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Administering Server Environments for Oracle WebLogic Server

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This document describes how to design, configure, and manage WebLogic Server environments. It is a resource for system administrators and operators responsible for implementing a WebLogic Server installation.

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Preface

This preface describes the document accessibility features and conventions used in this guide—*Administering Server Environments for Oracle WebLogic Server*.

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Conventions

The following text conventions are used in this document:

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

Introduction and Roadmap

This section describes the contents and organization of this guide—*Administering Server Environments for Oracle WebLogic Server*.

- [Document Scope and Audience](#)
- [Guide to This Document](#)
- [Related Documentation](#)
- [New and Changed Features in This Release](#)

1.1 Document Scope and Audience

This document describes how you design, configure, and manage WebLogic Server environments. It is a resource for system administrators and operators responsible for implementing a WebLogic Server installation. This document is relevant to all phases of a software project, from development through test and production phases.

It is assumed that the reader is familiar with Java EE and Web technologies, object-oriented programming techniques, and the Java programming language.

1.2 Guide to This Document

The document is organized as follows:

- This chapter, [Introduction and Roadmap](#) describes the scope of this guide and lists related documentation.
- [Using Work Managers to Optimize Scheduled Work](#) describes the WebLogic Server execution model and the process of configuring application access to the execute queue.
- [Avoiding and Managing Overload](#) describes detecting, avoiding, and recovering from overload conditions.
- [Configuring Network Resources](#) describes optimizing your WebLogic Server domain for your network.
- [Configuring Web Server Functionality](#) describes using WebLogic Server as a Web server.
- [Using the Plug-in for Oracle Virtual Assembly Builder](#) describes the WebLogic Server introspection plug-in for Oracle Virtual Assembly Builder, which can be used to examine a single WebLogic domain and the Middleware home directory in which it resides.

- [Configuring Concurrent Managed Objects](#) describes the Concurrent Managed Objects (CMOs) implemented by WebLogic Server to provide support for defining and implementing the Concurrency Utilities for Java EE 1.0 (JSR 236).
- [Using the Batch Runtime](#) describes the batch runtime implemented by WebLogic Server to provide support for defining, implementing, and running batch jobs, as defined for Java EE 7 in Batch Applications for the Java Platform (JSR 352).

1.3 Related Documentation

- *Understanding Domain Configuration for Oracle WebLogic Server*
- *Oracle WebLogic Server Administration Console Online Help*

1.4 New and Changed Features in This Release

This release of WebLogic Server enhances adds support for Java EE 7, including the following features:

- Concurrency Utilities for Java EE 1.0 (JSR 236). For information, see [Configuring Concurrent Managed Objects](#).
- Batch Applications for the Java Platform (JSR 352). For information, see [Using the Batch Runtime](#).

For a comprehensive listing of the new WebLogic Server features introduced in this release, see *What's New in Oracle WebLogic Server 12.2.1.2.0*.

Using Work Managers to Optimize Scheduled Work

This chapter describes how WebLogic Server lets you configure how your application prioritizes the execution of its work using a Work Manager. Based on rules you define and by monitoring actual run-time performance, WebLogic Server can optimize the performance of your application and maintain service-level agreements. You define the rules and constraints for your application by defining a Work Manger and applying it either globally to a WebLogic Server domain or to a specific application component.

This chapter includes the following sections:

- [Understanding How WebLogic Server Uses Thread Pools](#)
- [Understanding Work Managers](#)
- [Work Manager Scope](#)
- [Using Work Managers, Request Classes, and Constraints](#)
- [Deployment Descriptor Examples](#)
- [Work Managers and Execute Queues](#)
- [Accessing Work Managers Using MBeans](#)
- [Using CommonJ With WebLogic Server](#)

2.1 Understanding How WebLogic Server Uses Thread Pools

In previous versions of WebLogic Server, processing was performed in multiple execute queues. Different classes of work were executed in different queues, based on priority and ordering requirements, and to avoid deadlocks. In addition to the default execute queue, `weblogic.kernel.default`, there were pre-configured queues dedicated to internal administrative traffic, such as `weblogic.admin.HTTP` and `weblogic.admin.RMI`.

You could control thread usage by altering the number of threads in the default queue, or configure custom execute queues to ensure that particular applications had access to a fixed number of execute threads, regardless of overall system load.

Now WebLogic Server uses a single thread pool, in which all types of work are executed. WebLogic Server prioritizes work based on rules you define, and run-time metrics, including the actual time it takes to execute a request and the rate at which requests are entering and leaving the pool.

The common thread pool changes its size automatically to maximize throughput. The queue monitors throughput over time and based on history, determines whether to

adjust the thread count. For example, if historical throughput statistics indicate that a higher thread count increased throughput, WebLogic increases the thread count. Similarly, if statistics indicate that fewer threads did not reduce throughput, WebLogic decreases the thread count. This new strategy makes it easier for administrators to allocate processing resources and manage performance, avoiding the effort and complexity involved in configuring, monitoring, and tuning custom executes queues.

2.2 Understanding Work Managers

WebLogic Server prioritizes work and allocates threads based on an execution model that takes into account administrator-defined parameters and actual run-time performance and throughput.

Administrators can configure a set of scheduling guidelines and associate them with one or more applications, or with particular application components. For example, you can associate one set of scheduling guidelines for one application, and another set of guidelines for other applications. At run time, WebLogic Server uses these guidelines to assign pending work and enqueued requests to execution threads.

Note:

Work requests from all Work Managers are executed by a single thread pool; separate thread pools are not created for each Work Manager.

To manage work in your applications, you define one or more of the following Work Manager components:

- Fair Share Request Class
- Response Time Request Class
- Min Threads Constraint
- Max Threads Constraint
- Capacity Constraint
- Context Request Class

For more information on these components, see [Request Classes](#) or [Constraints](#).

You can use any of these Work Manager components to control the performance of your application by referencing the name of the component in the application deployment descriptor. In addition, you may define a *Work Manager* that encapsulates all of the above components (except Context Request Class; see [Example 2-3](#)) and reference the name of the Work Manager in your application's deployment descriptor. You can define multiple Work Managers—the appropriate number depends on how many distinct demand profiles exist across the applications you host on WebLogic Server.

You can configure Work Managers at the domain level, application level, and module level in one of the following configuration files, or by using the WebLogic Server Administration Console:

- `config.xml`—Work Managers specified in `config.xml` can be assigned to any application, or application component, in the domain.

- `weblogic-application.xml`—Work Managers specified at the application level can be assigned to that application, or any component of that application.
- `weblogic-ejb-jar.xml` or `weblogic.xml`—Work Managers specified at the component level can be assigned to that component.
- `weblogic.xml`—Work Managers specified for a Web application.

[Example 2-1](#) is an example of a Work Manager definition.

- [Request Classes](#)
- [Constraints](#)
- [Stuck Thread Handling](#)

Example 2-1 Work Manager Stanza

```
<work-manager>
<name>highpriority_workmanager</name>
  <fair-share-request-class>
    <name>high_priority</name>
    <fair-share>100</fair-share>
  </fair-share-request-class>
  <min-threads-constraint>
    <name>MinThreadsCountFive</name>
    <count>5</count>
  </min-threads-constraint>
</work-manager>
```

To assign the Work Manager in [Example 2-1](#) to control the dispatch policy of the entire Web application, add the code in [Example 2-2](#) to the Web application's `weblogic.xml` file:

Example 2-2 Referencing the Work Manager in a Web Application

```
<wl-dispatch-policy>highpriority-workmanager</wl-dispatch-policy>
```

To assign the Work Manager to control the dispatch policy of a particular servlet, add the following code to the Web application's `web.xml` file:

```
<servlet>
  ...
  <init-param>
    <param-name>wl-dispatch-policy</param-name>
    <param-value>highpriority_workmanager</param-value>
  </init-param>
  ...
</servlet>
```

The components you can define and use in a Work Manager are described in following sections:

2.2.1 Request Classes

A request class expresses a scheduling guideline that WebLogic Server uses to allocate threads to requests. Request classes help ensure that high priority work is scheduled before less important work, even if the high priority work is submitted after the lower priority work. WebLogic Server takes into account how long it takes for requests to each module to complete.

Request classes define a best effort. They do not guarantee that the configured ratio will be maintained consistently. The observed ratio may vary due to several factors during a period of sufficient demand, such as:

- The mixture of requests from different request classes in the queue at any particular time. For example, more requests than the configured ratio may be processed for a lower priority request class if there are not enough requests from a higher priority request class in the Work Manager queue.
- Because the ratio is specified in terms of thread-usage time, a larger number of shorter requests could be processed in the same amount of thread-usage time as a smaller number of time-consuming requests.

There are multiple types of request classes, each of which expresses a scheduling guideline in different terms. A Work Manager may specify only one request class.

- `fair-share-request-class`—Specifies the average thread-use time required to process requests. The default fair share value is 50.

For example, assume that WebLogic Server is running two modules. The Work Manager for `ModuleA` specifies a `fair-share-request-class` of 80 and the Work Manager for `ModuleB` specifies a `fair-share-request-class` of 20.

During a period of sufficient demand, with a steady stream of requests for each module such that the number requests exceed the number of threads, WebLogic Server will allocate 80% and 20% of the thread-usage time to `ModuleA` and `ModuleB`, respectively.

Note:

The value of a fair share request class is specified as a relative value, not a percentage. Therefore, in the above example, if the request classes were defined as 400 and 100, they would still have the same relative values.

- `response-time-request-class`—Specifies a response time goal in milliseconds. Response time goals are not applied to individual requests. Instead, WebLogic Server computes a tolerable waiting time for requests with that class by subtracting the observed average thread use time from the response time goal, and schedules requests so that the average wait for requests with the class is proportional to its tolerable waiting time.

For example, given that `ModuleA` and `ModuleB` in the previous example, have response time goals of 2000 ms and 5000 ms, respectively, and the actual thread use time for an individual request is less than its response time goal. During a period of sufficient demand, with a steady stream of requests for each module such that the number of requests exceed the number of threads, and no "think time" delays between response and request, WebLogic Server will schedule requests for `ModuleA` and `ModuleB` to keep the average response time in the ratio 2:5. The actual average response times for `ModuleA` and `ModuleB` might be higher or lower than the response time goals, but will be a common fraction or multiple of the stated goal. For example, if the average response time for `ModuleA` requests is 1,000 ms., the average response time for `ModuleB` requests is 2,500 ms.

The previous sections described request classes based on fair share and response time by relating the scheduling to other work using the same request class. A mix of fair share and response time request classes is scheduled with a marked bias in favor of response time scheduling.

- `context-request-class`—Assigns request classes to requests based on context information, such as the current user or the current user's group.

For example, the `context-request-class` in [Example 2-3](#) assigns a request class to requests based on the value of the request's `subject` and `role` properties.

The `high_fairshare` and `low_fairshare` request classes referenced by the `context_workmanager` in [Example 2-3](#) could be defined in the `config.xml` as follows:

```
<self-tuning>
  ...
  <fair-share-request-class>
    <name>high_fairshare</name>
    <target>myserver</target>
    <fair-share>75</fair-share>
  </fair-share-request-class>
  <fair-share-request-class>
    <name>low_fairshare</name>
    <target>myserver</target>
    <fair-share>25</fair-share>
  </fair-share-request-class>
  ...
</self-tuning>
```

Note:

If a Web application's Work Manager references a context request class, the first user call will go through the default request class; subsequent calls in same session will go through the user-defined request class.

When using context request classes, set session timeout values to prevent sessions from expiring while requests wait in the Work Manager queue.

Example 2-3 Context Request Class

```
<work-manager>
  <name>context_workmanager</name>
  <context-request-class>
    <name>test_context</name>
    <context-case>
      <user-name>system</user-name>
      <request-class-name>high_fairshare</request-class-name>
    </context-case>
    <context-case>
      <group-name>everyone</group-name>
      <request-class-name>low_fairshare</request-class-name>
    </context-case>
  </context-request-class>
</work-manager>
```

2.2.2 Constraints

A constraint defines minimum and maximum numbers of threads allocated to execute requests and the total number of requests that can be queued or executing before WebLogic Server begins rejecting requests.

You can define the following types of constraints:

- `max-threads-constraint`—Limits the number of concurrent threads executing requests from the constrained work set. The default is unlimited. For example, consider a constraint defined with maximum threads of 10 and shared by 3 entry points. The scheduling logic ensures that not more than 10 threads are executing requests from the three entry points combined.

You can define a `max-threads-constraint` in terms of the availability of the resource that requests depend upon, such as a connection pool.

A `max-threads-constraint` might, but does not necessarily, prevent a request class from taking its fair share of threads or meeting its response time goal. Once the constraint is reached the server does not schedule requests of this type until the number of concurrent executions falls below the limit. The server then schedules work based on the fair share or response time goal.

- `min-threads-constraint`—Guarantees the number of threads the server will allocate to affected requests to avoid deadlocks. The default is zero. A `min-threads-constraint` value of one is useful, for example, for a replication update request, which is called synchronously from a peer.

A `min-threads-constraint` might not necessarily increase a fair share. This type of constraint has an effect primarily when the server instance is close to a deadlock condition. In that case, the constraint will cause WebLogic Server to schedule a request even if requests in the service class have gotten more than its fair share recently.

- `capacity`—Causes the server to reject requests only when it has reached its capacity. The default is -1. Note that the capacity includes all requests, queued or executing, from the constrained work set. Work is rejected either when an individual capacity threshold is exceeded or if the global capacity is exceeded. This constraint is independent of the global queue threshold.

Note that the `capacity` constraint is not enforced if the request is made by a user belonging to the WebLogic Server Administrators group.

2.2.3 Stuck Thread Handling

In response to stuck threads, you can define a Stuck Thread Work Manager component that can shut down the Work Manager, move the application into admin mode, or mark the server instance as failed.

For example, the Work Manager defined in [Example 2-4](#) shuts down the Work Manager when two threads are stuck for longer than 30 seconds.

Example 2-4 Stuck-Thread Work Manager

```
<work-manager>
  <name>stuckthread_workmanager</name>
  <work-manager-shutdown-trigger>
    <max-stuck-thread-time>30</max-stuck-thread-time>
    <stuck-thread-count>2</stuck-thread-count>
  </work-manager-shutdown-trigger>
</work-manager>
```

2.2.4 Self-Tuning Thread Pool

WebLogic Server maintains three groups of threads for the self-tuning thread pool:

- Running threads: threads that are currently executing work requests submitted to Work Managers

- Idle threads: threads that are idly waiting for a work request

Idle threads include threads that have completed their previous work requests and are waiting for new requests, as well as threads that are created by the self-tuning thread pool based on usage statistics in order to anticipate future workload.

- Standby threads: threads that are not currently processing or waiting for work requests

Standby threads do not count toward the self-tuning thread pool thread count. When the self-tuning thread pool decides to decrease the thread count based on usage statistics, threads are moved from the group of idle threads into the group of standby threads. Conversely, when the self-tuning thread pool decides to increase the thread count, it first tries to find threads in the standby thread group to move to the idle thread group. The self-tuning thread pool only creates new threads if there are not enough threads in the standby group.

Threads are shut down when the number of standby threads reaches an internal maximum limit of 256. Ideally, a number of standby threads are ready if WebLogic Server needs to increase the self-tuning thread pool count occurs so that the WebLogic Server instance can avoid creating new threads at a time when workload is high. Standby threads can also be created and used to satisfy minimum threads constraints. For more information, see [Constraints](#).

2.2.4.1 Self-Tuning Thread Pool Size

By default, the self-tuning thread pool size limit is 400. This limit includes all running and idle threads, but does not include any standby threads. You can configure the limit using the `SelfTuningThreadPoolSizeMax` attribute in the [KernelMBean](#). You may choose a higher size limit if your system can support additional workload even when the self-tuning thread pool has reached its upper thread count limit. Contrarily, you may choose to lower the limit if your system resources, such as CPU, become overloaded at a lower thread count. However, if lowering the `SelfTuningThreadPoolSizeMax` limit, note that if the value is set too low, the self-tuning thread pool may not be allowed to create enough threads to handle the system workload. This could result in a backlog of pending work requests on some Work Managers.

Note:

Minimum threads constraints can affect the number of threads that are executing work requests for Work Managers, especially if the WebLogic Server instance is under heavy load.

The self-tuning thread pool does not consider the `SelfTuningThreadPoolSizeMax` attribute when creating a new standby thread to process incoming work requests for a Work Manager to satisfy its allocated minimum threads constraint. This is due to the importance of allocating threads for processing work requests for Work Managers with minimum threads constraints, which are designed to be used to avoid server-to-server deadlocks.

As a result, the maximum possible number of threads maintained by the self-tuning thread pool is the sum of the configured `SelfTuningThreadPoolSizeMax` attribute value and the sum of the values for all minimum threads constraints configured in the WebLogic Server instance, assuming a worst-case scenario where the configured number of threads are allocated to all configured minimum threads constraints.

2.2.4.2 ThreadLocal Clean Out

To clean up stray ThreadLocal use by applications and third-party libraries, configure the `eagerThreadLocalCleanup` attribute in the [KernelMBean](#). The `eagerThreadLocalCleanup` attribute specifies whether to clean up all ThreadLocal storage from self-tuning thread pools after they have finished processing each work request.

By default, the `eagerThreadLocalCleanup` attribute is set to false, in which the self-tuning thread pool only cleans up ThreadLocal storage when a thread returns to a standby pool and after an application is undeployed.

Setting the `eagerThreadLocalCleanup` attribute to true ensures that all thread pool threads have no leftover ThreadLocal values from previous requests when running work for a new request. However, overhead occurs from cleaning up ThreadLocal storage after each work request and then reestablishing ThreadLocal values for each new request. Since some applications cache objects that are expensive to create in the ThreadLocal storage, cleaning up ThreadLocal values after each request may negatively impact performance on those applications.

2.3 Work Manager Scope

Essentially, there are three types of Work Managers, each one characterized by its scope and how it is defined and used.

- [The Default Work Manager](#)
- [Global Work Managers](#)
- [Application-scoped Work Managers](#)

2.3.1 The Default Work Manager

To handle thread management and perform self-tuning, WebLogic Server implements a default Work Manager. This Work Manager is used by an application when no other Work Managers are specified in the application's deployment descriptors.

In many situations, the default Work Manager may be sufficient for most application requirements. WebLogic Server thread-handling algorithms assign each application its own fair share by default. Applications are given equal priority for threads and are prevented from monopolizing them.

2.3.1.1 Overriding the Default Work Manager

You can override the behavior of the default Work Manager by creating and configuring a global Work Manager called `default`. This allows you to control the default thread-handling behavior of WebLogic Server.

Note:

When you override the default Work Manager, all instances are overridden.

2.3.1.2 When to Use Work Managers

Use the following are guidelines to help you determine when you might want to use Work Managers to customize thread management:

- The default fair share (50) is not sufficient.
This usually occurs in situations where one application needs to be given a higher priority over another.
- A response time goal is required.
- A minimum thread constraint needs to be specified to avoid server deadlock

2.3.2 Global Work Managers

You can create global Work Managers that are available to all applications and modules deployed on a server, in the WebLogic Server Administration Console and in `config.xml`.

An application uses a globally-defined Work Manager as a template. Each application creates its own instance which handles the work associated with that application and separates that work from other applications. This separation is used to handle traffic directed to two applications which are using the same dispatch policy. Handling each application's work separately, allows an application to be shut down without affecting the thread management of another application. Although each application implements its own Work Manager instance, the underlying components are shared.

