aspects of OPMN, conditionals are case sensitive. The values that may be used can be:

- DMS metrics available from the OPMN DMS tree
  
  For more information about DMS refer to the Oracle Application Server Performance Guide.

- Constant values (for example, 500000)

- Temporal values (for example, 5 PM)

DMS metrics are described based on their location in the OPMN DMS tree. This description can be:
a fully qualified path

a hierarchical relative reference

a global absolute reference

A fully qualified path to the metric desired such begins with a "/ " and includes the full path from the OPMN instance, /pm/host_statistics/freePhysicalMem. The OPMN instance prefix is automatically added to these paths.

Metrics with fully qualified paths can be referenced by both hierarchical and global RMD conditionals.

If the RMD is hierarchical the metric can take a relative path form such as [process-set].numProcs which specifies the numProcs metric for any process-set in the hierarchy to which this RMD belongs.

The following component specifications are allowed for hierarchical RMD conditionals:

- [ias-component]: refers to the ias-component element within the hierarchy of the opmn.xml file.
- [process-type]: refers to the process-type within the hierarchy of the opmn.xml file.
- [process-set]: refers to the process-set within the hierarchy of the opmn.xml file.
- [process]: refers to the process within the run time hierarchy.
- [application]: refers to the application within the run time hierarchy. Unlike all other hierarchical specifications, a specific application can be named.

If the RMD is global the metric can be an absolute description of a starting point followed by a relative path. For example:

[ias-component=WebCache][process-set=WebCache].numProcs

which specifies the metric numProcs for the process-set Webcache that belongs to the ias-component WebCache.

The following component specifications are allowed for global RMD conditionals:

- [ias-component=<comp>]: refers to the ias-component <comp> in the opmn.xml file.
- [process-type=<ptype>]: refers to the process-type <ptype> in the opmn.xml file.
- [process-set=<pset>]: refers to the process-set <pset> in the opmn.xml file.
- [process]: refers to the process.
- [application]: refers to the application.
- [application=<app>]: refers to the application <app> running in the process.

As with OPMN process requests, components not specified in the directive are assumed to be wildcards; thus a global RMD referencing [process-set=home] would be evaluated for every process-set with the id home configured in the opmn.xml file.

No conditional is allowed to reference more than one OPMN component. For example, the same conditional cannot reference [ias-component=Webcache] and
Similarly, references to lower configuration components must belong to any referenced higher component within the same conditional.

With the exception of process, the sections surrounded by square brackets must match a DMS tree type as shown in a dump of the OPMN DMS tree.

For both hierarchical and global RMDs multiple bracketed sections can be specified but each subsequent section must further narrow the tree. The order must progress from the top of the tree toward the leaf. A process cannot appear before an \texttt{ias-component}.

Constant values must be simple, numeric values, including decimal values. When comparing a constant value with a DMS metric, the constant must have the same units as the DMS metric it is being compared to. The DRM will convert the numeric value on the right hand of an operator to the same type (decimal or integer) on the left, but no other unit conversions will be performed by the DRM.

Temporal values consist of a 24 hour format (\texttt{hh:mm}) time combined optionally with a day of the week indicator. The allowed day of the week abbreviations are mon, tue, wed, thu, fri, sat, sun. Day of the week indicators can be a single value, a comma separated list, or a dashed inclusive list. For example:

- 17:00 Daily at 5 PM
- \texttt{[mon-fri].21:45} weekdays at 9:45 PM
- \texttt{[mon,wed,fri].5:00} Monday, Wednesday, Friday at 5 AM

The current time is represented by the key word \texttt{(time)}. A time comparison is evaluated false if the day of the week specified on the left of the operator does not include a day of the week specified on the right; by default the day of the week is only evaluated as equals and only if this is true is the time value itself evaluated for the specified operator. You can force the comparison to be made against a single day of the week by appending the @ character after the day, with Sunday (\texttt{sun}) having the value 0 and Saturday (\texttt{sat}) 6.

- \texttt{(time) < [wed].12:00}: evaluates true only on Wednesday until noon
- \texttt{(time) < [wed@].12:00}: evaluates true from Sunday at 00:00 until Wednesday at noon

Comparisons between values include the following: less than (<), less than or equal to (<=), greater than (>), greater than or equal to (>=), equals (=), or not equals (!=).

String values may also be specified between quotes (using the single quote character (‘)), but the only allowable operators are equals (=) and not equals (!=).

Comparisons may be logically combined using the operators and (\&), or (\texttt{|}), not (!), and grouping (\{ \}). The logical not unary operator (!) can be placed before any logical group of comparisons to logically negate the result of the outcome.

The key word \texttt{(duration(value))} may also be used to indicate that a conditional should only trigger if it has evaluated as true over the specified time interval expressed in seconds. It is important to note that the conditional is only evaluated on a periodic basis. Specifying the duration value will force the conditional to only trigger if all evaluations over the time period meet the conditional. This is an approximation of ensuring that the condition holds true over the entire time period. The accuracy of this approximation depends on the ratio of the duration value to the evaluation period. When a conditional is evaluated as true, all durations for that evaluation are reset. When a conditional evaluates false, any duration that was not encountered during the evaluation is reset.
The following RMD conditional examples detect specific states:

- If the heap size of a JVM has exceeded 500 Megabytes (global RMD):
  \[\text{process-set}=\text{home}\][\text{process}].heapSize > 500000

- If the time is 5 PM on a weekday
  \{\text{time}\} = [\text{MonFri}].1700

- If the average request time is greater than 500 ms for at least 60 seconds and there are less than 4 processes running for the process-set at which this hierarchical RMD was configured (OC4J):
  \([\text{process}].\text{avgReqTime} > 500
  (\text{duration}(60)))\&([\text{process-set}].\text{numProcs} < 4)

- If there has been less than 50 megabytes of free system memory for the last 3 minutes:
  \[/\text{pm}/\text{host}\_\text{statistics}.\text{freePhysicalMemory} < 50000
  (\text{duration}(180))\]

### 3.4.2.2 RMD Actions

The Action section of an RMD is a list of action elements, each of which specifies a process management command that describes an action that should be performed if the conditional of the RMD is satisfied. The syntax of these commands is similar to that of opmnctl without the scope.

The possible actions for an RMD are:

- **start**: perform a start request with the given argument list
- **restart**: perform a restart request with the given argument list
- **stop**: perform a stop request with the given argument list
- **exec**: execute the given program or script with the listed arguments

The targets for the **start**, **restart**, and **stop** requests is assumed to be relative to the OPMN components referenced in the RMD conditional. Key words representing these components should be used to narrow the scope of the request.

The following set of key words are available:

- \(\{\text{ias-component}\}\) \text{ias-component}=<\text{comp}>  
- \(\{\text{process-type}\}\) \text{process-type}=<\text{ptype}>  
- \(\{\text{process-set}\}\) \text{process-set}=<\text{pset}>  
- \(\{\text{process}\}\) \text{uniqueid}=<\text{uid}>  
- \(\{\text{application}\}\) \text{application}=<\text{app}>  

For **start**, **restart**, and **stop** actions, the key word \(\{\text{process}\}\) should not be used with the other keywords.

In addition the **exec** action can use the \(\{\text{pid}\}\) key word, which equates to \text{pid}=<\text{pid}> if the conditional refers to a process-set or process.

Note that an action cannot reference a key word for an OPMN component at a level below the lowest OPMN component referenced in the conditional (if the conditional only references an ias-component, then the action can only use the (ias-component) key word, for example). The exception to this rule is that an action may reference \(\{\text{process}\}\) if the conditional references a process-set, but
this will force the RMD to be evaluated at the process level and not the process-set level.

If the start, restart, and stop request returns a non successful status (200 is success) or an exec exits with any code other than 0, then the remaining actions are skipped and any exceptions configured for the RMD are executed.

A timeout value can be configured for each action. The default timeout for start, restart, and stop actions is the configured (or default) timeout for the OPMN request. The default timeout for exec actions is 30 seconds.

The results of the RMD requests are logged in the OPMN process manager log (the beginning and completion of the request with completion status at level 4, and full results at level 5). The stdout and stderr of exec programs or scripts is sent to $ORACLE_HOME/opmn/logs/rmd.out. Note that there is no rotation performed on the rmd.out file. Therefore, programs and scripts should maintain and use their own log files. Programs and scripts should not print output to either of the stdout and stderr file descriptors.

The following are RMD Action Examples:

- Start another JVM in the home OC4J instance within a hierarchical RMD defined within the home instance (note this process-set must be configured with minprocs/maxprocs):
  
  ```
  start {ias-component}{process-type}{process-set} numprocs=1
  ```

- Restart a JVM in the home instance within a hierarchical RMD defined within the home instance:
  
  ```
  restart {process}
  ```

- Stop the entire ias-component referred to by the RMD conditional:
  
  ```
  stop {ias-component}
  ```

- Execute the given program and pass in the referenced process UID and pid:
  
  ```
  exec $ORACLE_HOME/mybin/report.sh "RMD triggered" {process} {pid}
  ```

### 3.4.2.3 RMD Exceptions

The Exception section of an RMD is a list of process management commands that are to be performed in the case that any of the process management commands in the action section of the RMD fail to execute normally. The format of the exception section is identical to that of the action section.

### 3.4.2.4 RMD Configuration in the opmn.xml file

RMDs are configured in the opmn.xml file in a section entitled rmd-defintions. The conditional, action, and exception portions of each RMD are attributes in the .xml definition. Example 3–8 shows how an RMD would be defined as a hierarchical RMD in the opmn.xml file and Example 3–9 shows how an RMD would be defined as a global RMD.

**Example 3–8 Hierachal RMD Example**

```xml
<process-type id='home' moduleid='OC4J' status='enabled'>
  .
  .
  <rmd-defintions>
```

<rmd name="requesttime" description="Start another OC4J (if possible) when the response time of any exiting OC4J in home exceeds 500msecs for a minute" interval="30">
  <conditional>
    <![CDATA[([process].avgReqTime > 500 (duration(60)))&([process-set].numProcs < 4)])]>
  </conditional>
  <action value="start {ias-component}{process-type}{process-set} numprocs=1"/>
  <exception value="exec $ORACLE_HOME/mybin/mailer.sh {ias-component}{process-type}{process-set} failed to start on RMD request"/>
</rmd>
</rmd-defintions>
</process-type>

**Example 3–9 Global RMD Example**

<process-manager>
  
  
  <rmd-defintions>
    <rmd name="requesttime" description="Start another OC4J (if possible) when the response time of any exiting OC4J in home exceeds 500msecs for a minute" interval="30">
      <conditional>
        <![CDATA[([[process].avgReqTime > 500 (duration(60)))&([ias-component=OC4J][process-set=home].numProcs < 4)])]>
      </conditional>
      <action value="start {ias-component}{process-type}{process-set}.numprocs=1"/>
      <exception value="exec $ORACLE_HOME/mybin/mailer.sh {ias-component}{process-type}{process-set} failed to start on RMD request"/>
    </rmd>
  </rmd-defintions>
</process-type>

3.4.2.5 RMD Evaluation

RMDs will be evaluated periodically based upon their configured interval or the default value of 30 seconds. Note that there is a trade off between CPU cycles consumed evaluating RMDs and the sensitivity of the execution of RMDs. The evaluation period and the time value defined by the `duration()` key word should relate in a reasonable ratio.

RMDs are evaluated based upon where they are configured and what their conditionals reference. A global RMD that only references full paths to metrics or the internal temporal value is truly global and only a single evaluation is performed for each configured interval. A hierarchical RMD that is defined under an `ias-component`, but references a `process-set` will be evaluated once for each interval for each `process-set` configured for the `ias-component`. Any RMD that references a process in either its conditional, actions or exceptions will be evaluated once for each interval for each process that exists under the components referenced by the RMD. Note that RMDs that reference a process will only be evaluated if a process exists and is in the Alive state.

DMS metrics are retrieved at evaluation time. If a referenced DMS metric cannot be found, that part of the conditional will evaluate as false.
Invalid type comparisons for metrics are discovered at evaluation time. When the invalid type comparisons are encountered, the current evaluation is aborted, the RMD is disabled, and all other evaluations based upon this RMD are aborted. An error is logged in the OPMN process manager log.

3.5 Service Failover

Service failover is a mechanism to specify a critical process that must be run somewhere in an Oracle Application Server cluster if service is disrupted on a processing server. This enables you to preferentially select which processes must be kept running.

Any process-type `opmn.xml` file element may be configured as a service fail-over such that, once started, OPMN will ensure that the configured number of processes for the service are running on Oracle Application Server instances somewhere in the cluster.

You can configure which Oracle Application Server instances will participate in the service fail-over on an instance by instance basis. You can configure each instance for preferential selection of running the process on available instances.

Only one process-set may be defined for each process-type configured as a service fail-over. Only one process will be run for each service fail-over instance.

In the following Figure 3–11, a service fail-over process has been started in a cluster where all instances are configured to participate in the service fail-over.

**Figure 3–11  Start of Service Failover**

As shown in Figure 3–12, if the instance on which the service fail-over process is running goes down, such as for maintenance or an unprotected power outage or network failure, OPMN will select another participating Oracle Application Server instance on which to run the process. All of the instances shown in Figure 3–12 are participating in the service fail-over.
3.6 Automatic Restart

OPMN gives the user control over automatic death detection and restart of components; you can configure the parameters by which OPMN determines a process has died and disable automatic restart for individual components.

OPMN monitors the operation of its managed processes by the following methods:

- Operating system level detection of Oracle Application Server process death
- Periodic ping requests to Oracle Application Server processes
- Periodic status notification from Oracle Application Server processes (reverse-ping)

The ping and notification functionality is only used where appropriate according to the functionality of the Oracle Application Server component.

OPMN automatically restarts Oracle Application Server components that terminate unexpectedly. OPMN will also restart processes that are unresponsive according to the result of notification and ping operations.

See Also:

- Chapter 6, "opmn.xml Common Configuration"

3.7 Event Scripts

You can configure OPMN to execute your own custom event scripts whenever a particular component starts, stops, or crashes. You can select from one or more of the following event types:

- **pre-start**: OPMN runs the pre-start script after any configured dependency checks have been performed and passed, and before the Oracle Application Server component starts. For example, the pre-start script can be used for site-specific initialization of external components.
3.8 Start Order Dependencies

Some Oracle Application Server components and services require that other components and services are up and running before starting. OPMN is configured at installation with default start order dependencies, which enables you to start all of the components in an instance in the proper order with a single command. Refer to the Oracle Application Server Administrator’s Guide for more information on Oracle Application Server dependencies.

OPMN is configured with a set of dependencies but you can configure additional dependencies according to the environment.

3.9 OPMN Log Files

The log files generated by OPMN provide important information that can help you identify and diagnose performance and configuration issues. The Application Server Control Console makes reviewing these log files easier by helping you locate and view Oracle Application Server component log files.

See Also:
- Section A.2.1, "OPMN log Files"
- Oracle Application Server Administrator’s Guide

3.10 Security

The OPMN local listener port used by ONS clients and PM administrative processes do not use Secure Socket Layer (SSL) encryption for security, but rely on two other mechanisms to ensure authorized access to the OPMN server:

- OPMN binds the local listener port to the local host. Users on the local system can connect to this port and issue OPMN process control requests. Information requests are allowed on the OPMN request port, which is bound to the system IP. The request port does not have SSL encryption.

- When the OPMN server process first starts up and successfully binds to the local port, it creates a string of printable ASCII characters which it uses as a key for local connections. All connection attempts on the local port must include this key or the connection is closed by the OPMN server. The ASCII character string is written into the ORACLE_HOME/opmn/conf/.formfactor file. Processes that cannot access the .formfactor file are not permitted to interact with the OPMN server.
For security reasons, the OPMN server logs any attempts to connect to its local port with an invalid form factor key (a key that does not match the value written by this OPMN process into the `.formfactor` file).

In addition to attempted security violations, there are four common user errors that can cause this error to occur:

- The user attempts to run the OPMN client manually with the wrong user identification. Only the application server user can read the value from the `.formfactor` file, and so requests or processes run as the wrong user will not be able to provide the correct key to the OPMN server.

- The user is attempting to run an OPMN client from the wrong `ORACLE_HOME`. It is possible to have multiple `ORACLE_HOME` instances set up on the same system. If the other `ORACLE_HOME` instances have OPMN configured to use the same local port then the Oracle Application Server process request from the wrong `ORACLE_HOME` will read the wrong `.formfactor` file.

- The user has manually changed the local port configuration in the `opmn.xml` file and started a new OPMN server without first stopping the previous OPMN server. The new OPMN server will run, bind to the new port, and overwrite the `.formfactor` file. The previous OPMN server is now unreachable through the local port, and can only be shutdown through remote OPMN requests (if SSL and authentication are configured) or by manually stopping the previous OPMN server.

- The Oracle Application Server and the Oracle Database both use ONS. When these two products are installed onto the same host, an ONS port conflict arises since the default port values (`local="6100" remote="6200"`) for ONS are the same for both the Oracle Database and Oracle Application Server.

ONS with the Oracle Database is only used for special configurations and therefore is typically never started. However, the database listener will attempt to connect to the Database ONS server but will end up connecting to the ONS server that was installed with Oracle Application Server. ONS (as part of OPMN) is always started whenever Oracle Application Server is started.

Because the Oracle Database is installed in a different `ORACLE_HOME` than that of Oracle Application Server, the Database ONS does not have access to the `.formfactor` file that was created when OPMN started up with the Oracle Application Server. As a result, the database listener attempts to connect to OPMN; the DB listener interprets it as a its standalone ONS) without a form factor string. Oracle Application Server OPMN logs an error similar to the following in the `ons.log` file:

```
04/11/15 18:43:32 [4] Local connection 0,127.0.0.1,6100 invalid form factor
```

This is expected OPMN behavior Oracle Application Server; preventing client access to the ONS server unless they possess the correct formfactor string.

To avoid having the Oracle Database listener contact the Oracle Application Server OPMN server, change the default local and remote port values for the ONS server that was installed with the Oracle Database. Alternatively, you can apply the latest Oracle Database patchset available on OTN:

http://www.oracle.com/technology/products/
3.10.1 Remote Security

OPMN supports remote requests to other OPMN servers in the same cluster, but for security reasons all process control requests (start, restart and stop) are only enabled if SSL is enabled in the opmn.xml file and a wallet file is configured. If neither SSL nor a wallet file are configured, OPMN will reject any remote process control request with HTTP code 403.

The remote port used for remote administration must be SSL-enabled. The remote port should only be used for communication between multiple OPMN servers. Oracle Application Server components and Application Server Control Console transmit through the local port which is inaccessible to remote administration. All access control and authentication is controlled by going through Application Server Control Console.

During Oracle Application Server installation, OPMN will be configured to use a wallet that contains a default certificate. For secure operation, the certificate used must be replaced with a secure, unique certificate. Refer to the Oracle Application Server Administrator’s Guide for information on how to configure certificates within an Oracle Wallet.

The orapki script, which is documented in the Oracle Application Server Administrator’s Guide, can be used to generate a random, self-signed certificate that is sufficient to provide the appropriate level of security for OPMN.

Note that use of OPMN in a cluster requires configuration with certificates that are trusted by all other members of the cluster. This can be accomplished by either using the same wallet in all OPMN instances in the cluster or using certificates created by a common certificate authority.

See Also: Oracle Application Server Administrator’s Guide

3.11 IPv6 Support

In 10.1.3, ONS is able to concurrently support the IPv4 and IPv6 network interfaces.

IPv4 is version 4 of the Internet Protocol (IP). It was the first version of the Internet Protocol to be widely deployed, and forms the basis for most of the current Internet (as of 2004).

IPv4 uses 32-bit addresses, limiting it to 4,294,967,296 unique addresses, many of which are reserved for special purposes such as local networks or multicast addresses, reducing the number of addresses that can be allocated as public Internet addresses.

IPv6 is intended to address the concern that there are too few IP addresses available for the future demand of device connectivity (especially cell phones and mobile devices). IPv6 supports 340 undecillion (3.4 × 1038) addresses.

As shown in Figure 3–13, for output, such as debug or log records, each IPv4 identifier will be displayed as four, eight bit fields for the address (each a three digit decimal format) and a single 16 bit field for the port (a five digit decimal format).

Each IPv6 identifier will be displayed as eight 16 bit fields for the address (each a four digit hexadecimal format) and a single 16 bit field for the port (the five digit decimal format).
Figure 3–13 IPv4 and IPv6 Host Identifier

IPv4 ONS Host Identifier

<table>
<thead>
<tr>
<th>0</th>
<th>0</th>
<th>0</th>
<th>ADDR</th>
<th>PORT</th>
</tr>
</thead>
<tbody>
<tr>
<td>123.123.123.123.12345</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

IPv6 ONS Host Identifier

<table>
<thead>
<tr>
<th>ADDR</th>
<th>ADDR</th>
<th>ADDR</th>
<th>ADDR</th>
<th>PORT</th>
</tr>
</thead>
<tbody>
<tr>
<td>####.####.####.####.####.####.####.####.####.####.####.####.####.####.####.12345</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
This chapter provides an overview of `opmnctl` commands for Oracle Application Server components managed by OPMN. It features the following topics:

- Section 4.1, "opmnctl"
- Section 4.2, "opmnctl Command Quick Reference"
- Section 4.3, "opmnctl Detailed Command Description"

### 4.1 opmnctl

`opmnctl` is the supported tool for starting and stopping all components in an Oracle Application Server instance, with the exception of the Oracle Enterprise Manager 10g Application Server Control Console (Application Server Control Console). `opmnctl` provides a centralized way to control and monitor Oracle Application Server components from the command line. You can use `opmnctl` to execute control and monitoring commands across multiple Oracle Application Server instances simultaneously.

`opmnctl` also enables you to perform operations on a specified Oracle Application Server instance in a cluster or all instances in a cluster using an optional parameter called `scope`. You can also use the `scope` option to control an individual Oracle Application Server process.

The `opmnctl` command is located in the following directory locations:

(Linux) `ORACLE_HOME/opmn/bin/opmnctl`

(Microsoft Windows) `ORACLE_HOME\opmn\bin\opmnctl`

---

**Note:** Oracle Application Server components managed by OPMN should never be started or stopped manually. Do not use command line scripts or utilities from previous versions of Oracle Application Server for starting and stopping Oracle Application Server components. Use the Application Server Control Console and the `opmnctl` command line utility to start or stop Oracle Application Server components.

---

**Note:** Oracle recommends starting OPMN as the user that has installed Oracle Application Server.
4.1.1 opmnctl Syntax

The following command shows an example of the syntax of the opmnctl command:

```
opmnctl [verbose] [<scope>] <command> [<options>]
```

Table 4–1 provides a description about opmnctl syntax.