2.3.3 Application-scoped Work Managers

In addition to globally-scoped Work Managers, you can also create Work Managers that are available only to a specific application or module. You can define application-scoped Work Managers in the WebLogic Server Administration Console and in the following descriptors:

- `weblogic-application.xml`
- `weblogic-ejb-jar.xml`
- `weblogic.xml`

If you do not explicitly assign a Work Manager to an application, it uses the default Work Manager.

A method is assigned to a Work Manager, using the `<dispatch-policy>` element in the deployment descriptor. The `<dispatch-policy>` can also identify a custom execute queue, for backward compatibility. For an example, see [Example 2-2](#).

2.4 Using Work Managers, Request Classes, and Constraints

Work Managers, Request Classes, and Constraints require the following:

- A definition. You may define Work Managers, Request Classes, or Constraints globally in the domain's configuration using the WebLogic Server Administration Console, (see **Environments > Work Managers** in the WebLogic Server Administration Console) or you may define them in one of the deployment descriptors listed previously. In either case, you assign a name to each.
- A mapping. In your deployment descriptors you reference one of the Work Managers, Request Classes, or Constraints by its name.

2.4.1 Dispatch Policy for EJB

`weblogic-ejb-jar.xml`—The value of the existing `dispatch-policy` tag under `weblogic-enterprise-bean` can be a named `dispatch-policy`. For backwards compatibility, it can also name an `ExecuteQueue`. In addition, Oracle allows `dispatch-policy`, `max-threads`, and `min-threads`, to specify named (or unnamed with a numeric value for constraints) policy and constraints for a list of methods, analogously to the present `isolation-level` tag.

2.4.2 Dispatch Policy for Web Applications

`weblogic.xml`—Also supports mappings analogous to the `filter-mapping` of the `web.xml`, where named `dispatch-policy`, `max-threads`, or `min-threads` are mapped for `url-patterns` or `servlet names`.

2.5 Deployment Descriptor Examples

This section contains examples for defining Work Managers in various types of deployment descriptors.

For additional reference, see the schema for these deployment descriptors:

- `weblogic-ejb-jar.xml` schema: <http://xmlns.oracle.com/weblogic/weblogic-ejb-jar/1.6/weblogic-ejb-jar.xsd>
- `weblogic-application.xml` schema: <http://xmlns.oracle.com/weblogic/weblogic-application/1.7/weblogic-application.xsd>
- `weblogic.xml` schema: See `weblogic.xml` Deployment Descriptor Elements in *Developing Web Applications, Servlets, and JSPs for Oracle WebLogic Server*.

Example 2-5 `weblogic-ejb-jar.xml` With Work Manager Entries

```
<weblogic-ejb-jar xmlns="http://xmlns.oracle.com/weblogic/weblogic-ejb-jar"
  xmlns:j2ee="http://java.sun.com/xml/ns/j2ee"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://xmlns.oracle.com/weblogic/weblogic-ejb-jar
  http://xmlns.oracle.com/weblogic/weblogic-ejb-jar/1.6/weblogic-ejb-jar.xsd">

  <weblogic-enterprise-bean>
    <ejb-name>WorkEJB</ejb-name>
    <jndi-name>core_work_ejb_workbean_WorkEJB</jndi-name>
    <dispatch-policy>weblogic.kernel.System</dispatch-policy>
  </weblogic-enterprise-bean>

  <weblogic-enterprise-bean>
    <ejb-name>NonSystemWorkEJB</ejb-name>
    <jndi-name>core_work_ejb_workbean_NonSystemWorkEJB</jndi-name>
    <dispatch-policy>workbean_workmanager</dispatch-policy>
  </weblogic-enterprise-bean>

  <weblogic-enterprise-bean>
    <ejb-name>MinThreadsWorkEJB</ejb-name>
    <jndi-name>core_work_ejb_workbean_MinThreadsWorkEJB</jndi-name>
    <dispatch-policy>MinThreadsCountFive</dispatch-policy>
  </weblogic-enterprise-bean>

  <work-manager>
    <name>workbean_workmanager</name>
```

```

</work-manager>

<work-manager>
  <name>stuckthread_workmanager</name>
  <work-manager-shutdown-trigger>
    <max-stuck-thread-time>30</max-stuck-thread-time>
    <stuck-thread-count>2</stuck-thread-count>
  </work-manager-shutdown-trigger>
</work-manager>

<work-manager>
  <name>minthreads_workmanager</name>
  <min-threads-constraint>
    <name>MinThreadsCountFive</name>
    <count>5</count>
  </min-threads-constraint>
</work-manager>

<work-manager>
  <name>lowpriority_workmanager</name>
  <fair-share-request-class>
    <name>low_priority</name>
    <fair-share>10</fair-share>
  </fair-share-request-class>
</work-manager>

<work-manager>
<name>highpriority_workmanager</name>
  <fair-share-request-class>
    <name>high_priority</name>
    <fair-share>100</fair-share>
  </fair-share-request-class>
</work-manager>

<work-manager>
<name>veryhighpriority_workmanager</name>
  <fair-share-request-class>
    <name>veryhigh_priority</name>
    <fair-share>1000</fair-share>
  </fair-share-request-class>
</work-manager>

```

The EJBs in [Example 2-6](#) are configured to get as many threads as there are instances of a resource they depend upon—a connection pool, and an application-scoped connection pool.

Example 2-6 *weblogic-ejb-jar.xml with Connection Pool Based Max Thread Constraint*

```

<weblogic-ejb-jar xmlns="http://xmlns.oracle.com/weblogic/weblogic-ejb-jar"
  xmlns:j2ee="http://java.sun.com/xml/ns/j2ee"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://xmlns.oracle.com/weblogic/weblogic-ejb-jar
  http://xmlns.oracle.com/weblogic/weblogic-ejb-jar/1.6/weblogic-ejb-jar.xsd">

  <weblogic-enterprise-bean>
    <ejb-name>ResourceConstraintEJB</ejb-name>
    <jndi-name>core_work_ejb_resource_ResourceConstraintEJB</jndi-name>
    <dispatch-policy>test_resource</dispatch-policy>
  </weblogic-enterprise-bean>

```

```
<weblogic-enterprise-bean>
  <ejb-name>AppScopedResourceConstraintEJB</ejb-name>
  <jndi-name>core_work_ejb_resource_AppScopedResourceConstraintEJB
  </jndi-name>
  <dispatch-policy>test_appscoped_resource</dispatch-policy>
</weblogic-enterprise-bean>

<work-manager>
  <name>test_resource</name>
  <max-threads-constraint>
    <name>pool_constraint</name>
    <pool-name>testPool</pool-name>
  </max-threads-constraint>
</work-manager>

<work-manager>
  <name>test_appscoped_resource</name>
  <max-threads-constraint>
    <name>appscoped_pool_constraint</name>
    <pool-name>AppScopedDataSource</pool-name>
  </max-threads-constraint>
</work-manager>
</weblogic-ear-jar>
```

Example 2-7 *weblogic-ear-jar.xml with commonJ Work Managers*

For information using commonJ, see [Using CommonJ With WebLogic Server](#) and the [commonJ Javadocs](#).

Example 2-8 *weblogic-application.xml*

```
<weblogic-application xmlns="http://xmlns.oracle.com/weblogic/weblogic-application"
  xmlns:j2ee="http://java.sun.com/xml/ns/j2ee"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://xmlns.oracle.com/weblogic/weblogic-application
  http://xmlns.oracle.com/weblogic/weblogic-application/1.7/weblogic-
  application.xsd">

  <max-threads-constraint>
    <name>j2ee_maxthreads</name>
    <count>1</count>
  </max-threads-constraint>

  <min-threads-constraint>
    <name>j2ee_minthreads</name>
    <count>1</count>
  </min-threads-constraint>

  <work-manager>
    <name>J2EEScopedWorkManager</name>
  </work-manager>
</weblogic-application>
```

The Web application in [Example 2-9](#) is deployed as part of the Enterprise application defined in [Example 2-8](#). This Web application's descriptor defines two Work Managers. Both Work Managers point to the same max threads constraint, `j2ee_maxthreads`, which is defined in the application's `weblogic-application.xml` file. Each Work Manager specifies a different response time request class.

Example 2-9 Web Application Descriptor

```

<weblogic xmlns="http://xmlns.oracle.com/weblogic"
  xmlns:j2ee="http://java.sun.com/xml/ns/j2ee"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://xmlns.oracle.com/weblogic
  http://xmlns.oracle.com/weblogic/1.0/weblogic.xsd">

  <work-manager>
    <name>fast_response_time</name>
    <response-time-request-class>
      <name>fast_response_time</name>
      <goal-ms>2000</goal-ms>
    </response-time-request-class>
    <max-threads-constraint-name>j2ee_maxthreads
    </max-threads-constraint-name>
  </work-manager>

  <work-manager>
    <name>slow_response_time</name>
    <max-threads-constraint-name>j2ee_maxthreads
    </max-threads-constraint-name>
    <response-time-request-class>
      <name>slow_response_time</name>
      <goal-ms>5000</goal-ms>
    </response-time-request-class>
  </work-manager>

</weblogic>

```

The descriptor in [Example 2-10](#) defines a Work Manager using the context-request-class.

Example 2-10 Web Application Descriptor

```

<?xml version="1.0" encoding="UTF-8"?>
<weblogic-web-app xmlns="http://xmlns.oracle.com/weblogic/weblogic-web-app"
  xmlns:j2ee="http://java.sun.com/xml/ns/j2ee"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://xmlns.oracle.com/weblogic/weblogic-web-app
  http://xmlns.oracle.com/weblogic/weblogic-web-app/1.8/weblogic-web-app.xsd">
  <work-manager>
    <name>foo-servlet-1</name>
    <request-class-name>test-fairshare2</request-class-name>
    <max-threads-constraint>
      <name>foo-mtc</name>
      <pool-name>oraclePool</pool-name>
    </max-threads-constraint>
  </work-manager>

  <work-manager>
    <name>foo-servlet</name>
    <context-request-class>
      <name>test-context</name>
    <context-case>
      <user-name>anonymous</user-name>
      <request-class-name>test-fairshare1</request-class-name>
    </context-case>

    <context-case>
      <group-name>everyone</group-name>
    </context-request-class>

```

```
</work-manager>  
</weblogic-web-app>
```

2.6 Work Managers and Execute Queues

This section describes how to enable backward compatibility with Execute Queues and how to migrate applications from using Execute Queues to Work Managers.

2.6.1 Enabling Execute Queues

WebLogic Server, Version 8.1, implemented Execute Queues to handle thread management in which you created thread-pools to determine how workload was handled. WebLogic Server still provides Execute Queues for backward compatibility, primarily to facilitate application migration. However, when developing new applications, you should use Work Managers to perform thread management more efficiently.

You can enable Execute Queues in the following ways:

- Using the command line option -
`Dweblogic.Use81StyleExecuteQueues=true`
- Setting the `Use81StyleExecuteQueues` property via the Kernel MBean in `config.xml`.

Enabling Execute Queues disables all Work Manager configuration and thread self tuning. Execute Queues behave exactly as they did in WebLogic Server 8.1.

When enabled, Work Managers are converted to Execute Queues based on the following rules:

- If the Work Manager implements a minimum or maximum threads constraint, then an Execute Queue is created with the same name as the Work Manager. The thread count of the Execute Queue is based on the value defined in the constraint.
- If the Work Manager does not implement any constraints, the global default Execute Queue is used.

2.6.2 Migrating from Execute Queues to Work Managers

When an application is migrated from WebLogic Server 8.1, any Execute Queues defined in the server configuration before migration will still be present. WebLogic Server does not automatically convert the Execute Queues to Work Managers.

When an 8.1 application implementing Execute Queues is deployed on WebLogic Server 9.x, the Execute Queues are created to handle thread management for requests. However, only those requests whose dispatch-policy maps to an Execute Queue will take advantage of this feature.

2.7 Accessing Work Managers Using MBeans

Work Managers can be accessed using the `WorkManagerMBean` configuration MBean. For more information, see [WorkManagerMBean](#).

`WorkManagerMBean` is accessed in the runtime tree or configuration tree depending on how the Work Manager is accessed by an application.

- If the Work Manager is defined at the module level, the `WorkManagerRuntimeMBean` is available through the corresponding `ComponentRuntimeMBean`.

- If a Work Manager is defined at the application level, then `WorkManagerRuntime` is available through `ApplicationRuntime`.
- If a Work Manager is defined globally in `config.xml`, each application creates its own instance of the Work Manager. Each application has its own corresponding `WorkManagerRuntime` available at the application level.

2.8 Using CommonJ With WebLogic Server

WebLogic Server Work Managers provide server-level configuration that allows administrators a way to set dispatch-policies to their servlets and EJBs.

WebLogic Server also provides a programmatic way of handling work from within an application. This is provided via the CommonJ API. WebLogic Server implements the `commonj.work` and `commonj.timers` packages of the CommonJ specification.

For specific information on the WebLogic Server implementation of CommonJ, see the [CommonJ Javadocs](#).

The WebLogic Server implementation of CommonJ enables an application to break a single request task into multiple work items, and assign those work items to execute concurrently using multiple Work Managers configured in WebLogic Server. Applications that do not need to execute concurrent work items can also use configured Work Managers by referencing or creating Work Managers in their deployment descriptors or, for Java EE Connectors, using the JCA API.

The following are some differences between the WebLogic Server implementation and the CommonJ specification:

- The `RemoteWorkItem` interface is an optional interface provided by the CommonJ specification and is not supported in WebLogic Server. WebLogic Server implements its own cluster load balancing and failover policies. Workload management is based on these policies.
- WebLogic CommonJ timers behave differently than `java.util.Timer`. When the execution is greater than twice the period, the WebLogic CommonJ timer will skip some periods to avoid falling further behind. The `java.util.Timer` does not do this.
- In a WebLogic Server environment, the `WorkListener.WorkRejected` method is called when a thread becomes stuck.

2.8.1 Accessing CommonJ Work Managers

Unlike WebLogic Server Work Managers, which can only be accessed from an application via dispatch policies, you can access CommonJ Work Managers directly from an application. The following code example demonstrates how to lookup a CommonJ Work Manager using JNDI:

```
InitialContext ic = new InitialContext();
commonj.work.WorkManager wm =
(commonj.work.WorkManager)ic.lookup("java:comp/env/wm/myWM");
```

For more information on using CommonJ Work Managers, see the [CommonJ Javadocs](#).

2.8.2 Mapping CommonJ to WebLogic Server Work Managers

You can map an externally defined CommonJ Work Manager to a WebLogic Server Work Manager. For example, if you have a CommonJ Work Manager defined in a descriptor, `ejb-jar.xml`, for example, as:

```
<resource-ref>
  <res-ref-name>minthreads_workmanager</res-ref-name>
  <res-type>commonj.work.WorkManager</res-type>
  <res-auth>Container</res-auth>
  <res-sharing-scope>Shareable</res-sharing-scope>
</resource-ref>
```

You can link this to a WebLogic Server Work Manager by ensuring that the name element is identical in the WebLogic Server descriptor such as `weblogic-ear-jar.xml`:

```
<work-manager>
  <name>minthreads_workmanager</name>
  <min-threads-constraint>
    <count>5</count>
  </min-threads-constraint>
</work-manager>
```

This procedure is similar for a `resource-ref` defined in `web.xml`. The WebLogic Server Work Manager can be defined in either a module descriptor (`weblogic-ear-jar.xml` or `weblogic.xml`, for example) or in the application descriptor (`weblogic-application.xml`).

Avoiding and Managing Overload

This chapter describes the features that WebLogic Server has for detecting, avoiding, and recovering from overload conditions. WebLogic Server's overload protection features help prevent the negative consequences that can result from continuing to accept requests when the system capacity is reached. These consequences are degraded application performance and stability.

This chapter includes the following sections:

- [Configuring WebLogic Server to Avoid Overload Conditions](#)
- [WebLogic Server Self-Monitoring](#)
- [WebLogic Server Exit Codes](#)

3.1 Configuring WebLogic Server to Avoid Overload Conditions

When system capacity is reached, if an application server continues to accept requests, application performance and stability can deteriorate. The following sections demonstrate how you can configure WebLogic Server to minimize the negative results of system overload.

3.1.1 Limiting Requests in the Thread Pool

In WebLogic Server, all requests, whether related to system administration or application activity—are processed by a single thread pool. An administrator can throttle the thread pool by defining a maximum queue length. Beyond the configured value, WebLogic Server will refuse requests, except for requests on administration channels.

Note:

Administration channels allow access only to administrators. The limit you set on the execute length does not effect administration channel requests, to ensure that reaching the maximum thread pool length does not prevent administrator access to the system. To limit the number of administration requests allowed in the thread pool, you can configure an administration channel, and set the `MaxConnectedClients` attribute for the channel.

When the maximum number of enqueued requests is reached, WebLogic Server immediately starts rejecting:

- Web application requests.
- Non-transactional RMI requests with a low fair share, beginning with those with the lowest fair share.

If the overload condition continues to persist, higher priority requests will start getting rejected, with the exception of JMS and transaction-related requests, for which overload management is provided by the JMS and the transaction manager.

Throttle the thread pool by setting the `Shared Capacity For Work Managers` field in the WebLogic Server Administration Console (see **Environments > Servers > server_name > Configuration > Overload**). The default value of this field is 65536.

3.1.1.1 Work Managers and Thread Pool Throttling

An administrator can configure Work Managers to manage the thread pool at a more granular level, for sets of requests that have similar performance, availability, or reliability requirements. A Work Manager can specify the maximum requests of a particular request class that can be queued. The maximum requests defined in a Work Manager works with the global thread pool value. The limit that is reached first is honored.

See [Using Work Managers to Optimize Scheduled Work](#).

3.1.2 Limiting HTTP Sessions

An administrator can limit the number of active HTTP sessions based on detection of a low memory condition. This is useful in avoiding out of memory exceptions.

WebLogic Server refuses requests that create new HTTP sessions after the configured threshold has been reached. In a WebLogic Server cluster, the proxy plug-in redirects a refused request to another Managed Server in the cluster. A non-clustered server instance can redirect requests to alternative server instance.

The Servlet container takes one of the following actions when maximum number of sessions is reached:

- If the server instance is in a cluster, the servlet container throws a `SessionCreationException`. Your application code should handle this runtime exception and send a relevant response.

To implement overload protection, you should handle this exception and send a 503 response explicitly. This response can then be handled by the proxy or load balancer.

You set a limit for the number of simultaneous HTTP sessions in the deployment descriptor for the Web application. For example, the following element sets a limit of 12 sessions:

```
<session-descriptor>
  <max-in-memory-sessions>12</max-in-memory-sessions>
</session-descriptor>
```

3.1.3 Exit on Out of Memory Exceptions

Administrators can configure WebLogic Server to exit upon an out of memory exception. This feature allows you to minimize the impact of the out of memory condition—automatic shutdown helps avoid application instability, and you can configure Node Manager or another high availability (HA) tool to automatically restart WebLogic Server, minimizing down-time.

You can configure this using the WebLogic Server Administration Console, or by editing the following elements in `config.xml`:

```
<overload-protection>
  <panic-action>system-exit</panic-action>
</overload-protection>
```

For more information, see the description of the [OverloadProtectionMBean](#) in the *MBean Reference for Oracle WebLogic Server*.

3.1.4 Stuck Thread Handling

WebLogic Server checks for stuck threads periodically. If all application threads are stuck, a server instance marks itself failed, if configured to do so, exits. You can configure Node Manager or a third-party high-availability solution to restart the server instance for automatic failure recovery.