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>verbose</td>
<td>Prints detailed execution message, if available.</td>
</tr>
<tr>
<td>scope</td>
<td>Specifies where the request is routed. Refer to Section 4.3.1.1, “Scope” for a list of options.</td>
</tr>
<tr>
<td>command</td>
<td>Specifies an opmnctl command. Refer to Example 4–1 for a list of commands.</td>
</tr>
<tr>
<td>options</td>
<td>Specifies options for the command. Refer to Section 4.3.4.1.1, “Options for the Status Command of opmnctl” for a list of options.</td>
</tr>
</tbody>
</table>

4.2 opmnctl Command Quick Reference

Example 4–1 lists opmnctl commands for quick reference. You can obtain the same output information by executing the opmnctl help command.

```
Example 4–1  opmnctl Commands

prompt > opmnctl help

  scope  command  options
  ____  ____  ________
  start   - Start opmn
  startall - Start opmn and all managed processes
  stopall - Stop opmn and all managed processes
  shutdown  - Shutdown opmn and all managed processes
[<scope>] startproc [<attr>=<val>..] - Start opmn managed processes
[<scope>] restartproc [<attr>=<val>..] - Restart opmn managed processes
[<scope>] stopproc [<attr>=<val>..] - Stop opmn managed processes
[<scope>] reload  - Trigger opmn to reread opmn.xml
[<scope>] status [<options>]  - Get managed process status
[<scope>] dmsdump [<attr>=<val>&..]  - Get DMS stats
[<scope>] set  [<attr>=<val>..]  - Set opmn log parameters
[<scope>] query  [<attr>=<val>..]  - Query opmn log parameters
  ping  [<max_retry>]  - Ping local opmn
  validate  [<filename>]  - Validate the given xml file
  config  [<options>]  - Modify the opmn xml file
  help  - Print brief usage description
  usage  [<command>]  - Print detailed usage description

4.3 opmnctl Detailed Command Description

The following sections contains detailed descriptions of the opmnctl commands listed in Example 4–1. The opmnctl commands are displayed in the following sections:

- Section 4.3.1, "Command Definitions"
- Section 4.3.2, "Server Control Commands"
- Section 4.3.3, "Process Control Commands"
4.3.1 Command Definitions

opmnctl features command definitions that enable you to further define the action you would like to execute with OPMN.

This section describes the command definitions available with the opmnctl command. It includes the following sections:

- Section 4.3.1.1, "Scope"
- Section 4.3.1.2, "Attributes"
- Section 4.3.1.3, "Verbose"

4.3.1.1 Scope

Syntax: @instance[:instname[:instname...]]

@cluster[:clusname[:clusname...]]

The scope option specifies which Oracle Application Server instances the opmnctl command applies to. You can use the scope option for opmnctl commands for single or multiple Oracle Application Server instances and clusters.

- **@instance**: If you do not specify a name after @instance option, the opmnctl command is applied to the local Oracle Application Server instance; local refers to the Oracle Application Server instance or cluster containing the OPMN server handling the request. The default is the local Oracle Application Server instance. If the @instance option is followed by Oracle Application Server instance names, the request will be routed to Oracle Application Server instances. To apply the command to one or more Oracle Application Server instances, specify @instance[:instname[:instname...]].

- **@cluster**: If you do not specify a name after @cluster option, the opmnctl command is applied to the local Oracle Application Server cluster. If @cluster is followed by a set of 1 or more cluster names, the request will be routed to the all Oracle Application Server instances contained in the specified Oracle Application Server clusters. To apply the command to all Oracle Application Server instances within one or more Oracle Application Server clusters, specify @cluster[:clusname[:clusname...]].

For example, the following command starts OC4J on Oracle Application Server instance named "myInst2.foo.com":

```
prompt > opmnctl @instance:myInst2.foo.com startproc ias-component=HTTP_Server
```

See Also: Chapter 5, "Using OPMN"

4.3.1.2 Attributes

Syntax: <attribute>=<value>

The opmnctl attributes enable you to apply process control operations to specific Oracle Application Server components.

For example, the following command starts all Oracle Application Server processes configured for OracleAS Wireless:

```
prompt > opmnctl startproc ias-component=wireless
```
For example, the following command starts all of the processes in the OC4J group COLORS:

```bash
prompt > opmnctl @cluster startproc oc4j-group=COLORS
```

Refer to Chapter 5, "Using OPMN" for additional opmnctl command examples.

Table 4–2 lists the attribute names and values that can be used with the opmnctl command:

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Attribute Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>ias-instance</td>
<td>Value should be the same as the value for the id attribute for the &lt;ias-instance&gt; element in the opmn.xml file.</td>
</tr>
<tr>
<td>ias-component</td>
<td>Value should be the same as the value for the id attribute for the &lt;ias-component&gt; element in the opmn.xml file.</td>
</tr>
<tr>
<td>process-type</td>
<td>Value should be the same as the value for the id attribute for the &lt;process-type&gt; element in the opmn.xml file.</td>
</tr>
<tr>
<td>process-set</td>
<td>Value should be the same as the value for the id attribute for the &lt;process-set&gt; element in the opmn.xml file.</td>
</tr>
<tr>
<td>mode</td>
<td>Value can either be sync or async. The default value is &quot;sync,&quot; meaning that this request operates synchronously, and waits for the operation to complete before returning. &quot;async&quot; indicates that the request returns immediately, while OPMN continues to perform the request until the operation finishes.</td>
</tr>
<tr>
<td>timeout</td>
<td>This can only be specified in sync mode. The value is in seconds. After this timeout expires, OPMN does not continue to perform the request for startproc operations. The request does continue for restartproc and stopproc operations. The timeout attribute will override the configured timeout value for the request to take for each ias-instance, ias-component, process-type, and process-set value.</td>
</tr>
<tr>
<td>uniqueid</td>
<td>This value is assigned by OPMN after starting up. You can use this value when you execute the opmnctl restartproc and opmnctl stopproc commands.</td>
</tr>
<tr>
<td>application</td>
<td>The application value must match an application name that already exists within a process, and was reported by the process to OPMN (the application attribute is not configured in opmn.xml).</td>
</tr>
<tr>
<td>sequential</td>
<td>If the value of the sequential attribute is true, each process or application targetted by the request will be acted upon sequentially (one at a time). The request order of affected managed-process dependencies will be honored.</td>
</tr>
<tr>
<td>report</td>
<td>If the value of the report attribute is true, OPMN will report the results of each part of the request as it completes (as each process starts, for example). The default behavior is for OPMN to wait until the entire request has completed before sending all of the results at once.</td>
</tr>
<tr>
<td>oc4j-group</td>
<td>The oc4j-group attribute may be used to start an entire OC4J group (ias-component containing OC4J processes). The value for this attribute is the same as the id value for the ias-component. oc4j-group may be used in combination with &lt;scope&gt; but not target options.</td>
</tr>
</tbody>
</table>

The target attributes of ias-instance, ias-component, process-type, and process-set may be specified in a hierarchical manner, with an ias-instance, a
single `ias-component` within that `ias-instance`, a single `process-type` within the `ias-component`, and a single `process-set` within the `process-type`. Any of these attributes may be omitted, and will be treated as a wild card (`process-set` is omitted, for example, then all `process-sets` under the specified `process-type` will match the request).

The target attributes may also be specified in a list of a single hierarchical type (a list of `ias-components`, for example).

---

**Note:** If Oracle Internet Directory is managed by OPMN and an Oracle Internet Directory dependency (not a managed-process dependency for Oracle Internet Directory) is encountered as part of the request, and the request is expected to start both Oracle Internet Directory processes (such as an `opmnctl startall` request), the Oracle Internet Directory process **will not** start unless it has been configured in the `opmn.xml` file previously. Otherwise, the request will timeout with an Oracle Internet Directory dependency failure.

---

**See Also:** Chapter 5, "Using OPMN"

### 4.3.1.3 Verbose

**Syntax:** `opmnctl verbose command`

The `opmnctl verbose` option enables you to obtain detailed information about the command you are executing.

For example, the following command outputs the information shown in Example 4–2:

```
prompt> opmnctl verbose startproc ias-component=HTTP_Server
```

**Example 4–2  `opmnctl verbose` output**

HTTP/1.1 200 OK  
Content-Length: 0  
Content-Type: text/html  
Response: Ping succeeded.

opmnctl: starting opmn managed processes...  
HTTP/1.1 200 OK  
Content-Length: 571  
Content-Type: text/html  
Response: 1 of 1 processes started.

```xml
<response>
  <opmn id="jerichar-sun.us.oracle.com:6200" http-status="200" http-response="1 of 1 processes started.">
    <ias-instance id="M140801.jerichar-sun.us.oracle.com">
      <ias-component id="HTTP_Server">
        <process-type id="HTTP_Server">
          <process-set id="HTTP_Server">
            <process id="1954086921" pid="9355" status="Alive" index="1" log="/home/demoas/M140801/opmn/logs/HTTP_Server~1" operation="request" result="success">
            </process>
          </process-set>
        </process-type>
      </ias-component>
    </ias-instance>
  </opmn>
</response>
```
4.3.2 Server Control Commands

The `opmnctl start`, `startall`, `reload`, `stopall`, and `shutdown` commands enable you to control the OPMN server.

- Section 4.3.2.1, "Server Control Commands on Microsoft Windows"
- Section 4.3.2.2, "opmnctl start"
- Section 4.3.2.3, "opmnctl startall"
- Section 4.3.2.4, "opmnctl stopall"
- Section 4.3.2.5, "opmnctl shutdown"
- Section 4.3.2.6, "opmnctl reload"

Output is not generated for the successful execution of an `opmnctl` server control command. Refer to Appendix A, "OPMN Troubleshooting" if you receive any error messages during `opmnctl` command execution.

4.3.2.1 Server Control Commands on Microsoft Windows

On the Microsoft Windows operating system, OPMN is installed as a Windows service (Oracle<OracleHomename>ProcessManager) and it starts up automatically when you restart your computer. When you start or stop OPMN using Windows Services you start or stop all OPMN-managed components on the local instance.

Use the Application Server Control Console and the `opmnctl` command line utility to start or stop Oracle Application Server components.

4.3.2.2 opmnctl start

Syntax: `opmnctl start`

Use this command to start the OPMN server for a local Oracle Application Server instance without starting OPMN-managed processes.

Execute this command as soon as possible after starting your computer.

```
Note: OPMN starts up automatically on Microsoft Windows when you start or restart your computer. All OPMN-managed processes are also started.
```

See Also: Chapter 5, "Using OPMN"

4.3.2.3 opmnctl startall

Syntax: `opmnctl startall [timeout=<seconds>]`

Use this command to start OPMN as well as the OPMN managed processes for a local Oracle Application Server instance. The `startall` is equivalent to the `start` command and the `startproc` command without arguments. Oracle recommends using the `start` or `startproc` command.

This command operates synchronously and waits for the operation to complete before returning. To set a timeout for the request, specify the timeout value in seconds.
Components with `id-matching="true"` will not be started.

Enter the following command for additional detailed information:

```
prompt > opmnctl usage startall
stopall
start startall startproc
```

On Microsoft Windows, you can also perform an `opmnctl startall` by starting the Oracle<OracleHomename>ProcessManager service in the Windows services control panel. The Oracle<OracleHomename>ProcessManager starts automatically when you start or restart your computer.

### 4.3.2.4 opmnctl stopall

**Syntax:** `opmnctl stopall`

Use the `opmnctl stopall` command to shut down the OPMN server as well as the OPMN-managed processes for the local Oracle Application Server instance. This request operates synchronously; it waits for the operation to complete before returning.

Shutting down the OPMN server is not necessary during normal operation. Shutting down the OPMN server prevents remote commands to OPMN from executing on the Oracle Application Server instance until OPMN is restarted.

The `opmnctl stopall` command should only be executed prior to shutting down OPMN and your computer. This request first tries to stop all OPMN-managed processes gracefully. Processes which will not stop gracefully will be forcefully shutdown. After stopping all managed processes, the OPMN daemon will shutdown itself.

The `opmnctl stopall` command should only be used when it is necessary to stop the OPMN daemon. Once started, the OPMN daemon should remain up until it is necessary to restart the computer or some other unforeseen administrative event occurs.

To stop all OPMN-managed processes without stopping the OPMN daemon, consider using the `opmnctl stopproc` command without any arguments.

To restart the OPMN daemon without restarting any OPMN-managed processes, consider using the `opmnctl reload` command. The `opmnctl reload` command is the appropriate command to use when the only goal is to restart the opmn daemon with a new configuration.

Use the `opmnctl stopproc` command if you want to stop all OPMN managed processes.

Use the `opmnctl reload` if you want OPMN to reread its configuration.

Enter one of the following commands to obtain additional information:

```
prompt > opmnctl usage stopall

or

prompt > opmnctl usage shutdown
```

### 4.3.2.5 opmnctl shutdown

**Syntax:** `opmnctl shutdown`
Use the `opmnctl shutdown` command to shut down the OPMN server as well as the OPMN-managed processes for the local Oracle Application Server instance.

The `opmnctl shutdown` command quickly shuts down the OPMN daemon and OPMN-managed processes for the local Oracle Application Server instance.

The `opmnctl shutdown` command is similar to the `opmnctl stopall` command but waits less time before initiating a forceful termination of OPMN-managed processes. After all of the OPMN-managed processes are stopped, the OPMN daemon will shutdown itself.

The `opmnctl shutdown` command should only be performed when it is necessary to stop the OPMN daemon. Once started, the OPMN daemon should remain up until it is necessary to restart the computer or some other unforeseen administrative event occurs.

To stop all OPMN-managed processes without stopping the OPMN daemon, consider using the `opmnctl stopproc` command without any arguments.

To restart the OPMN daemon without restarting any OPMN-managed processes, consider using the `opmnctl reload` command. The `opmnctl reload` command is the appropriate command to use when the objective is to restart the OPMN daemon with a new configuration.

On Microsoft Windows, you can also perform an `opmnctl shutdown` by stopping the `Oracle<OracleHomename>ProcessManager` service in the Windows services control panel.

Use the `opmnctl stopproc` command if you want to stop all OPMN managed processes.

Use the `opmnctl reload` if you want OPMN to reread its configuration.

Enter one of the following commands to obtain additional information:

```
prompt > opmnctl usage stopall
```

or

```
prompt > opmnctl usage shutdown
```

### 4.3.2.6 opmnctl reload

**Syntax:** `opmnctl [scope] reload`

Use this command to trigger the OPMN to reread its configuration files in the requested scope. This command restarts the OPMN server without restarting any Oracle Application Server processes managed by OPMN. The OPMN server for the Oracle Application Server instance must be up and running.

---

**Note:** On Microsoft Windows, you can highlight the `Oracle<OracleHomename>ProcessManager` in the services control panel and select **Restart**. The restart of the service is not equivalent to an `opmnctl reload`, however. This action is equivalent to an `opmnctl shutdown` followed by an `opmnctl startall`. It is a much slower operation than `opmnctl reload` because it restarts OPMN and all the processes managed by OPMN.

---

Enter the following command for additional detailed information:
prompt > opmnctl usage reload

See Also: Section 4.3.1, "Command Definitions"

4.3.3 Process Control Commands

The opmnctl process control commands enable you to start, stop, or restart single or multiple Oracle Application Server components. You can control an Oracle Application Server component at the <ias-component>, <process-set>, or <process-type> level.

This section describes the process control commands available with opmnctl. It includes the following process control commands:

- Section 4.3.3.1, "opmnctl startproc, opmnctl restartproc and opmnctl stopproc"
- Section 4.3.3.2, "Progressive Request Reports"
- Section 4.3.3.3, "Sequential Requests"
- Section 4.3.3.4, "opmnctl config"
- Section 4.3.3.5, "Starting a Specific J2EE Application"
- Section 4.3.3.6, "Starting an OC4J group"

Output is not generated for the successful execution of an opmnctl process control command. Refer to Appendix A, "OPMN Troubleshooting" if you receive any error messages during opmnctl command execution.

4.3.3.1 opmnctl startproc, opmnctl restartproc and opmnctl stopproc

Syntax: opmnctl [<scope>] startproc [<attr>=<value>...]  
opmnctl [<scope>] restartproc [<attr>=<value>...]  
opmnctl [<scope>] stopproc [<attr>=<value>...]

Use these commands to start, restart, or stop OPMN-managed processes in the requested scope. The OPMN server for the Oracle Application Server instance must be up and running.

You can use attributes for these commands. If no attribute is supplied when executing startproc, stopproc, and restartproc, all OPMN managed processes except components with id-matching="true" in the opmn.xml file will be started.

The following attributes and values can be used with the startproc, stopproc, and restartproc commands:

- ias-component, process-type, and process-set: The values for these attributes should be the same as the id value specified in the opmn.xml file. If no attribute is supplied, the command is applied to all OPMN-managed processes other than those that are configured in the opmn.xml file with id-matching="true". To execute commands on components configured with id-matching="true", it is necessary to specify the ias-component argument.

- mode: The mode attribute value can be either sync or async; the default value is sync. The sync value for mode causes the opmnctl command to operate synchronously and wait for the command to be executed completely before a return prompt is displayed. The timeout element can only be specified when the value of mode is sync. The value is specified in number of seconds. After the specified timeout expires, the operation is aborted for startproc but not for restartproc or stopproc. The opmnctl command prompt returns, the
OPMN server continues to perform the `opmnctl restartproc` or `stopproc` command request until the operation is finished.

The `async` value for mode causes the return prompt to be displayed immediately, while the OPMN server continues to perform the `opmnctl` command request until the operation is finished.

- `uniqueid`: This value is assigned by OPMN after starting up. You can use this value when you execute the `restartproc` and `stopproc` commands. You can obtain this value by entering the following command and obtaining the unique number for the Oracle Application Server component in the `uid` column of the generated output:

  ```
prompt > opmnctl status -l
  ```

Attribute names other than those listed may be specified for some types of Oracle Application Server processes managed by OPMN. Unique attribute name should be specific to each type of Oracle Application Server process.

All processes matching all of the attributes will be started. Components with `id-matching="true"` in the `opmn.xml` file will be started only if `ias-component(oc4j-group)` is explicitly specified.

Using the `opmnctl startproc`, `restartproc`, or `stopproc` commands with a specified scope and attributes enables control of specific processes in your enterprise. You can execute the `opmnctl startproc`, `restartproc`, or `stopproc` commands at the `<ias-component>`, `<process-type>` and the `<process-set>` level.

For example, the following command starts OracleAS Wireless at the `<process-set>` level:

```
prompt > opmnctl startproc ias-component=wireless process-type=alert_server process-set=alert_instance_1
  ```

The following command restarts OC4J at the `<process-type>` level:

```
prompt > opmnctl restartproc ias-component=OC4J process-type=home
  ```

The following command stops Oracle HTTP Server at the `<ias-component>` level:

```
prompt > opmnctl stopproc ias-component=HTTP_Server
  ```

Enter one of the following commands to obtain additional information:

```
prompt > opmnctl usage startproc
  ```

or

```
prompt > opmnctl usage restartproc
  ```

or

```
prompt > opmnctl usage stopproc
  ```

**See Also:**

- Section 4.3.1, "Command Definitions"
- Chapter 5, "Using OPMN"
4.3.3.2 Progressive Request Reports

The `report=true` attribute when used with `startproc`, `restartproc`, or `stopproc` enables OPMN to report back on each part of a request as it completes. For example, if an `opmnctl startproc` request will attempt to start 4 processes, OPMN will report back to the user the result of each process start attempt as soon as it completes. This attribute works on scoped requests in the same way.

For example, the following shows the reports display when a request is issued:

1. `% opmnctl @instance:your_company:ias_stado17_1 startproc report=true opmnctl: starting opmn managed processes...
2. `% opmnctl @instance:your_company:ias_stado17_1 startproc report=true opmnctl: starting opmn managed processes...

   *ias_stado17_1/HTTP_Server/HTTP_Server/HTTP_Server/1,86061,17501: success*
   *ias_stado17_1/ppid/ppid/ppid/1,86063,17503: success*

3. `% opmnctl @instance:your_company:ias_stado17_1 startproc report=true opmnctl: starting opmn managed processes...

   *ias_stado17_1/HTTP_Server/HTTP_Server/HTTP_Server/1,86061,17501: success*
   *ias_stado17_1/ppid/ppid/ppid/1,86063,17503: success*
   *your_company/HTTP_Server/HTTP_Server/HTTP_Server/1,2452,11833: success*

4. `% opmnctl @instance:your_company:ias_stado17_1 startproc report=true opmnctl: starting opmn managed processes...

   *ias_stado17_1/HTTP_Server/HTTP_Server/HTTP_Server/1,86061,17501: success*
   *ias_stado17_1/ppid/ppid/ppid/1,86063,17503: success*
   *your_company/HTTP_Server/HTTP_Server/HTTP_Server/1,2452,11833: success*
   *ias_stado17_1/OC4J/home/default_group/1,86062,17502: success*

   *ias_stado17_1: 3 of 3 processes started.*

5. `% opmnctl @instance:your_company:ias_stado17_1 startproc report=true opmnctl: starting opmn managed processes...

   *ias_stado17_1/HTTP_Server/HTTP_Server/HTTP_Server/1,86061,17501: success*
   *ias_stado17_1/ppid/ppid/ppid/1,86063,17503: success*
   *your_company/HTTP_Server/HTTP_Server/HTTP_Server/1,2452,11833: success*
   *ias_stado17_1/OC4J/home/default_group/1,86062,17502: success*
   *ias_stado17_1: 3 of 3 processes started.*

   *your_company/OC4J/home/default_group/1,2451,11851: failure*

   failed to start a managed process after the maximum retry limit
Log:/private/oracle/OraHome_1/opmn/logs/OC4J-home-default_group-1 your_company: 1 of 2 processes started.

### 4.3.3.3 Sequential Requests

By default an OPMN request is run for all affected processes at the same time, unless a dependency dictates a specific ordering. If the attribute `sequential=true` is specified when used with the `startproc`, `restartproc`, or `stopproc` command, then OPMN will only run the request on a single process at a time, waiting for the request to complete on the first before running the request on the second. When the request has finished on one process, it works on the next.

Note that dependencies are still honoured, and take part in the request sequentially as well.

As shown in Figure 4–1, by default OPMN issues jobs for all processes in parallel such that they run at the same time (except when honoring dependencies). For example, with the following command:

```
> opmnctl startproc ias-component=OC4J
```

![OC4J Processes in Parallel](image)

If the sequential attribute is set to true, OPMN will only perform the request upon one process at a time (shown in Figure 4–2).

For example the following command:

```
% opmnctl startproc ias-component=OC4J sequential=true
```

starts all of the OC4J processes sequentially.

![OC4J Process Sequential Request #1](image)
OPMN is processing one OC4J process, before moving on the next shown in Figure 4–3.

As shown in Figure 4–3, when the request completes for the first OC4J process, the request starts on the next OC4J process.

**Figure 4–3  OC4J Process Sequential Request #2**

As shown in Figure 4–4, all affected OC4J processes have completed the request.

**Figure 4–4  OC4J Process Sequential Request #3**

### 4.3.3.4 opmnctl config

**Syntax:** opmnctl config <target> <operation> <options>

The `opmnctl config` command enables you to execute configuration operations on either the `topology` or `port` element of the `opmn.xml` file using the command line. You do not need to access the `opmn.xml` file to perform a topology or port configuration.

- `<target>` = `topology` or `port`
- `<operation>` = `update` or `delete`
- `<options>` = the use of this parameter is dependent on your selection for the `<target>` and `<operation>` arguments

The `topology` target is used to configure the `discover` element in the `opmn.xml` file. The `discover` element provides a list of discovery service addresses. The local OPMN server will use the `discover` element to find and connect with remote OPMN servers in the same cluster. You can configure multiple `discover` elements.

The arguments for the `topology` command are:
- **update**: for the `update` parameter, a `discover` attribute with a value is required. The format is `discover=<value>` where the value is the discovery service address.

- **delete**: for the `delete` parameter, a `discover` attribute is required but no value needs to be supplied.

The following examples show usage of the described arguments and parameters:

- Update the discover attribute in the `opmn.xml` file with the discovery service address of `*234.5.6.7:8910`:
  ```
  > opmnctl config topology update discover="*234.5.6.7:8910"
  ```

- Delete the discover attribute in the `opmn.xml` file:
  ```
  > opmnctl config topology delete discover
  ```

The `port` target is used to configure the port elements in the `opmn.xml` file. The arguments for the `port` command are:

- **ias-component=<id>**: this argument specifies the `ias-component` in which the port element resides.
- **process-type=<id>**: this argument specifies the `process-type` in which the port element resides.
- **portid=<id>**: this argument specifies the port ID that needs to be updated or deleted.
- **range=<port range>**: optional argument for the update operation. This parameter is invalid for the delete operation.
- **protocol=<port protocol>**: optional argument for the update operation. This is an invalid argument for the delete operation.

The following examples show usage of the described arguments and parameters:

- Update the default Web site port element for the OC4J `ias-component` element, in the `home` `process-type` using HTTP protocol:
  ```
  > opmnctl config port update ias-component=OC4J process-type=home
  portid=default-web-site protocol=http
  ```

- Delete the default Web site port element for the OC4J `ias-component` element, in the `home` `process-type`:
  ```
  > opmnctl config port delete ias-component=OC4J process-type=home
  portid=default-web-site
  ```

**4.3.3.5 Starting a Specific J2EE Application**

You can start or stop your J2EE based application using the `application` attribute. You can use this attribute with the `startproc`, `restartproc`, or `stopproc`, `opmnctl` commands.

For example:

- ```
  prompt > opmnctl startproc application=mailserver
  ```
  Start the application `mailserver` on every process in the local Oracle Application Server instance that has the application `mailserver`.
prompt > opmnctl @cluster startproc
    application=password-manager
Start the password-manager application on every process in the entire Oracle Application Server cluster that has the password-manager application.

prompt > opmnctl @cluster startproc process-type=home
    application=web-module
Start the application web-module on every process in the entire Oracle Application Server cluster that belongs to the process-type named home and has the application web-module.

prompt > opmnctl @instance:inst1:inst2:inst3 startproc
    process-type=home application=web-module
Start the application web-module on every process in the three named Oracle Application Server instances that belong to the process-type named home and has the application web-module.

4.3.3.6 Starting an OC4J group
OPMN allows you to start or stop an OC4J group cluster-wide using a single command. You can start or stop your OC4J group based application using the application attribute. You can use this attribute with the startproc, restartproc, or stopproc opmnctl commands.

For example to start an OC4J group named COLORS you would use the following command:

prompt> opmnctl @cluster startproc oc4j-group=COLORS

All of the OC4J groups you would like to start must belong to the same group. You must have one Oracle Application Server instance running the Application Server Control Console in order to manage all of the associated OC4J groups.

4.3.4 Status Commands
The opmnctl status commands enable you to determine the status of OPMN-managed processes.

This section describes the command options available with the opmnctl command. It includes the following sections:

- Section 4.3.4.1, "opmnctl status"
- Section 4.3.4.2, "opmnctl status for OC4J Groups"
- Section 4.3.4.3, "opmnctl dmsdump"
- Section 4.3.4.4, "opmnctl ping"
- Section 4.3.4.5, "opmnctl set"
- Section 4.3.4.6, "opmnctl query"
4.3.4.1 opmnctl status

Syntax: opmnctl [<scope>] status [<options>]

The `status` command enables you to obtain information on the Oracle Application Server processes managed by OPMN.

The output is a text table. Each row in the table represents one Oracle Application Server process.

You can customize the status command in the following ways:

- Supply a scope to obtain status of processes running on other Oracle Application Server instances
- Change the information displayed about each Oracle Application Server process
- Remove the table headers from the output
- Change the field separator
- Change the record separator
- Change the width of individual columns
- Change the justification of the data in an individual column

Enter the `opmnctl usage status` command to obtain full details on how to use the status command.

Example 4–3 shows the output after entering the `opmnctl status` command for the AppSrv1 instance on host comp1 for the domain yourcompany.com:

Example 4–3 opmctl Status Output

```
prompt > opmnctl status

Processes in Instance: AppSrv1.comp1.yourcompany.com

+-----------------+-----------------+--------+---------+
| ias-component   | process-type    | pid    | status  |
|-----------------+-----------------+--------+---------+
| OC4JGroup:COLORS| OC4J:home       | 16301  | Alive   |
| OC4JGroup:COLORS| OC4J:oc4j_soa   | 16256  | Alive   |
| ASG             | ASG             | N/A    | Down    |
| HTTP_Server     | HTTP_Server     | 13225  | Alive   |
```

The ASG process is the OracleAS Guard server which is discussed further in the Oracle Application Server High Availability Guide.

You can use the `opmnctl status` command with `<scope>` to obtain additional detailed information. For example, the following command gives you the status of every process of every component of every OracleAS Instance in an entire cluster:

```
prompt > opmnctl @cluster status
```
4.3.4.1.1 Options for the Status Command of opmnctl

The following are the options you can specify for the <options> parameter:

- **-l**: Use this option to obtain the unique id (uid) value and other specific process parameter information.