You can configure these actions to occur when not all threads are stuck, but the number of stuck threads have exceeded a configured threshold:

- Shut down the Work Manager if it has stuck threads. A Work Manager that is shut down will refuse new work and reject existing work in the queue by sending a rejection message. In a cluster, clustered clients will fail over to another cluster member.
- Shut down the application if there are stuck threads in the application. The application is shutdown by bringing it into admin mode. All Work Managers belonging to the application are shut down, and behave as described above. Once the stuck thread condition is cleared, the application automatically returns to running mode.
- Mark the server instance as failed and shut it down if there are stuck threads in the server. In a cluster, clustered clients that are connected or attempting to connect will fail over to another cluster member.

For more information, see the description of the [OverloadProtectionMBean](#) in the *MBean Reference for Oracle WebLogic Server*.

3.2 WebLogic Server Self-Monitoring

The following sections describe WebLogic Server features that aid in determining and reporting overload conditions.

3.2.1 Overloaded Health State

WebLogic Server has a health state—`OVERLOADED`—which is returned by the `ServerRuntimeMBean.getHealthState()` when a server instance whose life cycle state is `RUNNING` becomes overloaded. This condition occurs as a result of low memory.

Upon entering the `OVERLOADED` state, server instances start rejecting requests from the Work Manager queue (if a Work Manager is configured), HTTP requests return a 503 Error (Service Unavailable), and RMI requests fail over to another server if clustered, otherwise, a remote exception is returned to the client.

The server instances health state returns to `OK` after the overload condition passes. An administrator can suspend or shut down an `OVERLOADED` server instance.

3.3 WebLogic Server Exit Codes

When WebLogic Server exits it returns an exit code. The exit codes can be used by shell scripts or HA agents to decide whether a server restart is necessary. See *WebLogic Server Exit Codes and Restarting After Failure* in *Administering Server Startup and Shutdown for Oracle WebLogic Server*.

Configuring Network Resources

This chapter describes how to configure WebLogic Server network resources, including network channels and domain-wide administration ports. These configurable network resources help you effectively use the network features of the machines that host your applications and manage quality of service.

This chapter includes the following sections:

- [Overview of Network Configuration](#)
- [Understanding Network Channels](#)
- [Configuring a Channel](#)
- [Assigning a Custom Channel to an EJB](#)
- [Using IPv6 with IPv4](#)

4.1 Overview of Network Configuration

For many development environments, configuring WebLogic Server network resources is simply a matter of identifying a Managed Server listen address and listen port. However, in most production environments, administrators must balance finite network resources against the demands placed upon the network. The task of keeping applications available and responsive can be complicated by specific application requirements, security considerations, and maintenance tasks, both planned and unplanned.

WebLogic Server lets you control the network traffic associated with your applications in a variety of ways, and configure your environment to meet the varied requirements of your applications and end users. You can:

- Designate the Network Interface Cards (NICs) and ports used by Managed Servers for different types of network traffic.
- Support multiple protocols and security requirements.
- Specify connection and message time-out periods.
- Impose message size limits.

You specify these and other connection characteristics by defining a network channel—the primary configurable WebLogic Server resource for managing network connections. You configure a network channel in the WebLogic Server Administration Console (**Servers > Protocols > Channels**) or by using the `NetworkAccessPointMBean`.

4.2 Understanding Network Channels

The sections that follow describe network channels and the standard channels that WebLogic Server pre-configures, and discusses common applications for channels.

4.2.1 What Is a Channel?

A network channel is a configurable resource that defines the attributes of a network connection to WebLogic Server. For instance, a network channel can define:

- The protocol the connection supports.
- The listen address.
- The listen ports for secure and non-secure communication.
- Connection properties such as the login time-out value and maximum message sizes.
- Whether or not the connection supports tunneling.
- Whether the connection can be used to communicate with other WebLogic Server instances in the domain, or used only for communication with clients.

4.2.1.1 Rules for Configuring Channels

Follow these guidelines when configuring a channel.

- You can assign a particular channel to only one server instance.
- You can assign multiple channels to a server instance.
- Each channel assigned to a particular server instance must have a unique combination of listen address, listen port, and protocol.
- You can configure a custom identity keystore, and other channel-specific SSL attributes, that are separate from and that override the default keystore and SSL configuration settings for the Managed Server instance or the domain.
- If you assign non-SSL and SSL channels to the same server instance, make sure that they do not use the same port number.

4.2.1.2 Custom Channels Can Inherit Default Channel Attributes

If you do not assign a channel to a server instance, it uses the WebLogic Server default channel, which is automatically configured by WebLogic Server, based on the attributes in `ServerMBean` or `SSLMBean`; the operating system determines the network interface. The default channel is described in [The Default Network Channel](#).

`ServerMBean` and `SSLMBean` represent a server instance and its SSL configuration. When you configure a server instance listen address, listen port, and SSL listen port, using the **Server > Configuration > General** page, those values are stored in the `ServerMBean` and `SSLMBean` for the server instance.

If you do not specify a particular connection attribute in a custom channel definition, the channel inherits the value specified for the attribute in `ServerMBean`. For example, if you create a channel, and do not define its listen address, the channel uses the listen address defined in `ServerMBean`. Similarly, if a Managed Server cannot

bind to the listen address or listen port configured in a channel, the Managed Server uses the defaults from `ServerMBean` or `SSLMBean`.

4.2.2 Why Use Network Channels?

You use network channels to manage quality of service, meet varying connection requirements, and improve utilization of your systems and network resources. For example, network channels allow you to:

- **Segregate different types of network traffic**—You can configure whether or not a channel supports outgoing connections. By assigning two channels to a server instance—one that supports outgoing connections and one that does not—you can independently configure network traffic for client connections and server connections, and physically separate client and server network traffic on different listen addresses or listen ports.

You cannot create an outbound only network channel; there always has to be a corresponding inbound interface, port, and protocol associated with the channel. However, you can avoid directing your traffic to it or use a firewall to block it. Also remember that a custom channel is protocol specific, so you will need a network channel defined per protocol (HTTP, HTTPS, t3, t3s, and such). See, also [NetworkAccessPointMBean.OutboundEnabled](#).

You can also segregate instance administration and application traffic by configuring a domain-wide administration port or administration channel. For more information, see [Administration Port and Administrative Channel](#).

- **Support varied application or user requirements on the same Managed Server**—You can configure multiple channels on a Managed Server to support different protocols, or to tailor properties for secure versus non-secure traffic.

By configuring a network channel to use a custom identity keystore, you can assert an identity on that channel that is different from the identity configured for the Managed Server or domain.

- **Segregate internal application network traffic**—You can assign a specific channel to an EJB.

If you use a network channel with a server instance on a multihomed machine, you must enter a valid listen address either in `ServerMBean` or in the channel. If the channel and `ServerMBean` listen address are blank or specify the localhost address (IP address 0.0.0.0 or 127.*.*), the server binds the network channel listen port and SSL listen ports to all available IP addresses on the multihomed machine. See [The Default Network Channel](#) for information on setting the listen address in `ServerMBean`.

4.2.2.1 Handling Channel Failures

When initiating a connection to a remote server, and multiple channels with the same required destination, protocol and quality of service exist, WebLogic Server will try each in turn until it successfully establishes a connection or runs out of channels to try.

4.2.2.2 Upgrading Quality of Service Levels for RMI

For RMI lookups only, WebLogic Server may upgrade the service level of an outgoing connection. For example, if a T3 connection is required to perform an RMI lookup, but an existing channel supports only T3S, the lookup is performed using the T3S channel.

This upgrade behavior does not apply to server requests that use URLs, since URLs embed the protocol itself. For example, the server cannot send a URL request beginning with `http://` over a channel that supports only `https://`.

4.2.3 Standard WebLogic Server Channels

WebLogic Server provides pre-configured channels that you do not have to explicitly define.

- Default channel—Every Managed Server has a default channel.
- Administrative channel—If you configure a domain-wide administration port, WebLogic Server configures an administrative channel for each Managed Server in the domain.

4.2.3.1 The Default Network Channel

Every WebLogic Server domain has a default channel that is generated automatically by WebLogic Server. The default channel is based on the listen address and listen port defined in the `ServerMBean` and `SSLMBean`. It provides a single listen address, one port for HTTP (non-secure) communication (7001 by default), and one port for HTTPS (secure) communication (7002 by default). You can configure the listen address and listen port using the **Configuration > General** page in the WebLogic Server Administration Console; the values you assign are stored in attributes of the `ServerMBean` and `SSLMBean`.

The default configuration may meet your needs if:

- You are installing in a test environment that has simple network requirements.
- Your server uses a single NIC, and the default port numbers provide enough flexibility for segmenting network traffic in your domain.

Using the default configuration ensures that third-party administration tools remain compatible with the new installation, because network configuration attributes remain stored in `ServerMBean` and `SSLMBean`.

Even if you define and use custom network channels for your domain, the default channel settings remain stored in `ServerMBean` and `SSLMBean`, and are used if necessary to provide connections to a server instance.

Note:

Unless specified, WebLogic Server uses the non-secure default channel for cluster communication to send session information among cluster members. If you disable the non-secure channel, there is no other channel available *by default* for the non-secure communication of cluster session information. To address this, you can:

- Enable the `secureReplicationEnabled` attribute of the `ClusterMBean` so that the cluster uses a secure channel for communication. See [Configuring a Replication Channel](#).
 - Create a custom channel for non-secure communication. See [Custom Channels Can Inherit Default Channel Attributes](#).
-
-

4.2.3.2 Administration Port and Administrative Channel

You can separate administration traffic from application traffic in your domain by defining an optional administration port. When configured, the administration port is used by each Managed Server in the domain exclusively for communication with the domain Administration Server. If an administration port is enabled, WebLogic Server automatically generates an administrative channel for your domain, based on the port settings upon server instance startup. The administrative channel provides a listen address and listen port to handle administration traffic.

4.2.3.2.1 Administration Port Capabilities

An administration port enables you to:

- Start a server in standby state. This allows you to administer a Managed Server, while its other network connections are unavailable to accept client connections. For more information on the standby state, see *STANDBY State in Administering Server Startup and Shutdown for Oracle WebLogic Server*.
- Separate administration traffic from application traffic in your domain. In production environments, separating traffic ensures that critical administration operations (starting and stopping servers, changing a server's configuration, and deploying applications) do not compete with high-volume application traffic on the same network connection.
- Administer a deadlocked server instance using WLST. If you do not configure an administration port, administrative commands such as `threadDump` and `shutdown` will not work on deadlocked server instances.

4.2.3.2.2 Administration Port Restrictions

The administration port accepts only secure, SSL traffic, and all connections via the port require authentication. Enabling the administration port imposes the following restrictions on your domain:

- The Administration Server and all Managed Servers in your domain must be configured with support for the SSL protocol. Managed Servers that do not support SSL cannot connect with the Administration Server during startup—you will have to disable the administration port in order to configure them.
- Because all server instances in the domain must enable or disable the administration port at the same time, you configure the administration port at the domain level. You can change an individual Managed Server administration port number, but you cannot enable or disable the administration port for an individual Managed Server. The ability to change the port number is useful if you have multiple server instances with the same listen address.
- After you enable the administration port, you must establish an SSL connection to the Administration Server in order to start any Managed Server in the domain. This applies whether you start Managed Servers manually, at the command line, or using Node Manager. For instructions to establish the SSL connection, see [Administration Port Requires SSL](#).
- After enabling the administration port, all WebLogic Server Administration Console traffic *must* connect via the administration port.
- If multiple server instances run on the same computer in a domain that uses a domain-wide administration port, you must either:

- Host the server instances on a multihomed machine and assign each server instance a unique listen address, or
- Override the domain-wide port on all but one of the servers instances on the machine. Override the port using the Local Administration Port Override option in the Advanced Attributes section of the **Server > Connections > SSL Ports** page in the WebLogic Server Administration Console.

4.2.3.2.3 Administration Port Requires SSL

The administration port requires SSL, which is enabled by default when you install WebLogic Server. If SSL has been disabled for any server instance in your domain, including the Administration Server and all Managed Servers, re-enable it using the **Server > Configuration > General** page in the WebLogic Server Administration Console.

Ensure that each server instance in the domain has a configured default listen port or default SSL listen port. The default ports are those you assign on the **Server > Configuration > General** page in the WebLogic Server Administration Console. A default port is required in the event that the server cannot bind to its configured administration port. If an additional default port is available, the server will continue to boot and you can change the administration port to an acceptable value.

By default WebLogic Server is configured to use demonstration certificate files. To configure production security components, follow the steps in Configuring SSL in *Administering Security for Oracle WebLogic Server*.

4.2.3.2.4 Configure Administration Port

Enable the administration port as described in [Enabling the Domain-Wide Administration Port](#) in *Oracle WebLogic Server Administration Console Online Help*.

After configuring the administration port, you must restart the Administration Server and all Managed Servers to use the new administration port.

4.2.3.2.5 Booting Managed Servers to Use Administration Port

If you reboot Managed Servers at the command line or using a start script, specify the administration port in the port portion of the URL. The URL must specify the `https://` prefix, rather than `http://`, as shown below.

```
-Dweblogic.management.server=https://host:admin_port
```

Note:

If you use Node Manager for restarting the Managed Servers, it is not necessary to modify startup settings or arguments for the Managed Servers. Node Manager automatically obtains and uses the correct URL to start a Managed Server.

If the hostname in the URL is not identical to the hostname in the Administration Server's certificate, disable hostname verification in the command line or start script, as shown below:

```
-Dweblogic.security.SSL.ignoreHostnameVerification=true
```

4.2.3.2.6 Booting Managed Servers to Use Administrative Channels

To allow a Managed Server to bind to an administrative channel during reboot, use the following command-line option:

```
-Dweblogic.admin.ListenAddress=<addr>
```

This allows the Managed Server to startup using an administrative channel. After the initial bootstrap connection, a standard administrative channel is used.

Note:

This option is useful to ensure that the appropriate NIC semantics are used before `config.xml` is downloaded.

4.2.3.2.7 Custom Administrative Channels

If the standard WebLogic Server administrative channel does not satisfy your requirements, you can configure a custom channel for administrative traffic. For example, a custom administrative channel allows you to segregate administrative traffic on a separate NIC.

To configure a custom channel for administrative traffic, configure the channel as described in [Configuring a Channel](#), and select "admin" as the channel protocol. Note the configuration and usage guidelines described in:

- [Administration Port Requires SSL](#)
- [Booting Managed Servers to Use Administration Port](#)

4.2.4 Using Internal Channels

Previous version of WebLogic Server allowed you to configure multiple channels for external traffic, but required you to use the default channel for internal traffic between server instances. WebLogic Server now allows you to create network channels to handle administration traffic or communications between clusters. This can be useful in the following situations:

- Internal administration traffic needs to occur over a secure connection, separate from other network traffic.
- Other types of network traffic, for example replication data, need to occur over a separate network connection.
- Certain types of network traffic need to be monitored.

4.2.4.1 Channel Selection

All internal traffic is handled via a network channel. If you have not created a custom network channel to handle administrative or clustered traffic, WebLogic Server automatically selects a default channel based on the protocol required for the connection. For more information on default channels, see [The Default Network Channel](#).

4.2.4.2 Internal Channels Within a Cluster

Within a cluster, internal channels can be created to handle to the following types of server-to-server connections:

- Multicast traffic
- Replication traffic
- Administration traffic

For more information on configuring channels within a cluster, see [Configuring Network Channels For a Cluster](#).

4.3 Configuring a Channel

You can configure a network channel using **Servers > Protocols > Channels** page in the WebLogic Server Administration Console or using the `NetworkAccessPointMBean`.

To configure a channel for clustered Managed Servers see, [Configuring Network Channels For a Cluster](#).

For a summary of key facts about network channels, and guidelines related to their configuration, see [Guidelines for Configuring Channels](#).

4.3.1 Guidelines for Configuring Channels

Follow these guidelines when configuring a channel.

4.3.1.1 Channels and Server Instances

- Each channel you configure for a particular server instance must have a unique combination of listen address, listen port, and protocol.
- A channel can be assigned to a single server instance.
- You can assign multiple channels to a server instance.
- If you assign non-SSL and SSL channels to the same server instance, make sure that they do not use the same combination of address and port number.

4.3.1.2 Dynamic Channel Configuration

- In WebLogic Server, you can configure a network channel without restarting the server. Additionally, you can start and stop dynamically configured channels while the server is running. However, when you shutdown a channel while the server is running, the server does not attempt to gracefully terminate any work in progress.

4.3.1.3 Channels and Identity

- By default, when you configure a network channel, the channel uses the SSL configuration that is set for the server instance. This means that the channel uses the same identity and trust that is established for the server. The server might use a custom identity that is specific to that server, or it might be a single domain-wide identity, depending on how the server instance and domain are configured.

- You can configure a network channel to use a custom identity keystore, and other SSL attributes, that are specific to that channel. This allows you to use an identity on that channel that is different from the one configured for the server. Using this capability, you can configure a server that can switch to a different identity when communicating with a particular client.

For more information, see *Configuring an Identity Keystore Specific to a Network Channel* in *Administering Security for Oracle WebLogic Server*.

4.3.1.4 Channels and Protocols

- Some protocols do not support particular features of channels. In particular the COM protocol does not support SSL or tunneling.
- You must define a separate channel for each protocol you wish the server instance to support, with the exception of HTTP.

HTTP is enabled by default when you create a channel, because RMI protocols typically require HTTP support for downloading stubs and classes. You can disable HTTP support on the Advanced Options portion of the **Servers > Protocols > Channels** page in the WebLogic Server Administration Console.

4.3.1.5 Reserved Names

- WebLogic Server uses the internal channel names `.WLDefaultChannel` and `.WLDefaultAdminChannel` and reserves the `.WL` prefix for channel names. Do not begin the name of a custom channel with the string `.WL`.

4.3.1.6 Channels, Proxy Servers, and Firewalls

If your configuration includes a firewall between a proxy Web server and a cluster (as described in *Firewall Between Proxy Layer and Cluster* in *Administering Clusters for Oracle WebLogic Server*), and the clustered servers are configured with two custom channels for segregating HTTPS and HTTP traffic, those channels must share the same listen address. Furthermore, if both HTTP and HTTPS traffic needs to be supported, there must be a custom channel for each—it is not possible to use the default configuration for one or the other.

If either of those channels has a `PublicAddress` defined, as is likely given the existence of the firewall, both channels must define `PublicAddress`, and they both must define the same `PublicAddress`.

4.3.2 Configuring Network Channels For a Cluster

To configure a channel for clustered Managed Servers, note the information in [Guidelines for Configuring Channels](#), and follow the guidelines described in the following sections.

4.3.2.1 Create the Cluster

If you have not already configured a cluster you can:

- Use the Configuration Wizard to create a new, clustered domain, following the instructions in *Create a Clustered Domain* in *Administering Clusters for Oracle WebLogic Server*, or
- Use the WebLogic Server Administration Console to create a cluster in an existing domain, following the instructions [Create and configure clusters](#) in *Oracle WebLogic Server Administration Console Online Help*.

For information and guidelines about configuring a WebLogic Server cluster, see *Before You Start* in *Administering Clusters for Oracle WebLogic Server*.

4.3.2.2 Create and Assign the Network Channel

Use the instructions in [Configuring a Network Channel](#) in *Oracle WebLogic Server Administration Console Online Help* to create a new network channel for each Managed Server in the cluster. When creating the new channels:

- For each channel you want to use in the cluster, configure the channel identically, including its name, on each Managed Server in the cluster.
- Make sure that the listen port and SSL listen port you define for each Managed Server's channel are different than the Managed Server's default listen ports. If the custom channel specifies the same port as a Managed Server's default port, the custom channel and the Managed Server's default channel will each try to bind to the same port, and you will be unable to start the Managed Server.
- If a cluster address has been explicitly configured for the cluster, it will appear in the Cluster Address field on the **Server > Protocols > Channels > Configuration** page.

If you are using dynamic cluster addressing, the Cluster Address field will be empty, and you do not need to supply a cluster address. For information about the cluster address, and how WebLogic Server can dynamically generate the cluster address, see *Cluster Address* in *Administering Clusters for Oracle WebLogic Server*.

Note:

If you want to use dynamic cluster addressing, do not supply a cluster address on the **Server > Protocols > Channels > Configuration** page. If you supply a cluster address explicitly, that value will take precedence and WebLogic Server will not generate the cluster address dynamically.

4.3.2.3 Configuring a Replication Channel

A replication channel is a network channel that is designated to transfer replication information between clusters. If a replication channel is not explicitly defined, WebLogic Server uses a default network channel to communicate replication information.

When WebLogic Server uses a default network channel as the replication channel, it does not use SSL encryption by default. You must enable SSL encryption using the `secureReplicationEnabled` attribute of the `ClusterMBean`. You can also update this setting from the WebLogic Server Administration Console.

Enabling SSL encryption can have a direct impact on clustered application throughput as session replication is blocking by design. In other words, no response is sent to the client until replication is completed. You should consider this when deciding to enable SSL on the replication channel.

If a replication channel is explicitly defined, the channel's protocol is used to transmit replication traffic.

4.3.2.4 Increase Packet Size When Using Many Channels

Use of more than about twenty channels in a cluster can result in the formation of multicast header transmissions that exceed the default maximum packet size. The

MTUSize attribute in the Server element of config.xml sets the maximum size for packets sent using the associated network card to 1500. Sending packets that exceed the value of MTUSize can result in a java.lang.NegativeArraySizeException. You can avoid exceptions that result from packet sizes in excess of MTUSize by increasing the value of MTUSize from its default value of 1500.

4.4 Assigning a Custom Channel to an EJB

You can assign a custom channel to an EJB. After you configure a custom channel, assign it to an EJB using the network-access-point element in weblogic-ejb-jar.xml. For more information, see network-access-point in *Developing Enterprise JavaBeans, Version 2.1, for Oracle WebLogic Server*.

4.5 Using IPv6 with IPv4

WebLogic Server supports host machines configured to use either Internet Protocol (IP) versions 4 or 6 (IPv4 and IPv6).

If you have a domain that includes some machines that use IPv4 in network communications and others that use IPv6, and the Administration Server is hosted on a machine using IPv4, the status of the Managed Server instances hosted on the machines using IPv6 might be displayed as "unknown" in the WebLogic Server Administration Console.

To make the status of these Managed Server instances available in the WebLogic Server Administration Console, you must specify a listen address for them. If your server is running, you will have to restart it after specifying the listen address. For information on assigning the listen address for a Managed Server in an existing domain using the WebLogic Server Administration Console, see [Configure listen addresses](#) in the *Oracle WebLogic Server Administration Console Online Help*.

You can also specify the listen address for your Managed Server when configuring it with the Configuration Wizard. On the **Managed Servers** page, enter the physical IP address of each Managed Server in the **Listen Address** field, save changes and continue configuring.

Configuring Web Server Functionality

This chapter describes how to configure a Java EE Web application hosted on WebLogic Server to function as a standard HTTP Web server hosting static content. Web applications also can host dynamic content such as JSPs and Servlets. See *Developing Web Applications, Servlets, and JSPs for Oracle WebLogic Server*.

This chapter includes the following sections:

- [Overview of Configuring Web Server Components](#)
- [Configuring the Server](#)
- [Web Applications](#)
- [Configuring Virtual Hosting](#)
- [How WebLogic Server Resolves HTTP Requests](#)
- [Setting Up HTTP Access Logs](#)
- [Preventing POST Denial-of-Service Attacks](#)
- [Setting Up WebLogic Server for HTTP Tunneling](#)
- [Using Native I/O for Serving Static Files \(Windows Only\)](#)

5.1 Overview of Configuring Web Server Components

In addition to hosting dynamic Java-based distributed applications, WebLogic Server functions as a Web server that handles high-volume Web sites, serving static files such as HTML files and image files, as well as servlets and JavaServer Pages (JSP). WebLogic Server supports the HTTP 1.1 standard.

5.2 Configuring the Server

You can specify the port that each WebLogic Server listens on for HTTP requests. Although you can specify any valid port number, if you specify port 80, you can omit the port number from the HTTP request used to access resources over HTTP. For example, if you define port 80 as the listen port, you can use the form `http://hostname/myfile.html` instead of `http://hostname:portnumber/myfile.html`.

On UNIX systems, binding a process to a port lower than 1025 must be done from the account of a privileged user, usually root. Consequently, if you want WebLogic Server to listen on port 80, you must start WebLogic Server as a privileged user; yet it is undesirable from a security standpoint to allow long-running processes like WebLogic Server to run with more privileges than necessary. WebLogic Server needs root privileges only until the port is bound.

WebLogic Server provides capabilities to switch its UNIX user ID (UID) and/or UNIX group ID (GID) after it binds to port 80. You can change the UID (or GID) either through the WebLogic Server Administration Console (see [Configuring the Listen Port](#)) or by accessing `UnixMachineMBean` using WLST. Use `UnixMachineMBean.setPostBindUID()` to set the UID and enable the switch by setting `UnixMachineMBean.setPostBindUIDEnabled()` to `true`. Similarly, the GID can be changed using methods `UnixMachineMBean.setPostBindGID()` and `UnixMachineMBean.setPostBindGIDEnabled()`.

You can switch to the UNIX account "nobody," which is the least privileged user on most UNIX systems. If desired, you may create a UNIX user account expressly for running WebLogic Server. Make sure that files needed by WebLogic Server, such as log files and the WebLogic classes, are accessible by the non-privileged user. Once ownership of the WebLogic process has switched to the non-privileged user, WebLogic will have the same read, write, and execute permissions as the non-privileged user.

You define a separate listen port for non-SSL and secure (using SSL) requests. For additional information on configuring listen ports, see [Understanding Network Channels](#).

5.2.1 Configuring the Listen Port

1. Use the WebLogic Server Administration Console to set the listen port to port 80. See [Configure Listen Ports](#).
2. If the machine hosting WebLogic Server is running Windows, skip to step 8.
3. Use the WebLogic Server Administration Console to create a new Unix Machine. See [Configure Machines](#).
4. Select the `Enable Post-Bind UID` field.
5. Enter the user name you want WebLogic Server to run as in the `Post-Bind UID` field.
6. Select the `Enable Post-Bind GID` fields.
7. Enter the group name you want WebLogic Server to run as in the `Post-Bind GID` field.
8. Click **Save**.
9. To activate these changes, in the Change Center of the WebLogic Server Administration Console, click **Activate Changes**.

5.3 Web Applications

HTTP and Web applications are deployed according to the Java EE Servlet 3.0 and JSP 2.2 specifications, which describe *Web Applications* as a standard for grouping the components of a Web-based application. These components include JSP pages, HTTP servlets, and static resources such as HTML pages or image files. In addition, a Web application can access external resources such as EJBs and JSP tag libraries. Each server can host any number of Web applications. You typically use the name of the Web application as part of the URI you use to request resources from the Web application.

For more information, see *Developing Web Applications, Servlets, and JSPs for Oracle WebLogic Server*.

5.3.1 Web Applications and Clustering

Web applications can be deployed to a WebLogic Server cluster. When a user requests a resource from a Web application, the request is routed to one of the servers in the cluster that host the Web application. If an application uses a session object, then sessions must be replicated across the nodes of the cluster. Several methods of replicating sessions are provided.

For more information, see *Administering Clusters for Oracle WebLogic Server*.

5.4 Configuring Virtual Hosting

Virtual hosting allows you to define host names that servers or clusters respond to. When you use virtual hosting you use DNS to specify one or more host names that map to the IP address of a WebLogic Server instance or cluster, and you specify which Web applications are served by the virtual host. When used in a cluster, load balancing allows the most efficient use of your hardware, even if one of the DNS host names processes more requests than the others.

For example, you can specify that a Web application called `books` responds to requests for the virtual host name `www.books.com`, and that these requests are targeted to WebLogic Servers A,B, and C, while a Web application called `cars` responds to the virtual host name `www.autos.com` and these requests are targeted to WebLogic Servers D and E. You can configure a variety of combinations of virtual host, WebLogic Server instances, clusters, and Web applications, depending on your application and Web server requirements.

For each virtual host that you define you can also separately define HTTP parameters and HTTP access logs. The HTTP parameters and access logs set for a *virtual host* override those set for a *server*. You may specify any number of virtual hosts.

You activate virtual hosting by targeting the virtual host to a server or cluster of servers. Virtual hosting targeted to a cluster will be applied to all servers in the cluster.

5.4.1 Virtual Hosting and the Default Web Application

You can also designate a *default Web Application* for each virtual host. The default Web application for a virtual host responds to all requests that cannot be resolved to other Web applications deployed on the same server or cluster as the virtual host.

Unlike other Web applications, a default Web application does not use the Web application name (also called the *context path*) as part of the URI used to access resources in the default Web application.

For example, if you defined virtual host name `www.mystore.com` and targeted it to a server on which you deployed a Web application called `shopping`, you would access a JSP called `cart.jsp` from the `shopping` Web application with the following URI:

```
http://www.mystore.com/shopping/cart.jsp
```

If, however, you declared `shopping` as the default Web application for the virtual host `www.mystore.com`, you would access `cart.jsp` with the following URI:

```
http://www.mystore.com/cart.jsp
```

For more information, see [How WebLogic Server Resolves HTTP Requests](#).

When using multiple Virtual Hosts with different default Web applications, you can not use single sign-on, as each Web application will overwrite the JSESSIONID cookies set by the previous Web application. This will occur even if the CookieName, CookiePath, and CookieDomain are identical in each of the default Web applications.

5.4.2 Setting Up a Virtual Host

1. Use the to define a virtual host. See [Virtual Host](#).
2. Add a line naming the virtual host to the `etc/hosts` file on your server to ensure that the virtual host name can be resolved.

5.5 How WebLogic Server Resolves HTTP Requests

When WebLogic Server receives an HTTP request, it resolves the request by parsing the various parts of the URL and using that information to determine which Web application and/or server should handle the request. [Table 5-1](#) demonstrates various combinations of requests for Web applications, virtual hosts, servlets, JSPs, and static files and the resulting response.

Note:

If you package your Web application as part of an Enterprise application, you can provide an alternate name for a Web application that is used to resolve requests to the Web application. For more information, see *Developing Web Applications, Servlets, and JSPs for Oracle WebLogic Server*.

[Table 5-1](#) provides some sample URLs and the file that is served by WebLogic Server. The Index Directories Checked column refers to the Index Directories attribute that controls whether or not a directory listing is served if no file is specifically requested.

Table 5-1 Examples of How WebLogic Server Resolves URLs

URL	Index Directories Checked?	This file is served in response
<code>http://host:port/apples</code>	No	Welcome file* defined in the <code>apples</code> Web application.
<code>http://host:port/apples</code>	Yes	Directory listing of the top-level directory of the <code>apples</code> Web application.
<code>http://host:port/oranges/</code> <code>naval</code>	Does not matter	Servlet mapped with <code><url-pattern></code> of <code>/naval</code> in the <code>oranges</code> Web application. There are additional considerations for servlet mappings. For more information, see <i>Configuring Servlets in Developing Web Applications, Servlets, and JSPs for Oracle WebLogic Server</i> .

Table 5-1 (Cont.) Examples of How WebLogic Server Resolves URLs

URL	Index Directories Checked?	This file is served in response
http://host:port/naval	Does not matter	Servlet mapped with <code><url-pattern></code> of <code>/naval</code> in the <code>oranges</code> Web application and <code>oranges</code> is defined as the default Web application. For more information, see <i>Configuring Servlets in Developing Web Applications, Servlets, and JSPs for Oracle WebLogic Server</i> .
http://host:port/apples/pie.jsp	Does not matter	<code>pie.jsp</code> , from the top-level directory of the <code>apples</code> Web application.
http://host:port	Yes	Directory listing of the top-level directory of the <i>default</i> Web application
http://host:port	No	Welcome file* from the <i>default</i> Web application.
http://host:port/apples/myfile.html	Does not matter	<code>myfile.html</code> , from the top-level directory of the <code>apples</code> Web application.
http://host:port/myfile.html	Does not matter	<code>myfile.html</code> , from the top-level directory of the <i>default</i> Web application.
http://host:port/apples/images/red.gif	Does not matter	<code>red.gif</code> , from the <code>images</code> subdirectory of the top-level directory of the <code>apples</code> Web application.
http://host:port/myFile.html	Does not matter	Error 404 Where <code>myfile.html</code> does not exist in the <code>apples</code> Web application and a <i>default servlet</i> has not been defined.
http://www.fruit.com/	No	Welcome file from the default Web application for a virtual host with a host name of <code>www.fruit.com</code> .

Table 5-1 (Cont.) Examples of How WebLogic Server Resolves URLs

URL	Index Directories Checked?	This file is served in response
<code>http://www.fruit.com/</code>	Yes	Directory listing of the top-level directory of the default Web application for a virtual host with a host name of <code>www.fruit.com</code> .
<code>http://www.fruit.com/oranges/myfile.html</code>	Does not matter	<code>myfile.html</code> , from the oranges Web application that is targeted to a virtual host with host name <code>www.fruit.com</code> .

5.6 Setting Up HTTP Access Logs

WebLogic Server can keep a log of all HTTP transactions in a text file, in either *common log format* or *extended log format*. Common log format is the default. Extended log format allows you to customize the information that is recorded. You can set the attributes that define the behavior of HTTP access logs for each server instance or for each virtual host that you define.

To set up HTTP logging for a server or a virtual host, refer to the following topics in the *Oracle WebLogic Server Administration Console Online Help*:

- [Enabling and Configuring HTTP Access Logs](#)
- [Specifying HTTP Log File Settings for a Virtual Host](#)

5.6.1 Log Rotation

You can rotate the log file based on either the size of the file or after a specified amount of time has passed. When either criterion is met, the current access log file is closed and a new access log file is started. If you do not configure log rotation, the HTTP access log file grows indefinitely. You can configure the name of the access log file to include a time and date stamp that indicates when the file was rotated. If you do not configure a time stamp, each rotated file name includes a numeric portion that is incremented upon each rotation. Separate HTTP access logs are kept for each Virtual Host you have defined.

5.6.2 Common Log Format

The default format for logged HTTP information is the common log format (see <http://www.w3.org/Daemon/User/Config/Logging.html#common-logfile-format>). This standard format follows the pattern:

```
host RFC931 auth_user [day/month/year:hour:minute:second
  UTC_offset] "request" status bytes
```

where:

host

Either the DNS name or the IP number of the remote client

RFC931

Any information returned by IDENTD for the remote client; WebLogic Server does not support user identification

auth_user

If the remote client user sent a userid for authentication, the user name; otherwise "-"

day/month/year:hour:minute:second UTC_offset

Day, calendar month, year and time of day (24-hour format) with the hours difference between local time and GMT, enclosed in square brackets

"request"

First line of the HTTP request submitted by the remote client enclosed in double quotes

status

HTTP status code returned by the server, if available; otherwise "-"

bytes

Number of bytes listed as the content-length in the HTTP header, not including the HTTP header, if known; otherwise "-"

5.6.3 Setting Up HTTP Access Logs by Using Extended Log Format

WebLogic Server also supports extended log file format, version 1.0, an emerging standard defined by the draft specification from the W3C at <http://www.w3.org/TR/WD-logfile.html>. The current definitive reference is on the W3C Technical Reports and Publications page at <http://www.w3.org/TR/>.

The extended log format allows you to specify the type and order of information recorded about each HTTP communication. To enable this format in the WebLogic Server Administration Console:

1. Navigate to the *server-name* > **Logging** > **HTTP** page.
2. Make sure that **HTTP access log file enabled** is checked.
3. Click **Advanced**.
4. In the field labeled **Format**, select **Extended**.

In the field labeled **Extended Logging Format Fields**, you can select one or more of the fields described in [Supported Field Identifiers](#). If you want to add custom fields to an HTTP access log file, see [Creating Custom Field Identifiers](#) for details.

You specify the information that should be recorded in the log file with directives, included in the actual log file itself. A directive begins on a new line and starts with a pound sign (#). If the log file does not exist, a new log file is created with default directives. However, if the log file already exists when the server starts, it must contain valid directives at the head of the file.

5.6.3.1 Creating the Fields Directive

The first line of your log file must contain a directive stating the version number of the log file format. You must also include a `Fields` directive near the beginning of the file:

```
#Version: 1.0
#Fields: xxxx xxxx xxxx ...
```

Where each `xxxx` describes the data fields to be recorded. Field types are specified as either simple identifiers, or may take a prefix-identifier format, as defined in the W3C specification. For example:

```
#Fields: date time cs-method cs-uri
```

This identifier instructs the server to record the date and time of the transaction, the request method that the client used, and the URI of the request for each HTTP access. Each field is separated by white space, and each record is written to a new line, appended to the log file.

Note:

The `#Fields` directive must be followed by a new line in the log file, so that the first log message is not appended to the same line.

5.6.3.2 Supported Field Identifiers

The following identifiers are supported, and do not require a prefix.

date

Date at which transaction completed, field has type `<date>`, as defined in the W3C specification.

time

Time at which transaction completed, field has type `<time>`, as defined in the W3C specification.

time-taken

Time taken for transaction to complete in seconds, field has type `<fixed>`, as defined in the W3C specification.

bytes

Number of bytes transferred, field has type `<integer>`.

Note that the `cached` field defined in the W3C specification is not supported in WebLogic Server.

The following identifiers require prefixes, and cannot be used alone. The supported prefix combinations are explained individually.

5.6.3.2.1 IP Address Related Fields

These fields give the IP address and port of either the requesting client, or the responding server. These fields have type `<address>`, as defined in the W3C specification. The supported fields are:

c-ip

The IP address of the client.

s-ip

The IP address of the server.

5.6.3.2.2 DNS Related Fields

These fields give the domain names of the client or the server and have type `<name>`, as defined in the W3C specification. The supported fields are:

c-dns

The domain name of the requesting client.

s-dns

The domain name of the requested server.

sc-status

Status code of the response, for example (404) indicating a "File not found" status. This field has type <integer>, as defined in the W3C specification.

sc-comment

The comment returned with status code, for instance "File not found". This field has type <text>.

cs-method

The request method, for example GET or POST. This field has type <name>, as defined in the W3C specification.

cs-uri

The full requested URI. This field has type <uri>, as defined in the W3C specification.

cs-uri-stem

Only the stem portion of URI (omitting query). This field has type <uri>, as defined in the W3C specification.

cs-uri-query

Only the query portion of the URI. This field has type <uri>, as defined in the W3C specification.

5.6.3.2.3 Diagnostic Message Correlation Fields

These fields give message correlation information for diagnostic messages, helping you to determine relationships between messages across components. These fields are logged if the diagnostic context is present and populated for the executed request. The diagnostic context may be present if it is propagated into the server with the incoming request, or it may be created for the request by WebLogic Server if the diagnostic context is enabled. The supported fields are:

ctx-ecid

The Execution Context ID (ECID). The ECID is a globally unique identifier associated with the execution of a particular request.

ctx-rid

The Relationship ID (RID). The RID distinguishes the work done in one thread on one process, from work done by any other threads on this and other processes on behalf of the same request.