  ```
prompt > opmnctl status -l
  ```

For example, the command outputs the information shown in Example 4–4 (some columns are not shown to improve readability).

**Example 4–4 opmnctl status -l output**

```
Processes in Instance: AppSrv1.compl1.yourcompany.com

<table>
<thead>
<tr>
<th>ias-component</th>
<th>process-type</th>
<th>uid</th>
<th>memused</th>
<th>ports</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASG</td>
<td>ASG</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>HTTP_Server</td>
<td>HTTP_Server</td>
<td>632452828</td>
<td>101212</td>
<td>jms:3701, rmi: 3201,ajp:3000</td>
</tr>
</tbody>
</table>
```

The uid information enables you to stop or restart an individual Oracle Application Server process.

For example, the following command stops the home process-type:

```
prompt > opmnctl stopproc uniqueid=632225812
  ```

- **-fsep <string>**: Use this option to assign a field separator value for your opmnctl status output. The default value is `|`.

- **-rsep <string>**: Use this option to assign a record separator value for your opmnctl status output. The default value is `\n`.

- **-noheaders**: Use this option if you do not want a header displayed after you run the opmnctl status command.

- **-fmt <fmtlist>**: This is a single string containing one or more statistic identifiers connected together where each identifier has the following format: `<statname>[<width>{<justification>}]`. The default value is: `%cmp18%prt18%pid5R%sta8`.

Table 4–3 lists the format string syntax for the <fmtlist> option.
For example, the following command displays the output shown in Example 4–5:
prompt> opmnctl status -noheaders -fsep @ -fmt %cmp%prt%pid%sta

Example 4–5  opmnctl status -noheaders output

OC4JGroup:oc4j_soa@OC4J:home@124720Alive
ASG@ASG@N/A@Down

See Also:  Section 4.3.1, "Command Definitions"

Enter the following command for additional detailed information:
prompt > opmnctl usage status

4.3.4.1.2  opmnctl status -port

The opmnctl status -port command enables you to display the request connect string used to connect to the OPMN daemon. For example, the command:
prompt > opmnctl status -port
displays:

123.your_company.com:6200

This information can be used by a remote tool that is seeking to access OPMN. For example, in a J2EE Server and Process Management installation type, the request port information can be used in conjunction with the admin_client.jar utility to perform a deployment to an OC4J instance within the scope of the identified OPMN instance.

This opmnctl status -port command is a convenient shortcut that replaces the need to look inside of the opmn.xml file to determine the request access port.

4.3.4.1.3 opmnctl status -app

The opmnctl status -app command displays information for applications (module-ids) that are managed by OPMN.

For example, after entering the following command:

> opmnctl status -app

you will see the output displayed in Example 4–6:

Example 4–6  opmnctl status -app Output

<table>
<thead>
<tr>
<th>pid</th>
<th>name</th>
<th>state</th>
<th>rtid</th>
<th>routable</th>
<th>parent</th>
</tr>
</thead>
<tbody>
<tr>
<td>2816</td>
<td>system</td>
<td>started</td>
<td>g_rt_id</td>
<td>true</td>
<td></td>
</tr>
<tr>
<td>2816</td>
<td>default</td>
<td>started</td>
<td>g_rt_id</td>
<td>true</td>
<td>system</td>
</tr>
<tr>
<td>2816</td>
<td>bc4j</td>
<td>stopped</td>
<td>g_rt_id</td>
<td>false</td>
<td></td>
</tr>
<tr>
<td>2816</td>
<td>ascontrol</td>
<td>started</td>
<td>g_rt_id</td>
<td>true</td>
<td></td>
</tr>
</tbody>
</table>

Only applications that are reported by live processes show up in the opmnctl status -app output.

The information that is reported using the opmnctl status -app command varies for each module-id. A separate table is created for each module-id. Data that is not available with a process is shown as empty or as N/A in the process table.

You can use the command options specified in Section 4.3.4.1, "opmnctl status" with the opmnctl status -app command.

4.3.4.2 opmnctl status for OC4J Groups

The opmnctl status command for OC4J groups displays information for OC4J groups that are managed by OPMN. The command enables you to filter the command output.

To only see the status of the OC4J group COLORS, you can use the following command:

> opmnctl @cluster status -l oc4j-group=COLORS

The output of opmnctl status -l command for 10.1.3.1.0 labels OC4J Groups and OC4J processes is shown in Example 4–7 (some columns are not shown to improve readability).

Example 4–7  opmnctl status -l Output for OC4J Groups

Processes in Instance: AppSrv1.compl.yourcompany.com
### 4.3.4.3 opmnctl dmsdump

**Syntax:**

```plaintext
opmnctl [<scope>] dmsdump
[attr]=<value>[&<attr>=<val>...]
```

The `opmnctl dmsdump` command enables you to print the Oracle Dynamic Monitoring Service (DMS) statistics for OPMN. You can obtain a printout of process control operations for specific Oracle Application Server components. If no attributes are specified, performance data for all OPMN-managed processes for your Oracle Application Server components are printed out.

DMS enables you to monitor a specific performance metric, a set of performance metrics, or all performance metrics. Options allow you to specify a reporting interval to report the requested metrics.

Multiple `<attr>=<value>` pairs must be separated by an `&`. For example, the following `opmnctl` command:

```plaintext
prompt > opmnctl dmsdump "table=opmn_ons&format=xml"
```

will output the set of statistics that are gathered for ONS. The output includes the ports that ONS listens on and the number of notifications that ONS has processed. The output is in `.xml` format rather than text. If you want to review the output in text format do not include `&format=xml` on the command line.

For more information about DMS performance metric attributes and values refer to the Oracle Application Server Performance Guide.

### 4.3.4.4 opmnctl ping

**Syntax:** `opmnctl ping [<max_retry>]`

The `opmnctl ping` command enables you to contact the local OPMN server to verify operation. `<max_retry>` specifies the maximum number of retry times. If `<max_retry>` is specified, the local OPMN is pinged every one second, until the command execution succeeds or `<max_retry>` is reached.

For example, the following command,

```plaintext
prompt > opmnctl ping 10
```

designates pinging of OPMN 10 times until the ping command succeeds.

### 4.3.4.5 opmnctl set

**Syntax:** `opmnctl [<scope>] set [<attr>=<value> ...]`

The `opmnctl set` command sets the logging configuration for OPMN.

The `scope` defines where the `opmnctl set` request will be routed. If none or only `@instance` is specified, the request will be routed to the local Oracle Application Server instance only. If `@instance` is followed by specified instance names, the request will be routed to the specified Oracle Application Server instances.

If `@cluster` is specified, the request will be routed to all instances in the cluster.
An attribute name must be specified along with an attribute value. The following attribute names are required by OPMN for this command:

- **target**: the value for `target` can be either `log` or `debug`, which refer to the `opmn.log` or the `opmn.dbg`, respectively. Refer to Section A.2.1, "OPMN log Files" for more information.

---

**Note:** Enable usage of the `opmn.dbg` file only after conferring with Oracle Support. The `opmn.dbg` file is used by Oracle Support to debug and diagnose OPMN issues. Messages that are contained in the `opmn.dbg` file are typically not readily comprehensible to the user.

---

- **comp**: specifies the OPMN internal components and subcomponents

### 4.3.4.5.1 The `comp` Attribute

The value for the `comp` attribute can be either `ons` or `pm`. Additionally, the attribute value can be a specific set of sub-components for either the `ons` or `pm` attributes.

The following values for `comp` specify the OPMN internal components and subcomponents:

- **internal**: specifies the common internal information for OPMN
- **ons**: specifies the ONS component information for OPMN
- **pm**: specifies the PM component information for OPMN

Both the `ons` and `pm` components consist of subcomponents which may be specified using the `component[subcomponents]` syntax where `component` can be either `ons` or `pm`. If both `ons` and `pm` are specified together they must be separated by a semicolon in the `opmn.xml` file. If subcomponents are listed, the listed items must be separated by a comma.

#### Table 4–4 ONS Component Codes

<table>
<thead>
<tr>
<th>ONS element</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>all</td>
<td>all subcomponents</td>
</tr>
<tr>
<td>local</td>
<td>local information</td>
</tr>
<tr>
<td>listener</td>
<td>listener information</td>
</tr>
<tr>
<td>discover</td>
<td>discover (server or multicast) information</td>
</tr>
<tr>
<td>servers</td>
<td>remote servers currently up and connected to the cluster</td>
</tr>
<tr>
<td>topology</td>
<td>current cluster wide server connection topology</td>
</tr>
<tr>
<td>server</td>
<td>remote server connection information</td>
</tr>
<tr>
<td>client</td>
<td>client connection information</td>
</tr>
<tr>
<td>connect</td>
<td>generic connection information</td>
</tr>
<tr>
<td>subscribe</td>
<td>client subscription information</td>
</tr>
<tr>
<td>message</td>
<td>notification receiving and processing information</td>
</tr>
<tr>
<td>deliver</td>
<td>notification delivery information</td>
</tr>
<tr>
<td>special</td>
<td>special notification processing</td>
</tr>
<tr>
<td>internal</td>
<td>internal resource information</td>
</tr>
<tr>
<td>secure</td>
<td>SSL operation information</td>
</tr>
</tbody>
</table>
Each subcomponent for ons and pm may be prefaced with the negation character, !, which deselects the subcomponent. By using all with negated sub-components, specific subcomponents can be easily eliminated from the display.

Components and subcomponents are set or negated in the order in which they are encountered. Therefore:

ons[all,!topology]

will yield all ons subcomponents excluding topology, while:

ons[!topology,all]

will yield all ons subcomponents including topology.

**4.3.4.6 opmnctl query**

**Syntax:** opmnctl [<scope>] query [<attr>=<value> ...]

The opmnctl query command enables you to query the logging configuration for OPMN.
The attribute name of target must be specified along with an attribute value. The value for target can be either log or debug, which refer to the opmn.log file or the opmn.dbg file, respectively. Refer to Section A.2.1, "OPMN log Files" for more information.

4.3.5 Help Commands

The opmnctl help commands enable you to obtain additional information regarding OPMN.

This section describes the help command options available with the opmnctl command. It includes the following sections:

- Section 4.3.5.1, "opmnctl help"
- Section 4.3.5.2, "opmnctl usage"
- Section 4.3.5.3, "opmnctl validate"

4.3.5.1 opmnctl help

Syntax: opmnctl help

Use this command to print a short syntax description of opmnctl commands.

Example 4–8 shows the output from the opmnctl help command.

Example 4–8 opmnctl help Output

Prompt > opmnctl help

Usage: /ORACLE_HOME/bin/opmnctl [verbose] [<scope>] <command> [<options>]

Verbose: print detailed execution message if available

Permitted <scope>/<command>/<options> combinations are:

<table>
<thead>
<tr>
<th>scope</th>
<th>command</th>
<th>options</th>
</tr>
</thead>
<tbody>
<tr>
<td>start</td>
<td>start</td>
<td>- Start opmn</td>
</tr>
<tr>
<td>startall</td>
<td>startall</td>
<td>- Start opmn &amp; all managed processes</td>
</tr>
<tr>
<td>stopall</td>
<td>stopall</td>
<td>- Stop opmn &amp; all managed processes</td>
</tr>
<tr>
<td>shutdown</td>
<td>shutdown</td>
<td>- Shutdown opmn &amp; all managed processes</td>
</tr>
<tr>
<td>[scope]</td>
<td>startproc</td>
<td>[attr]=&lt;val&gt;... - Start opmn managed processes</td>
</tr>
<tr>
<td>[scope]</td>
<td>restartproc</td>
<td>[attr]=&lt;val&gt;... - Restart opmn managed processes</td>
</tr>
<tr>
<td>[scope]</td>
<td>stopproc</td>
<td>[attr]=&lt;val&gt;... - Stop opmn managed processes</td>
</tr>
<tr>
<td>[scope]</td>
<td>reload</td>
<td>- Trigger opmn to reread opmn.xml</td>
</tr>
<tr>
<td>[scope]</td>
<td>status</td>
<td>[options] - Get managed process status</td>
</tr>
<tr>
<td>[scope]</td>
<td>dmsdump</td>
<td>[attr]=&lt;val&gt;&amp;.. - Get DMS stats</td>
</tr>
<tr>
<td>[scope]</td>
<td>set</td>
<td>[attr]=&lt;val&gt;&amp;.. - Set opmn log parameters</td>
</tr>
<tr>
<td>[scope]</td>
<td>query</td>
<td>[attr]=&lt;val&gt;&amp;.. - Query opmn log parameters</td>
</tr>
<tr>
<td></td>
<td>ping</td>
<td>[&lt;max_retry&gt;] - Ping local opmn</td>
</tr>
<tr>
<td></td>
<td>validate</td>
<td>[filename] - Validate the given xml file</td>
</tr>
<tr>
<td></td>
<td>config</td>
<td>[options] - Modify the opmn xml file</td>
</tr>
<tr>
<td></td>
<td>help</td>
<td>- Print brief usage description</td>
</tr>
<tr>
<td></td>
<td>usage</td>
<td>[&lt;command&gt;] - Print detailed usage description</td>
</tr>
</tbody>
</table>

4.3.5.2 opmnctl usage

Syntax: opmnctl usage [<command>]

opmnctl Commands 4-23
The usage command displays help for all opmnctl commands, or only for the specified command. The command can be one or more of the following:

- start
- startall
- startproc
- stopall
- stopproc
- restartproc
- reload
- shutdown
- ping
- status
- dmsdump
- config
- help

For example, enter the following command to receive the output shown in Example 4–9:

```
prompt > opmnctl usage stopall
```

**Example 4–9 opmnctl usage stopall output**

```
opmnctl stopall
Stop opmn daemon and opmn managed processes for local ias instance.
```

This request first tries to stop all opmn managed processes gracefully. Processes which will not stop gracefully will be forcefully shutdown. After stopping all managed processes, the opmn daemon will shutdown itself.

This request should only be performed when it is necessary to stop the opmn daemon. Once started, the opmn daemon should remain up until it is necessary to restart the computer or some other rare administrative event occurs.

To stop all opmn managed processes without stopping the opmn daemon, consider using the stopproc command without any arguments.

To restart the opmn daemon without restarting any managed processes, consider using the the reload command. The reload command is the appropriate command to use when the only goal is to restart the opmn daemon with a new configuration.

This request operates synchronously and will wait for the operation to complete before returning.

**4.3.5.3 opmnctl validate**

Syntax: opmnctl validate [<filename>]
The `opmnctl validate` command validates the XML syntax of the `opmn.xml` file. The default `ORACLE_HOME/opmn/conf/opmn.xml` is validated if the `filename` parameter is not specified. The `<filename>` can be specified by either the relative or absolute path.

Only one file can be validated at a time.
This chapter provides command-line examples on how to use OPMN for Oracle Application Server. It features the following topics:

- Section 5.1, "Starting OPMN"
- Section 5.2, "Starting and Stopping OPMN-Managed Processes for a Local Oracle Application Server Instance"
- Section 5.3, "Starting and Stopping all OPMN Managed Processes for a Remote Oracle Application Server Instance"
- Section 5.4, "Starting and Stopping an Oracle Application Server Component in a Local Oracle Application Server Instance"
- Section 5.5, "Starting and Stopping an Oracle Application Server Process Type in a Local Oracle Application Server Instance"
- Section 5.6, "Starting and Stopping a Multi-Oracle Application Server Instance Environment"
- Section 5.7, "Starting a Component on an Oracle Application Server Cluster"
- Section 5.8, "Starting an OC4J Group"

5.1 Starting OPMN

OPMN does not depend on any other Oracle Application Server component being up and running before it can be started and used. The OPMN server should be started as soon as possible after turning on the host.

Use the following command to start OPMN without starting other Oracle Application Server components:

```
prompt > opmnctl start
```

5.2 Starting and Stopping OPMN-Managed Processes for a Local Oracle Application Server Instance

Use the following command to start OPMN-managed processes for a local Oracle Application Server instance:

```
prompt > opmnctl startproc
```

Use the following command to stop OPMN-managed processes for a local Oracle Application Server instance:
prompt > opmnctl stopproc

---

**Note:** Without arguments the `opmnctl startproc` and `opmnctl stopproc` commands start and stop all OPMN-managed processes.

### 5.3 Starting and Stopping all OPMN Managed Processes for a Remote Oracle Application Server Instance

Use the following command to **start** OPMN managed processes for a remote Oracle Application Server instance:

```plaintext
prompt > opmnctl @instance:oracleas2.foo.com startproc
```

Use the following command to **stop** OPMN managed processes for a remote Oracle Application Server instance:

```plaintext
prompt > opmnctl @instance:oracleas2.foo.com stopproc
```

### 5.4 Starting and Stopping an Oracle Application Server Component in a Local Oracle Application Server Instance

Use the following command to **start** Oracle Internet Directory in a local Oracle Application Server instance:

```plaintext
prompt > opmnctl startproc ias-component=OID
```

Use the following command to **stop** Oracle Internet Directory in a local Oracle Application Server instance:

```plaintext
prompt > opmnctl stopproc ias-component=OID
```

### 5.5 Starting and Stopping an Oracle Application Server Process Type in a Local Oracle Application Server Instance

Use the following command to **start** the `performance_server` process-type in a local Oracle Application Server instance:

```plaintext
prompt > opmnctl startproc ias-component=OC4J process-type=performance_server
```

Use the following command to **stop** the `performance_server` process-type in a local Oracle Application Server instance:

```plaintext
prompt > opmnctl stopproc ias-component=OC4J process-type=performance_server
```

### 5.6 Starting and Stopping a Multi-Oracle Application Server Instance Environment

Use the following command to **start** a multi-Oracle Application Server instance environment from local instance oracleas1:

```plaintext
prompt > opmnctl @instance:oracleas1.foo.com:oracleas2.bar.com startproc
```
This command starts all processes of all components on both instances specified with the \textless scope\textgreater argument. Notice that the local instance \texttt{oracleas1} is specified in the command.

Use the following command to \textbf{stop} a multi-Oracle Application Server instance environment from local instance \texttt{oracleas1}:

\begin{verbatim}
prompt > opmnctl @instance:oracleas1.foo.com:oracleas2.bar.com stopproc
\end{verbatim}

This command stops all processes of all components on all two instances specified with the \textless scope\textgreater argument. Notice that the local instance \texttt{oracleas1} is specified in the command.

\textbf{Note:} You must also indicate your local Oracle Application Server instance when using the \texttt{@instance \textless scope\textgreater} with other Oracle Application Server instances. Commands with a \textless scope\textgreater argument only operates on the instances described by the \textless scope\textgreater argument. The command will only be applied to the local instance if it is described in the \textless scope\textgreater argument.

\section{5.7 Starting a Component on an Oracle Application Server Cluster}

Use the following command to \textbf{start} the same Oracle Application Server component on multiple Oracle Application Server instances:

\begin{verbatim}
prompt > opmnctl @cluster startproc ias-component=HTTP_Server
\end{verbatim}

Use the following command to \textbf{stop} the same Oracle Application Server component on multiple Oracle Application Server instances:

\begin{verbatim}
prompt > opmnctl @cluster stopproc ias-component=HTTP_Server
\end{verbatim}

\section{5.8 Starting an OC4J Group}

Use the following command to \textbf{start} an OC4J group called \texttt{COLORS} on a cluster of Oracle Application Server instances:

\begin{verbatim}
prompt > opmnctl @cluster startproc oc4j-group=colors
\end{verbatim}

Use the following command to \textbf{stop} an OC4J group called "green" on a cluster of Oracle Application Server instances:

\begin{verbatim}
prompt > opmnctl @cluster stopproc oc4j-group=colors
\end{verbatim}

Refer to Section 3.2, "OC4J Groups" for more information about the OC4J groups.
This chapter provides common configuration examples, and descriptions of elements and attributes for the OPMN `opmn.xml` file.

It contains the following topics:

- Section 6.1, "Example of `opmn.xml` Elements and Attributes"
- Section 6.2, "`opmn.xml` Element and Attribute Descriptions"

### 6.1 Example of `opmn.xml` Elements and Attributes

Example 6–1 shows all possible elements and attributes that may appear in an `opmn.xml` file that are not specific to any Oracle Application Server component.

**Note:** OPMN will convert slashes in the path value string to be those of the directory path separator character for the system on which OPMN is running (for Linux each `\` character is converted to `/; for Microsoft Windows each `/` is converted to `\`). OPMN uses the `^` character as an escape character to disable slash conversion. `^/` on a Microsoft Windows system will yield a `/` in the string. Specify two `^` characters if you need to specify the `^` character in the resultant string. For example, `^^` yields `^`.

```xml
<opmn>
  <log path="path" comp="comp-codes" rotation-size="kBytes" rotation-hour="HOD"/>
  <debug path="path" comp="comp-codes" rotation-size="kBytes" rotation-hour="HOD"/>
  <notification-server interface="type">
    <ipaddr remote="ip" request="ip"/>
    <port local="port" remote="port" request="port"/>
    <ssl enabled="boolean" wallet-file="path" wallet-password="password" openssl-certfile="path" openssl-keyfile="path" openssl-password="password" openssl-lib="path"/>
    <tune io-timeout="timeout" io-idle="interval" timeout="timeout"/>
    <topology>
      <nodes list="nodes"/>
      <discover list="nodes"/>
      <gateway list="nodes"/>
    </topology>
  </notification-server>
  <process-manager insecure-remote-requests="boolean">
    <process-modules>
      <module path="path" tag="tag-id" status="state" cron="interval"/>
    </process-modules>
  </process-manager>
</opmn>
```

Example 6–1  Common Configuration Elements and Attributes
<module-data>
  <category id="id">
    <data id="id" value="value" process-conversion="boolean"/>
  </category>
</module-data>

<module-id id="module-id"/>

</process-modules>

<ias-instance id="ias-instance-id" name="ias-instance-name" ORACLE_HOME="path">
  <environment>
    <variable id="id" value="value" append="boolean" process-conversion="boolean"/>
  </environment>

  <!-- module-data -->

  <rmd-definitions>
    <rmd name="name" description="description" interval="interval">
      <conditional>
        <![CDATA[condition]]>
      </conditional>
      <action value="action"/>
      <exception value="exception"/>
    </rmd>

  </rmd-definitions>

  <ias-component id="component-id" id-matching="boolean" status="state">
    <!-- environment -->
    <!-- module-data -->
    <dependencies>
      <database db-connect-info="connect" infrastructure-key="key" timeout="depend-timeout"
        cache-timeout="cache-timeout"/>
      <OID address="address" infrastructure="boolean" timeout="depend-timeout"
        cache-timeout="cache-timeout"/>
      <ssl enabled="boolean" wallet-file="path" wallet-password="password"/>
      <OID>
        <SSL host="hostname" port="port" URI="uri" timeout="depend-timeout"
          cache-timeout="cache-timeout"/>
        <ssl enabled="boolean" wallet-file="path" wallet-password="password"/>
      </OID>
      <OSSO host="hostname" port="port" URI="uri" timeout="depend-timeout"
        cache-timeout="cache-timeout"/>
      <SSL enabled="boolean" wallet-file="path" wallet-password="password"/>
      <managed-process ias-instance="ias-instance-id" ias-component="ias-component-id"
        process-type="process-type-id" process-set="process-set-id" autostart="boolean"
        autostop="boolean" timeout="depend-timeout" cache-timeout="cache-timeout"/>
    </dependencies>

    <!-- rmd-definitions -->
    <process-type id="process-type-id" module-id="module-id" status="state" working-dir="path"
      service-failover="num" service-weight="value">
      <!-- environment -->
      <!-- module-data -->
      <!-- dependencies -->
      <event-scripts>
        <pre-start path="path"/>
        <pre-stop path="path"/>
        <post-crash path="path"/>
      </event-scripts>
      <!-- rmd-definitions -->
      <start timeout="timeout" retry="num"/>
      <stop timeout="timeout"/>
      <restart timeout="timeout" retry="num"/>
      <ping timeout="timeout" retry="num" interval="interval"/>
      <port id="id" range="range"/>
      <process-set id="process-set-id" restart-on-death="boolean" numprocs="num" minprocs="min"
        maxprocs="max" status="state" working-dir="path" parallel-requests="boolean"/>
      <!-- environment -->
    </process-type>
  </ias-component>
</ias-instance>
6.2 opmn.xml Element and Attribute Descriptions

This section describes the elements and attributes in the opmn.xml file that are not specific to any Oracle Application Server component. This section also provides attribute descriptions of the elements.

<opmn>
Required: true
Default: none
Parents: none
Attributes: none

<opmn> is the top-level element in the opmn.xml file.

<log>
Required: false
Default: see attributes
Parents: <opmn>
Attributes: path, comp, rotation-size, rotation-hour

The configuration definitions for the OPMN log mechanism.

**path="path"**
Required: true
Default: $ORACLE_HOME/opmn/logs/opmn.log
Valid Values: The path name for the OPMN log file.

All directories specified in the path attribute must exist. OPMN must have read and write permissions for the directory containing the log file. The $ORACLE_HOME directory may be used.

**comp="comp-codes"**
Required: true
Default: internal, ons, pm
Valid Values: A list of comp-codes. A semi-colon must be used to separate the items on the comp-codes list.
The `comp` attribute specifies the component codes for logged events. These codes can be viewed and changed dynamically at OPMN run-time using the following commands:

```bash
> opmnctl query target=log
> opmnctl set target=log comp=<comp-codes>
```

The values revert back to the configured values in the `opmn.xml` file when OPMN is reloaded.

The following `comp-codes` are displayed in the log and debug elements of the `opmn.xml` file:

- **internal**: a log for the common internal information for OPMN
- **ons**: a log for the ONS component information for OPMN
- **pm**: a log for the PM component information for OPMN

Both the `ons` and `pm` components consist of subcomponents which may be specified using the `component[subcomponents]` syntax. The component can be either `ons` or `pm` (separated by a semicolon if both are specified). The list of valid subcomponents for the given component are each separated by a comma. For example, `comp="ons[local,listener];pm"`.

The following Table 6–1 lists the ONS component codes.

<table>
<thead>
<tr>
<th>ONS Attribute</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>all</td>
<td>all subcomponents</td>
</tr>
<tr>
<td>local</td>
<td>local information</td>
</tr>
<tr>
<td>listener</td>
<td>listener information</td>
</tr>
<tr>
<td>discover</td>
<td>discover (server or multicast) information</td>
</tr>
<tr>
<td>servers</td>
<td>remote servers currently up and connected to the cluster</td>
</tr>
<tr>
<td>topology</td>
<td>current cluster wide server connection topology</td>
</tr>
<tr>
<td>server</td>
<td>remote server connection information</td>
</tr>
<tr>
<td>client</td>
<td>client connection information</td>
</tr>
<tr>
<td>connect</td>
<td>generic connection information</td>
</tr>
<tr>
<td>subscribe</td>
<td>client subscription information</td>
</tr>
<tr>
<td>message</td>
<td>notification receiving and processing information</td>
</tr>
<tr>
<td>deliver</td>
<td>notification delivery information</td>
</tr>
<tr>
<td>special</td>
<td>special notification processing</td>
</tr>
<tr>
<td>internal</td>
<td>internal resource information</td>
</tr>
<tr>
<td>secure</td>
<td>SSL operation information</td>
</tr>
<tr>
<td>workers</td>
<td>worker threads</td>
</tr>
</tbody>
</table>

The following Table 6–2 lists the PM component codes.
Each subcomponent (for ons or pm) may be prefaced with the negation character \!', which deselects the subcomponent. By using the term "all" with negated sub-components, specific subcomponents are eliminated from the display.

Components and subcomponents are set or negated in the order in which they are encountered. The ons[all,!topology] will yield all ons subcomponents excluding topology, while ons[!topology,all] will yield all ons subcomponents including topology.

**rotation-size="kBytes"**
Required: false
Default: none
Valid Values: An integer.

The rotation-size is the maximum size in kilobytes of the log file. When the log file reaches the configured size, the OPMN logging mechanism will close the log, rename it with a time stamp suffix, and then create a new log file. This attribute may be used with rotation-hour.

**rotation-hour="HOD"**
Required: false
Default: none
Valid Values: An integer value between 0 to 23.
At the given hour of the day, the OPMN logging mechanism will close the log, rename it with a time stamp suffix, and then create a new log file. This attribute may be used with rotation-size.

<debug>

Required: false
Default: see attributes
Parents: <opmn>
Attributes: path, comp, rotation-size, rotation-hour

The debug element contains the configuration definitions for the OPMN debug log mechanism.

---

**Note:** Enable usage of the opmn.dbg file only after conferring with Oracle Support. The opmn.dbg file is used by Oracle Support to debug and diagnose OPMN issues. Messages that are contained in the opmn.dbg file are typically not readily comprehensible to the user.

---

path="path"

Required: true
Default: $ORACLE_HOME/opmn/logs/opmn.dbg
Valid Values: The path name for the OPMN debug log file.

All directories specified in the path name must already exist, and OPMN must have read and write permissions for the directory in which the debug log file resides. The $ORACLE_HOME directory may be used.

comp="comp-codes"

Required: true
Default: internal, ons, pm
Valid Values: A list of comp-codes. A semi-colon must be used to separate the items on the comp-codes list.

The comp attribute specifies the component codes for logged events. These codes can be viewed and changed dynamically at OPMN run-time using the following commands:

```bash
> opmnctl query target=log
> opmnctl set target=log comp=<comp-codes>
```

The values revert back to the configured values in the opmn.xml file when OPMN is reloaded.

The following comp-codes are displayed in the log and debug elements of the opmn.xml file:

- internal: a log for the common internal information for OPMN
- ons: a log for the ONS component information for OPMN
- pm: a log for the PM component information for OPMN

Both the ons and pm components consist of subcomponents which may be specified using the component[subcomponents] syntax. The component can be either ons or pm (separated by a semicolon if both are specified). The list of valid subcomponents for
the given component are each separated by a comma. For example, comp="ons[local,listener];pm".

The following Table 6–3 lists the ONS component codes.

<table>
<thead>
<tr>
<th>ONS Attribute</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>all</td>
<td>all subcomponents</td>
</tr>
<tr>
<td>local</td>
<td>local information</td>
</tr>
<tr>
<td>listener</td>
<td>listener information</td>
</tr>
<tr>
<td>discover</td>
<td>discover (server or multicast) information</td>
</tr>
<tr>
<td>servers</td>
<td>remote servers currently up and connected to the cluster</td>
</tr>
<tr>
<td>topology</td>
<td>current cluster wide server connection topology</td>
</tr>
<tr>
<td>server</td>
<td>remote server connection information</td>
</tr>
<tr>
<td>client</td>
<td>client connection information</td>
</tr>
<tr>
<td>connect</td>
<td>generic connection information</td>
</tr>
<tr>
<td>subscribe</td>
<td>client subscription information</td>
</tr>
<tr>
<td>message</td>
<td>notification receiving and processing information</td>
</tr>
<tr>
<td>deliver</td>
<td>notification delivery information</td>
</tr>
<tr>
<td>special</td>
<td>special notification processing</td>
</tr>
<tr>
<td>internal</td>
<td>internal resource information</td>
</tr>
<tr>
<td>secure</td>
<td>SSL operation information</td>
</tr>
<tr>
<td>workers</td>
<td>worker threads</td>
</tr>
</tbody>
</table>

The following Table 6–4 lists the PM component codes.

<table>
<thead>
<tr>
<th>PM Attribute</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>all</td>
<td>all subcomponents</td>
</tr>
<tr>
<td>requests</td>
<td>HTTP (user) requests</td>
</tr>
<tr>
<td>remote</td>
<td>remote HTTP requests</td>
</tr>
<tr>
<td>scheduler</td>
<td>scheduler thread and resource information</td>
</tr>
<tr>
<td>monitor</td>
<td>monitor thread information</td>
</tr>
<tr>
<td>workers</td>
<td>worker threads</td>
</tr>
<tr>
<td>process</td>
<td>managed processes</td>
</tr>
<tr>
<td>depend</td>
<td>dependency processing</td>
</tr>
<tr>
<td>rmd</td>
<td>RMD directives</td>
</tr>
<tr>
<td>fos</td>
<td>service failover information</td>
</tr>
<tr>
<td>internal</td>
<td>internal resources</td>
</tr>
<tr>
<td>schedjobs</td>
<td>periodic scheduled jobs</td>
</tr>
<tr>
<td>procjobs</td>
<td>for each process scheduled jobs</td>
</tr>
<tr>
<td>fos</td>
<td>service failover processing</td>
</tr>
</tbody>
</table>
Each subcomponent (for `ons` or `pm`) may be prefaced with the negation character `!` which deselects the subcomponent. By using the term "all" with negated sub-components, specific subcomponents are eliminated from the display.

Components and subcomponents are set or negated in the order in which they are encountered. The `ons[all,!topology]` will yield all `ons` subcomponents excluding `topology`, while `ons[!topology,all]` will yield all `ons` subcomponents including `topology`.

### `rotation-size="kBytes"`
- Required: false
- Default: none
- Valid Values: An integer.

The `rotation-size` is the maximum size in kilobytes of the log file. When the log file reaches the configured size, the OPMN logging mechanism will close the log, rename the log with a time stamp suffix, and then create a new log file.

The `rotation-size` attribute may be used with the `rotation-hour` attribute.

### `rotation-hour="HOD"`
- Required: false
- Default: none
- Valid Values: An integer value between 0 to 23.

The `rotation-hour` attribute for use with the log file at the specified time of day, the OPMN logging mechanism will close the log file, rename it with a time stamp suffix, and then create a new log file. This attribute may be used with the `rotation-size` attribute.

```xml
<notification-server>
  Required: true
  Default: none
  Parents: <opmn>
  Attributes: interface
</notification-server>
```

The `notification-server` element configures or, contains the elements to configure the ONS portion of OPMN.

### `interface="type"`
- Required: false
- Default: any
- Valid Values: any, IPv6, or IPv4
By default, OPMN will support both the IPv6 and IPv4 network interfaces (see Section 3.11, "IPv6 Support"). OPMN binds to both interfaces for its listener ports and attempts connections using either interface. OPMN always attempts to use the IPv6 interface first, if such an address is available. This behavior is the same as the default behavior for the Sun Java Virtual Machine (JVM).

Both IPv4 and IPv6, require that you use the same network for connection to other OPMN servers. For example, IPv6 forces OPMN to only use the IPv6 network interface even if the IPv4 interface is available. This means that OPMN is only able to connect to (and be connected from) other OPMN servers that can use the same network interface. If you configure IPv6 or IPv4 on a system that does not provide the same network interface support, OPMN will not start.

```
<iapddr>
Required: true
Default: none
Parents: <notification-server>
Attributes: remote, request

The <iapddr> element specifies host information for ONS listener threads and host port bindings.

remote="ip; ip"
Required: false
Default: none
Valid Values: an IP address (in the ###.###.###.### format) or host name to which ONS will bind its remote port. A list of IP values may be configured to force ONS to bind to a specific set of IP addresses. Each IP value must be separated by a semi-colon on the list.

The remote attribute is the IP address or host name to which ONS will bind its remote port. The remote port is used for ONS to ONS communication. Notifications pass from ONS to ONS through the remote port, and OPMN uses ONS to route remote requests to other OPMN servers through the remote port.

request="ip; ip"
Required: false
Default: IP address for default system host name
Valid Values: an IP address (in ###.###.###.### format) or host name to which ONS will bind its request port. A list of IP values may be configured to force ONS to bind to a set of specific IP addresses. The values on the list must be separated by a semi-colon.

The request attribute is for the IP address or host name to which ONS will bind its remote port. This port can only be used for obtaining status information.
```

```
<port>
Required: true
Default: none
Parents: <notification-server>
Attributes: local, remote, request

The <port> element contains configuration information for ONS listener threads host and port bindings.
```
**local="port"**
Required: true
Default: none
Valid Values: A valid port number.

The `local` attribute is for the ONS local port value.

**remote="port"**
Required: false
Default: none
Valid Values: A port number.

The `remote` attribute is for the ONS remote port value.

**request="port"**
Required: false
Default: none
Valid Values: A port number.

The `request` attribute is for the ONS request port value.

**<ssl>**
Required: false
Default: none
Parents: `<notification-server>`
Attributes: enabled, wallet-file, wallet-password, openssl-certfile, openssl-keyfile, openssl-password, and openssl-lib

The `ssl` element is used for ONS to ONS security and authentication configuration. You may configure either the Oracle SSL layer (`wallet-file` and `wallet-password`) or the Open SSL layer (`openssl-certfile`, `openssl-keyfile`, `openssl-password`, and `openssl-lib`). You cannot use both. If you configure both Oracle and Open SSL layers within the same `opmn.xml` file, the server will not start.

The Oracle SSL layer uses the libraries shipped with either the Oracle Application Server or Oracle Database products. The Oracle SSL layer uses the standard Oracle wallet.

The Open SSL layer provides better performance, documentation, and support for encryption hardware. It also has uses less hardware space within OPMN. Open SSL is an open source tool kit to develop security protocols. You can find more information at:

http://www.openssl.org

**enabled="boolean"**
Required: true
Default: none
Valid Values: `true` or `false`

If the `enabled` value is set to true, it enables SSL connections for ONS.

**wallet-file="path"**
Required: false (for Oracle SSL only)
Default: none
Valid Values: The path name to the Oracle wallet.

The `wallet-file` attribute specifies the path name to the Oracle wallet to use for authentication on ONS connections. The $ORACLE_HOME directory may be used.

`wallet-password="password"`
Required: false (for Oracle SSL only)
Default: none
Valid Values: A string for the wallet password.

The `wallet-password` attribute is the password string for the specified Oracle wallet.

`openssl-certfile="path"`
Required: true (for Open SSL only)
Default: none
Valid Values: The path name to the Open SSL cert file.

The `openssl-certfile` attribute specifies the Open SSL certificate file to use for authentication on ONS connections. The $ORACLE_HOME directory may be used.

`openssl-keyfile="path"`
Required: true (for Open SSL only)
Default: none
Valid Values: The path name to the Open SSL key file.

The `openssl-keyfile` attribute specifies the Open SSL key file to use for authentication on ONS connections. The $ORACLE_HOME directory may be used.

`openssl-password="password"`
Required: true (for Open SSL only)
Default: none
Valid Values: A string for the `openssl-keyfile` password.

The `openssl-password` attribute is the password string for the specified `openssl-keyfile`.

`openssl-lib="path"`
Required: false (for Open SSL only)
Default: none
Valid Values: The path name to the Open SSL library.

The `openssl-lib` attribute specifies the path name to the Open SSL library where the shared library files (for example, libssl and libcrypto) reside. If the `openssl-lib` path name is not provided, then the environment from which OPMN is launched must include the path name in the proper system variable. The $ORACLE_HOME directory may be used.

`<tune>`
Required: false
Default: See attributes
Parents: notification-server
Attributes: io-timeout, io-idle, timeout

The tune element contains the information for the Tuneable Notification Server ONS parameters.

**io-timeout="timeout"**
- Required: false
- Default: 30
- Valid Values: 0 or an integer value >= 4 and <= 3600

The io-timeout is the socket read timeout value in seconds used by each remote OPMN (or ONS) server directly connected to the local server. If the remote server does not receive any data across the connection with the local server in the configured io-timeout period, the remote server will time-out the connection and close the socket. The io-timeout value is the timeout period remote OPMN (or ONS) servers will use for the local server.

The io-timeout value is also used as a timeout for resource cleanup after an ONS connection has disconnected. If the connection is reestablished before the timeout period, the resources are transferred to the new connection. Otherwise the resources are released after the timeout period has expired.

Service failover participant state, duplicate ONS notification detection state, and notifications routed to the downed connection all use the io-timeout value. Notifications are queued to the down connection until the timeout occurs or the connection is reestablished.

The io-timeout parameter should be increased for servers running on very busy or overloaded systems.

A value of 0 disables io-timeout checking on remote servers for the local server. The io-timeout disables cleaning up of failover participant state, duplicate notification detection state, and notifications queued for the down connection. Notifications will continue to be queued until the connection is reestablished, which can consume an ever expanding amount of memory on the remote OPMN or ONS servers if the timeout check is disabled and the connection never comes back. The io-timeout parameter should only be set to 0 for debug purposes.

A configured non-zero value that is less than the minimum value is set to the minimum, and a value greater than the maximum is set to the maximum.

**io-idle="interval"**
- Required: false
- Default: io-timeout - (io-timeout / 3)
- Valid Values: an integer value >= 2 and <= (io-timeout - 2)

The interval in seconds between sending a message to each remote server to which the local server is directly connected. If no normal network traffic is sent from the local server to any remote server in the configured interval, a message is sent to the remote server.

The io-idle parameter ensures that an idle but responsive OPMN server does not have its connection timed out when with a remote server. On busy systems, this value should be far enough below the io-timeout value such that there is enough time for the local server to queue and send the idle message to the remote server before the remote server detects the timeout.
If the `io-timeout` is 0, the `io-idle` attribute is ignored. A configured value that is less than the minimum value is set to the minimum, and a value greater than the maximum is set to the maximum.

**timeout=**"timeout"

Required: false  
Default: 20  
Valid Values: an integer value >= 1 and <= 3600

The `timeout` parameter is the socket timeout value in seconds used for the local OPMN server for connection attempts and client connection writes. If the connection handshake to the local OPMN server takes longer than the configured timeout value, then the socket is closed and the connection resources are available. If a write on a client connection socket takes longer than the configured timeout value, then the socket is closed and the connection resources are available.

**<topology>**

Required: false  
Default: none  
Parents: notification-server  
Attributes: none

The `topology` element contains the configuration information for the ONS topology within a cluster.

**<nodes>**

Required: false  
Default: none  
Parents: topology  
Attributes: list

The `nodes` element provides a list of specific addresses for OPMN servers in the same cluster as the local OPMN server. The local OPMN server is included in the list. Multiple `nodes` elements may be configured.

**list=**"list-of-nodes"

Required: true  
Default: none  
Valid Values: a list of nodes, with a comma separating each listed node. Each node represents an OPMN server in the cluster.

Each `node` entry represents an instance in the cluster to which the local OPMN server will attempt to connect to remote OPMN servers. The connection is needed to transfer information such as notifications, status, and user requests. If OPMN is unable to connect to a configured remote node, it will try again every 120 seconds. Duplicate entries are ignored.

Each `node` entry must be specified in the address:port format. The address must be a valid Transmission Control Protocol (TCP) IP address. Refer to Section 3.11, "IPv6 Support" for more information about supported IP connections for OPMN.

Each `node` value should correspond to an OPMN server running on the system. The OPMN server must be specified by address and configured to listen on the remote port specified by the `port` element.
The value of address should be the same as the one configured for the corresponding OPMN. If the system has multiple IP addresses or multiple host names, then the value of address must match the value configured for the remote attribute of the ipaddr element of the notification server.

The address portion of each node may consist of a list of host names or IP addresses for the same system. The lists are available only if the remote node ipaddr remote attribute is configured with the same set of information. The listed host names and IP addresses must be separated by a semi-colon.

The value of the port element must match the value configured for the remote attribute of the port element of the notification-server element.

For example:

- Configure host1 through host5:
  ```xml
  <nodes list="host1.com:6200,host2.com:6200,host3.com:6200"/>
  <nodes list="host4.com:6200,host5.com:6200"/>
  ```

- Configure a host that has two names:
  ```xml
  <nodes list="hostnameA.com;hostnameB.com:6200"/>
  ```

### <discover>

**Required:** false  
**Default:** none  
**Parents:** topology  
**Attributes:** list

The discover element provides a list of discovery service addresses. The local OPMN server will use the discover element to find and connect with remote OPMN servers in the same cluster. You can configure multiple discover elements.

**list="list-of-services"**

**Required:** true  
**Default:** none  
**Valid Values:** a list of discovery multi-cast addresses or a discovery OPMN host addresses. A comma must be used to separate the list of services.

Each service entry represents a discovery resource through which the local OPMN server will locate remote OPMN servers in the same cluster. Each OPMN server in a discovered topology will automatically manage its connections to other OPMN servers in the same topology. A service may be one of two types: a multicast node or a host node.

The syntax for the multicast node is *node. *node is a multi-cast IP address (or host name) and port pair (refer to nodes). OPMN will treat each unique *node entry as a separate topology of instances to join, although typically any given OPMN server will participate in only a single discover topology.

For example:

```xml
<discover list="*225.0.0.37:8205"/>
```

The multicast address must be within the valid address range, which is 224.0.0.1 to 239.255.255.255. The asterisk (*) preceding the IP address is critical, because it informs OPMN that the value specified is a multicast address.
The syntax for the discover server node is node. node is an IP address (or host name) and OPMN remote port pair for an OPMN instance in the cluster that will serve as a discovery host in a topology. Each topology may have multiple discovery servers configured.

For example:

```xml
<discover list="host1.com:6200"/>
```

Within each discover topology, OPMN will maintain a circular connection of servers. For clusters with groups of instances in locations remote from one another, instances should be grouped in separate topologies based upon location, in which case, the separate topologies must be joined through the gateway mechanism.

For discovery topology loops with large numbers of instances, OPMN will automatically break the circular connection loop into smaller sub loops in order to minimize latency from passing a notification from server to server. By default, OPMN will auto-break a circular loop when the number of nodes exceeds 16. You can configure this auto-break threshold by prefacing the discovery list with a `[number]` prefix, where `number` is the maximum number of instances OPMN should allow in a topology loop before breaking it into multiple loops. The minimum value for `number` is eight.

For example:

- Set the auto-break number to 8 for a discovery multi-cast topology:
  ```xml
  <discover list="*[8]225.0.0.37:8205"/>
  ```

- Set the auto-break number to 8 for a discovery host topology:
  ```xml
  <discover list="[8]host1.com:6200,host2.com:6200"/>
  ```

### `<gateway>`

Required: false
Default: none
Parents: topology
Attributes: list

The gateway element is used to connect isolated discovery topologies. You can configure multiple gateway elements.

**list="list-of-gateways"**

Required: true
Default: none
Valid Values: a list of gateways. Each gateway represents a link or set of links between two OPMN discovery topologies. Each listed gateway must be separated by a comma.

The gateway syntax is source/target.

The source/target are lists of node entries. Each node entry on the list is separated by an ampersand (&). For more information refer to nodes. Each OPMN server listed in the source will connect to each OPMN server listed in the target. If the target is omitted, then it is assumed to be the same as the source. OPMN servers that are not listed in the source ignore the gateway specification.

For example:
The OPMN server on host1a is part of a discovery topology that is isolated to subnet subA, and has been selected to be the gateway instance between that topology and the discovery topology isolated on subnet subB. The OPMN server on host1b is part of a discovery topology that is isolated to subnet subB, and has been selected to be the gateway instance between that topology and the discovery topology isolated on subnet subA.

<gateway list="host1a.subA.com:6200&host1b.subB.com:6200"/>

With this configuration, OPMN server host1a.subA.com:6200 will connect to OPMN server host1b.subB.com:6200, and OPMN server host1b.subB.com:6200 will connect to OPMN server host1a.subA.com:6200.

For maximum redundancy you may wish to configure more than one host as the gateway for each discovery topology.

For example:

The OPMN server on host1a is part of a discovery topology that is isolated to subnet subA, and has been selected to be the gateway instance between that topology and the discovery topology isolated on subnet subB. The OPMN server on host1b is part of a discovery topology that is isolated to subnet subB, and has been selected to be the gateway instance between that topology and the discovery topology isolated on subnet subA.

This is the same as the previous example, but with two hosts configured from each subnet.

<gateway list="host1a.subA.com:6200&host2a.subA.com:6200&host1b.subB.com:6200&host2b.subB.com:6200"/>

However with this configuration the two instances on subnet A will always connect to one another and the two nodes on subnet B will always connect to one another, which may result in unnecessary connection overhead.

A more precise configuration requires two separate gateway elements:

<gateway list="host1a.subA.com:6200&host2a.subA.com:6200/host1b.subB.com:6200&host2b.subB.com:6200"/>
<gateway list="host1b.subB.com:6200&host2b.subB.com:6200/host1a.subA.com:6200&host2a.subA.com:6200"/>

Now the instances on the same subnet will only connect to one another if needed.

<process-manager>
  Required: true
  Default: none
  Parents: <opmn>
  Attributes: insecure-remote-requests

The process-manager contains the configuration definitions for the PM portion of OPMN.

insecure-remote-requests="boolean"
  Required: false
  Default: false
  Valid Values: true or false
The **insecure-remote-request** attribute is a security check which disables requests until security features are configured. By default OPMN will only allow start, stop, restart, shutdown and reload requests rerouted from remote OPMN servers if ONS SSL is enabled and a wallet file is configured for authentication.

---

**Note:** Setting the **insecure-remote-request** attribute to **true** overrides that security check and enables these requests to be issued remotely with no security features configured.

Setting the insecure-remote-request attribute to **true** is a major security risk and should only be done for testing purposes with all connected OPMN servers behind a well secured fire wall or completely disconnected from any external network.

---

**<process-modules>**

- **Required:** true
- **Default:** none
- **Parents:** <process-manager>
- **Attributes:** none

Each process module is designed to support a specific set of process-type elements; it is only required if the process-type elements are configured. The PM dynamically loads in a library for each specified process module.

**<module>**

- **Required:** true
- **Default:** none
- **Parents:** <process-modules>
- **Attributes:** path, tag, status, cron

The module element is used to provide process-type specific support for the PM. Each module is implemented as a shared library. The module exports a set of standard functions and uses the PM process module API. A module must provide a list of the process-types it supports. Only one configured process module may list a specific process-type. No two modules can list the same process-type.

**path=“path”**

- **Required:** true
- **Default:** none
- **Valid Values:** The path name for the module shared library.

The path attribute must specify the path name of the shared library file. The library file has the system suffix of .so for Linux and .dll for Microsoft Windows. The suffix may be omitted and OPMN will automatically append it. ORACLE_HOME may be used when specifying the path name.

**tag=“tag-id”**

- **Required:** false
- **Default:** The value specified by the path element.
- **Valid Values:** A string uniquely identifying the module.
The tag attribute identifies the module. A module may report its tag value when logging errors to the PM log file or as part of the response to a request. While optional, it is a good idea to set this attribute to a meaningful value to help track any issues with process management.

**status="state"**
Required: false
Default: enabled
Valid Values: critical, enabled, or disabled

A module may be enabled, in which case PM loads in its shared library when it starts and calls the module's initialization functions, or disabled in which case the module entry is completely ignored. If the module process-types are configured in the opmn.xml file they must also be disabled. The critical state is the same as enabled, except that OPMN will terminate with a fatal error code if the module initialization fails.

**cron="interval"**
Required: false
Default: none
Valid Values: An integer.

Specify the interval in seconds between calls to the module's cron callback function. Configuring a cron interval for a module that does not support the cron callback is not allowed. Unless you have designed the module, you should neither add nor alter this attribute.

**<module-data>**
Required: false
Default: none
Parents: <module>, <ias-instance>, <ias-component>, <dependencies>, <process-set>
Attributes: none

The module-data blocks are used to define module specific name-value pairs that are meaningful only to a specific module. Each module-data block is organized into categories, which contain the name-value data pairs.

The module-data blocks can be defined for multiple elements within the opmn.xml file, and OPMN will create an aggregate module-data block at the process-set level that contains all values defined at or above it. If multiple definitions exist in this hierarchy with the same category id and data id, the value defined at the lowest level is used.

Table 6–5 illustrates the module-data defined at each level in the hierarchy (with the highest level displayed at the top) and the resultant union at the process-set level of all of the module-data definitions:

<table>
<thead>
<tr>
<th>Module</th>
<th>Definition</th>
</tr>
</thead>
</table>
| ias-instance | <category id="CatA">  
|           |   <data id="DataAA" value="aaaa"/>  
|           |   </category>  |
<category>
Required: true
Default: none
Parents: <module-data>
Attributes: id

The category element is an organizational level within a module-data block.

id="id"
Required: true
Default: none
Valid Values: A string.

This id string identifies a data category. Each category id within a single module-data block must be unique, but multiple module-data blocks may contain the same data category ids, in which case the categories are considered to be related.

<data>
Required: true
Default: none
Parents: <category>
Attributes: id, value, process-conversion

A data name value definition within a module-data category.
id="id"
Required: true
Default: none
Valid Values: A string.

This string identifies a data attribute. Each data id within a single category must be unique, but multiple categories may contain the same data identifications. Data elements with the same identification as other data elements, that are defined in different categories with the same identification, are related.

value="value"
Required: true
Default: none
Valid Values: A string.

The value string associated with the data element id. Any environment variable defined anywhere within the scope of the process-set (any level at or above the process-set) in which the data value is defined (again, any level at or above the process-set) referenced within the value string as $variable or %variable% will be expanded to the variable value.

process-conversion="boolean"
Required: false
Default: true
Valid Values: true or false

The process-conversion attribute enables you to set the separator character. By default OPMN will convert slashes in the data value string to be those of the directory path separator character for the system on which OPMN is running (on UNIX each \ character is converted to / and on Windows each / is converted to \). Set this attribute to false to disable this conversion.

Note that if process-conversion is true, OPMN uses the ^ character as an escape character to disable process conversion for the following character, and so ^/ on a Windows system will yield a / in the string. Specify two ^ characters if you need to specify the ^ character in the resultant string: ^^ yields ^.

<data id="routing-id">
Required: false
Default: none
Parents: category
Attributes: value

The data id defines the value for the routing-id module.

For more information about the routing-id refer to the Oracle HTTP Server Administrator's Guide.

value="routing id"
Required: true
Default: none
Valid Values: Any string.

The Routing ID specifies a routing relationship between OC4J and Oracle HTTP Server. In other words, an Oracle HTTP Server routes to every OC4J that it shares a
Routing ID with. Out of the box, the routing ID is specified as a module data under the `ias-instance` in the opmn.xml file. The value of the default routing-ID is `g_rt_id`. Because of the hierarchical nature of the opmn.xml file, every component configured in the opmn.xml file inherits the configured routing ID. The user can configure a separate routing ID for any Oracle HTTP Server or OC4J by configuring a routing ID at a lower level in the opmn.xml file. As with most entities in the opmn.xml file, like entities configured at a lower level override those configured at a higher level.