If the diagnostic context does not exist, or the values of the ECID and RID are not available in the diagnostic context, a hyphen (-) is logged as their values. For more information about the ECID and RID, see *Correlating Messages Across Log Files and Components* in *Administering Oracle Fusion Middleware*.

5.6.3.3 Creating Custom Field Identifiers

You can also create user-defined fields for inclusion in an HTTP access log file that uses the extended log format (ELF). To create a custom field, you identify the field in

the ELF log file using the `Fields` directive and then you create a matching Java class that generates the desired output. You can create a separate Java class for each field, or the Java class can output multiple fields. For a sample of the Java source for such a class, see [Example 5-1](#).

To create a custom field:

1. Include the field name in the `Fields` directive, using the form:

```
x-myCustomField.
```

Where `myCustomField` is a fully-qualified class name.

For more information about the `Fields` directive, see [Creating the Fields Directive](#).

2. Create a Java class with the same fully-qualified class name as the custom field you defined with the `Fields` directive (for example `myCustomField`). This class defines the information you want logged in your custom field. The Java class must implement the following interface:

```
weblogic.servlet.logging.CustomELFLogger
```

In your Java class, you must implement the `logField()` method, which takes a `HttpAccountingInfo` object and `FormatStringBuffer` object as its arguments:

- Use the `HttpAccountingInfo` object to access HTTP request and response data that you can output in your custom field. Getter methods are provided to access this information. For a complete listing of these get methods, see [Get Methods of the HttpAccountingInfo Object](#).
 - Use the `FormatStringBuffer` class to create the contents of your custom field. Methods are provided to create suitable output.
3. Compile the Java class and add the class to the `CLASSPATH` statement used to start WebLogic Server. You will probably need to modify the `CLASSPATH` statements in the scripts that you use to start WebLogic Server.

Note:

Do not place this class inside of a Web application or Enterprise application in exploded or jar format.

4. Configure WebLogic Server to use the extended log format. For more information, see [Setting Up HTTP Access Logs by Using Extended Log Format](#).

Note:

When writing the Java class that defines your custom field, do not execute any code that is likely to slow down the system (For instance, accessing a DBMS or executing significant I/O or networking calls.) Remember, an HTTP access log file entry is created for *every* HTTP request.

Note:

If you want to output more than one field, delimit the fields with a tab character. For more information on delimiting fields and other ELF formatting issues, see "Extended Log Format" at <http://www.w3.org/TR/WD-logfile-960221.html>.

5.6.3.3.1 Get Methods of the `HttpAccountingInfo` Object

The following methods return various data regarding the HTTP request. These methods are similar to various methods of `javax.servlet.ServletRequest`, `javax.servlet.http.HttpServletRequest`, and `javax.servlet.http.HttpServletResponse`.

The Javadoc for these interfaces is available at the following locations:

- <http://docs.oracle.com/javaee/7/api/javax/servlet/ServletRequest.html>
- <http://docs.oracle.com/javaee/7/api/javax/servlet/ServletResponse.html>
- <http://docs.oracle.com/javaee/7/api/javax/servlet/http/HttpServletRequest.html>

For details about these methods, see the corresponding methods in the Java interfaces listed in the following table, or refer to the specific information contained in this table.

Table 5-2 *Getter Methods of `HttpAccountingInfo`*

HttpAccountingInfo Methods	Method Information
<code>Object getAttribute(String name);</code>	<code>javax.servlet.ServletRequest</code>
<code>Enumeration getAttributeNames();</code>	<code>javax.servlet.ServletRequest</code>
<code>String getCharacterEncoding();</code>	<code>javax.servlet.ServletRequest</code>
<code>int getResponseContentLength();</code>	<code>javax.servlet.HttpServletResponse.setContentLength()</code> This method gets the content length of the response, as set with the <code>setContentLength()</code> method.
<code>String getContentType();</code>	<code>javax.servlet.ServletRequest</code>
<code>Locale getLocale();</code>	<code>javax.servlet.ServletRequest</code>
<code>Enumeration getLocales();</code>	<code>javax.servlet.ServletRequest</code>

Table 5-2 (Cont.) Getter Methods of *HttpAccountingInfo*

HttpAccountingInfo Methods	Method Information
<code>String getParameter(String name);</code>	<code>javax.servlet.ServletRequest</code>
<code>Enumeration getParameterNames();</code>	<code>javax.servlet.ServletRequest</code>
<code>String[] getParameterValues(String name);</code>	<code>javax.servlet.ServletRequest</code>
<code>String getProtocol();</code>	<code>javax.servlet.ServletRequest</code>
<code>String getRemoteAddr();</code>	<code>javax.servlet.ServletRequest</code>
<code>String getRemoteHost();</code>	<code>javax.servlet.ServletRequest</code>
<code>String getScheme();</code>	<code>javax.servlet.ServletRequest</code>
<code>String getServerName();</code>	<code>javax.servlet.ServletRequest</code>
<code>int getServerPort();</code>	<code>javax.servlet.ServletRequest</code>
<code>boolean isSecure();</code>	<code>javax.servlet.ServletRequest</code>
<code>String getAuthType();</code>	<code>javax.servlet.http.HttpServletRequest</code>
<code>String getContextPath();</code>	<code>javax.servlet.http.HttpServletRequest</code>
<code>Cookie[] getCookies();</code>	<code>javax.servlet.http.HttpServletRequest</code>
<code>long getDateHeader(String name);</code>	<code>javax.servlet.http.HttpServletRequest</code>
<code>String getHeader(String name);</code>	<code>javax.servlet.http.HttpServletRequest</code>
<code>Enumeration getHeaderNames();</code>	<code>javax.servlet.http.HttpServletRequest</code>

Table 5-2 (Cont.) Getter Methods of *HttpAccountingInfo*

HttpAccountingInfo Methods	Method Information
Enumeration getHeaders(String name);	javax.servlet.http.HttpServletRequest
int getIntHeader(String name);	javax.servlet.http.HttpServletRequest
String getMethod();	javax.servlet.http.HttpServletRequest
String getPathInfo();	javax.servlet.http.HttpServletRequest
String getPathTranslated();	javax.servlet.http.HttpServletRequest
String getQueryString();	javax.servlet.http.HttpServletRequest
String getRemoteUser();	javax.servlet.http.HttpServletRequest
String getRequestURI();	javax.servlet.http.HttpServletRequest
String getRequestedSessionId();	javax.servlet.http.HttpServletRequest
String getServletPath();	javax.servlet.http.HttpServletRequest
Principal getUserPrincipal();	javax.servlet.http.HttpServletRequest
boolean isRequestedSessionIdFromCookie();	javax.servlet.http.HttpServletRequest
boolean isRequestedSessionIdFromURL();	javax.servlet.http.HttpServletRequest
boolean isRequestedSessionIdFromUrl();	javax.servlet.http.HttpServletRequest
boolean isRequestedSessionIdValid();	javax.servlet.http.HttpServletRequest
byte[] getURIAsBytes();	Returns the URI of the HTTP request as byte array, for example: If GET /index.html HTTP/1.0 is the first line of an HTTP Request, /index.html is returned as an array of bytes.

Table 5-2 (Cont.) Getter Methods of *HttpAccountingInfo*

HttpAccountingInfo Methods	Method Information
<code>long getInvokeTime();</code>	Returns the starting time of <code>currentTimeMillis()</code> . To get the length of time taken by the servlet to send the response to the client, use the following code: <code>long milsec = System.currentTimeMillis() - metrics.getInvokeTime();</code> <code>Float sec = new Float(milsec / 1000.0);</code>
<code>int getResponseStatusCode();</code>	<code>javax.servlet.http.HttpServletResponse</code>
<code>String getResponseHeader(String name);</code>	<code>javax.servlet.http.HttpServletResponse</code>

Example 5-1 Java Class for Creating a Custom ELF Field

```
import weblogic.servlet.logging.CustomELFLogger;
import weblogic.servlet.logging.FormatStringBuffer;
import weblogic.servlet.logging.HttpAccountingInfo;
/* This example outputs the User-Agent field into a
   custom field called MyCustomField
*/
public class MyCustomField implements CustomELFLogger{
    public void logField(HttpAccountingInfo metrics,
        FormatStringBuffer buff) {
        buff.appendValueOrDash(metrics.getHeader("User-Agent"));
    }
}
```

5.7 Preventing POST Denial-of-Service Attacks

A Denial-of-Service attack is a malicious attempt to overload a server with phony requests. One common type of attack is to send huge amounts of data in an HTTP POST method. You can set three attributes in WebLogic Server that help prevent this type of attack. These attributes are set in the Console, under *Servers* or *Virtual Hosts*. If you define these attributes for a virtual host, the values set for the virtual host override those set under *Servers*.

PostTimeoutSecs

Amount of time that WebLogic Server waits between receiving chunks of data in an HTTP POST.

The default value for `PostTimeoutSecs` is 30.

MaxPostTimeSecs

Maximum time that WebLogic Server spends receiving post data. If this limit is triggered, a `PostTimeoutException` is thrown and the following message is sent to the server log:

```
Post time exceeded MaxPostTimeSecs.
```

The default value for `MaxPostTimeSecs` is 30.

MaxPostSize

Maximum number of bytes of data received in a POST from a single request. If this limit is triggered, a `MaxPostSizeExceeded` exception is thrown and the following message is sent to the server log:

```
POST size exceeded the parameter MaxPostSize.
```

An HTTP error code 413 (Request Entity Too Large) is sent back to the client.

If the client is in listening mode, it gets these messages. If the client is not in listening mode, the connection is broken.

The default value for `MaxPostSize` is -1.

5.8 Setting Up WebLogic Server for HTTP Tunneling

HTTP tunneling provides a way to simulate a stateful socket connection between WebLogic Server and a Java client when your only option is to use the HTTP protocol. It is generally used to *tunnel* through an HTTP port in a security firewall. HTTP is a stateless protocol, but WebLogic Server provides tunneling functionality to make the connection appear to be a regular `T3Connection`. However, you can expect some performance loss in comparison to a normal socket connection.

5.8.1 Configuring the HTTP Tunneling Connection

Under the HTTP protocol, a client may only make a request, and then accept a reply from a server. The server may not voluntarily communicate with the client, and the protocol is stateless, meaning that a continuous two-way connection is not possible.

WebLogic HTTP tunneling simulates a `T3Connection` via the HTTP protocol, overcoming these limitations. There are attributes that you can configure in the to tune a tunneled connection for performance. It is advised that you leave them at their default settings unless you experience connection problems. These properties are used by the server to determine whether the client connection is still valid, or whether the client is still alive.

Enable Tunneling

Enables or disables HTTP tunneling. HTTP tunneling is disabled by default.

Note that the server must also support both the HTTP and T3 protocols in order to use HTTP tunneling.

Tunneling Client Ping

When an HTTP tunnel connection is set up, the client automatically sends a request to the server, so that the server may volunteer a response to the client. The client may also include instructions in a request, but this behavior happens regardless of whether the client application needs to communicate with the server. If the server does not respond (as part of the application code) to the client request within the number of seconds set in this attribute, it does so anyway. The client accepts the response and automatically sends another request immediately.

Default is 45 seconds; valid range is 20 to 900 seconds.

Tunneling Client Timeout

If the number of seconds set in this attribute have elapsed since the client last sent a request to the server (in response to a reply), then the server regards the client as dead, and terminates the HTTP tunnel connection. The server checks the elapsed time

at the interval specified by this attribute, when it would otherwise respond to the client's request.

Default is 40 seconds; valid range is 10 to 900 seconds.

5.8.2 Connecting to WebLogic Server from the Client

When your client requests a connection with WebLogic Server, all you need to do in order to use HTTP tunneling is specify the HTTP protocol in the URL. For example:

```
Hashtable env = new Hashtable();
env.put(Context.PROVIDER_URL, "http://wlhost:80");
Context ctx = new InitialContext(env);
```

On the client side, a special tag is appended to the `http` protocol, so that WebLogic Server knows this is a tunneling connection, instead of a regular HTTP request. Your application code does not need to do any extra work to make this happen.

The client must specify the port in the URL, even if the port is 80. You can set up your WebLogic Server instance to listen for HTTP requests on any port, although the most common choice is port 80 since requests to port 80 are customarily allowed through a firewall.

You specify the listen port for WebLogic Server in the under the "Servers" node, under the "Network" tab.

5.9 Using Native I/O for Serving Static Files (Windows Only)

When running WebLogic Server on Windows NT/2000/XP you can specify that WebLogic Server use the native operating system call `TransmitFile` instead of using Java methods to serve static files such as HTML files, text files, and image files. Using native I/O can provide performance improvements when serving larger static files.

To use native I/O, add two parameters to the `web.xml` deployment descriptor of a Web application containing the files to be served using native I/O. The first parameter, `weblogic.http.nativeIOEnabled` should be set to `TRUE` to enable native I/O file serving. The second parameter, `weblogic.http.minimumNativeFileSize` sets the minimum file size for using native I/O. If the file being served is larger than this value, native I/O is used. If you do not specify this parameter, a value of 4K is used.

Generally, native I/O provides greater performance gains when serving larger files; however, as the load on the machine running WebLogic Server increases, these gains diminish. You may need to experiment to find the correct value for `weblogic.http.minimumNativeFileSize`.

The following example shows the complete entries that should be added to the `web.xml` deployment descriptor. These entries must be placed in the `web.xml` file after the `<distributable>` element and before `<servlet>` element.

```
<context-param>
  <param-name>weblogic.http.nativeIOEnabled</param-name>
  <param-value>TRUE</param-value>
</context-param>
<context-param>
  <param-name>weblogic.http.minimumNativeFileSize</param-name>
  <param-value>500</param-value>
</context-param>
```

`weblogic.http.nativeIOEnabled` can also be set as a context parameter in the `FileServlet`.

Using the Plug-in for Oracle Virtual Assembly Builder

This chapter describes the WebLogic Server introspection plug-in for Oracle Virtual Assembly Builder, which examines a single WebLogic domain. The domain specified and the Oracle home are captured.

Note:

This chapter describes the WebLogic Server plug-in that is included with the WebLogic Server installation program. Older versions of this plug-in are included with the Oracle Virtual Assembly Builder installation program.

This chapter includes the following sections:

- [Overview](#)
- [Introspection Plug-in Parameters](#)
- [Reference System Prerequisites](#)
- [Plug-in Usage Requirements](#)
- [Resulting Artifact Type](#)
- [Wiring](#)
- [Wiring Properties](#)
- [WebLogic Server Appliance Properties](#)
- [Oracle Coherence*Web Introspection Extension](#)
- [Supported Template Types](#)

6.1 Overview

The following topics provide a brief overview of Oracle Virtual Assembly Builder and the WebLogic Server introspection plug-in:

- [About Oracle Virtual Assembly Builder](#)
- [About the WebLogic Server Introspection Plug-in](#)

6.1.1 About Oracle Virtual Assembly Builder

Oracle Virtual Assembly Builder is a tool for virtualizing installed Oracle components, modifying those components, and then deploying them into your own environment. Using Oracle Virtual Assembly Builder, you capture the configuration of existing software components in artifacts called software appliances. Appliances can then be grouped, and their relationships defined into artifacts called software assemblies which provide a blueprint describing a complete multi-tier application topology.

Oracle Virtual Assembly Builder allows the logical connections between appliances within an assembly to be reconfigured by a process known as assembly editing. When a desired assembly configuration has been achieved, you use Oracle Virtual Assembly Builder to prepare the assembly for deployment and then deploy it into your environment.

6.1.2 About the WebLogic Server Introspection Plug-in

Introspection is an operation performed on a software component or a group of related components to create an appliance or assembly. During introspection, Oracle Virtual Assembly Builder creates an XML description of the component and captures a component-specific set of configuration files. This information forms a snapshot of the component's configuration at the time of introspection.

The introspection architecture is plug-in based. A plug-in is available for each supported component type, including a plug-in for WebLogic Server. Typically the result of introspecting a component is an appliance. However, when you use Oracle Virtual Assembly Builder to introspect a WebLogic Server domain, the introspection plug-in generates an assembly. The generated assembly contains:

- An appliance representing the Administration Server.
- One appliance for each standalone Managed Server.
- One appliance for each cluster. (This appliance encompasses all Managed Server instances contained in that cluster.)

The WebLogic Server introspection plug-in fully supports WebLogic domains that are configured with dynamic clusters and dynamic servers.

6.1.3 Setting Up the WebLogic Server Introspection Plug-in

The following steps summarize the process of making the WebLogic Server introspection plug-in available for us with Oracle Virtual Assembly Builder:

1. Install the Oracle Fusion Middleware Infrastructure software (`wls_jrf_generic.jar`).

For installation type, select **Fusion Middleware Infrastructure**.

2. Install Oracle Virtual Assembly Builder.
3. Install the WebLogic Server plug-in for Oracle Virtual Assembly Builder using the following command:

```
$AB_INSTANCE/bin/abctl installPlugins -productRoot $ORACLE_HOME/wlserver
```

In the preceding command, `$AB_INSTANCE` is the environment variable set to the Studio instance home directory.

6.2 Introspection Plug-in Parameters

Table 6-1 lists the introspection parameters for the WebLogic Server plug-in for Oracle Virtual Assembly Builder. The specific set of parameters that are available for use depend on whether you are using the `abctl` command or Oracle Virtual Assembly Builder Studio. The column labeled Command-Line Support indicates whether the corresponding parameter may be specified using the `abctl` command. The column labeled Required indicates whether the parameter must be specified for the plug-in.

Table 6-1 WebLogic Server Plug-in Introspection Parameters

Parameter	Description	Command-Line Support	Required
<code>domainRoot</code>	The fully qualified path to the domain you want to introspect. This should be the directory that contains the <code>config</code> directory.	Yes	Yes
<code>wlsHome</code>	The fully qualified path to the WebLogic home directory. For example, <code>/u01/Oracle/Middleware/Oracle_Home/wlserver</code> .	Yes	Yes
<code>adminUser</code>	The administrative user for the WebLogic domain.	Yes	Yes
<code>adminPassword</code>	The password for the administrative user corresponding to the <code>adminUser</code> parameter.	No	Yes
<code>nodeManagerUser</code>	The Node Manager user name. If you specify this parameter during introspection time, the specified user name is used when the domain is rehydrated. If you specify this option in the <code>abctl</code> command, you are automatically prompted for the <code>nodeManagerPassword</code> , which is used during dehydration. If you do not specify this parameter, the value of the <code>adminUser</code> parameter is used by default as the Node Manager user.	Yes	No
<code>nodeManagerPassword</code>	The password for the user specified with the <code>nodeManagerUser</code> parameter.	No	Yes ¹
<code>nodeManagerDir</code>	The non-default directory that contains the Node Manager configuration. If this parameter is not specified, the following value is used by default: <code>\$WL_HOME/common/nodemanager</code>	Yes	No
<code>identityKeystorePassPhrase</code>	The password for the identity keystore that is used if the domain is configured to have a custom identity keystore.	No	No
<code>privateKeyPassPhrase</code>	The password for the private key contained in the custom identity keystore.	No	No

¹ Required only if the Node Manager user name is specified.

6.3 Reference System Prerequisites

The Administration Server for the domain must be running and introspection must target the Administration Server host machine.

6.4 Plug-in Usage Requirements

Table 6-2 lists and describes the requirements for using the introspection plug-in. Some requirements listed in this table pertain to the WebLogic Server plug-in, while others pertain overall to Oracle Virtual Assembly Builder.

Table 6-2 Requirements for Using the Introspection Plug-in

Requirement	Description
Editable domain	You must ensure that any WebLogic domain being introspected is configured to be editable. This allows edits to be performed successfully during deployment. For more information, see <i>Understanding Domain Configuration for Oracle WebLogic Server</i> .
Oracle Internet Directory	Oracle recommends the use of Oracle Internet Directory as the LDAP identity store on the reference system, not a file-based LDAP server. File-based LDAP cannot work properly in a deployed system due to synchronization issues.
Remote user	The remote user specified for remote introspection of WebLogic Server must be able to access files created by the user who owns the WebLogic Server process. When possible Oracle recommends that the remote user specified be the same as the user who owns the WebLogic Server process.
Applications accessing Web services	For each application that accesses a Web service hosted on the WebLogic Server reference system, you must: <ol style="list-style-type: none"> 1. Update the application to access the Web service WSDL on the new Oracle VM host. 2. Redeploy the application to the Oracle VM WebLogic Server environment, using any of the administration tools listed in Summary of System Administration Tools and APIs in <i>Understanding Oracle WebLogic Server</i>.
Avoid creating templates on individual servers	You must not create a template on an individual server in WebLogic Server. Such templates cannot be deployed because they lack certain deployment artifacts (the domain template jar in content, and data at the assembly level).

Table 6-2 (Cont.) Requirements for Using the Introspection Plug-in

Requirement	Description
Administration Server URL	If you want to perform manual starts from the context of the Guest-OS, you must manually modify the <code>StartManagedServer</code> script to provide the correct Administration Server URL (Administration Server host name). This is required to provide the default Administration Server URL the correct value (the machine name of the Administration Server is not known at the time of template creation).

6.5 Resulting Artifact Type

An atomic assembly that contains an appliance for the Administration Server and appliances for any clusters found and any standalone (that is, non-clustered) Managed Servers found. One appliance is created for a cluster regardless of the number of Managed Servers in that cluster. The WebLogic Server plug-in assumes that every Managed Server in a cluster is configured identically. The names and the number of Managed Servers in the cluster are saved as 'scale out' information in the appliance metadata.

Note:

An atomic assembly cannot be edited to add or remove appliances. To wire other appliances to an atomic WebLogic Server assembly a non-atomic assembly must be created and the WebLogic Server assembly must be added to the non-atomic assembly.

6.6 Wiring

Inputs are created on the WebLogic Server assembly for all the channels the servers in the domain are listening on. Typically Oracle HTTP Server outputs would be connected to the WebLogic Server inputs.

Outputs are created on the WebLogic Server assembly for the following types of configuration that are found:

- JDBC
- LDAP
- JMS messaging bridges
- Foreign JMS

These outputs must all be connected to either an external resource or to an appliance before deployment. The description on the output and the protocol supported by the output provide hints about the type of appliance to connect the output to.

6.7 Wiring Properties

All input endpoints have the following wiring properties:

- Two editable properties: `port` and `description`.
- One non-editable property: a list of `protocols`. The `protocols` indicate the type of outputs that can be connected to the input.

All output endpoints have the following wiring properties:

- One editable property: `description`.
- The following non-editable properties:
 - `protocol` — Indicates the type of input that can be connected to the output.
 - `singleton` — Indicates the type of appliance that the output can be connected to. If `singleton` is true, the output can be connected only to an input on an appliance that has a scalability absolute max value of 1.

Table 6-3 describes common WebLogic Server appliance input user properties:

Table 6-3 Common WebLogic Server Appliance Input User Properties

Name	Type	Req'd	Default	Description
<code>keepLocalHost</code>	Boolean	false	none	If this input was originally bound to localhost explicitly, this property will exist and be set to true. Connections should not be made to this input if this property exists and its value is not overridden to false.
<code>readymetric-naming-password</code>	String	false	none	The password to use for the connection made to the server when doing the ready metric check.
<code>readymetric-naming-protocol</code>	String	false	none	Optional protocol you can specify for naming connections used for the ready metric check (for example, <code>iiop</code>).
<code>readymetric-naming-user</code>	String	false	none	The user to use for the connection made to the server when doing the ready metric check (for example, <code>weblogic</code>).
<code>readymetric-server-protocol</code>	String	false	none	The protocol to use for the connection made to the server when doing the ready metric check (for example, <code>iiop</code>).

Table 6-4 describes common WebLogic Server appliance input properties. These are not user-modifiable properties.

Table 6-4 Common WebLogic Server Appliance Input Properties

Name	Type	Req'd	Default	Description
<code>originalBindAddresses</code>	String	false	none	The original address of the system that was introspected.

Table 6-4 (Cont.) Common WebLogic Server Appliance Input Properties

Name	Type	Req'd	Default	Description
originalDefaultHostname	String	false	none	The original host name of the system that was introspected. (For example, example.com).

[Table 6-5](#) describes the Administration Server appliance input system properties:

Table 6-5 Administration Server Appliance Input Properties

Name	Type	Req'd	Default	Description
admin-password	String	true	none	The admin user's password. This is a user-modified property, specified in the deployment plan, that allows a deployer to introspect a well-known domain and deploy it multiple times, each deployed instance having a custom password.
admin-username	String	true	none	The admin user name for connecting to the Administration Server (for example, weblogic).

[Table 6-6](#) through [Table 6-9](#) describe Administration Server appliance output user properties for JDBC, foreign JMS, JMS messaging bridge, and LDAP.

[Table 6-6](#) describes Administration Server appliance output user and system properties for JDBC. The password and username properties are user properties, and original-url is a system property.

Table 6-6 Administration Server Appliance Output Properties: JDBC

Name	Type	Req'd	Default	Description
password	String	false	<empty>	The password for the user needed for the data source connection.
username	String	false	none	The user needed for the data source connection. The value will be the original user for the data source connection.
original-url	String	false	none	The original JDBC URL from the introspected WebLogic domain. For example, jdbc:oracle:thin:@adc2100927.example.com:1521:orcl.

[Table 6-7](#) describes Administration Server appliance output user properties for foreign JMS:

Table 6-7 Administration Server Appliance Output Properties: Foreign JMS

Name	Type	Req'd	Description
original-connection-url	String	false	The original URL for the foreign JMS server.

[Table 6-8](#) describes Administration Server appliance output system properties for JMS messaging bridge:

Table 6-8 Administration Server Appliance Output Properties: JMS Messaging Bridge

Name	Type	Req'd	Default	Description
original-url	String	false	none	The original URL for the JMS messaging bridge server.
original-username	String	false	none	The original username for the JMS messaging bridge server.
original-password	String	false	none	The original password for the JMS messaging bridge server, encrypted.

[Table 6-9](#) describes Administration Server appliance output system properties for LDAP:

Table 6-9 Administration Server Appliance Output Properties: LDAP

Name	Type	Req'd	Default	Description
original-name	String	false	none	The original name for the LDAP security provider.
original-host	String	false	none	The original host for the LDAP security provider.
original-port	String	false	none	The original port for the LDAP security provider.
original-user	String	false	none	The original user for the LDAP security provider.

6.8 WebLogic Server Appliance Properties

This section discusses the following properties for assemblies with a WebLogic Server appliance. Those properties include assembly-level properties, properties on the

inputs and outputs of each application, and properties of the appliances themselves. This section contains the following subsections:

- [Assembly-Level System Properties](#)
- [Properties Common to Administration Server and Managed Server Appliances](#)
- [Administration Server Appliance Properties](#)

6.8.1 Assembly-Level System Properties

[Table 6-10](#) describes assembly-level system properties:

Table 6-10 Assembly-level System Properties

Name	Type	Req'd	Default	Description
admin-password	String	true	none	The admin user password for the domain.
admin-username	String	true	none	The admin user for the domain (for example, <code>weblogic</code>).
admsvr-jmx-input	String	true	none	Indicates what input on the Administration Server appliance should be used when making JMX connections (for example, <code>Default</code>).
admsvr-jmx-protocol	String	true	none	The protocol to use when making a JMX connection to the Administration Server (for example, <code>iiop</code>).
domain-name	String	false	none	The domain name of the domain that was introspected (for example, <code>test_domain</code>).
usesOracleHomes	boolean	true	none	Indicates that this is not a core WebLogic Server installation and as such has an Oracle home associated with it. This will be true for SOA and WebCenter domains. Allowable values are true and false.

6.8.2 Properties Common to Administration Server and Managed Server Appliances

The following information describes properties common to Administration Server and Managed Server appliances.

[Table 6-11](#) describes common WebLogic Server appliance user properties:

Table 6-11 Common WebLogic Server Appliance User Properties

Name	Type	Req'd	Default	Description
NodeManagerPort	Integer	true	5556	The port the Node Manager should listen on (for example, 5556). This will only be present if the Node Manager was found to be configured on the reference system.

Table 6-11 (Cont.) Common WebLogic Server Appliance User Properties

Name	Type	Req'd	Default	Description
readymetric-attribute-compare-type	String	false	EQUALS	The comparison to make between the readymetric-attribute's value and the value specified for the property readymetric-attribute-value. Valid values are EQUALS, LESSER_THAN, GREATER_THAN, LESSER_THAN_OR_EQUAL, and GREATER_THAN_OR_EQUAL.
readymetric-attribute-name	String	false	State	The MBean attribute to check.
readymetric-attribute-type	String	false	STRING	The type of the MBean attribute. Valid values (but specific to the attribute being examined) are STRING, INTEGER, SHORT, LONG, DOUBLE, FLOAT, and BOOLEAN.
readymetric-attribute-value	String	false	RUNNING	The value the property readymetric-attribute-name must have for the check to be considered successful.
readymetric-instance-name-0	String	false	com.bea:Name=AdminServer,Type=ServerRuntime	The instance name to use for the JMX ready metric check.
readymetric-max-wait-period	String	false	600	The maximum time in seconds to wait for a successful ready metric check.
readymetric-naming-input	String	false	none	The input to use for the ready metric check (for example, "Default").
readymetric-polling-period	String	false	none	The time between connection attempts, in seconds, for the ready metric check.
readymetric-server-input	String	false	none	The input to use for the ready metric check (for example, "Default").
readymetric-trust-store-0	String	false	none	The location of the trust store to use if the ready metric check is using an SSL enabled port.
readymetric-type	String	false	JMX	The type of ready metric to use for the appliance.
readymetric-verify	String	false	true	If this property is set to true the ready metric check will be performed. Otherwise it will be skipped.

Table 6-11 (Cont.) Common WebLogic Server Appliance User Properties

Name	Type	Req'd	Default	Description
useTemplate	String	false	OEL	Specifies the template type to use by default when creating a template for the appliance.

6.8.3 Administration Server Appliance Properties

[Table 6-12](#) describes Administration Server appliance system properties:

Table 6-12 Administration Server Appliance System Properties

Name	Type	Req'd	Default	Description
admin-input-name	String	false	none	The input to use for connecting to the Administration Server admin-input-protocol (for example, "Default").
admin-input-protocol	String	false	none	The protocol to use for connecting to the Administration Server (for example, "http").

[Table 6-13](#) describes Administration Server appliance user properties:

Table 6-13 Administration Server Appliance User Properties

Name	Type	Req'd	Default	Description
<cluster name>-cluster-address	String	false	<empty>	The cluster address for the cluster named by the first part of the property name.
<cluster name>-frontend-host	String	false	<empty>	The front-end host for the cluster named by the first part of the property name.
<cluster name>-frontend-http-port	String	false	<empty>	The non-secure front-end port for the cluster named by the first part of the property name.
<cluster name>-frontend-https-port	String	false	<empty>	The secure front-end port for the cluster named by the first part of the property name.

6.9 Oracle Coherence*Web Introspection Extension

The Oracle Coherence*Web introspection extension extends the functionality of the WebLogic Server Introspector. It examines the configuration of Coherence cache clusters and servers configured as part of a WebLogic domain. For more information, see the Oracle Coherence documentation.

6.10 Supported Template Types

The supported template type is Oracle Enterprise Linux (OEL).

Configuring Concurrent Managed Objects

This chapter describes the Concurrent Managed Objects (CMOs) implemented by WebLogic Server to provide support for defining and implementing the Concurrency Utilities for Java EE 1.0 (JSR 236).

This chapter includes the following sections:

- [About Java EE Concurrency Utilities](#)
- [How Concurrent Managed Objects Provide Concurrency for WebLogic Server Containers](#)
- [Default Java EE CMOs](#)
- [Customized CMOs in Configuration Files](#)
- [Global CMO Templates](#)
- [Configuring Concurrent Constraints](#)
- [Querying CMOs](#)

7.1 About Java EE Concurrency Utilities

The Concurrency Utilities for Java EE 1.0 (JSR 236) implements a standard API for providing asynchronous capabilities to Java EE application components, such as servlets and EJBs.

As described in the Java EE 7 Tutorial, the two main concurrency concepts are processes and threads:

- Processes are primarily associated with applications running on the operating system (OS). A process has specific runtime resources to interact with the underlying OS and allocate other resources, such as its own memory, just as the JVM process does. A JVM is in fact a process.
- Threads share some features with processes, since both consume resources from the OS or the execution environment. But threads are easier to create and consume many fewer resources than a process.

The primary components of the concurrency utilities are:

- **ManagedExecutorService (MES):** Used by applications to execute submitted tasks asynchronously. Tasks are executed on threads that are started and managed by the container. The context of the container is propagated to the thread executing the task.
- **ManagedScheduledExecutorService (MSES):** Used by applications to execute submitted tasks asynchronously at specific times. Tasks are executed on threads

that are started and managed by the container. The context of the container is propagated to the thread executing the task.

- **ManagedThreadFactory (MTF):** Used by applications to create managed threads. The threads are started and managed by the container. The context of the container is propagated to the thread executing the task.
- **ContextService:** Used to create dynamic proxy objects that capture the context of a container and enable applications to run within that context at a later time or be submitted to a Managed Executor Service. The context of the container is propagated to the thread executing the task.

For more detailed information, see "Concurrency Utilities for Java EE" in *The Java EE 7 Tutorial*. Also see the Java Specification Request 236: Concurrency Utilities for Java EE 1.0 (<http://jcp.org/en/jsr/detail?id=236>).

7.1.1 Concurrency 1.0 Code Examples in WebLogic Server

When you install WebLogic Server complete with the examples, the examples source code is placed in the `EXAMPLES_HOME\examples\src\examples` directory. The default path is `ORACLE_HOME\wlserver\samples\server`. From this directory, you can access the source code and instruction files for the Concurrency 1.0 examples without having to set up the samples domain.

The `ORACLE_HOME\user_projects\domains\wl_server` directory contains the WebLogic Server examples domain; it contains your applications and the XML configuration files that define how your applications and Oracle WebLogic Server will behave, as well as startup and environment scripts. For more information about the WebLogic Server code examples, see *Sample Applications and Code Examples in Understanding Oracle WebLogic Server*.

- **Using Concurrency ContextService** – demonstrates how to use `ContextService` interface to create dynamic proxy objects.

`EXAMPLES_HOME/wl_server/examples/src/examples/javaee7/concurrency/dynamicproxy`

- **Using Concurrency Executor** – demonstrates how to use `javax.enterprise.concurrent.ManagedExecutorService` for submitting tasks.

`EXAMPLES_HOME/examples/src/examples/javaee7/concurrency/executor`

- **Using Concurrency Schedule** – demonstrates how to use `javax.enterprise.concurrent.ManagedScheduledExecutorService` for submitting delayed or periodic tasks.

`EXAMPLES_HOME/examples/src/examples/javaee7/concurrency/schedule`

- **Using Concurrency Threads** – demonstrates how to use `javax.enterprise.concurrent.ManagedThreadFactory` to obtain a thread from the Java EE container.

`EXAMPLES_HOME/examples/src/examples/javaee7/concurrency/threads`

Oracle recommends that you run these examples before programming your own applications that use concurrency.

7.2 How Concurrent Managed Objects Provide Concurrency for WebLogic Server Containers

This section discusses how WebLogic Server provides concurrency capabilities to Java EE applications by associating the Concurrency Utilities API with the Work Manager to make threads container-managed.

- [How WebLogic Server Handles Asynchronous Tasks in Application Components](#)
- [Concurrent Managed Objects \(CMOs\)](#)
- [CMOs versus CommonJ API](#)
- [CMO Context Propagation](#)
- [Self Tuning for CMO Tasks](#)
- [Threads Interruption When CMOs Are Shutting Down](#)
- [CMO Constraints for Long-Running Threads](#)

7.2.1 How WebLogic Server Handles Asynchronous Tasks in Application Components

With JSR236 Concurrent Utilities, WebLogic Server can recognize the asynchronous tasks in a server application component, and then manages them by:

- Providing the proper execution context. See [CMO Context Propagation](#).
- Submitting tasks to the single server-wide self-tuning thread pool to make them prioritized based on defined rules and run-time metrics. See [Self Tuning for CMO Tasks](#).
- Interrupting the thread that the task is executed in when the component that created the task is shutting down. See [Threads Interruption When CMOs Are Shutting Down](#).
- Limiting the number of new running threads to be created by managed objects when the task is not suitable to be dispatched to the self-tuning thread pool. See [CMO Constraints for Long-Running Threads](#).

7.2.2 Concurrent Managed Objects (CMOs)

In WebLogic Server, asynchronous task management is provided by four types of Concurrent Managed Objects (or CMOs).

[Table 7-1](#) summarizes the CMOs that provide asynchronous task management.

Table 7-1 CMOs that Provide Asynchronous Task Management

Managed Object	Context Propagation	Self Tuning	Thread Interruption While Shutting Down	Limit of Concurrent Long-Running New Threads
Managed Executor Service (MES)	Contexts are propagated based on configuration. See CMO Context Propagation .	Only short-running tasks are dispatched to the single self-tuning thread pool by a specified work manager. See Self Tuning for CMO Tasks .	When Work Manager is shutting down, all the unfinished task will be canceled. See Threads Interruption When CMOs Are Shutting Down .	The maximum number of long-running threads created by MES/MSES can be configured to avoid excessive number of these threads making negative effect on server. See CMO Constraints for Long-Running Threads .
Managed Scheduled Executor Service (MSES)	Contexts are propagated based on configuration. See CMO Context Propagation .	Same behavior as MES. See Self Tuning for CMO Tasks .	Same behavior as MES. See Threads Interruption When CMOs Are Shutting Down .	Same behavior as MES. See CMO Constraints for Long-Running Threads .
Context Service	Contexts are propagated based on configuration. See CMO Context Propagation .	n/a	n/a	n/a
Managed Thread Factory (MTF)	Contexts are propagated based on configuration. See CMO Context Propagation .	Threads returned by the <code>newThread()</code> method are not from the single self-tuning thread pool and will not be put into the thread pool when the task is finished. See Self Tuning for CMO Tasks .	Threads created by the <code>newThread()</code> method will be interrupted when the MTF is shutting down. See Threads Interruption When CMOs Are Shutting Down .	The maximum number of new threads created by MTF can be configured to avoid excessive number of these threads making negative effect on server. See CMO Constraints for Long-Running Threads .

There are three types of JSR236 CMOs in WebLogic Server, each one characterized by its scope and how it is defined and used.

- [Default Java EE CMOs](#) – Required by the Java EE standard that default resources be made available to applications, and defines specific JNDI names for these default resources.
- [Customized CMOs in Configuration Files](#) – Can be defined at the application and module level or referenced from an application component environment (ENC) that is bound to JNDI.
- [Global CMO Templates](#) – Can be defined globally as templates in the domain's configuration by using the WebLogic Server Administration Console and configuration MBeans.

Similar to Work Managers, global CMO templates can be defined at the domain or server level using the WebLogic Server Administration Console or configuration MBeans. For more information see, [Configuring CMO Templates using the Administration Console](#) and [Using MBeans to Configure CMO Templates](#).