```
<module-id>
  Required: true
  Default: none
  Parents: <module>
  Attributes: id

  The module-id name defines the type of process and associates the configuration with a process module.

  This identifier is used by each process-type to specify which module supports it. A module may be configured with multiple module-ids.

  id="module-id"
  Required: true
  Default: none
  Valid Values: A string.
```

```
<iast-instance>
  Required: true
  Default: none
  Parents: <process-manager>
  Attributes: id, ORACLE_HOME

  The configuration definitions for an Oracle Application Server instance. Only one ias-instance is supported for each OPMN.

  id = ias-instance-id; name = ias-instance-name; ORACLE_HOME = "path name"

  id="ias-instance-name"
  Required: true
  Default: none
  Valid Values: A string.

  The string specifies the ias-instance id.

  name="ias-instance-name"
  Required: false
  Default: ias-instance-id
  Valid Values: A string.

  The name string specifies the ias-instance name, and it is this value that is used to identify the instance for a scoped OPMN request.

  ORACLE_HOME="path"
  Required: true
```
Default: none
Valid Values: A path string.

This ORACLE+_HOME path attribute must be the ORACLE_HOME equivalent for the Oracle Application Server instance.

<environment>
Required: true
Default: Refer to the following paragraph.
Parents: ias-instance, ias-component, process-type, process-set
Attributes: none

Like module-data blocks, environment blocks can be defined for multiple elements within the opmn.xml file, and OPMN will create an aggregate environment block at the process-set level that contains all values defined at, or above it. If multiple definitions exist in the hierarchy with the same id, the value defined at the lowest level is used.

Note: OPMN sets the following default environment variables at the ias-instance level, with the values extracted either from the ias-instance configuration or from the OPMN run time environment:

Linux: ORACLE_HOME, ORACLE_NLS, OPMN_ENV_LC_ALL, OPMN_ENV_LANG, OPMN_ENV_NLS_LANG, SHELL
Microsoft Windows: COMSPEC, SYSTEM_DRIVE, and SYSTEM_ROOT

<variable>
Required: true
Default: none
Parents: <environment>
Attributes: id, value, append, process-conversion

The variable element defines the environment variable name and value.

id="id"
Required: true
Default: none
Valid Values: A string.

The id is the environment variable name. An environment id may be duplicated within an environment block, with the last defined value taking priority over earlier definitions. The same environment id may be defined within environment blocks for different elements, and the value defined at the lowest level will take priority over values defined at higher levels.

value="value"
Required: true
Default: none
Valid Values: A string.
The environment value. Environment variables referenced within the value string as $variable or $variable will be expanded to the variable value. The same environment variable may reference itself to use a definition defined at a higher level, or earlier within this same environment block.

You may use the Linux shell syntax for referencing an environment variable, $variable or $(variable), or the Microsoft Windows format %variable%. Referenced variables that have not been defined remain in place as referenced, and so value="_notdefined_" would remain unchanged.

For example, the following environment block yields a value for accumulate of "foobar".

```xml
<environment>
  <variable id="accumulate" value="foo">
  </variable>
  <variable id="accumulate" value="${accumulate}bar">
    </variable>
</environment>
```

**append="boolean"**

Required: false
Default: false
Valid Values: true or false

You can force OPMN to append the new environment variable value to the previously defined value, with the system library delimiter placed in between the two values (':' for Linux and ';' for Microsoft Windows) by specifying a value of true for this attribute. This is useful when assembling a value for a variable such as CLASSPATH.

For example, the following environment block yields a value for CLASSPATH of "/foo:/bar" on a Linux system.

```xml
<environment>
  <variable id="CLASSPATH" value="/foo">
  </variable>
  <variable id="CLASSPATH" value="/bar" append="true">
    </variable>
</environment>
```

**process-conversion="boolean"**

Required: false
Default: true
Valid Values: true or false

The RMD definitions provide the ability to have process management commands issued based on system conditions according to a set of user-configured directives. The system conditions that can be taken into account include any DMS metrics that are available within the Oracle Application Server instance. This includes preset metrics that are always present as well as metrics that are defined and implemented by other applications.

RMD definitions are either:
Hierarchical: if defined at the ias-instance level or lower. Hierarchical RMDs assume an association within the OPMN configuration components in which they are defined.

Global: if defined at the process-manager level. Global RMDs require explicit OPMN component specifications.

```xml
<rmd>
  Required: true
  Default: none
  Parents: rmd-definitions
  Attributes: name, description, interval

  A directive specifying a condition and a set of actions to take when the condition evaluates true and an optional set of exceptions to enact should any action fail.

  name="name"
  Required: true
  Default: none
  Valid Values: An identifier for the RMD.

  For hierarchical RMDs the name must be unique within the hierarchical component in which it was defined. For global RMDs the name must be unique within the global rmd-definitions block.

  description="description"
  Required: false
  Default: none
  Valid Values: A string.

  A description of the RMD.

  interval="interval"
  Required: false
  Default: 30
  Valid Values: An integer greater than or equal to five or the string "joinons group".

  The interval attribute specifies the period between conditional checks for the RMD. The actual time elapsed between checks may be somewhat greater than the configured interval depending upon system load. A smaller value yields more frequent checks of the RMD at the expense of additional system resources.

  If interval is set to the string "joinonsgroup", then the RMD is evaluated when the ONS layer detects that the OPMN server has joined a new ONS topology group.

<conditional>
  Required: true (false if rmd attribute interval="joinonsgroup")
  Default: none
  Parents: rmd
  Attributes: CDATA

  The conditional element contains the conditional statement to be evaluated by OPMN.
```
<![CDATA[statement]]>

Required: true  
Default: none  
Valid Values: A string (the conditional statement).

The CDATA conditional statement describes a state of the system that will trigger an action. The statement consists of a logical combination of comparisons between values. Like all other aspects of OPMN, conditionals are case sensitive. The values that may be used can be the following types:

- DMS metrics available from the OPMN DMS tree
- Constant values (for example, 500000)
- Temporal values (for example, 5 p.m.)

DMS metrics are described based on their location in the OPMN DMS tree. The description can be a fully qualified path name, a hierarchical relative reference, or a global absolute reference.

A fully qualified path name to the target metric begins with a '/'. The fully qualified path name includes the full path name to the OPMN instance. The OPMN instance prefix is automatically added to fully qualified path names. For example:

```
/pm/host_statistics/freePhysicalMem
```

Metrics with fully qualified path names can be referenced by both hierarchical and global RMD conditionals.

If the RMD element is hierarchical, then the metric must use a relative path name form. For example:

```
[process-set].numProcs
```

which specifies the numProcs metric for any process-set in the hierarchy for which the RMD is evaluated. The exception to this rule is the application metric, in which the path name may be specified as either relative or absolute. The following component specifications are allowed for hierarchical RMD conditionals:

- [ias-component] Refers to the ias-component element within the hierarchy of the opmn.xml file.
- [process-type] Refers to the process-type element within the hierarchy of the opmn.xml file.
- [process-set] Refers to the process-set element within the hierarchy of the opmn.xml file
- [process] Refers to the process element within the run time hierarchy
- [application] Refers to the application element within the run time hierarchy
- [application=<app>] Refers to the application <app>.

If the RMD element is global, then the metric must be an absolute description of a starting point followed by a relative path name. For example:

```
[ias-component=HTTP_Server][process-set=HTTP_Server].numProcs
```

specifies the metric numProcs for the process-set HTTP_Server that belongs to the ias-component=HTTP_Server. The exceptions to this rule are:

- process: must always be specified as relative
- application: may be specified as either relative or absolute.
The following component specifications are allowed for global RMD conditionals:

- `[ias-component=<comp>]` Refers to the `ias-component <comp>` in the `opmn.xml` file.
- `[process-type=<ptype>]` Refers to the `process-type <ptype>` in the `opmn.xml` file.
- `[process]` Refers to a process.
- `[application]` Refers to an application.
- `[application=<app>]` Refers to the application `<app>`.

As with OPMN process requests, components not specified in the directive are assumed to be wildcards; thus a global RMD referencing `[process-set=home]` would be evaluated for every `process-set` with the `id "home"` configured in the `opmn.xml` file.

A conditional cannot reference more than one OPMN logical component. For example, the same conditional cannot reference `[ias-component=HTTP_Server]`. Similarly, references to lower configuration components must not belong to a referenced higher component within the same conditional.

For hierarchical and global RMDs multiple bracketed sections can be specified but each subsequent section must further narrow the tree. That is, the order must progress from the top of the tree toward the leaf. For example, a `process` cannot appear before an `ias-component`.

Constant values must be simple numeric values, including decimal values. When comparing a constant value with a DMS metric, the constant must have the same units as the DMS metric it is being compared to. OPMN will convert the numeric values so that the values are similar.

Temporal values consist of a 24 hour format (hh:mm) time combined with an optional day of the week indicator. The day of the week abbreviations are `sun`, `mon`, `tue`, `wed`, `thu`, `fri` and `sat`. The day of the week indicators can be a single value, a comma separated list, or a dashed inclusive list. For example:

- `17:00` Daily at 5 PM
- `[mon,wed,fri].05:00` Monday, Wednesday, Friday at 5 AM
- `[mon-fri].21:45` Week days at 9:45 PM

The current time is represented by the key word `{time}`). A time comparison is evaluated false if the day of the week specified on the left of the operator does not include a day of the week specified on the right.

By default, the day of the week is only evaluated if the values are equal. If the day of the week evaluation is true then the time value is also evaluated.

You can force the comparison to be made against a single day of the week by appending the `@` character after the day, with Sunday (sun) having the value 0 and Saturday (sat) 6. For example:

- `{time} < [wed].12:00` Evaluates true only on Wednesday from 00:00 until noon
- `{time} < [wed@].12:00` Evaluates true from Sunday at 00:00 until Wednesday at noon
Comparisons between values include less than (<), less than or equal to (<=), greater than (>), greater than or equal to (>=), equals (=), or not equals (!=).

String values may also be specified between quotes (using the single quote character "'"), but the only allowable operators are equals (=) and not equals (!=).

Comparisons may be logically combined using the operators and (&) or (|), and grouping (parentheses). The logical operator (!) can be placed before any logical group of comparisons to negate the result of the outcome.

The key word \{duration(interval)\} may also be used to indicate that a conditional should only trigger if it has evaluated as true over the specified time interval (expressed in seconds). It is important to note that the conditional is only evaluated on a periodic basis, and specifying the duration value will force the conditional to only trigger if the evaluations over the time period meet the conditional value. This is an approximation of ensuring that the condition holds true over the entire time period. The accuracy of this approximation depends on the ratio of the duration interval value to the evaluation configured interval. When a conditional is evaluated as true, all durations for that evaluation are reset. When a conditional evaluates false, any duration that was not encountered during the evaluation is also reset.

If interval is set to the string \joinonsgroup, then the conditional is only evaluated when the ONS layer detects that the OPMN server has joined a new ONS topology group. If the conditional is omitted, then the RMD evaluation will always be true. If the conditional is defined, then process level references are not allowed and the duration key word should not be used. For example:

- If the heap size of a JVM has exceeded 500 Megabytes (global RMD):
  
  ![math]

- If the time is 5 PM on a weekday:

  ![math]

If the average request time is greater than 500 milliseconds for at least 60 seconds, and there are less than four processes running for the process-set at which the hierarchical RMD was configured:

![math]

If there has been less than 50 MBs of free system memory for the last three minutes:

![math]

The action element indicates an action to be taken if the conditional evaluates true.

**value=request**

Required: true
Default: none
Parents: rmd
Attributes: value

Valid Values: A string (the request).
An action can be either a process management request, or a specified program to execute, when a RMD conditional evaluates true. An RMD may have multiple actions, and they are executed sequentially in the order in which they are defined.

If an action request returns a value other than success (200), or the executed program exits with a status other than 0, then the remaining actions for the RMD will be skipped, and any configured exceptions will be performed.

An RMD will not be evaluated while either its actions or exceptions are in progress.

The possible actions for an RMD are:
- start: perform a start request with the given argument list
- restart: perform a restart request with the given argument list
- stop: perform a stop request with the given argument list
- exec: execute the given program or script with the listed arguments

The targets for the start, restart, and stop requests are assumed to be relative to the OPMN components referenced in the RMD conditional. Key words representing these components should be used to narrow the scope of the request.

The following set of key words, with expansion, is provided:
- \{ias-component\} ias-component=<comp>
- \{process-type\} process-type=<ptype>
- \{process-set\} process-set=<pset>
- \{process\} uniqueid=<uid>
- \{application\} application=<app>

For start, restart, and stop actions, the key word \{process\} should not be used with the other key words because OPMN requests do not allow this combination.

In addition the exec action can use the \{pid\} key word, which expands to pid=<pid> if the conditional refers to a process-set or process.

Note that an action cannot reference a key word for an OPMN component at a level below the lowest OPMN component referenced in the conditional (if the conditional only references an ias-component, then the action can only use the \{ias-component\} key word, for example). The exception to this rule is that an action may reference \{process\} if the conditional references a process-set, but this will force the RMD to be evaluated at the process level and not the process-set level.

The results of the action requests are logged in the OPMN process manager log (the beginning and completion of the request with completion status at level 4, and full results at level 5). The stdout and stderr output of executable programs or scripts are sent to $ORACLE_HOME/opmn/logs/rmd.out. There is no rotation performed on the rmd.out file. Other programs and scripts should maintain and use their own log files and not print output using the stdout and stderr file descriptors.

The following are some action examples:
- Start another JVM in the home OC4J instance within a hierarchical RMD defined within the ORACLE_HOME instance (note the process-set must be configured with minprocs/maxprocs):
  - start \{ias-component\}\{process-type\}\{process-set\} numprocs=1
Restart a JVM in the "home" instance within a hierarchical RMD defined within the "home" instance:

- restart {process}

Stop the entire ias-component referred to by the RMD conditional:

- stop {ias-component}

Execute the given program and pass in the referenced process UID and pid:

- exec $ORACLE_HOME/mybin/report.sh "rmd triggered" {process} {pid}

**timeout=timeout**

Required: false
Default: the configured (or default) timeout for the OPMN request for affected components (see following paragraph)
Valid Values: An integer > 0 and < 3600

A timeout value can be configured for each action. The default timeout for start, restart, and stop actions is the configured (or default) timeout for the OPMN request on these components. The default timeout for exec is the configured (or default) timeout for the OPMN request on these components. The default timeout for exec action is 30 seconds.

**<exception>**

Required: false
Default: none
Parents: rmd
Attributes: value

An action to be taken if the any of the actions definitions for the RMD fail.

The configuration is identical to action.

If an exception request returns a value other than success (200), or the executed program exits with a status other than 0, then the remaining exceptions for the RMD will be skipped.

**<ias-component>**

Required: true
Default: none
Parents:<ias-instance>
Attributes: id, id-matching, status

An ias-component is a logical grouping of process-type for administrative purposes.

---

**Note:** For more information about OC4J groups using the ias-component element refer to Section 3.2, "OC4J Groups".

---

**id="component-id"**

Required: true
Default: none
Valid Values: a string
The `id` attribute uniquely identifies the `ias-component` within the `ias-instance`.

**id-matching="boolean"**

Required: false  
Default: false  
Valid Values: true or false

By default OPMN requests that do not specify `ias-components` match all configured `ias-components`, unless the `id-matching` attribute for a component is set to true, in which case the request must explicitly include the `ias-component` id in order to affect the `ias-component` or any `process-type` or `process-set` configured for that `ias-component`.

**status="state"**

Required: false  
Default: enabled  
Valid Values: enabled or disabled

An `ias-component` may be enabled, in which case OPMN parses all of its configured attributes and elements and enables requests to operate upon it, or disabled, in which case the `ias-component` entry is completely ignored.

**<dependencies>**

Required: false  
Default: none  
Parents: `<ias-component>`, `<process-type>`, `<process-set>`  
Attributes: none

OPMN uses dependencies to determine if a process should be started or not. Like `module-data` and `environment` block, dependencies blocks can be defined for multiple elements within the `opmn.xml` file, and OPMN will create an aggregate dependency list at the `process-set` level that contains all dependencies defined at or above it. If duplicate dependencies are defined at different levels, then duplicate checks on that dependency will be made before starting a process. OPMN will create an aggregate dependency list at the `process-set` level that contains all dependencies defined at or above it. If duplicate dependencies are defined at different levels, then duplicate checks on the dependency will be made before starting a process.

There are two primary types of dependencies: external and internal. External dependencies are for those resources not managed by OPMN. For example: Application Server Control Console.

An external program is executed by OPMN to perform the check on the resource. Internal dependencies are for OPMN-managed processes (unit), which may include processes managed on a remote OPMN.

OPMN maintains a cache of dependency states which contains the last known state of each dependency, and the time it was last checked. A `cache-timeout` parameter for each dependency enables users to specify how long to use its state in the cache, or if it should be used at all. Similarly, a general timeout parameter for each dependency will determine how long OPMN will wait for a status update from that dependency before aborting the dependency check and the process start.

OPMN checks dependencies in the order in which they are declared. The traversal of the list of dependencies concludes either with the full sequence of successful checks,
the dependency is available, or the first check failure, the dependency is not available, or the dependency check timed out.

<database>
  Required: false
  Default: none
  Parents: <dependencies>
  Attributes: db-connect-info, infrastructure-key, timeout, cache-timeout

The database element specifies the database to check. Either db-connect-info or infrastructure-key is used to identify the database.

db-connect-info="connect"
  Required: true if infrastructure-key is not specified.
  Default: none
  Valid Values: A string

The db-connect-info attribute is the string required to connect to the database. The string can be in either of the following formats:
  ■ <host>:<port>/<service name>
  ■ (DESCRIPTION=(ADDRESS=(PROTOCOL=tcp) (HOST=<host>)
    (PORT=<port>)) (CONNECT_DATA=(SERVICE_NAME=<service name>)))

For example:
pdsun7dev:1521/asdb.us.oracle.com

Database connection information can be found in $ORACLE_HOME/network/admin/tnsnames.ora.

infrastructure-key="key"
  Required: true if db-connect is not specified.
  Default: none
  Valid Values: A string

The infrastructure key attribute is required to identify the database.

timeout="depend-timeout"
  Required: false
  Default: 1200
  Valid Values: An integer

The timeout attribute specifies in seconds how long OPMN will wait for a dependency check to complete. If the check takes longer than the configured timeout, then OPMN will consider the check to have failed.

cache-timeout="cache-timeout"
  Required: false
  Default: 600
  Valid Values: An integer

The cache-timeout attribute specifies how long in seconds OPMN will use the current "up" status for the dependency entry in the cache. If the last successful
dependency check was within the prescribed number of seconds from the current check, then the dependency check is instantly flagged as successful, otherwise another dependency check will be performed. Note that the cache-timeout is only for the last successful check of the dependency, and if the previous check failed, another access of the dependency will be performed for this check. A value of 0 indicates OPMN will always perform the check.

**<OID>**

Required: false  
Default: none  
Parents: <dependencies>  
Attributes: address, infrastructure, timeout, cache-timeout

The `<OID>` element specifies the Oracle Internet Directory service to check either an address string for a specific Oracle Internet Directory, or that the OracleAS Infrastructure flag is set to true to use the default infrastructure Oracle Internet Directory.

**address="address"**

Required: true  
Default: none  
Valid Values: A string

The address element is the address string required to connect to Oracle Internet Directory.

**infrastructure="boolean"**

Required: true if address is not set.  
Default: none  
Valid Values: true or false

Use the default infrastructure Oracle Internet Directory for the Oracle Application Server instance.

**<ssl>**

Required: false  
Default: none  
Parents: <OID>  
Attributes: enabled, wallet-file, wallet-password

The SSL information for the Oracle Internet Directory connection.

**enabled="boolean"**

Required: true  
Default: none  
Valid Values: true or false

To enable SSL on the Oracle Internet Directory connection, set the enabled attribute to true.

**wallet-file="path"**

Required: true  
Default: none
Valid Values: A valid path name

The path name to the wallet file for authentication of the Oracle Internet Directory connection. The $ORACLE_HOME directory location may be used.

wallet-password="password"
Required: false
Default: none
Valid Values: A string

The wallet-password attribute is the password for the specified wallet-file.

timeout="depend-timeout"
Required: false
Default: 1200
Valid Values: An integer

The timeout attribute specifies in seconds how long OPMN will wait for a dependency check to complete. If the check takes longer than the configured timeout, then OPMN considers the check to have failed.

cache-timeout="cache-timeout"
Required: false
Default: 600
Valid Values: An integer

The cache-timeout attribute specifies how long in seconds OPMN will use the current "up" status for the dependency entry in the cache. If the last successful dependency check was within the prescribed number of seconds from the current check, then the dependency check is flagged as successful. Otherwise, OPMN performs another dependency check. The cache-timeout is only for the last successful check of the dependency. If the previous check failed, OPMN performs another access of the dependency check. A value of 0 indicates OPMN will always perform the check.

<OSSO>
Required: false
Default: none
Parents: <dependencies>
Attributes: host, port, URI, timeout, cache-timeout

The OSSO element specifies the OracleAS Single Sign-On service to check.

host="hostname"
Required: true
Default: none
Valid Values: A string

The host attribute is the hostname for the OracleAS Single Sign-On connection.

port="port"
Required: true
Default: none
Valid Values: A port number

The port attribute is the port for the OracleAS Single Sign-On connection.

**URI="uri"**
Required: true
Default: none
Valid Values: A string

The URI attribute is the URI for the OracleAS Single Sign-On connection.

**<ssl>**
Required: false
Default: none
Parents: <OSSO>
Attributes: enabled, wallet-file, wallet-password

The ssl element is the SSL information for the OracleAS Single Sign-On connection.

**enabled="boolean"**
Required: true
Default: none
Valid Values: true or false

The enabled attribute enables the SSL connection OracleAS Single Sign-On. To enable the connection set this attribute to true.

**wallet-file="path"**
Required: true
Default: none
Valid Values: A path name

The wallet-file attribute is the path name to the wallet file for authentication of the OracleAS Single Sign-On connection. The ORACLE_HOME value may be used.

**wallet-password="password"**
Required: false
Default: none
Valid Values: A string

The wallet-password is the password for the specified wallet-file.

**timeout="depend-timeout"**
Required: false
Default: 1200
Valid Values: An integer

The timeout attribute specifies in seconds how long OPMN will wait for a dependency check to complete. If the check takes longer than the configured timeout, then OPMN considers the check to have failed.

**cache-timeout="cache-timeout"**
Required: false
Default: 600
Valid Values: An integer

The `cache-timeout` attribute specifies how long in seconds OPMN will use the current “up” status for the dependency entry in the cache. If the last successful dependency check was within the prescribed number of seconds from the current check, then the dependency check is flagged as successful. Otherwise, OPMN performs another dependency check. The `cache-timeout` is only for the last successful check of the dependency. If the previous check failed, OPMN performs another dependency check. A value of 0 indicates OPMN will always perform the check.

```xml
<managed-process>
  Required: false
  Default: none
  Parents: <dependencies>
  Attributes: ias-instance, ias-component, process-type, process-set, autostart, autostop, timeout, cache-timeout

The managed-process attribute specifies the managed process to check. A process for `process-type` or `process-set` does not start unless the specified dependency managed process is active. Circular dependencies are detected and rejected for local managed processes, but not for remote managed processes; this may result in a dependency check deadlock, which times out.

`ias-instance="ias-instance-id"`
  Required: false
  Default: The ias-instance of the current process-type or process-set.
  Valid Values: A string

The `ias-instance` for the managed process dependency. If the specified `ias-instance` is not managed by the current OPMN, it is assumed to be a remote managed process dependency.

`ias-component="ias-component-id"`
  Required: true
  Default: none
  Valid Values: A string

The `ias-component` for the managed process dependency.

`process-type="process-type-id"`
  Required: true
  Default: none
  Valid Values: A string

The `process-type-id` for the managed process dependency.

`process-set="process-set-id"`
  Required: true
  Default: none
  Valid Values: A string

The `process-set-id` for the managed process dependency.
**autostart**="boolean"
Required: false
Default: false
Valid Values: true or false

The autostart attribute is used for the managed process dependency. If the process is not running when the check is performed, the autostart element will OPMN to attempt to start it.

**autostop**="boolean"
Required: false
Default: false
Valid Values: true or false

When the managed process dependency is stopped, then stop the managed process. The attribute is always false for remote managed process dependencies.

**timeout**="depend-timeout"
Required: false
Default: 1200
Valid Values: An integer

The timeout attribute specifies, in seconds, how long OPMN will wait for a dependency check to complete. If the check takes longer than the configured timeout, then OPMN considers the check to have failed.

**cache-timeout**="cache-timeout"
Required: false
Default: 600
Valid Values: An integer

The cache-timeout attribute is only used for a process managed by a remote OPMN. The cache-timeout attribute specifies how long in seconds OPMN will use the current "up" status for the dependency entry in the cache. If the last timeout dependency check was within the prescribed number of seconds from the current check, then the dependency check is instantly flagged as successful, otherwise OPMN performs another dependency check. Note that the cache-timeout is only for the last successful check of the dependency, and if the previous check failed, OPMN another access of the dependency will be performed for this check. A value of 0 indicates OPMN will always perform the check.

---

**Note:** The cache-timeout is only for the last successful check of the dependency, and if the previous check failed, OPMN will perform another dependency check.

---

**<process-type>**
Required: true
Default: none
Parents: <ias-component>
Attributes: id, module-id, status, working-dir

A process-type is a grouping of process-sets that are supported by the same module.
**id**="process-type-id"
**Required:** true  
**Default:** none  
**Valid Values:** a string

The `id` attribute uniquely identifies the `process-type` within the `ias-component`.

**module-id**="module-id"
**Required:** true  
**Default:** none  
**Valid Values:** a string

The `module-id` attribute must map directly map to the `module-id` attribute that supports the `process-type`.

**status**="state"
**Required:** false  
**Default:** enabled  
**Valid Values:** enabled or disabled

A `process-type` may be enabled, in which case OPMN parses all of its configured attributes and elements and enables requests to operate upon it, or disabled, in which case the `process-type` entry is completely ignored and treated as if it were not listed in the `opmn.xml` file.

**working-dir**="path"
**Required:** false  
**Default:** `ORACLE_HOME`  
**Valid Values:** A path name

The `working-dir` path name specifies the working location that is set for managed processes created by the `process-type` element. If a `process-set` also defines a `working-dir` attribute, then the process-set path name takes precedence over the `process-type` path name. The `$ORACLE_HOME` directory may be used.

**service-failover**="num"
**Required:** false  
**Default:** 0  
**Valid Values:** An integer value > 0.

A `process-type` may be configured as a `service-failover` (if `num` is not zero), which represents a process that exists `num` times somewhere in the Oracle Application Server cluster when it is up. The implementation is limited such that only one process of this type will run on a single instance, and so the maximum number of processes for a specific `service-failover` in the cluster can never be more than the number of participating instances in the cluster. If the value of `num` is greater than the number of instances participating in this `service-failover` in the cluster and the `service-failover` is active (it has been started), then each participant added to the cluster will automatically start its `service-failover` process until the total number cluster wide is `num`.

A `service-failover` process can run on any instance participating in the service, which means each instance must have the service configured with the same `ias-component id`, `process-type id` and `process-set id`. To target the
service itself, a request must specify both the ias-component and the process-type (it can also include the process-set).

A service-failover process-type can have only one process-set. Because the number of processes for a failover service is always 1, this process-set cannot specify numprocs, minprocs, or maxprocs.

A service-failover can be specified as a dependency (like any managed-process) or can specify dependencies. If specified as a dependency, the dependency check for a service-failover will evaluate true as soon as one process of this type is active anywhere in the cluster, regardless of the configured value for num.

**service-weight="value"**

Required: false  
Default: 100  
Valid Values: An integer value > 0.

The instances that run the actual service-failover processes are selected based upon the configured (or default) service-weight value. Instances with higher weights are selected over instances with lower weights. If a set of instances have the same weight for a service, then the configured number of instances are selected from the set to run the processes.

The service-weight attribute can only be specified if the service-failover attribute is set to a nonzero value.

**<event-scripts>**

Required: false  
Default: none  
Parents: <process-type>, <process-set>  
Attributes: none

A configured event script is executed when a specific process related event has occurred. OPMN waits until the script completes or times out before proceeding with the next action for the process.

Table 6–6 shows event script arguments.

<table>
<thead>
<tr>
<th>Option Name</th>
<th>Option Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-timeStamp</td>
<td>&lt;time&gt;</td>
<td>An integer value for the current time on the system (in seconds).</td>
</tr>
<tr>
<td>-instanceName</td>
<td>&lt;instance-name&gt;</td>
<td>The instance-name of the managed process.</td>
</tr>
<tr>
<td>-componentId</td>
<td>&lt;component-id&gt;</td>
<td>The component-id of the managed process.</td>
</tr>
<tr>
<td>-processType</td>
<td>&lt;process-type-id&gt;</td>
<td>The process-type of the managed process.</td>
</tr>
<tr>
<td>-processSet</td>
<td>&lt;process-set-id&gt;</td>
<td>The process-set of the managed process.</td>
</tr>
<tr>
<td>-processIndex</td>
<td>&lt;index&gt;</td>
<td>The process-index of the managed process.</td>
</tr>
<tr>
<td>-stderr&lt;sup&gt;1&lt;/sup&gt;</td>
<td>&lt;path&gt;</td>
<td>The path name for the stderr file pointer of the process.</td>
</tr>
<tr>
<td>-stdout&lt;sup&gt;1&lt;/sup&gt;</td>
<td>&lt;path&gt;</td>
<td>The path name for the stdout file pointer of the process. Note: this argument will only be given for a pre-start script if the start is part of a process restart request.</td>
</tr>
</tbody>
</table>
OPMN runs the pre-start script after any configured dependency checks have been performed (and passed) and before the process is actually started. The timeout for the pre-start script is the timeout value configured for starting the process itself, and any time consumed by the execution of this script counts toward the process start timeout. If the script times out, the process will not be started and any associated HTTP request will fail.

Be cautious when you execute any OPMN process requests such as start, stop or restart within an event script. These requests are serialized at the process-set level. If the script invokes a request on a process-set on which the current request (or another already queued request) is operating, then the script will hang until it times out.

**path=“path”**

Required: true
Default: none
Valid Values: The path name to the executable script.

The path name must specify either an executable program for which OPMN has execute permission, or a script file for which OPMN has both read and executable permission. The ORACLE_HOME value may be used.

**<pre-stop>**

Required: false
Default: none
Parents: <event-scripts>
Attributes: path

OPMN runs the specified script before stopping the associated process. The timeout for the script is the value configured for stopping the process itself. Any time

---

Table 6–6 (Cont.) Event Script Arguments

<table>
<thead>
<tr>
<th>Option Name</th>
<th>Option Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-reason</td>
<td>&lt;reason&gt;</td>
<td>A string indicating the reason script was executed. The http_request indicates the process action is the result of the user HTTP request to OPMN. The non_http_request indicates the process action was initiated by OPMN itself.</td>
</tr>
<tr>
<td>-pid²</td>
<td>&lt;process-id&gt;</td>
<td>The operating system integer value given for the process-id.</td>
</tr>
<tr>
<td>-startTime²</td>
<td>&lt;time&gt;</td>
<td>An integer value for the system start time of the process (in seconds).</td>
</tr>
</tbody>
</table>

1 This argument will only be given for a pre-start script if the start is part of a process restart request. The pre-start event is triggered only prior to performing a start. A restart operation may be composed of a stop operation followed by a start operation. A start operation can occur as an operation all by itself or as a sub-operation of a restart.

2 This argument is only available with pre-stop or post-crash event scripts.
consumed by the execution of the script counts toward the process stop timeout. If the script times out, any associated HTTP request will fail. However, OPMN will proceed with stopping the process.

Be cautious when you execute any OPMN process requests such as start, stop, or restart. These requests are serialized at the process-set level. If the script invokes a request on a process-set on which the current request (or another already queued request) is operating, then the script will hang until it times out.

**path="path"**
- Required: true
- Default: none
- Valid Values: The path name to the executable script.

The path attribute must specify either an executable program for which OPMN has execute permission, or a script file for which OPMN has both read and executable permission. The $ORACLE_HOME directory may be used.

**<post-crash>**
- Required: false
- Default: none
- Parents: <event-scripts>
- Attributes: path

OPMN runs the specified script after the associated process has terminated unexpectedly. The timeout for the script is the timeout value configured for stopping the process itself. After the script has terminated OPMN schedules a replacement of the terminated process.

Be cautious when you execute any OPMN process requests such as start, stop or restart. These requests are serialized at the process-set level. If the script invokes a request on a process-set on which the current request (or another already queued request) is operating, then the script will hang until it times out.

**path="path"**
- Required: true
- Default: none
- Valid Values: The path name to the executable script.

The path attribute must specify either an executable program for which OPMN has execute permission, or a script file for which OPMN has both read and executable permission. The $ORACLE_HOME directory may be used.

**<start>**
- Required: false
- Default: Refer to the values in the following paragraphs.
- Parents: <process-type>, <process-set>
- Attributes: timeout, retry

The start attribute contains the start parameters for a managed processes.

**timeout="timeout"**
- Required: false
- Default: 60
- Valid Values: An integer
The `timeout` attribute specifies the timeout value in seconds for the start of a managed process.

**retry="num"**
- Required: false
- Default: 0
- Valid Values: An integer

The `retry` attribute specifies the number of consecutive attempts that will be made to start the process for a single request.

**<stop>**
- Required: false
- Default: Refer to the values in the following paragraphs.
- Parents: `<process-type>`, `<process-set>`
- Attributes: `timeout`

The `stop` attribute specifies the stop parameters for managed processes.

**timeout="timeout"**
- Required: false
- Default: 30
- Valid Values: An integer

The `timeout` value in seconds for the stopping a managed process.

**<restart>**
- Required: false
- Default: Refer to the values in the following paragraphs.
- Parents: `<process-type>`, `<process-set>`
- Attributes: `timeout, retry`

The `restart` parameters for managed processes.

**timeout="timeout"**
- Required: false
- Default: 90
- Valid Values: An integer

The `timeout` value in seconds for the restart of a managed process.

**retry="num"**
- Required: false
- Default: 0
- Valid Values: An integer

The `retry` attribute is the number of consecutive attempts that will be made to restart the process for a single request.

**<ping>**
- Required: false
- Default: Refer to the values in the following paragraphs.
Parents: `<process-type>` , `<process-set>` 
Attributes: `timeout`, `retry`, `interval`

The **ping** element is the ping parameters for managed processes.

**timeout**="timeout"
Required: false  
Default: 20  
Valid Values: An integer

The `timeout` value in seconds for the ping of a managed process. Each module specifies a ping timeout.

**retry**="num"
Required: false  
Default: 0  
Valid Values: An integer

The `retry` attribute is the number of consecutive ping failures that will be tolerated before the module declares the process unreachable and restarts it. Each module specifies ping retries.

**interval**="interval"
Required: false  
Default: 20  
Valid Values: An integer

The `interval` attribute is the interval, in seconds, between each ping of a managed process.

**port**
Required: false  
Default: none  
Parents: `<process-type>` 
Attributes: `id`, `range`

The `port` element provides a port management mechanism for modules to use. Each module uses the ports configured with `id`.

**id**="id"
Required: true  
Default: none  
Valid Values: A string

The `id` attribute identifies the range of ports for the `process-type`. Each module has its own list of required or optional `port` ids.

**range**="range"
Required: true  
Default: none  
Valid Values: A port range

The `port range` specifies which ports to use for the `id`. 
Upon request from a module for a port number from the id, OPMN checks if a port in the range has been bound on the local system, and if it has not, it returns that port number back to the module. Syntax of the port range is a comma separated list of individual port numbers or a low-high range specification.

Examples:

Specify ports 5555, 6666, 7777, 8888, and 9999:

```xml
range="5555,6666,7777,8888,9999"
```

Specify ports 4000 through 4250 (inclusive):

```xml
range="4000-4250"
```

Specify ports 7000 through 70049, 7775, 7785, and 8050 through 8099:

```xml
range="7000-7049,7775,7785,8050-8099"
```

**<process-set>**

Required: true
Default: none
Parents: `<process-type>`
Attributes: id, restart-on-death, numprocs, minprocs, maxprocs, status, working-dir, parallel-requests

A process-set is the abstraction of a process within OPMN. All module-data, environment variables, and other configuration parameters are resolved into their final values at the process-set level.

**id="process-set-id"**

Required: true
Default: none
Valid Values: A string

The id attribute uniquely identifies the process-set within the process-type.

**restart-on-death="boolean"**

Required: false
Default: false
Valid Values: true or false

If a managed process terminates unexpectedly, that is, not stopped by a request, then OPMN will not automatically restart it. To enable automatic restarting of terminated managed processes set the attribute to true.

**numprocs="num"**

Required: true unless minprocs is configured; otherwise false
Default: none
Valid Values: An integer

Specifies the number of processes for OPMN to start for the process-set.

**minprocs="min"**

Required: true unless numprocs is configured; otherwise false
Default: none
Valid Values: An integer

Specifies the default number of processes for OPMN to start for this process set. If minprocs is configured, then maxprocs must be set with a value greater than or equal to the value for minprocs. If minprocs and maxprocs are configured, a specific number of processes may be given in an OPMN request for this process set. This attribute may not be specified if numprocs has been configured.

**maxprocs="max"**

Required: true if minprocs is configured; otherwise false
Default: none
Valid Values: An integer

The maxprocs attribute must be specified if minprocs has been configured, but cannot be specified if numprocs has been configured.

**status="state"**

Required: false.
Default: enabled
Valid Values: enabled or disabled

A process-set may be enabled, in which case OPMN parses all of its configured attributes and elements and enables requests to operate upon it, or disabled, in which case the process-set entry is complete ignored and treated as if it were not even listed in the opmn.xml file.

**working-dir="path"**

Required: false.
Default: $ORACLE_HOME
Valid Values: A path name

The working-dir path name specifies the working directory set for the managed processes created that belong to the process-set. The $ORACLE_HOME directory may be used.

**parallel-requests="boolean"**

Required: false
Default: false
Valid Values: true or false

OPMN serializes requests at the process-set level, such that only one request can execute on a given process-set at a time: each subsequent request must wait until the previous request completes before it can execute. This default behavior is disabled for a process-set when parallel-requests is set to true.
Note: When the parallel-requests attribute is enabled OPMN performs no serialization on requests for the process-set at all, which means conflicting requests may be issued and execute at virtually the same time, thus leaving processes in the process-set in unpredictable states; therefore when parallel-requests is set to true you must verify that conflicting requests are not issued at the same time for the process-set (this includes requests with implicit wild-cards for matching process-sets).
This chapter describes Oracle HTTP Server configuration in the OPMN opmn.xml file. It features the following topics:

- Section 7.1, "Oracle HTTP Server Process Module Configuration"
- Section 7.2, "Oracle HTTP Server Minimum Configuration"
- Section 7.3, "Oracle HTTP Server Complete Configuration"
- Section 7.4, "Oracle HTTP Server Attribute Descriptions"
- Section 7.5, "Oracle HTTP Server 2"
- Section 7.6, "Generic Apache (Linux only)"

---

Note:

- Only one Oracle HTTP Server can be configured for each ORACLE_HOME.
- Oracle Application Server 10g Release 3 (10.1.3.1.0) comes with Oracle HTTP Server based on Apache 1.3. This version of Oracle Application Server cannot be configured to run Oracle HTTP Server 2 based on Apache 2.
- To obtain Oracle HTTP Server 2 you must use the Oracle HTTP Server 2 standalone install. The Oracle HTTP Server 2 standalone installation is available on the companion CD. The Oracle HTTP Server 2 installation cannot be configured to run Oracle HTTP Server.

---

7.1 Oracle HTTP Server Process Module Configuration

The following lines load and identify the Oracle HTTP Server process module. Management of Oracle HTTP Server processes by the process module are identified by the module id.

```
<module path="ORACLE_HOME/opmn/lib/libopmnohs.so">
  <module-id="OHS"/>
</module>
```
7.2 Oracle HTTP Server Minimum Configuration

The following lines represent the minimum configuration for Oracle HTTP Server. Default values are assigned to all other configuration elements and attributes for Oracle HTTP Server.

```xml
<ias-component id="HTTP_Server">
  <process-type id="HTTP_Server" module-id="OHS">
    <process-set id="HTTP_Server" numprocs="1"/>
  </process-type>
</ias-component>
```

7.3 Oracle HTTP Server Complete Configuration

The following lines show a complete configuration for Oracle HTTP Server. It contains all possible configuration elements and attributes for Oracle HTTP Server.

```xml
<ias-component id="HTTP_Server" status="enabled" id-matching="false">
  <process-type id="HTTP_Server" module-id="OHS">
    <process-set id="HTTP_Server" restart-on-death="true" numprocs=1>
      <module-data>
        <category id="start-parameters">
          <data id="config-file" value="/myconfs/httpd.conf"/>
          <data id="start-mode" value="ssl-disabled"/>
          <data id="command-line" value="-D MyDefine"/>
          <data id="routing-id" value="routing id"/>
        </category>
        <category id="ping-parameters">
          <data id="ping-url" value="/"/>
        </category>
        <category id="restart-parameters">
          <data id="reverseping-timeout" value="345"/>
          <data id="no-reverseping-failed-ping-limit" value="3"/>
          <data id="reverseping-failed-ping-limit" value="6"/>
        </category>
      </module-data>
      <start timeout="300" retry="3"/>
      <stop timeout="300"/>
      <restart timeout="300"/>
      <ping timeout="30" interval="30"/>
    </process-set>
  </process-type>
</ias-component>
```

7.4 Oracle HTTP Server Attribute Descriptions

This section describes the attributes that are specific for Oracle HTTP Server. The Oracle HTTP Server attributes are described with the following format:

- **Title**: This is the attribute name and value being defined. For example, `id="HTTP_Server"`.
- **Required**: This field defines whether or not the attribute is required in the component definition.
- **Default**: This defines the default value assigned to the attribute. The default value appears in the installed version of the `opmn.xml` file or is assigned internally if the attribute is not present.
- **Valid values:** If applicable, this field defines the valid values for the attribute. For example, `HTTP_Server`.

- **Path:** This field defines in which elements the attribute can appear. For example, `ias-component/process-type/process-set`

**id="HTTP_Server"**

- Required: true
- Default: none
- Valid values: `HTTP_Server`
- Path: `ias-component`
- Path: `ias-component/process-type`
- Path: `ias-component/process-type/process-set`

The `id` attribute is required and cannot be changed. The `id` must match the `targets.xml` entry or Application Server Control Console will not work.

**module-id="OHS"**

- Required: true
- Default: none
- Valid values: `OHS`
- Path: `ias-component/process-type`

The `module-id` attribute defines the type of process. It associates the configuration with a process module. The `OHS` `module-id` can be configured for managing Apache 1.3.

**numprocs=1**

- Required: true
- Default: none
- Valid values: 1
- Path: `ias-component/process-type/process-set`

The number of Oracle HTTP Server Instances to start. Only valid value is 1.

The `numprocs` attribute gives the number of Oracle HTTP Server instances to start. The only valid value is 1.

**id="start-parameters"**

- Required: false
- Default: none
- Path: `ias-component/process-type/process-set/module-data/category`

The `start-parameters` category contains the parameters that are relevant for the startup of Oracle HTTP Server.

**id="config-file"**

- Required: false
- Default: `ORACLE_HOME/Apache/Apache/conf/httpd.conf`
- Valid values: any full path to an existing configuration file
- Path: `ias-component/process-type/process-set/module-data/category/data`
The `config-file` id is a start command option which specifies the `httpd.conf` for starting Oracle HTTP Server. The `config-file` id is not supported on Microsoft Windows.

**id="start-mode"**

Required: false
Default: ssl-disabled
Valid values: ssl-enabled/ssl-disabled
Path: ias-component/process-type/process-set/module-data/
category/data

This option specifies whether Oracle HTTP Server will be started with ssl enabled.

**id="command-line"**

Required: false
Default: none
Valid values: any valid command line options to Oracle HTTP Server
Path: ias-component/process-type/process-set/module-data/
category/data

This id option specifies extra command lines to append to the Oracle HTTP Server command line.

**id="routing-id"**

Required: false
Default: none
Parents: category
Attributes: value

The `routing-id` defines the value for the routing ID module.

You can configure the `routing-id` element for Oracle HTTP Server in both the `opmn.xml` file and in the configuration for Oracle HTTP Server. However, if the `routing-id` element is configured in both locations, OPMN will not start.

**value="routing id"**

Required: true
Default: none
Valid Values: Any string.

The Routing ID specifies a routing relationship between OC4J and Oracle HTTP Server. In other words, an Oracle HTTP Server routes to every OC4J that it shares a routing ID with. Out of the box, the routing ID is specified as a module data under the `ias-instance` in the `opmn.xml` file. The value of the default `routing-id` is `g_rt_id`. Because of the hierarchical nature of the `opmn.xml` file, every component configured in the `opmn.xml` file inherits the configured routing ID. You can configure a separate routing ID for any Oracle HTTP Server or OC4J by configuring a routing ID at a lower level in the `opmn.xml` file. As with most entities in the `opmn.xml` file, like entities configured at a lower level override those configured at a higher level.

**id="ping-parameters"**

Required: false
Default: none
Path: ias-component/process-type/process-set/module-data/
category

The ping parameters category contains the parameters that configure how OPMN pings Oracle HTTP Server.

**id="ping-url"**

Required: false  
Default: /  
Valid values: the path portion of an url; for example: http://127.0.0.1/<path>  
Path: ias-component/process-type/process-set/module-data/category/data

The ping-url id specifies the URL at which OPMN pings Oracle HTTP Server.

**id="restart-parameters"**

Required: false  
Default: none  
Path: ias-component/process-type/process-set/module-data/category

The restart-parameters category is used for defining parameters that will be used in death-detection.

**id="reverseping-timeout"**

Required: false  
Default: 300 seconds  
Valid values: Any reasonable timeout value  
Path: ias-component/process-type/process-set/module-data/category/data

The reverseping-timeout value is the maximum allowable time between two notifications arriving from an Oracle HTTP Server process. As part of death-detection, the Oracle HTTP Server module performs forward pings on the Oracle HTTP Server process. In the event that forward pings start failing, the reverse pings are taken into account in death-detection and Oracle HTTP Server processes are restarted.

**id="no-reverseping-failed-ping-limit"**

Required: false  
Default: 1  
Valid values: Any reasonable value that reflects the tolerance that OPMN should have for failed forward pings when reverse pings are also failing. This tolerance is used by OPMN to determine when the process should be declared as unresponsive and replaced.  
Path: ias-component/process-type/process-set/module-data/category/data

This id module data element defines the tolerance for failed forward pings in the event that reverse pings are also not being received (within the timeout period specified by the reverseping-timeout data element). After the number of ping failures equals this limit, the process is deemed unresponsive and restarted by OPMN.
id="reverseping-failed-ping-limit"
  Required: false
  Default: 3
  Valid values: Any reasonable value that reflects the tolerance that OPMN should have for failed forward pings when reverse pings are being received. This tolerance is used by OPMN to determine when the process should be declared as unresponsive and replaced.
  Path: ias-component/process-type/process-set/module-data/category/data

This module data element defines the tolerance for failed forward pings when reverse pings are succeeding. After the number of ping failures equals this limit, the process is deemed unresponsive and restarted by OPMN.

### 7.5 Oracle HTTP Server 2

The Oracle HTTP Server 2 based on Apache 2 (OHS2) module ID is used to manage the version of Apache 2 shipped with Oracle Application Server 10g on the companion CD.

module-id="OHS2"
  Required: true
  Default: none
  Valid values: OHS2
  Path: ias-component/process-type

The module-id attribute defines the type of process. It associates the configuration with a process module.

id="mpm"
  Required: false
  Default: prefork
  Valid values: worker/prefork
  Path: ias-component/process-type/process-set/module-data/category/data

This option specifies what threading model OHS2 should use. This option is only valid for OHS2 and is only valid on Linux platforms.

Oracle does not support the perchild MPM. Microsoft Windows uses the mpm_winnt MPM.

### 7.6 Generic Apache (Linux only)

The Oracle HTTP Server process module can be configured to manage generic Apache processes. Follow these steps to configure the Oracle HTTP Server process module to manage generic Apache:

- Update the module definition to include the generic Apache module-id. The module definition should look similar to:

```xml
<module path="ORACLE_HOME/opmn/lib/libopmnohs.so">
  <module-id id="OHS" />
  <module-id id="GENERIC_APACHE" />
```
Alter your HTTP_Server component to manage generic Apache. A GENERIC_APACHE process has one required parameter specified as module-data. It is "apache-home" in the "start-parameters" module-data category. The "apache-home" specifies the installation directory of the generic Apache. The following example shows a generic Apache configuration:

```xml
<ias-component id="HTTP_Server">
  <process-type id="HTTP_Server" module-id="GENERIC_APACHE">
    <module-data>
      <category id="start-parameters">
        <data id="apache-home" value="/privatel/apbuild/runapache_1.3.27"/>
      </category>
    </module-data>
    <process-set id="HTTP_Server" numprocs="1"/>
  </process-type>
</ias-component>
```
This chapter describes OC4J configuration in the OPMN opmn.xml file. It features the following topics:

- Section 8.1, "OC4J Process Module Configuration"
- Section 8.2, "OC4J Minimum Configuration"
- Section 8.3, "OC4J Complete Configuration"
- Section 8.5, "OC4J Attribute Descriptions"

8.1 OC4J Process Module Configuration

The following lines load and identify the OC4J process module. Management of OC4J processes by the process module are identified by the module id.

```
<module path="ORACLE_HOME/opmn/lib/libopmnoc4j.so">
    <module-id id="OC4J" />
</module>
```

8.2 OC4J Minimum Configuration

The following lines represent the minimum configuration for OC4J. Default values are assigned to all other configuration elements and attributes for OC4J.

```
<ias-component id="OC4J">
    <process-type id="home" module-id="OC4J">
        <port id="ajp" range="3301-3400" />
        <port id="rmi" range="3101-3200" />
        <port id="jms" range="3201-3300" />
        <process-set id="default-group" numprocs="1"/>
    </process-type>
</ias-component>
```

8.3 OC4J Complete Configuration

The complete configuration example in this section showcases the attributes of OC4J configuration that you can control. It contains all possible configuration elements and attributes that can be used with this component.

```
<ias-component id="OC4J" status="enabled" id-matching="false">
    <environment>
        <variable id="LD_LIBRARY_PATH" value="ORACLE_HOME/lib" append='true' />
    </environment>
</ias-component>
```
8.4 OC4J Group Configuration

The following lines represent an example OC4J group configuration for OC4J. Default values are assigned to all other configuration elements and attributes for OC4J.

```
<ias-component id="COLORS">
  <process-type id="home" module-id="OC4J">
    <port id="ajp" range="3301-3400" />
    <port id="rmi" range="3101-3200" />
    <port id="jms" range="3201-3300" />
  </process-type>
  <process-type id="oc4j_soa" module-id="OC4J">
    <port id="ajp" range="3301-3400" />
    <port id="rmi" range="3101-3200" />
    <port id="jms" range="3201-3300" />
  </process-type>
</ias-component>
```

See Also: Section 3.2, "OC4J Groups" for more information.
8.5 OC4J Attribute Descriptions

This section describes the attributes that are specific for OC4J. This section also provides attribute descriptions of the attributes.

The OC4J attributes are described with the following format:

- **Title**: This is the attribute name and value being defined. For example, \texttt{id="OC4J"}.
- **Required**: This field defines whether or not the attribute is required in the component definition.
- **Default**: This defines the default value assigned to the attribute. The default value appears in the installed version of the \texttt{opmn.xml} file or is assigned internally if the attribute is not present.
- **Valid values**: If applicable, this field defines the valid values for the attribute. For example, \texttt{OC4J}.
- **Path**: This field defines in which elements the attribute can appear. For example, \texttt{ias-component}.

\texttt{id="OC4J"}

Required: true  
Default: none  
Valid values: OC4J  
Path: ias-component

The \texttt{id} name is required and cannot be changed. The \texttt{id} must match the entry in the \texttt{targets.xml} file or Application Server Control Console will not work.

\texttt{environment}

Required: false  
Default: none  
Path: ias-component

The \texttt{environment} element can be specified at multiple levels within the Oracle Application Server component. This concept is important for the OC4J module because OC4J processes can be part of other Oracle Application Server components. In those cases, the required environment may have to be specified at the \texttt{ias-component/process-type} level.

\texttt{process-type}

Required: true  
Default: none  
Path: ias-component

For OC4J processes, the \texttt{process-type} element is administratively equivalent to an OC4J instance.