7.2.3 CMOs versus CommonJ API

The CommonJ API (`commonj.work`) in WebLogic Server provides a set of interfaces that allows an application to execute multiple work items concurrently within a container. CMOs and CommonJ APIs operate at the same level: they both dispatch tasks to work managers and programmatically handle work from within an application. However, there are distinct differences between CMOs and the CommonJ API, such as:

- CommonJ API is Weblogic specific and CMOs have been standardized.
- CommonJ API provides functions similar to the CMO Managed Executor Service and Managed Scheduled Executor Service, but it does not provides CMO functions like the Managed Thread Factory and the Context Service.

For information about using the CommonJ API, see *Using the Timer and Work Manager API* in *Developing CommonJ Applications for Oracle WebLogic Server*.

7.2.4 CMO Context Propagation

This section explains the four context types that are propagated for CMOs and the context invocation points in WebLogic Server for MES and MSES managed objects.

7.2.4.1 Propagated Context Types

[Table 7-2](#) summarizes the contexts types that are propagated for the four types of managed objects.

Table 7-2 Propagated Context Types

Context Type	Description	Context Tasks Run with...
JNDI	JNDI namespace	For MES, MSES, and ContextService, tasks can access the application-scoped JNDI tree (such as <code>java:app</code> , <code>java:module</code> , <code>java:comp</code>) of the submitting thread. For MTF, tasks can access application-scoped JNDI tree of the component that created the ManagedThreadFactory instance.

Table 7-2 (Cont.) Propagated Context Types

Context Type	Description	Context Tasks Run with...
ClassLoader	Context Class loader	For MES, MSES, and ContextService, tasks run with the context classloader of the submitting thread. For MTF, tasks run with the classloader of the component that created the ManagedThreadFactory instance
Security	Subject identity	For MES, MSES, and ContextService, tasks run with the subject identity of the submitting thread. For MTF, tasks run with the anonymous subject.
WorkArea	WorkArea contexts with PropagationMode WORK	For MES, MSES, and Context Service there is a new WorkArea context type, and so all tasks run with a WorkContextMap, which contains all the submitting thread's contexts with WORK mode. For MTF, all tasks run with an empty WorkContextMap. Note: While the WorkContextMap is a new instance, the contained values are not, so updating the contents of the values can affect the contents of the submitting thread.

7.2.4.2 Contextual Invocation Points

Table 7-3 summarizes the callback methods of the Contextual Invocation Points in WebLogic Server and the context that the Contextual Invocation Point runs with for the MES and MSES managed objects.

Table 7-3 Contextual Invocation Points

Concurrent Managed Objects	Contextual Invocation Points	Context with which the Contextual Invocation Point Runs
ManagedExecutorService	callback method: <code>javax.enterprise.concurrent.ManagedTaskListener</code>	The Contextual Invocation Points run with the context of the application component instance that called the <code>submit()</code> , <code>invokeAll()</code> , <code>invokeAny()</code> methods.

Table 7-3 (Cont.) Contextual Invocation Points

Concurrent Managed Objects	Contextual Invocation Points	Context with which the Contextual Invocation Point Runs
ManagedScheduledExecutor Service	callback methods: <code>javax.enterprise.concurrent.ManagedTaskListener</code> and <code>javax.enterprise.concurrent.Trigger</code>	The application component instance that called the <code>submit()</code> , <code>invokeAll()</code> , <code>invokeAny()</code> , <code>schedule()</code> , <code>scheduleAtFixedRate()</code> , <code>scheduleWithFixedDelay()</code> methods.

7.2.5 Self Tuning for CMO Tasks

Short-running tasks submitted to the MES or the MSES are dispatched to the single self-tuning thread pool by associating with the Work Manager specified in deployment descriptors.

The execution of the tasks will be consistent with the rules defined for the specified Work Manager. For tasks submitted to the `execute` method in MES and MSES, if the Work Manager's overload policy rejects the task, the following events will occur:

- The `java.util.concurrent.RejectedExecutionException` will be thrown in the `submit` or `execute` method.
- The overload reason parameter passed to `weblogic.work.Work` will be set to the `RejectedExecutionException`.
- If the user registered the task with the `ManagedTaskListener`, this listener will not be notified because user can receive the overload message through the `RejectedExecutionException`.

Note: A `ManagedTaskListener` is used to monitor the state of a task's `Future`. For more information see, [Package `javax.enterprise.concurrent`](#).

For the `invokeAll()` and `invokeAny()` methods in the MES and MSES, for any of the submitted tasks that are is rejected by the Work Manager overload policy, the following events will occur:

- The user-registered `ManagedTaskListener`'s `taskSubmitted()` method will be called.
- The user-registered `ManagedTaskListener`'s `taskDone()` method will be called and the `throwableParam` will be `javax.enterprise.concurrent.AbortedException`.
- The overload reason parameter passed to `weblogic.work.Work` will be set to the `AbortedException`.

For the `schedule()`, `scheduleAtFixRate()`, `scheduleAtFixDelay()`, and `schedule(Trigger)()` methods, if the task is rejected by the Work Manager's overload policy, the following events will occur:

- The user-registered `ManagedTaskListener`'s `taskDone()` method will be called, the `throwableParam` will be `javax.enterprise.concurrent.AbortedException`.

- The overload reason parameter passed to `weblogic.work.Work` will be set to the `AbortedException`.
- If the task is periodic, the next run of task will still be scheduled.

7.2.6 Threads Interruption When CMOs Are Shutting Down

When either the MES or MSES is shut down:

- None of the waiting tasks will be executed.
- All the running threads will be interrupted. The user should check the `Thread.isInterrupted()` method and terminate their tasks because WebLogic Server will not force it to terminate.
- An executor returned Future object will throw the `java.util.concurrent.CancellationException()` if the `Future.get()` method is called.
- User registered `ManagedTaskListener`'s `taskAborted()` method will be called and `paramThrowable` will be the `CancellationException()`.

When the MTF is shut down:

- All threads that it has created using the `newThread()` method are interrupted. Calls to the `isShutdown()` method in the `ManageableThread` interface on these threads return true.
- All subsequent calls to the `newThread()` method throw a `java.lang.IllegalStateException`.

For the `ContextService`, no thread is interrupted. However:

- All invocations to any of the proxied interface methods will fail with a `java.lang.IllegalStateException`.

7.2.7 CMO Constraints for Long-Running Threads

As mentioned above, long-running tasks submitted to MES and MSES and the calling of `newThread()` method of MTF need to create new threads that will not be managed as a part of the self-tuning thread pool. Because an excessive number of running threads can have a negative affect on server performance and stability, configurations are provided to specify the maximum number of running threads that are created by concurrency utilities API.

7.2.7.1 Setting Limits for Maximum Concurrent Long Running Requests

The limit of concurrent long-running requests submitted to MES and MSES can be specified in managed object and server levels. All levels of configurations are independent and the maximum of the concurrent long-running requests cannot exceed any of them.

[Table 7-4](#) summarizes the limit of concurrent long-running requests with the `max-concurrent-long-running-requests` element that can be defined in the deployment descriptors.

Table 7-4 Limit of Concurrent Long-running Requests

Scope	Deployment Descriptor	Description	<max-concurrent-long-running-requests> Element Details
Server	In <code>config.xml</code> : As the sub-element of <domain><server> or <domain><server- template>	Limit of concurrent Long-running requests specified for that server.	Optional Range: [0-65534]. When out of range, the default value will be used Default value: 100
Managed Object	In <code>weblogic-application.xml</code> , <code>weblogic-ejb-jar.xml</code> , or <code>weblogic.xml</code> : As the sub-element of <managed-executor-service> or <managed-scheduled-executor-service> in <code>config.xml</code> : As the sub-element of <managed-executor-service-template> or <managed-scheduled-executor-service-template>	Limit of concurrent long-running requests specified for that MES or MSES.	The same as above with the exception that the default value is 10.

When the specified limit is exceeded, the MES or MSES will take following actions for new long-running tasks submitted to them:

- The `java.util.concurrent.RejectedExecutionException` will be thrown when calling the task submission API.
- If the user registered the task with the `ManagedTaskListener`, then this listener will not be notified because the submit method failed.

Note that above rule is not applied for the `invokeAll()` and `invokeAny()` methods. If any of the tasks submitted by these methods is rejected by the specified limit, the following events will occur:

- The user-registered `ManagedTaskListener`'s `taskSubmitted()` method will be called.
- The user-registered `ManagedTaskListener`'s `taskDone()` method will be called and the `throwableParam` will be `javax.enterprise.concurrent.AbortedException`.
- Other submitted tasks will not be affected.
- The method will *not* throw the `RejectedExecutionException`.

Example 7-1 demonstrates how the value specified for the `max-concurrent-long-running-requests` element in the `config.xml` can affect the maximum number of long-running requests.

Example 7-1 Sample Placements of max-concurrent-long-running-requests in config.xml

```

<domain>
  <server>
    <name>myserver</server>
    <max-concurrent-long-running-requests>50</max-concurrent-long-running-
requests> (place 1)
  </server>
  <max-concurrent-long-running-requests>10</max-concurrent-long-running-requests>
(place 2)
  <server-template>
    <name>mytemplate</name>
    <max-concurrent-long-running-requests>50</max-concurrent-long-running-
requests> (place 3)
  </server-template>
</domain>

```

- `place 1` – Affects the MES and MSES defined in the server instance *myserver*. All the MES and MSES running in that server instance can only create a maximum of 50 long-running-requests in total.
- `place 2` – Only affects MES and MSES defined in the domain. All the MES and MSES running in the domain can create a maximum of 10 long-running-requests in total.
- `place 3` – Affects MES & MSES defined in the server instances that apply to the template *mytemplate*. All the MES and MSES running in that server instance can only create a maximum of 50 long-running-requests in total.

[Example 7-2](#) demonstrates how the value specified for the `max-concurrent-long-running-requests` element in the `config.xml` can affect the maximum number of long-running requests.

Example 7-2 Sample Configurations of max-concurrent-long-running-requests

```

server1(100)
  |--application1
    |--managed-scheduled-executor-service1(not specified)
      |--module1
        |--managed-executor-service1(20)
          |--managed-scheduled-executor-service2(not specified)
  |--application2

```

In the following cases, none of the limits are exceeded and the above actions will not be taken:

- Assume 120 long-running tasks were submitted to `managed-executor-service1`, 115 of them were finished, 5 of them are being executed, if one more long-running task is submitted to `managed-executor-service1`, it will be executed because no limit is exceeded.

In the following cases, one of the limits is exceeded and the above actions will be taken:

- Assume 10 long-running tasks are being executed by `managed-scheduled-executor-service1`, if one more long-running task is submitted to `managed-scheduled-executor-service1`, then the limit of `managed-scheduled-executor-service1` is exceeded.

- Assume 10 long-running tasks are being executed by `application1`, 90 are being executed by `application2`, if one more long-running task is submitted to `application1` or `application2`, then the limit of `server1` is exceeded.

7.2.7.2 Setting Limits for Maximum Concurrent New Threads

The limit of concurrent new running threads created by calling the `newThread()` method of the MTF can be specified in a managed object, domain, and server level. All levels of configurations are independent and the maximum of the concurrent new running threads can not exceed any of them.

Note that the meaning of **running thread** is a thread that has been created by the MTF and which has not finished its `run()` method.

[Table 7-5](#) summarizes the limit of concurrent new running threads with an element `<max-concurrent-new-threads>` that can be defined in the deployment descriptors.

Table 7-5 Limit of Concurrent New Running Threads

Scope	Deployment Descriptor	Description	<code><max-concurrent-long-running-requests></code> Element Details
Server	In <code>config.xml</code> : As the sub-element of <code><domain><server></code> or <code><domain><server-template></code>	Limit of concurrent new running threads specified for that server.	Optional Range: [0-65534]. When out of range, the default value will be used Default value: 100
Managed Object	In <code>weblogic-application.xml</code> , <code>weblogic-ejb-jar.xml</code> , or <code>weblogic.xml</code> : As the sub-element of <code><managed-executor-service></code> or <code><managed-scheduled-executor-service></code> in <code>config.xml</code> : As the sub-element of <code><managed-executor-service-template></code> or <code><managed-scheduled-executor-service-template></code>	Limit of concurrent new running threads specified for that <code>ManagedThreadFactory</code>	The same as above with the exception that the default value is 10.

When the specified limit is exceeded, calls to the `newThread()` method of the MTF will return `null` to be consistent with the `ThreadFactory.newThread` Javadoc.

To see a sample snippet of using `max-concurrent-new-threads`, refer to [Example 7-2](#).

7.3 Default Java EE CMOs

The Java EE standard specifies that certain default resources be made available to applications, and defines specific JNDI names for these default resources. WebLogic

Server makes these names available through the use of logical JNDI names, which map Java EE standard JNDI names to specific WebLogic Server resources.

- [Default Managed Executor Service](#)
- [Default Managed Scheduled Executor Service](#)
- [Default Context Service](#)
- [Default Managed Thread Factory](#)

7.3.1 Default Managed Executor Service

There is a default MES instance for each application. It is automatically bound to the default JNDI name of `java:comp/DefaultManagedExecutorService` of all the sub-components when deployed.

- Uses the default Work Manager as the dispatch policy
- Propagates all the context-info
- The long-running request limit default is 10
- The long-running thread priority defaults to normal

You can also use the default MES in applications with the `@Resource` annotation. For example:

```
package com.example;
public class TestServlet extends HttpServlet {
    @Resource
    private ManagedExecutorService service;
```

Overriding the Default MES

The behavior of the default MES can be overridden by:

- Defining an executor template named `DefaultManagedExecutorService` in the `config.xml`. All applications will use this template to create a default MES.
- Defining a custom `managed-executor-service` in the `weblogic-application.xml`, using either deployment descriptors or annotations. This will also override the default MES definition in `config.xml` in the application. See [Custom Managed Executor Service Configuration Elements](#).

You *cannot* define a default executor named `DefaultManagedExecutorService` in the `weblogic.xml` or `weblogic-ejb-jar.xml`; doing so will cause the deployment to fail.

7.3.2 Default Managed Scheduled Executor Service

The default MSES instance is similar to the default MES instance, but is automatically bound to the default JNDI name of `java:comp/DefaultManagedScheduledExecutorService` of all the sub-components when deployed. It has the same default settings and propagates all the context information.

You can also use the default MSES in applications with the `@Resource` annotation. For example:

```
package com.example;
public class TestServlet extends HttpServlet {
```

```
@Resource
private ManagedScheduledExecutorService service;
```

Overriding the Default MSES

The behavior of the default MSES can be overridden by:

- Defining a scheduled executor template named `DefaultManagedScheduledExecutorService` in the `config.xml`. All applications will use this template to create a default MSES.
- Defining a custom `<managed-scheduled-executor-service>` in the `weblogic-application.xml`, using either deployment descriptors or annotations. This will also override the default MSES definition in `config.xml` in the application. See [Custom Managed Scheduled Executor Service Configuration Elements](#).

You *cannot* define a default scheduled executor named `DefaultManagedExecutorService` in the `weblogic.xml` or `weblogic-ejb-jar.xml`; doing so will cause the deployment to fail.

7.3.3 Default Context Service

There is a default context service instance for each application. It is automatically bound to the default JNDI name of `java:comp/DefaultContextService` of all the sub-components when deployed and propagates all types of supported contexts.

The default Context Service can also be bound to `java:comp/env/concurrent/cs` under an application component environment (ENC) using the `resource-env-ref` or `@Resource` annotation.

Note that the behavior of the default context service cannot be overridden.

[Example 7-3](#) shows how to use the default context service in a `web1.xml` file using the `resource-env-ref` element:

Example 7-3 Using the Default Context Service with `<resource-env-ref>` in a Web App

```
<!-- web.xml -->
<resource-env-ref>
  <resource-env-ref-name>concurrent/cs</resource-env-ref-name>
  <resource-env-ref-type>javax.enterprise.concurrent.ContextService</resource-env-
ref-type>
</resource-env-ref>
```

[Example 7-4](#) shows how to use the default context service in a servlet with the `@Resource` annotation:

Example 7-4 Using the Default Context Service with `@Resource` in a Servlet

```
// when using @Resource, the following 2 ways are correct.
@Resource(lookup="java:comp/env/concurrent/cs")
// @Resource(name="concurrent/cs")
private ContextService service;

// when using JNDI Naming Context to lookup:
// initialContext.lookup("java:comp/env/concurrent/cs")
```

7.3.4 Default Managed Thread Factory

There is a default MTF instance for each application. It is automatically bound to the default JNDI name of `java:comp/DefaultManagedThreadFactory` of all the sub-components when deployed.

- Propagates all types of supported contexts for new threads
- The default priority for long-running threads created by `newThread()` is `normal`
- The default limit for running concurrent new threads is 10

You can also use the default MTF in applications with the `@Resource` annotation. For example:

```
package com.example;
public class TestServlet extends HttpServlet {
    @Resource
    private ManagedThreadFactory service;
```

Overriding the Default MTF

The behavior of the default MTF can be overridden by:

- Defining a thread factory template named `DefaultManagedThreadFactory` in the `config.xml`. All applications will use this template to create a default MTF.
- Defining a custom `managed-thread-factory` in the `weblogic-application.xml`, using either deployment descriptors or annotations. This will also override the default MTF definition in `config.xml` in the application. See [Custom Managed Thread Factory Configuration Elements](#).

You *cannot* define a default thread factory named `DefaultManagedThreadFactory` in the `weblogic.xml` or `weblogic-ejb-jar.xml`; doing so will cause the deployment to fail.

7.4 Customized CMOs in Configuration Files

Customized CMOs can be defined at the application and module level or referenced from an application component environment (ENC) that is bound to JNDI.

- [Defining CMOs in WebLogic Configuration Files](#)
- [Binding CMOs to JNDI Under an Application Component Environment](#)
- [Custom Managed Executor Service Configuration Elements](#)
- [Custom Managed Scheduled Executor Service Configuration Elements](#)
- [Custom Managed Thread Factory Configuration Elements](#)
- [Transaction Management for CMOs](#)

Note:

In the current release, a custom Context Service cannot be configured.

7.4.1 Defining CMOs in WebLogic Configuration Files

Customized CMOs can be defined at the application and module level in one of these configuration files:

- `weblogic-application.xml`—CMOs specified at the application level can be assigned to that application, or any component of that application.
- `weblogic-ejb-jar.xml` or `weblogic.xml`—CMOs specified at the component level can be assigned to that component.

7.4.2 Binding CMOs to JNDI Under an Application Component Environment

Executor and thread factory CMOs can also be bound to JNDI under an application component environment (ENC) using the `resource-env-ref` element or the `@Resource` annotation. The `resource-env-ref` referencing a CMO can only be defined in `web.xml`, `ejb-jar.xml`, or `application.xml`.

The four ENC namespaces (`java:comp`, `java:module`, `java:application`, and `java:global`) are supported for `resource-env-ref-name` and `@Resource`.

If you bind an executor in an application, *AppA*, to the `java:global` JNDI namespace, the executor can be looked up and used by another application, *AppB*. Tasks submitted by *AppB* are canceled when *AppA* or *AppB* is shutdown

7.4.2.1 JNDI Binding Using `<resource-env-ref>`

[Example 7-5](#) demonstrates how to map an MES named `MyExecutor` to the `java:comp/env` JNDI namespace.

Example 7-5 Binding an Executor to JNDI Using `<resource-env-ref>`

```
weblogic.xml
<resource-env-description>
  <resource-env-ref-name>concurrent/MyExecutor</resource-env-ref-name>
  <resource-link>MyExecutor</resource-link>
</resource-env-description>

web.xml
<resource-env-ref>
  <resource-env-ref-name>concurrent/MyExecutor</resource-env-ref-name>
  <resource-env-ref-type>javax.enterprise.concurrent.ManagedExecutorService</
resource-env-ref-type>
</resource-env-ref>
```

In `weblogic.xml` the `resource-link` element specifies which executor is being mapped, which in [Example 7-5](#) is named `MyExecutor`.