\texttt{module-id="OC4J"}

Required: true  
Default: none  
Path: ias-component/process-type
The module-id associates the process with a module. For OC4J processes, this id has to match the module-id specified in the process module configuration for the OC4J module.

**port**

Required: true  
Default: none  
Path: ias-component/process-type

The OC4J processes will not be started up unless port elements for ajp and rmi ports are configured. An OC4J process can be pinged at the ajp ports; therefore one of the ports has to be configured. If both type of ports are configured, then the ajp port is used for pinging. In addition to the ajp and rmi ports, you can also configure other port types that will be passed in to the OC4J process at the command line during process startup.

**id="ajp"**

Required: true  
Default: none  
Path: ias-component/process-type/port

A port element defining ajp port values is required.

**id="rmi"**

Required: true  
Default: none  
Path: ias-component/process-type/port

A port element defining rmi port values is required.

**id="jms"**

Required: true  
Default: none  
Path: ias-component/process-type/port

A port element defining jms port values is required.

**range**

Required: true  
Default: none  
Valid values: range of ports, individual port numbers or 0  
Path: ias-component/process-type/port

This attribute is used to specify valid port ranges, comma separated list of ports or a mix of both. For port selection by the operating system to select ports, specify 0 and the OC4J process will use a port provided by the system.

**<process-set>**

Required: true  
Default: none  
Path: ias-component/process-type
For OC4J processes, the `process-set` element is administratively equivalent to an OC4J group.

**id="start-parameters"**

- Required: false
- Default: none
- Path: `ias-component/process-type/process-set/module-data/category`

The `start-parameters` id is a category that collects all of the parameters that are relevant for the startup of an OC4J process.

**id="java-options"**

- Required: false
- Default: none
- Valid values: any options acceptable to Java
- Path: `ias-component/process-type/process-set/module-data/category/data`

OC4J requires that some `java-options` be passed to start and stop commands. These options are derived internally by OPMN, are not part of the `opmn.xml` file configuration, and cannot be overridden. Additional `java-options` may be specified using this `module data` element.

**id="oc4j-options"**

- Required: false
- Default: none
- Valid values: any options acceptable to the OC4J executable
- Path: `ias-component/process-type/process-set/module-data/category/data`

OC4J processes require options to be passed in as part of the start or stop commands to function correctly. These options cannot be overridden. In addition to these options, other options can be passed in through this `module data` element. There is no default value for this data element.

**id="config-file"**

- Required: false
- Default: `ORACLE_HOME/j2ee/<process-type id>/config/server.xml`
- Valid values: any full path to an existing configuration file
- Path: `ias-component/process-type/process-set/module-data/category/data`

The configuration file is an OC4J option in the start command. The default value for this data element is built from the `ORACLE_HOME` variable and OC4J instance name (`process-type id`).

**id="java-bin"**

- Required: false
- Default: `ORACLE_HOME/jdk/bin/java`
- Valid values: Full path to `java.exe`
- Path: `ias-component/process-type/process-set/module-data/category/data`
The default value is the complete path to Java that is available in the installation. You can specify alternate paths to the Java executable. However, a valid version of Java will have to be used for the process to start up and work correctly.

**id="routing-id"**

Required: false  
Default: none  
Parents: category  
Attributes: value

The *routing-id* defines the value for the routing ID module.

**value="routing id"**

Required: true  
Default: none  
Valid Values: Any string.

The Routing ID specifies a routing relationship between OC4J and Oracle HTTP Server. In other words, an Oracle HTTP Server routes to every OC4J that it shares a routing ID with. Out of the box, the routing ID is specified as a module data under the *ias-instance* in the *opmn.xml* file. The value of the default *routing-id* is `g_rt_id`. Because of the hierarchical nature of the *opmn.xml* file, every component configured in the *opmn.xml* file inherits the configured routing ID. You can configure a separate routing ID for any Oracle HTTP Server or OC4J by configuring a routing ID at a lower level in the *opmn.xml* file. As with most entities in the *opmn.xml* file, those that are configured at a lower level override those configured at a higher level.

**id="stop-parameters"**

Required: false  
Default: none  
Path: *ias-component*/process-type/process-set/module-data/*category*

The *stop-parameters* id is a category that includes all the parameters that are relevant for stopping an OC4J process.

**id="restart-parameters"**

Required: false  
Default: none  
Path: *ias-component*/process-type/process-set/module-data/*category*

The *restart-parameters* category is used for defining parameters that will be used in death-detection.

**id="reverseping-timeout"**

Required: false  
Default: 300 seconds  
Valid values: Any reasonable timeout value  
Path: *ias-component*/process-type/process-set/module-data/*category*/data

The *reverseping-timeout* value is the maximum allowable time between two notifications arriving from an OC4J process. As part of death-detection, the OC4J
module performs forward pings on the process also. In the event that forward pings start failing, the reverse pings are taken into account in death-detection and restart.

**id="no-reverseping-failed-ping-limit"**

- **Required:** false
- **Default:** 1
- **Valid values:** Any value that reflects the tolerance that OPMN should have for failed forward pings when reverse pings are also failing. This tolerance is used by OPMN to determine when the process should be declared as unresponsive and replaced.
- **Path:** ias-component/process-type/process-set/module-data/category/data

This module data element defines the tolerance for failed forward pings in the event that reverse pings are not being received (within the timeout period specified by reverseping-timeout data element). After the number of ping failures equals this limit, the process is deemed unresponsive and restarted by OPMN.

**id="reverseping-failed-ping-limit"**

- **Required:** false
- **Default:** 3
- **Valid values:** Any reasonable value that reflects the tolerance that OPMN should have for failed forward pings when reverse pings are being received. This tolerance is used by OPMN to determine when the process should be declared as unresponsive and replaced.
- **Path:** ias-component/process-type/process-set/module-data/category/data

This module data element defines the tolerance for failed forward pings when reverse pings are succeeding. After the number of ping failures equals this limit, the process is deemed unresponsive and restarted by OPMN.

**id="urlping-parameters"**

- **Required:** false
- **Default:** Not Applicable
- **Valid values:** Not Applicable
- **Path:** ias-component/process-type/process-set/module-data/category

The "urlping-parameters" id enables you to specify URLs for ping operations as part of OC4J process ping operations. The data under this category consists of the URL and a valid HTTP return code. AJP13 protocol is used to directly connect to the OC4J process and the HTTP return code is validated against the configured code. If there are multiple URLs configured, failure in pinging any one of them will be considered a ping failure and the process will be restarted after the ping failures limit is exceeded.

**id="/j2ee/servlet/Spy"**

- **Required:** false
- **Default:** Not Applicable
- **Valid values:** Any valid URL on the OC4J process.
- **Path:** ias-component/process-type/process-set/module-data/category/data

This is the URL in the OC4J process that will be pinged.
value="200"
Required: false
Default: Not Applicable
Valid values: Any valid HTTP return code.
Path: ias-component/process-type/process-set/module-data/category/data

The following is the HTTP code that results from ping operations to the configured URL:

```xml
<category id="security-parameters">
  <data id="wallet-file" value="file:/private/user/ssl_cert/client_cert"/>
  <data id="wallet-password" value="welcome1"/>
</category>
```

id="security-parameters"
Required: false
Default: Not Applicable
Valid values: Not Applicable
Path: ias-component/process-type/process-set/module-data/category/

The OC4J process module can perform pings over SSL. The "security-parameters" id is a category that enables you to specify the wallet file and password for such communication.

id="wallet-file"
Required: false
Default: Not Applicable
Valid values: Not Applicable
Path: ias-component/process-type/process-set/module-data/category/data

The data id whose value is the path to the wallet file (not including the filename).

value="file:/private/user/ssl_cert/client_cert"
Required: false
Default: Not applicable
Valid values: Path to a wallet file (not including the filename).
Path: ias-component/process-type/process-set/module-data/category/data

The path to the wallet file (not including the filename). The data in the wallet file is used in SSL authentication during pinging.

id="wallet-password"
Required: false
Default: Not applicable
Valid values: Not applicable
Path: ias-component/process-type/process-set/module-data/category/data

The data id that specifies the wallet password.
value = "welcome1"

Required: false
Default: Not applicable
Valid values: The valid wallet password.
Path: ias-component/process-type/process-set/module-data/category/data

This value specifies the password for the wallet.
This chapter describes Oracle Application Server Port Tunnel (OracleAS Port Tunnel) configuration in the OPMN `opmn.xml` file.

It features the following topics:

- **Section 9.1, "OracleAS Port Tunnel Process Module Configuration"**
- **Section 9.2, "OracleAS Port Tunnel Minimum Configuration"**
- **Section 9.3, "OracleAS Port Tunnel Complete Configuration"**
- **Section 9.4, "OracleAS Port Tunnel Attribute Descriptions"**

**See Also:** Oracle HTTP Server Administrator’s Guide

### 9.1 OracleAS Port Tunnel Process Module Configuration

The following lines load and identify the OracleAS Port Tunnel process module. Management of OracleAS Port Tunnel processes by the process module are identified by the `module_id`.

```xml
<module path="ORACLE_HOME/opmn/lib/libopmniaspt.so">
  <module-id id="IASPT" />
</module>
```

### 9.2 OracleAS Port Tunnel Minimum Configuration

The following lines represent the minimum configuration for OracleAS Port Tunnel. Default values are assigned to all other configuration elements and attributes for OracleAS Port Tunnel.

```xml
<ias-component id="IASPT">
  <process-type id="IASPT" module-id="IASPT">
    <process-set id="IASPT" numprocs="1"/>
  </process-type>
</ias-component>
```

### 9.3 OracleAS Port Tunnel Complete Configuration

The following example represents the complete configuration for OracleAS Port Tunnel. It contains all possible configuration elements and attributes that can be used with OracleAS Port Tunnel.
9.4 OracleAS Port Tunnel Attribute Descriptions

This section describes the attributes that are specific for OracleAS Port Tunnel. The OracleAS Port Tunnel attributes are described with the following format:

- **Title**: This is the attribute name and value being defined. For example, `id="IASPT"`.
- **Required**: This field defines whether or not the attribute is required in the component definition.
- **Default**: This defines the default value assigned to the attribute. The default value appears in the installed version of the `opmn.xml` file or is assigned internally if the attribute is not present.
- **Valid values**: If applicable, this field defines the valid values for the attribute. For example, `IASPT`.
- **Path**: This field defines in which elements the attribute can appear. For example, `ias-component`.

### id="IASPT"

Required: true  
Default: none  
Valid values: IASPT  
Path: ias-component  
Path: ias-component/process-type  
Path: ias-component/process-set

The `id` name is required and cannot be changed. The `id` name must match the entry in the `targets.xml` file.

### module-id="IASPT"

Required: true  
Default: none  
Path: ias-component/process-type

The `module-id` name defines the type of process and associates the configuration with a process module.

### id="ajp"

Required: false  
Default: none  
Valid values: ajp  
Path: ias-component/process-type/port
The `id` value should be used together with `range` in `port` property to specify the `ajp` ports to be used by the OracleAS Port Tunnel server. If the `id` is specified, the `port` number configured in the `iaspt.conf` file is overwritten.

**range="6701-6703"**
- Required: false
- Default: none
- Valid values: Any single port or a range of ports
- Path: `ias-component/process-type/port`

The `range` value should be used together with `ajp` in `port` property to specify the `ajp` ports to be used by OracleAS Port Tunnel servers.

**numprocs="3"**
- Required: true
- Default: none
- Valid values: Any number
- Path: `ias-component/process-type/process-set`

This attribute tells how many OracleAS Port Tunnel server processes to be started. The `ajp` range should be configured in the `port` property if the value is 1. If the value is greater than 1, `ajp` range has to be configured to specify enough ports for each OracleAS Port Tunnel server process. Typically, the value is 1 port for each process.
This chapter describes custom process configuration in the OPMN opmn.xml file. It features the following topics:

- Section 10.1, "Custom Process Module Configuration"
- Section 10.2, "Custom Process Minimum Configuration"
- Section 10.3, "Custom Process Complete Configuration"
- Section 10.4, "Custom Process Attribute Descriptions"

### 10.1 Custom Process Module Configuration

The following lines load and identify the custom process module. Management of custom processes by the process module are identified by the module id.

```xml
<module path="ORACLE_HOME/opmn/lib/libopmncustom.so">
  <module-id id="CUSTOM" />
</module>
```

### 10.2 Custom Process Minimum Configuration

The following lines represent the minimum configuration for a custom process. Default values are assigned to all other configuration elements and attributes for the custom process.

```xml
<ias-component id="Custom">
  <process-type id="Custom" module-id="CUSTOM">
    <process-set id="Custom" numprocs="1">
      <module-data>
        <category id="start-parameters">
          <data id="start-executable" value="Your start executable here" />
        </category>
      </module-data>
    </process-set>
  </process-type>
</ias-component>
```

### 10.3 Custom Process Complete Configuration

Example 10–1 show a complete configuration for a custom process. It contains all possible configuration elements and attributes for a custom process.
A custom process can be part of any other Oracle Application Server component. In such cases, the process-type element in Example 10–1 must be part of the component configuration.

### 10.3.1 Ping

The custom module provides the framework for pinging a custom process in one of two ways:

- HTTP ping
- script ping

The type of ping can be configured by specifying the appropriate data in the ping-parameters category. The sample Oracle Application Server configuration example Example 10–1 shows a custom process using HTTP ping. Example 10–2 is an example of script ping that you can substitute into the component configuration.

**Example 10–1 Custom Process Complete Configuration**

```xml
<ias-component id="Custom" status="enabled" id-matching="false">
  <environment>
    <variable id="TEST_ENV_VARIABLE" value="/your/test/value" append="false"/>
  </environment>
  <process-type id="Custom" module-id="CUSTOM">
    <process-set id="Custom" restart-on-death="true" numprocs="1">
      <module-data>
        <category id="start-parameters">
          <data id="start-executable" value="Your start executable here"/>
          <data id="start-args" value="Your start args here"/>
        </category>
        <category id="stop-parameters">
          <data id="stop-executable" value="Your stop executable here"/>
          <data id="stop-args" value="Your stop args here"/>
        </category>
        <category id="restart-parameters">
          <data id="restart-executable" value="Your restart executable here"/>
          <data id="restart-args" value="Your restart args here"/>
        </category>
        <category id="ping-parameters">
          <data id="ping-type" value="http"/>
          <data id="ping-url" value="/your/ping/url"/>
          <data id="ping-host" value="abc.company.com"/>
          <data id="ping-port" value="7777"/>
          <data id="ping-limit" value="3"/>
          <data id="ping-timeout" value="300"/>
        </category>
        <category id="ready-parameters">
          <data id="use-ping-for-ready" value="false"/>
        </category>
      </module-data>
    </process-set>
  </process-type>
</ias-component>
```

Pinging with a script can be configured as shown in Example 10–2.

**Example 10–2 Ping Type Script**

```xml
<category id="ping-parameters">
  <data id="ping-type" value="http"/>
  <data id="ping-url" value="/your/ping/url"/>
  <data id="ping-host" value="abc.company.com"/>
  <data id="ping-port" value="7777"/>
  <data id="ping-limit" value="3"/>
  <data id="ping-timeout" value="300"/>
</category>
```
You can use pinging (when available) for determining the readiness of a process. This indicates that OPMN needs confirmation that a managed process has started successfully after creation. Processes can inform OPMN of their ready status in various ways. The custom module enables these processes to communicate readiness through pinging. If you configure pinging for a custom process, you can also use this mechanism to determine if the process is ready. You can choose not to configure any mechanism for determining readiness in which case the custom module just assumes that the process started successfully.

Note: The ready ping, if configured, is created soon after the process is created. If the process takes a while to initialize and respond to pings, then using pinging for determining readiness is not appropriate. This is because if the process does not respond to the "ready ping", OPMN will determine that the process did not start correctly and stop it.

10.4 Custom Process Attribute Descriptions

This section describes the attributes that are specific for a custom process. This section also provides attribute descriptions of the attributes.

The custom process attributes are described with the following format:

- **Title**: This is the attribute name and value being defined. For example, `id="Custom"`.
- **Required**: This field defines whether or not the attribute is required in the component definition.
- **Default**: This defines the default value assigned to the attribute. The default value appears in the installed version of the `opmn.xml` file or is assigned internally if the attribute is not present.
- **Valid values**: If applicable, this field defines the valid values for the attribute. For example, `custom`.
- **Path**: This field defines in which elements the attribute can appear. For example, `ias-component`.

**id="Custom"**

- Required: true
- Default: none
- Valid values: Any id of your choice
- Path: `ias-component`
- Path: `ias-component/process-type`
- Path: `ias-component/process-type/process-set`

This id is required and can be any name you choose. The id cannot be a duplicate of existing names.

**module-id="CUSTOM"**

- Required: true
Default: none  
Valid values: The same as the module-id specified in Section 10.1, "Custom Process Module Configuration".  
Path: `ias-component/process-type`  

The module-id associates the process with a module. For Custom processes, this `id` has to match the module-id specified in Process Module Configuration for the Custom module.

### `id="start-parameters"`

- **Required:** true  
- **Default:** none  
- **Path:** `ias-component/process-type/process-set/module-data/category`  

The `start-parameters` category contains child elements specifying the start executable and start arguments.

### `id="start-executable"`

- **Required:** true  
- **Default:** none  
- **Valid values:** a valid executable to run  
- **Path:** `ias-component/process-type/process-set/module-data/category/data`  

This data element specifies the name of the executable to be started.

### `id="start-args"`

- **Required:** false  
- **Default:** none  
- **Valid values:** Valid arguments to the executable specified by `start-executable` data element.  
- **Path:** `ias-component/process-type/process-set/module-data/category/data`  

The value of this data element should be a string containing all the arguments for the start executable. Multiple data elements with this `id` should not be specified.

### `id="stop-parameters"`

- **Required:** false  
- **Default:** none  
- **Path:** `ias-component/process-type/process-set/module-data/category`  

The `stop-parameters` category contains child elements specifying the stop executable and stop arguments. If this category is not configured, OPMN stops the process with the kill command.

### `id="stop-executable"`

- **Required:** false  
- **Default:** none
Path:
ias-component/process-type/process-set/module-data/category/data

This data element specifies the name of the executable to be used for stopping the process.

**id=**"stop-args"

Required: false  
Default: none  
Path:
ias-component/process-type/process-set/module-data/category/data

The value of this data element should be a string containing all the arguments to the stop executable. Multiple data elements with this id should not be specified.

**id=**"restart-parameters"

Required: false  
Default: none  
Path: ias-component/process-type/process-set/module-data/category

The restart-parameters category contains child elements specifying the restart executable and restart arguments. This category needs to be configured if the process has an explicit restart command. In the absence of a restart command, a stop followed by the start command will be executed whenever the process needs to be restarted.

When restart data is specified, OPMN assumes that the process ID of the process remains the same after a restart. If there is no explicit restart command available for the process, a stop followed by a start is issued. In this scenario, a process ID change is acceptable.

**id=**"restart-executable"

Required: false  
Default: none  
Valid values: A valid restart executable name  
Path: 
ias-component/process-type/process-set/module-data/category/data

This data element specifies the name of the executable to be used for restarting the process.

**id=**"restart-args"

Required: false  
Default: none  
Valid values: valid arguments to the restart executable  
Path: 
ias-component/process-type/process-set/module-data/category/data

The value of this data element should be a string containing all the arguments to the restart executable. Multiple data elements with this id should not be specified.
id="ping-parameters"

Required: false  
Default: none  
Path: ias-component/process-type/process-set/module-data/category

Custom processes that are pinged through the HTTP protocol must specify this category. This module data category consists of all the data required to perform such a ping.

id="ping-type"

Required: false  
Default: none  
Valid values: http, script  
Path: ias-component/process-type/process-set/module-data/category/data

Custom processes that wish to be pinged have to specify this module data.

See Also:
- Example 10-1, "Custom Process Complete Configuration"
- Example 10-2, "Ping Type Script"

id="ping-url"

Required: false  
Default: /  
Valid values: Any valid URL  
Path: ias-component/process-type/process-set/module-data/category/data

This data element is used to specify the URL at which the process will be pinged. The listed parameters are used for HTTP pings.

id="ping-host"

Required: false  
Default: none  
Valid values: A valid hostname to which a custom process is bound.  
Path: ias-component/process-type/process-set/module-data/category/data

This data element is used to specify the host name to which a custom process is bound. If this data is not specified, pinging will not be performed. If an invalid hostname is specified, the process-set will be disabled.

id="ping-port"

Required: false  
Default: none  
Valid values: A valid port at which a custom process is listening for HTTP requests  
Path: ias-component/process-type/process-set/module-data/category/data

See Also:
- Example 10-1, "Custom Process Complete Configuration"
- Example 10-2, "Ping Type Script"
data

The port at which a custom process is listening. If this data is not specified, pinging will not be performed. If an invalid port is specified, the process-set will be disabled.

**id="ping-limit"**

Required: false  
Default: 3  
Valid values: Any reasonable value that reflects the tolerance that OPMN should have for failed pings. This tolerance is used by OPMN to determine when the process should be declared unresponsive and restarted.  
Path: `ias-component/process-type/process-set/module-data/category/data`

This module data element defines the tolerance for failed pings. After the number of ping failures reaches this limit, the process is deemed unresponsive and restarted by OPMN.

**id="ping-timeout"**

Required: false  
Default: 300 seconds  
Valid values: Any reasonable timeout value  
Path: `ias-component/process-type/process-set/module-data/category/data`

The timeout value specified with this data element is used as the maximum time OPMN will wait for a ping response. If a response is not obtained within the timeout period, the ping attempt will be considered a failure.

**id="script-executable"**

Required: false  
Default: none  
Valid values: A valid script executable  
Path: `ias-component/process-type/process-set/module-data/category/data`

This data element specifies the name of the executable to be used for pinging the process. An exit value of 0 from this executable is considered success. All other values indicate a ping failure.

**id="script-args"**

Required: false  
Default: none  
Valid values: valid arguments to the ping executable  
Path: `ias-component/process-type/process-set/module-data/category/data`

The value of this data element should be a string containing all the arguments to the ping executable. Multiple data elements with this id should not be specified.

**id="ready-parameters"**

Required: false
Default: none
Path: ias-component/process-type/process-set/module-data/category

The module data category to indicate if pinging should be used to determine that a custom process started successfully.

**id="use-ping-for-ready"**

Required: false
Default: false
Valid values: true or false
Path: ias-component/process-type/process-set/module-data/category/data

The value of this data element determines if pinging should be used to determine if a process is available.
This chapter describes some troubleshooting tips for OPMN. It features the following topics:

- Section A.1, "Problems and Solutions"
- Section A.2, "Diagnosing OPMN Problems"
- Section A.3, "Need More Help?"

A.1 Problems and Solutions

This section describes some of the common problems encountered when using OPMN. It features the following topics:

- Section A.1.1, "Oracle Application Server Process Does Not Start"
- Section A.1.2, "Determining if Oracle Application Server Processes are Dying or Unresponsive"
- Section A.1.3, "opmnctl Command Execution Times Out"
- Section A.1.4, "Oracle Application Server Component Automatically Restarted by OPMN"
- Section A.1.5, "Unexpected opmnctl start Behavior"
- Section A.1.6, "Disabled Element in the opmn.xml File"
- Section A.1.7, "Unable to Start OC4J"
- Section A.1.8, "Unable to Stop Component"
- Section A.1.9, "globalInitNLS Error"
- Section A.1.10, "Start Remote Hosts of a Cluster Independently"
- Section A.1.11, "OPMN Start Up Consumes CPU Processing Capability"
- Section A.1.12, "Error Messages During Start-up of OPMN"
- Section A.1.13, "Disable, or Reconfigure, Firewall When Creating Topology Using Multi-Cast Address Configuration"

A.1.1 Oracle Application Server Process Does Not Start

**Problem**

Unable to start an Oracle Application Server process using OPMN.
Solution
Try the following if you are unable to start an Oracle Application Server process using OPMN:

- Verify and if necessary, correct, the command input. Confirm the spelling and choice of option for the command you are entering.

---

Note: Do not use command line scripts or utilities from previous versions of Oracle 9i Application Server or Oracle Application Server for starting OPMN or Oracle Application Server components.

---

- Review the standard out output log for the Oracle Application Server process. Output from the process console is located in the ORACLE_HOME/opmn/logs directory. For example, the standard output log for Oracle HTTP Server may be HTTP_Server-1.
- Verify the dependency requirements for the Oracle Application Server process you are attempting to start.
- Verify the element values for the Oracle Application Server component in the opmn.xml file. Use the opmnctl validate command to verify configuration of opmn.xml file. You may have mis-configured the opmn.xml for the Oracle Application Server component you are attempting to start.

A.1.2 Determining if Oracle Application Server Processes are Dying or Unresponsive

Problem
Your Oracle Application Server processes are dying or unreachable.

Solution
If your Oracle Application Server processes are dying or unreachable:

- Review the Oracle Application Server component specific output in the ORACLE_HOME/opmn/logs.
  Look at the ORACLE_HOME/opmn/logs/opmn.log for Oracle Application Server processes. Look for process crashed or process unreachable messages. OPMN automatically restarts Oracle Application Server processes that die or become unresponsive.

  See Also: Section A.2.1, "OPMN log Files"

- Create event scripts for any pre-stop or post-crash events. The event scripts could be used to create a specific log file or send you an email about a failure.

  See Also: Section A.2.4, "Troubleshooting with Event Scripts"

A.1.3 opmnctl Command Execution Times Out

Problem
The time it takes to execute an opmnctl command is dependent on the type of Oracle Application Server process and available computer hardware. Because of this the time it takes to execute an opmnctl command may not be readily apparent.
The default start time out for OC4J is approximately five minutes. If an OC4J process does not start-up after an opmnctl command, OPMN will wait approximately an hour before timing out and aborting the request.

**Solution**

To verify successful execution of the opmnctl command, try the following:

1. Increase the start element timeout attribute for the component that is not starting. Set the timeout in the opmn.xml file at a level that will allow OPMN to wait for process to come up. This functionality is available with the startproc command which will start all the relevant processes configured in opmn.xml.

2. Check the start element in the opmn.xml file and change the retry attribute to a higher increment of time.

3. Look at the ORACLE_HOME/opmn/logs/ for the Oracle Application Server process that is not starting.

4. Review the component-specific log file for the Oracle Application Server component that is not starting. For example, ORACLE_HOME/opmn/logs/OC4J~home~default_group~1.

**See Also:**  Chapter 6, "opmn.xml Common Configuration"

### A.1.4 Oracle Application Server Component Automatically Restarted by OPMN

**Problem**

An Oracle Application Server component is automatically restarted by OPMN.

**Solution**

If an Oracle Application Server component is automatically restarted by OPMN, try the following:

- Review the message for the Oracle Application Server component in the ORACLE_HOME/opmn/logs/opmn.log file.
- Verify that the ping timeout for the Oracle Application Server component is sufficient. An Oracle Application Server component that receives a lot of activity may require an increase in the length of time for the timeout. Increase the ping timeout element in the Oracle Application Server component opmn.xml file.

### A.1.5 Unexpected opmnctl start Behavior

**Problem**

Occasionally, there is unexpected behavior when you use the opmnctl start command to start OPMN; either only OPMN is started or OPMN makes a best effort to start Oracle Application Server OPMN-managed processes. Typically, this unexpected behavior is due to turning-off or rebooting your computer without first shutting down OPMN. When you restart your computer, all OPMN-managed processes are started.

**Solution**

Oracle recommends that you shutdown OPMN before shutting down your computer. Use the opmnctl stopall command to stop OPMN and OPMN-managed processes.
On the Microsoft Windows operating system, you can use the Windows services control panel to stop OPMN and OPMN-managed processes.

---

**Note:** OPMN keeps a record on disk of the expected status of the processes it manages. If a computer goes down while OPMN is running, upon restart OPMN will use the information cached on disk and make a best effort attempt to automatically restart all processes that were running at the time the system went down. This may catch some users off guard who start only OPMN and notice that processes managed by OPMN have also been started even though an explicit request to start those processes has not been issued. You can suppress this automatic process recovery by removing all files located in the `ORACLE_HOME/opmn/logs/states` directory before attempting to start OPMN.

The states directory and its contents should not be modified by the user if OPMN or any process managed by OPMN is running. Oracle recommends not modifying the `/states` directory.

---

**A.1.6 Disabled Element in the opmn.xml File**

**Problem**

Unable to start an Oracle Application Server process.

**Solution**

If you are unable to start an Oracle Application Server process, check if an element in the Oracle Application Server `opmn.xml` file is disabled. If an element in the `opmn.xml` file is disabled OPMN will generate an output message of "Missing" or "Disabled".

---

**A.1.7 Unable to Start OC4J**

**Problem**

If you have multiple Oracle Application Server installations on one host and you start them at the same time (for example, to start a cluster), OPMN may become unresponsive. You may receive an error message such as:

"failed to restart a managed process after the maximum retry limit"

This may occur when two Oracle homes on the same host use the same port ranges for RMI, JMS, and AJP ports. An OC4J instance in one Oracle home is trying to use the same port as an OC4J instance in a different Oracle home.

Port allocation for all OC4J instances within Oracle Application Server is controlled by OPMN; there can be overlapping port ranges within a single `opmn.xml` file. However, when two OPMN processes on a host start at the same time, there is no coordination between them on port usage.

**Solution**

To coordinate port usage, assign unique port ranges to each Oracle home. The OPMN process in one Oracle home and the OPMN in a different Oracle home will not attempt to use the same port numbers when assigning OC4J ports, and will not attempt to bind to the same port.
It is also recommended that you increase the maximum number of retries for starting OC4J instances. If you have identical port ranges in two Oracle homes and increase the number of times OPMN attempts to restart a process, OPMN will eventually select a port that works. This technique ultimately does not eliminate the problem, because there is the possibility that OPMN will not find a port that works in the number of port connection attempts that you have specified in the opmn.xml file.

---

**Note:** Oracle Application Server Administrator’s Guide

---

### A.1.8 Unable to Stop Component

**Problem**
If you are unable to stop Oracle Application Server components or OPMN-managed processes using the `opmnctl stop` or `opmnctl stopall` commands, the component or process was most likely not started using OPMN. The component or process might have been started using a startup script or utility.

**Solution**
Oracle Application Server components and OPMN-managed processes should never be started or stopped manually. Do not use command line scripts or utilities from previous versions of Oracle Application Server for starting and stopping Oracle Application Server components.

Use the Application Server Control Console and the `opmnctl` command line utility to start or stop Oracle Application Server components and OPMN-managed processes.

**See Also:** Chapter 5, "Using OPMN"

### A.1.9 globalInitNLS Error

**Problem**
You may receive a `globalInitNLS` error when executing the `opmnctl` command. The following error message is displayed:

```
'globalInitNLS: NLS boot file not found or invalid -- default linked-in boot block used XML parser init: error 201.'
```

**Solution**
This error occurs when the `ORA_NLS33` environmental variable is set. This environmental variable should not be set.

### A.1.10 Start Remote Hosts of a Cluster Independently

**Problem**
Starting a cluster of remote hosts using Application Server Control Console will result in an unknown status. This occurs because ONS is bound to the local host IP address and it is not reachable from remote hosts.
Solution
Oracle recommends starting each member of the cluster independently to effectively monitor and obtain the status from remote hosts. Additionally, make sure ONS is not bound to local host IP address.

A.1.11 OPMN Start Up Consumes CPU Processing Capability

Problem
On some computers, when OPMN starts up, it consumes large amounts of CPU processing capability. This can vary from approximately 50% to 60% of your computer’s CPU processing capabilities. In affected computers, the OPMN CPU processing consumption will continue until OPMN is shutdown.

Solution
The following are some possible causes for the excessive CPU processing consumption:

- the installation environment used multibyte text character sets such as Japanese.
- the multi-cast address for all ONS servers is mis-configured in the opmn.xml file.
  ONS uses this address to discover all other instances in the cluster

A.1.12 Error Messages During Start-up of OPMN

Problem
When trying to start OPMN using the opmnctl start or opmnctl startall commands you receive the following error messages:

pingwait exits with 1220384

or

pingwait exits with 1220396

These error messages are generated when there are syntax errors in the ORACLE_HOME/opmn/conf/opmn.xml that need to be corrected.

Solution
If you encounter these error messages do the following:

- run the following command (with the complete directory path to the opmn.xml file):
  prompt > opmnctl validate opmn.xml

- remove all empty tags from the opmn.xml file.

A.1.13 Disable, or Reconfigure, Firewall When Creating Topology Using Multi-Cast Address Configuration

Problem
When setting up a network of Oracle Application Server instances to form a topology using the multi-cast address configuration for all ONS servers, some of the instances are not recognized by OPMN.
Solution
If you are planning to network multiple Oracle Application Server instances to form a topology, by using the multi-cast address configuration for all ONS servers in the opmn.xml file, you must disable, or reconfigure, the firewall before initiating networking with other Oracle Application Server instances.

If the firewall is not disabled, or reconfigured, the multi-cast information for setting up the network may not get through and the topology will not be setup correctly. All of the OPMN ports must be allowed to accept incoming notifications.

A.1.14 Increasing Size of opmn.log File

Problem
If you install Oracle Application Server on a computer that contains a previous installation of the Oracle Database or Oracle Application Server, the ORACLE_HOME/opmn/logs/opmn.log file increases in size to over 4100000 KB due to continuous logging. The file may contain the following error message:

'[ons-connect] Local connection 127.0.0.1,6100 invalid form factor '

Solution
Change the request port for the opmn.xml file to a value greater than the 6100. For example:

```
<port local="6202" remote="6302" request="6105"/>
```

This error is most often caused by a conflict with a previous Oracle Database or Oracle Application Server installation on the same computer. The above occurs due to entries in the oraInventory directory of an existing or previous installation of Oracle Database or Oracle Application Server.

A.2 Diagnosing OPMN Problems

There are several methods for troubleshooting any problems you may have using OPMN:

- Section A.2.1, "OPMN log Files"
- Section A.2.2, "opmnctl debug"
- Section A.2.3, "Oracle Enterprise Manager 10g Application Server Control Console"
- Section A.2.4, "Troubleshooting with Event Scripts"
- Section A.2.5, "opmn.xml Environment Variables"

A.2.1 OPMN log Files

The OPMN log files enable you to troubleshoot difficulties you might have in execution and use of OPMN and OPMN-managed processes. OPMN and OPMN-managed processes generate log files during processing. You can review the following generated log files to verify successful or unsuccessful execution of an OPMN command:

- ORACLE_HOME/opmn/logs/opmn.out: contains the standard output (stdout) and standard error (stderr) logs of OPMN. Also referred to as the OPMN
“console log”. After a certain point in OPMN initialization, nothing else will be written to this file. Only a small set of messages will ever appear in this file; therefore, this file may not be present if you conduct a search through the log file directories.

- **Process control log files** *(ORACLE_HOME/opmn/logs/)*: contain the standard output and standard error of OPMN managed processes. OPMN creates a log file for each component and assigns a unique concatenation of the Oracle Application Server component with a number. For example, the standard output log for OC4J may be OC4J-home-default_group-1. When a process terminates and is replaced by a new process, console log output from the previous process is preserved and the replacement process appends to the end of the console log file. The process specific console logs are the first and best resource for investigating problems related to starting and stopping components.

- **ORACLE_HOME/opmn/logs/opmn.log**: tracks command execution and operation progress. It contains messages useful for monitoring the operations of the OPMN server. Output written to the opmn.log file contains the exit status of a child OPMN process. A status code of 4 indicates a normal reload of OPMN. All other status codes indicate an abnormal termination of the child OPMN process. The opmn.log file is configured using the `<log>` attribute in the opmn.xml file. Refer to Chapter 6, "opmn.xml Common Configuration" for more information.

- **ORACLE_HOME/opmn/logs/opmn.dbg**: contains OPMN debug log messages (English only) for ONS and PM. Review the error codes and messages that are shown in the opmn.dbg file. The PM portion of OPMN generates and outputs the error messages in this file. The opmn.dbg file tracks command execution and operation progress. The level of detail that gets logged in the opmn.dbg can be modified by configuration of the `<debug>` element in the opmn.xml file. Refer to Chapter 6, "opmn.xml Common Configuration" for examples of debug levels.

Use the opmn.dbg file to debug the ONS portion of OPMN or for early OPMN errors. The ONS portion of OPMN is initialized before PM. Therefore, errors that occur early in OPMN initialization will show up in the opmn.dbg file.

Enable usage of the opmn.dbg file only after conferring with Oracle Support. The opmn.dbg file is used by Oracle Support to debug and diagnose OPMN issues. Messages that are contained in the opmn.dbg file are typically not readily comprehensible to the user.

### A.2.1.1 opmn.log and opmn.dbg File Rotation

OPMN enables you to rotate the opmn.log and opmn.dbg files based on parameters of file size, specific time, or both, as a basis for file rotation. You can enable rotation by configuring the `rotation-size` and `rotation-hour` attributes of the `<log>` and `<debug>` tags in the opmn.xml file. When either the log file grows to a specified size or the specified time of the day is reached, or a combination of both parameters, the OPMN logging mechanism will close the file, rename the file with a unique time stamp suffix, and then create a new opmn.log or opmn.dbg file.

The OPMN console log file (opmn.out) is not rotated; this file is typically very small in size. Once OPMN surpasses an point of initialization, output is no longer generated to the console output file; therefore, only a relatively small set of messages will appear in this file.
A.2.1.2 Process Console log File Rotation

At process startup, before handing off an existing console log file to a managed process, OPMN checks the size against a configured limit (rotation-size attribute of the <log> tag). If the file size exceeds the limit, OPMN will rename the existing file to include a time stamp, and then create a new file for the managed process. If the rotation-size attribute is not configured, OPMN will not be able rotate the process console log file.

A.2.2 opmnctl debug

Use the opmnctl debug command to verify the status of an Oracle Application Server process and whether any actions are pending. This command generates output that can be used in conjunction with contact to your local Oracle support to diagnose your OPMN problem.

The syntax for the opmnctl debug command is:

```
opmnctl [<scope>] debug [comp=pm|ons] [interval=<secs> count=<num>]
```

where @scope is the optional scope for the request.

Output is generated following execution of the opmnctl debug command. Oracle recommends that you contact Oracle support to use the generated output to assist in diagnosis of your problem.

The attributes (<attr>) name for this command are either comp, interval, or count. The value for comp can be either ons or pm, representing ONS and PM, respectively. If comp is not specified, then both ons and pm debug information is reported. For example, the following command outputs debug information for ONS.

```
prompt > opmnctl debug comp=ons
```

You can specify the interval in seconds and number of requests sent to OPMN to assist in the debugging process. The values of <interval> and <count> must always be specified together. Values for them should be integers greater than 0. For example, the following command, outputs debug information at an interval of 5 seconds 3 times.

```
prompt > opmnctl debug comp=pm interval=5 count=3
```

Contact your local Oracle support to assist you in using the opmnctl debug command to diagnose your OPMN problem.

A.2.3 Oracle Enterprise Manager 10g Application Server Control Console

Application Server Control Console provides a graphical interface that enables diagnosis of Oracle Application Server components in your network and enterprise. Application Server Control Console features a log page. The log page enables you to view all of the Oracle Application Server log files in one place and trace problems across multiple log files. Application Server Control Console uses an API that contacts OPMN.

You can use Application Server Control Console to enable or disable Oracle Application Server components: You can disable components so they do not start when you start an Oracle Application Server instance.

See Also: Oracle Application Server Administrator's Guide
A.2.4 Troubleshooting with Event Scripts

You can create your own event scripts that record Oracle Application Server process event activities. You can create a script that records events prior to the start or stop of Oracle Application Server processes, as well as an unscheduled system crash.

Refer to the <event-scripts> element description in Chapter 6, "opmn.xml Common Configuration".

Example A–1 shows a pre-start event script.

**Example A–1 Pre-start Event Script**

```bash
#!/bin/sh

echo

timeStamp="N/A"
instanceName="N/A"
componentId="N/A"
processType="N/A"
processSet="N/A"
processIndex="N/A"
stderrPath="N/A" # not available w/pre-start unless part of restart
stdoutPath="N/A" # not available w/pre-start unless part of restart
reason="N/A"
pid="N/A" # only available with pre-stop, post-crash
startTime="N/A" # only available with pre-stop, post-crash

while [ $# -gt 0 ]; do
    case $1 in
        -timeStamp) timeStamp=$2; shift;;
        -instanceName) instanceName=$2; shift;;
        -componentId) componentId=$2; shift;;
        -processType) processType=$2; shift;;
        -processSet) processSet=$2; shift;;
        -processIndex) processIndex=$2; shift;;
        -stderr) stderrPath=$2; shift;;
        -stdout) stdoutPath=$2; shift;;
        -reason) reason=$2; shift;;
        -pid) pid=$2; shift;;
        -startTime) startTime=$2; shift;;
        *) echo "Option Not Recognized: [$1]"; shift;;
    esac
    shift
done

echo timeStamp=$timeStamp
echo instanceName=$instanceName
echo componentId=$componentId
echo processType=$processType
echo processSet=$processSet
echo processIndex=$processIndex
echo stderr=$stderrPath
echo stdout=$stdoutPath
echo reason=$reason
echo pid=$pid
echo startTime=$startTime
```
A.2.5 opmn.xml Environment Variables

The environment variable used to launch OPMN server is not inherited by the Oracle Application Server process started by OPMN server. OPMN sets the environment variables at the ias-instance level, with the values extracted either from the ias-instance configuration or from the OPMN run time environment.

See Also: Chapter 6, "opmn.xml Common Configuration"

A.3 Need More Help?

You can find more solutions on Oracle MetaLink (http://metalink.oracle.com). If you do not find a solution for your problem, log a service request.

See Also:

- Oracle Application Server Release Notes, available on the Oracle Technology Network:
  
  http://www.oracle.com/technology/documentation/
A
action, 6-27
ajp id, 8-4, 9-2
ajp ports, 9-3
Application Server Control, 2-2, 2-5, 4-6, A-9
async, 4-4, 4-9
attribute name, 4-10
attribute syntax, 4-3

C
cache-timeout, 6-36
cache-timeout attribute, 6-33
category element, 6-19
CDATA, 6-25
clu, 4-18
cluster discovery, 2-5
cluster syntax, 4-3
cmp, 4-18
command, 4-2
command definitions
  opmnctl, 4-3
comp attribute, 4-21
comp-codes, 6-3
complete configuration
  custom process, 10-1
  OC4J, 8-1
  Oracle HTTP Server, 7-2
  OracleAS Port Tunnel, 9-1
component codes, ONS, 6-4
component codes, PM, 6-4
component-id, 6-29
conditional, 6-24
config
  opmnctl, 4-2
config-file id, 7-4, 8-5
count, 9-9
cpu, 4-18
cron, 6-18
custom id, 10-3
custom module
  ping, 10-2
CUSTOM module-id, 10-3
custom process
  complete configuration, 10-1

minimum configuration, 10-1
custom process module, 10-1

D
data element, 6-19
data id, 6-20
database element, 6-31
db-connect-info, 6-31
default start time, A-3
dependencies element, 6-30
discover, 6-14
discovery server configuration, 3-4
DMS, 3-6
dmsdump
  opmnctl, 4-2, 4-20
DRM, 3-5
dynamic discovery, 3-3
Dynamic Monitoring Service, 3-6
Dynamic Resource Management, 3-5

E
enabled, 6-10
environment element, 6-22
event script
  post-crash, 3-20
  pre-start, 3-19
  pre-stop, 3-20
event script arguments, 6-38
event scripts, 3-19, A-10
event-scripts element, 6-38
example elements, 6-1
exception, 6-29

F
-fmt option, 4-17
fmtlist, 4-17
-fmtlist syntax, 4-17
form factor key, 3-21
.formfactor file, 3-20
-fsep option, 4-17
| G               | gateway, 6-15  
|                | gateway configuration, 3-5  
|                | grid computing, 2-5  
| H              | help  
|                | opmnctl, 4-2, 4-23  
|                | HTTP ping, 10-2  
|                | HTTP_Server id, 7-3  
| I              | ias-component, 4-9  
|                | ias-component element, 6-29  
|                | ias-component-id, 6-35  
|                | ias-instance attribute, 6-35  
|                | ias-instance element, 6-21  
|                | ias-instance-id, 6-35  
|                | IASPT id, 9-2  
|                | IASPT module-id, 9-2  
|                | idx, 4-18  
|                | infrastructure, 6-32  
|                | infrastructure-key, 6-31  
|                | ins, 4-18  
|                | insecure-remote-requests, 6-16  
|                | instance syntax, 4-3  
|                | interface, 6-8  
|                | interval, A-9  
|                | io-idle, 6-12  
|                | io-timeout, 6-12  
|                | ipaddr element, 6-9  
|                | IPv4, 3-22  
|                | IPv6, 3-22  
| J              | java options id, 8-5  
|                | java-bin id, 8-5  
|                | justification, 4-18  
| L              | -l option, 4-17  
|                | list-of-gateways, 6-15  
|                | list-of-nodes, 6-13  
|                | local instance  
|                | starting, 5-1  
|                | stopping, 5-1  
|                | local port, 3-22  
|                | log, 6-3  
|                | log files  
|                | OPMN, A-7  
|                | log page, A-9  
| M              | managed-process element, 6-35  
|                | max_retry, 4-20  
|                | maxprocs, 6-44  
|                | mem, 4-18  
|                | minimum configuration  
|                | custom process, 10-1  
|                | OC4J, 8-1  
|                | Oracle HTTP Server, 7-2  
|                | OracleAS Port Tunnel, 9-1  
|                | minprocs, 6-43  
|                | mode, 4-9  
|                | module, 6-17  
|                | module element, 6-17  
|                | module-data element, 6-18  
|                | module-id element, 6-21  
|                | modules  
|                | PM, 2-4  
|                | multi-cast configuration, 3-4  
|                | multiple instance  
|                | starting, 5-2  
|                | stopping, 5-3  
| N              | nodes, 6-13  
|                | -noheaders option, 4-17  
|                | no-reverseping-failed-ping-limit id, 7-5, 8-7  
|                | notification-server element, 3-3, 6-8  
|                | numprocs, 6-43, 7-3  
|                | numprocs attribute, 7-3  
|                | numprocs element, 7-3  
| O              | OC4J  
|                | complete configuration, 8-1  
|                | minimum configuration, 8-1  
|                | process module, 8-1  
|                | OC4J element, 8-3  
|                | OC4J Group  
|                | starting, 4-15  
|                | OC4J Groups, 1-1, 3-2  
|                | OC4J id, 8-3  
|                | OC4J module-id, 8-4  
|                | oc4j-options id, 8-5  
|                | OHS module id, 7-3  
|                | OHS2 module id, 7-6  
|                | OID element, 6-32  
|                | ONS, 6-9  
|                | ONS (Oracle Notification Server), 2-3  
|                | ONS component codes, 6-4  
|                | openssl-certfile, 6-11  
|                | openssl-keyfile, 6-11  
|                | openssl-lib, 6-11  
|                | openssl-password, 6-11  
|                | OPMN, 2-1, 2-2, 2-5  
|                | functionality, 2-1  
|                | log files, A-7  
|                | OPMN daemon, 4-6, 4-10  
|                | opmn element, 6-3  
|                | OPMN local listener, 3-20  
|                | opmnctl, 2-2, 4-1, 4-2, 4-6  

Index-2
Index-3

help, 4-2, 4-23
options, 4-17
ping, 4-20
process control commands, 4-9
quick reference, 4-2
stopall, 4-7
syntax, 4-2
usage, 4-7, 4-8
validate, 4-24
opmnctl attributes, 4-3
opmnctl command definitions, 4-3
opmnctl commands, 4-2
opmnctl config, 4-2, 4-13
opmnctl debug, A-9
opmnctl dmsdump, 4-2, 4-20
opmnctl help, 4-2
opmnctl option, 4-2
opmnctl ping, 4-2
opmnctl query, 4-2, 4-22
opmnctl reload, 4-2, 4-7, 4-8
opmnctl restartproc, 4-2, 4-9
opmnctl set, 4-2, 4-20
opmnctl shutdown, 4-2, 4-7
opmnctl start, 4-2, 4-6
opmnctl startall, 4-2, 4-6
opmnctl startproc, 4-2, 4-9
opmnctl status, 1-2, 4-2
OC4J Groups, 4-19
opmnctl status syntax, 4-16
opmnctl stopall, 4-2
opmnctl stopproc, 4-2, 4-7, 4-8, 4-9
opmnctl usage, 4-2
opmnctl usage syntax, 4-23
opmnctl validate, 4-2, A-2
opmnctl verbose syntax, 4-5
opmn.xml file, 2-3, 3-1
option
-fmt, 4-17
-fsep, 4-17
-l, 4-17
-noheaders, 4-17
-rsep, 4-17
options, 4-2
opmnctl, 4-17
Oracle Enterprise Manager Application Server Control, 2-5
Oracle HTTP Server
complete configuration, 7-2
minimum configuration, 7-2
process module, 7-1, 7-6
Oracle Notification Server see ONS
Oracle Process Manager Modules see PM Modules, 2-4
Oracle Process Manager see PM, 2-3
Oracle wallet, 6-11
OracleAS Port Tunnel
complete configuration, 9-1
minimum configuration, 9-1
process module, 9-1
OSSO element, 6-33
P
path, 6-3, 6-6
pid, 4-18
ping
custom module, 10-2
opmnctl, 4-2, 4-20
ping element, 6-41
ping parameters category, 7-5
ping timeout, A-3
ping-host id, 10-6
ping-limit id, 10-7
ping-parameters id, 10-6
ping-port id, 10-6
ping-timeout id, 10-7
ping-type id, 10-6
ping-url id, 7-5, 10-6
PM, 2-3
PM component codes, 6-4
PM Modules, 2-4
PM modules, 3-1
por, 4-18
port element, 6-9, 6-42
post-crash element, 6-40
post-crash event script, 3-20
pre-start event script, 3-19
pre-stop element, 6-39
pre-stop event script, 3-20
process control command
opmnctl, 4-9
process crashed, A-2
process module
custom, 10-1
OC4J, 8-1
Oracle HTTP Server, 7-1, 7-6
OracleAS Port Tunnel, 9-1
process unreachable, A-2
process-conversion, 6-20
process-manager element, 6-16
process-modules element, 6-17
process-set, 4-9
process-set element, 6-43
process-set-id, 6-35, 6-43
process-set-id attribute, 6-35
process-type, 4-9
process-type id attribute, 6-35
process-type-id, 6-35
progressive request reports, 4-11
prs, 4-18
prt, 4-18
publish-subscribe model, 2-3
Q
query
opmnctl, 4-2, 4-22
quick reference
opmnctl, 4-2
Index-3
range attribute, 8-4
range value, 9-3
ready-parameters id, 10-7
reload
  opmnctl, 4-2, 4-7, 4-8
remote, 6-9
remote instance
  starting, 5-2
  stopping, 5-2
remote port, 3-22
remote request, 3-22
request, 6-9
Resource Management Directives, 3-6
restart element, 6-41
restart-args id, 10-5
restart-executable id, 10-5
restart-parameters category, 7-5
restart-parameters id, 8-6
restartproc
  opmnctl, 4-2, 4-9
reverseping-failed-ping-limit element, 8-7
reverseping-failed-ping-limit id, 7-6, 8-7
reverseping-timeout id, 7-5, 8-6
RMD, 3-6, 3-7
rmi id, 8-4
rotation-hour, 6-5
rotation-size, 6-5
-rsep option, 4-17

S
scope, 4-1, 4-2, 4-3
script ping, 10-2
script-args id, 10-7
script-executable id, 10-7
sequential requests, 4-12
service failover, 3-18
service-weight, 6-38
set
  opmnctl, 4-2, 4-20
shutdown
  opmnctl, 4-2, 4-7
SSL, 3-20, 6-32
SSL element, 6-10, 6-34
sta, 4-18
standard out output log, A-2
start
  opmnctl, 4-2, 4-6
start element, 6-40, A-3
start order dependencies, 3-20
startall
  opmnctl, 4-2, 4-6

T
tag-id, 6-17
targets.xml file, 9-2
timeout, 4-4, 4-9
timeout attribute, 6-33, A-3
timeout value, 4-6
topology, 6-13
tune, 6-11
typ, 4-18

U
uid, 4-17, 4-18
uniqueid, 4-4, 4-10, 4-17
usage
   opmnctl, 4-2, 4-7, 4-8, 4-23
use-ping-for-ready id, 10-8
utm, 4-18

V
validate
   opmnctl, 4-2, 4-24
value, 4-3
value syntax, 4-3
variable element, 6-22
verbose, 4-2
   opmnctl, 4-5

W
wallet file, 3-22
wallet-file, 6-10, 6-32
wallet-password, 6-11, 6-33
width, 4-18
working-dir, 6-44
working-dir attribute, 6-37