Executors defined in `weblogic.xml` are searched first, followed by `weblogic-application.xml`, and then the `managed-executor-service-template` in `config.xml` to find a `executor-name` attribute that matches the one specified in `resource-link`.

If the `resource-env-description` is defined in `weblogic-ejb-jar.xml`, then `weblogic-ejb-jar.xml` is searched first, then `weblogic-application.xml`, and then `config.xml`.

7.4.2.2 JNDI Binding Using @Resource

The mapping rules for @Resource annotation are equivalent to those for resource-env-ref, but uses different these naming conventions:

- resource-env-ref-name is the name attribute value in @Resource.
- resource-link is equivalent to the mappedName attribute value defined in @Resource.

If @Resource is used under a web component, it is equivalent to define an resource-env-ref under web.xml

If @Resource is used under an EJB component, it is equivalent to define an resource-env-ref under ejb-jar.xml.

The annotation can also be used on class or methods as defined in the Java EE specification.

[Example 7-5](#) using the resource-env-ref definition is equivalent to [Example 7-6](#) using @Resource.

Example 7-6 Binding an Executor to JNDI Using @Resource

```
package com.example;
public class TestServlet extends HttpServlet {
    @Resource(name="concurrent/MyExecutor" mappedName="MyExecutor")
    private ManagedExecutorService service;
```

In this example, if the mappedName attribute of @Resource is not specified, then the default executor is used.

If you define both the resource-env-ref and @Resource, and the resource-env-ref-name and name attribute of @Resource are the same, then the resource-env-ref defined executor will be injected into the @Resource field.

You can also use @Resource with a look-up attribute or InitialContext.lookup to find a executor bound by resource-env-ref.

7.4.2.3 Updated Schemas for Custom CMO Modules

The following WebLogic Server schemas include elements for configuring CMO deployment descriptors:

- weblogic-javee.xsd – Describes common elements shared among all WebLogic-specific deployment descriptors:
<http://xmlns.oracle.com/weblogic/weblogic-javaee/1.4/weblogic-javaee.xsd>
- weblogic-application.xsd – The WebLogic Server-specific deployment descriptor extension for the application.xml Java EE deployment descriptor, where you configure features such as shared Java EE libraries referenced in an application and EJB caching.
See weblogic-application.xml Deployment Descriptor Elements in *Developing Applications for Oracle WebLogic Server*.
- weblogic-web-app.xsd – The WebLogic Server-specific deployment descriptor for Web applications.

See `weblogic.xml` Deployment Descriptor Elements in *Developing Web Applications, Servlets, and JSPs for Oracle WebLogic Server*.

- `weblogic-ejb-jar.xsd` – The WebLogic-specific XML Schema-based (XSD) deployment descriptor file for EJB deployments.

See `weblogic-ejb-jar.xml` Deployment Descriptor Reference in *Developing Enterprise JavaBeans, Version 2.1, for Oracle WebLogic Server*.

[Example 7-7](#) shows the CMO-related elements in the `weblogic-web-app.xsd`.

Example 7-7 CMO Elements in `weblogic-web-app.xsd`

```
<xs:complexType name="weblogic-web-appType">
  <xs:sequence>
    <xs:choice minOccurs="0" maxOccurs="unbounded">
      ...
      <!-- added for JSR236 -->
      <xs:element name="managed-executor-service" type="wls:managed-executor-
serviceType" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="managed-scheduled-executor-service" type="wls:managed-
scheduled-executor-serviceType" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="managed-thread-factory" type="wls:managed-thread-
factoryType" minOccurs="0" maxOccurs="unbounded"/>
      <!-- added end -->
      ...
    </xs:choice>
  </xs:sequence>
</xs:complexType>
```

7.4.2.4 Updated System Module Beans for CMOs

The following WebLogic Server system module beans include attributes for configuring CMOs in applications and modules:

- [ManagedExecutorServiceBean](#)
- [ManagedScheduledExecutorServiceBean](#)
- [ManagedThreadFactoryBean](#)
- [WeblogicApplicationBean](#)
- `WebLogicEjbJarBean`
- `WebLogicWebAppBean`

For more information, see the WebLogic Server System Module MBeans section in the [MBean Reference for Oracle WebLogic Server](#).

7.4.3 Custom Managed Executor Service Configuration Elements

This section defines the configuration elements for a managed executor service.

Table 7-6 Managed Executor Service Configuration Elements

Name	Description	Required	Default Value	Range
name	<p>The name of the MES.</p> <p>An MES with the same name cannot be configured in the same scope. For example, if the same MES name is used in an application or module scope, the deployment of the application will fail.</p> <p>An MES can have the same name as other types of managed objects, such as a ContextService, in any scope and it will be no relationship between them.</p> <p>An MES with the same name can only be configured in different scopes if:</p> <ul style="list-style-type: none"> • If there are more than one MES with same name configured in the server template, partition template, or application scope, the partition MES template executor will override the server template, and the application scope MES will override the other two levels. • If there is a MES A defined in module scope which name is same with the executor B defined in server template, partition template or application scope. A and B will both exists. Which executor is used is determined by the location referencing the executor. 	Yes	n/a	An arbitrary non-empty string.
dispatch-policy	<p>The name of the Work Manager. The rule of which Work Manager should be used is:</p> <ul style="list-style-type: none"> • Search module scope Work Manager first if the ManagedExecutorService is defined in module scope. • If not found, search application level. • If still not found, the default Work Manger is used. (This behavior is consistent with servlet and EJB's dispatch policy resolving strategy.) 	No	Default Work Manager	n/a
max-concurrent-long-running-requests)	<p>Maximum number of concurrent long running tasks.</p> <p>See Setting Limits for Maximum Concurrent Long Running Requests.</p>	No	10	[0-65534]. When out of range, the default value will be used.
long-running-priority	<p>An integer that specifies the long-running daemon thread's priority. If specified, all long-running threads will be affected.</p> <p>See Setting Limits for Maximum Concurrent New Threads.</p>	No	Thread.NORM_PRIORITY	1-10 Range between Thread.MIN_PRIORITY and Thread.MAX_PRIORITY. When out of range, the default value will be used.

7.4.3.1 Deployment Descriptor Examples

[Example 7-8](#) is an example of a custom MES definition in a Web application's `weblogic.xml` file:

Example 7-8 Using Deployment Descriptor to Define a Custom MES in an Application

```
<!-- weblogic.xml -->
  <managed-executor-service>
    <name>MyExecutor</name>
    <dispatch-policy>MyWorkManager</dispatch-policy>
    <long-running-priority>10</long-running-priority>
    <max-concurrent-long-running-requests>10</max-concurrent-long-running-
requests>
  </managed-executor-service>
```

[Example 7-9](#) is an example of a custom MES reference in the `weblogic.xml` descriptor using the `<resource-env-ref>` element:

Example 7-9 Referencing a Custom MES Using `<resource-env-ref>` in an Application

```
weblogic.xml
  <resource-env-description>
    <resource-env-ref-name>concurrent/MyExecutor</resource-env-ref-name>
    <resource-link>MyExecutor</resource-link>
  </resource-env-description>
```

[Example 7-10](#) is an example of a custom MES reference in a `web1.xml` file using the `<resource-env-ref>` element:

Example 7-10 Referencing a Custom MES Using `<resource-env-ref>` in a Web App

```
web.xml
  <resource-env-ref>
    <resource-env-ref-name>concurrent/MyExecutor</resource-env-ref-name>
    <resource-env-ref-type>javax.enterprise.concurrent.ManagedExecutorService</
resource-env-ref-type>
  </resource-env-ref>
```

[Example 7-11](#) is an example of a custom MES reference in a servlet using the `@Resource` annotation.

Example 7-11 Referencing a Custom MES in a Servlet Using `@Resource` in a Servlet

```
package com.example;
public class TestServlet extends HttpServlet {
  @Resource(name="concurrent/MyExecutor" mappedName="MyExecutor")
  private ManagedExecutorService service;
```

7.4.4 Custom Managed Scheduled Executor Service Configuration Elements

This section defines the configuration elements for a managed scheduled executor service.

Table 7-7 Managed Scheduled Executor Service Configuration Elements

Name	Description	Required	Default Value	Range
name	The name of the MSES. For naming convention rules, see Table 7-6 .	Yes	n/a	An arbitrary non-empty string.
dispatch-policy	The name of the Work Manager. For Work Manager usage rules, see Table 7-6 .	No	Default Work Manager	n/a
max-concurrent-long-running-requests	Maximum number of concurrent long-running tasks. See Setting Limits for Maximum Concurrent Long Running Requests .	No	10	[0-65534] . When out of range, the default value is used.
long-running-priority	An integer that specifies the long-running daemon thread's priority. If specified, all long-running threads will be affected. See Setting Limits for Maximum Concurrent New Threads .	No	5 Thread.NORM_PRIORITY	1-1 Range between Thread.MIN_PRIORITY and Thread.MAX_PRIORITY. When out of range, the default value is used.

7.4.4.1 ScheduledFuture.get() Method

The `ScheduledFuture.get()` method will block until the latest run of the task finishes. For example, if the `Trigger` method requires the task being scheduled to run two times (i.e., `Trigger.getNextRunTime` returns null on the third call), and the first run of the task is finished at time *A*, the second run of the task is finished at time *B*, then:

- If `Future.get()` is called before time *A*, it will wait for the first run to finish and return the first run result. If it is called after time *A* and before time *B*, it will wait to the second run finish and return the second run's result.
- If `Future.get()` is called after time *B*, it will immediately return the second run result. Also, if the first run fails and throws a exception, then the first `Future.get` call will throw that exception and the second run will still be scheduled (this is

different with `scheduleAtFixRate`). If the `Trigger.skipRun` returns true on the first run, then the first `Future.get` call will throw a `SkipException`.

7.4.4.2 Deployment Descriptor Examples

[Example 7-12](#) is an example of a custom MSES definition in a Web application's `weblogic.xml` file:

Example 7-12 Using Deployment Descriptor to Define a Custom MSES in an Application

```
<!-- weblogic.xml -->
<managed-scheduled-executor-service>
  <name>MyScheduledExecutor</name>
  <dispatch-policy>MyExecutor</dispatch-policy>
</managed-scheduled-executor-service>
```

7.4.5 Custom Managed Thread Factory Configuration Elements

This section defines the configuration elements for a managed thread factory.

Table 7-8 Managed Thread Factory Configuration Elements

Name	Description	Required	Default Value	Range
name	The name of the MTF. For naming convention rules, see Table 7-6 .	Yes	n/a	An arbitrary non-empty string.
priority	The priority to assign to the thread. (The higher the number, the higher the priority.) See Setting Limits for Maximum Concurrent New Threads .	No	5 Thread. .NORM_ PRIORI TY	1-10 Range between Thread. MIN_PRIORITY and Thread. MAX_PRIORITY. When out of range, the default value is used.
max-concurrent-new-threads	The maximum number of threads created by the MTF and are still executing the <code>run()</code> method of the tasks. See Setting Limits for Maximum Concurrent New Threads .	No	10	[0-65534] When out of range, the default value is used.

7.4.5.1 Contexts of Threads Created by MTF

According to JSR236, the Managed Thread Factory is different from the other managed objects because when the thread is started using the `Thread.start()` method, the runnable that is executed will run with the context of the application component instance that created the `ManagedThreadFactory` instance. Therefore, the context of the runnable depends on the application component that created the MTF instance.

In WebLogic Server, new MTF instances are created when an application or a component is started, as follows. (A component means a web module or an EJB.)

1. A default MTF is created by that component.
2. If there is `@Resource` annotation to get an MTF, an MTF instance is created by that component.
3. If there is a `<resource-env-ref>` defined in `web.xml/ejb-jar.xml`, and there is also a corresponding `<resource-env-description>` defined in

weblogic.xml/weblogic-ejb-jar.xml with a <resource-link> for an MTF, then an MTF instance is created by that component.

4. If there is a <resource-env-ref> defined in application.xml, and there is also a corresponding <resource-env-description> defined in weblogic-application.xml with a <resource-link> for an MTF, then an MTF instance is created by that application.

When an MTF is created by a component in the case of items 1, 2, and 3 listed above, the Runnable runs with the context of that component, as follows:

- **ClassLoader:** the class loader of that component.
- **JNDI:** The JNDI tree of that component that contains java:app, java:module, and java:comp.
- **Security:** Fixed to be the anonymous subject because there is no component-specific subject.
- **WorkArea:** Fixed to be an empty WorkContextMap because there is no component-specific WorkContextMap.

When an MTF is created by an application in the case of 4, the Runnable run with the context of that application as follows:

- **ClassLoader:** The class loader of that application.
- **JNDI:** The JNDI tree of that component that contains java:app but without java:module and java:comp.
- **Security:** Fixed to be the anonymous subject because there is no application-specific subject.
- **WorkArea:** Fixed to be an empty WorkContextMap because there is no application-specific WorkContextMap.

7.4.5.2 Deployment Descriptor Examples

[Example 7-13](#) is an example of a custom MTF definition in a Web application's weblogic.xml file:

Example 7-13 Using Deployment Descriptors to Define a Custom MTF in an Application

```
<!-- weblogic.xml -->
<managed-thread-factory>
  <name>factory1</name>
  <priority>3</priority>
  <max-concurrent-new-threads>20</max-concurrent-new-threads>
</managed-executor-service>
```

[Example 7-9](#) is an example of a custom MTF reference in a Web application's weblogic.xml file:

Example 7-14 Referencing a Custom MTF Using <resource-env-ref> in an Application

```
weblogic.xml
<resource-env-description>
  <resource-env-ref-name>ref-factory1</resource-env-ref-name>
  <resource-link>factory1</resource-link>
</resource-env-description>
```

[Example 7-10](#) is an example of a custom MTF reference in a Web application's `weblogic.xml` file:

Example 7-15 Referencing a Custom MTF Using `<resource-env-ref>` in a Web App

```
web.xml
<resource-env-ref>
  <resource-env-ref-name>ref-factory1</resource-env-ref-name>
  <resource-env-ref-type>javax.enterprise.concurrent.ManagedThreadFactory</
resource-env-ref-type>
</resource-env-ref>
```

[Example 7-11](#) is an example of a custom MTF reference in a servlet using the `@Resource` annotation:

Example 7-16 Referencing a Custom MTF Using `@Resource` in a Servlet

```
package com.example;
public class TestServlet extends HttpServlet {
  @Resource(lookup="java:comp/env/ref-factory1")
  private ManagedThreadFactory factory;
```

7.4.6 Transaction Management for CMOs

This section explains how transactions are managed by WebLogic Server for CMOs.

7.4.6.1 Transaction Management for MES and MSES

When using an MES, transactions are managed as follows:

- There are no transaction running in the Work Manager thread before the task is begun.
- The `UserTransaction.getStatus()` method is always `Status.STATUS_NO_TRANSACTION` unless the Transaction API is used to start a new transaction.
- User should always finish its transaction in user tasks; otherwise, the transaction will be rolled back.

Therefore `ManagedTask.TRANSACTION` and related attributes will be ignored.

7.4.6.2 Transaction Management for Context Service

By default, or by setting the value of execution property `ManagedTask.TRANSACTION` to `ManagedTask.SUSPEND`:

- Any transaction that is currently active on the thread will be suspended.
- A `javax.transaction.UserTransaction` accessible in the local JNDI namespace as `java:comp/UserTransaction` will be available so contextual proxy object may begin, commit, and roll back a transaction.
- If a transaction begun by a contextual proxy object is not completed before the method ends, a `WARNING` log will be output, and the transaction will be rolled back.
- The original transaction, if any was active on the thread, will be resumed when the task or contextual proxy object method returns.

By setting the value of execution property `ManagedTask.TRANSACTION` to `ManagedTask.USE_TRANSACTION_OF_EXECUTION_THREAD`:

- The transaction will be managed by the execution thread and the task themselves, so that any transaction that is currently active on the thread will not be suspended when contextual proxy object method begins, and will not be resumed when contextual proxy object method returns.
- If there is a currently active transaction on the thread, any resources used by the contextual proxy object will be enlisted to that transaction.
- If a transaction began by the contextual proxy object is not completed before the method ends, WebLogic Server will do nothing about it because there is the possibility that the transaction is completed by another method of the contextual proxy object.

7.4.6.3 Transaction Management for MTF

When using the MTF, transactions are managed as follows:

- The task runs without an explicit transaction (they do not enlist in the application component's transaction), so the `UserTransaction.getStatus()` method always returns `Status.STATUS_NO_TRANSACTION`, unless a new transaction is started in the task.
- If the transaction is not completed before the task method ends, a `WARNING` log will be output, the transaction will be rolled back.

7.5 Global CMO Templates

In addition to the JSR236 default CMOs, you can also define global CMOs as templates in the domain's configuration by using the WebLogic Server Administration Console and configuration MBeans. CMOs specified in `config.xml` can be assigned to any application, or application component, in the domain.

Note:

Partitioned domains for multi-tenancy are only available in WebLogic Server Premium Edition. For more information, see [LINK TO INTRO TO WEBLOGIC SERVER MT](#).

Note:

You should normally use the Administration Console to configure WebLogic Server's manageable objects and services and allow WebLogic Server to maintain the `config.xml` file.

You can define three types of CMO templates in a domain:

- Managed Executor Service Template
- Managed Scheduled Executor Service Template
- Managed Thread Factory Template

For example, if you define a `managed-executor-service-template`, a unique MES instance is created for each application deployed in the domain.

7.5.1 Configuring CMO Templates using the Administration Console

CMO templates can be configured globally in the domain's configuration using the WebLogic Server Administration Console.

1. In the **Domain Structure** tree, expand **Environment** and click **Concurrent Templates**.
2. Click **New** and choose one of the following template options:
 - **Managed Executor Service Template**
 - **Managed Scheduled Executor Service Template**
 - **Managed Thread Factory Template**
3. On the **Create New Template** page, enter the template properties as required. The properties vary depending on which type of concurrent template you are creating.
 - [Custom Managed Executor Service Configuration Elements](#)
 - [Custom Managed Scheduled Executor Service Configuration Elements](#)
 - [Custom Managed Thread Factory Configuration Elements](#)
4. Click **Next**.
5. Select whether to target the concurrent template to a specific WebLogic Server instance or to a WebLogic Server cluster.

Only applications that have been deployed to the selected servers or clusters can use this concurrent template.
6. Click **Finish**. The **Summary of Concurrent Templates** page displays and the new concurrent template is listed.
7. Repeat these steps to create other concurrent templates as necessary.

For instructions about using the WebLogic Server Administration Console to manage a WebLogic Server domain, see the Oracle WebLogic Server Administration Console Online Help.

7.5.2 Using MBeans to Configure CMO Templates

CMO templates can be configured using the following configuration MBeans under the `DomainMBean`.

- [ManagedExecutorServiceTemplateMBean](#)
- [ManagedScheduledExecutorServiceTemplateMBean](#)
- [ManagedThreadFactoryTemplateMBean](#)

For more information, see the Domain Configuration MBeans section in the [MBean Reference for Oracle WebLogic Server](#).

7.6 Configuring Concurrent Constraints

Constraints can also be defined globally in the domain's configuration using the WebLogic Server Administration Console and configuration MBeans. Concurrent constraints specified in `config.xml` can be assigned to any application, or application component, in the domain.

- [Using the Administration Console to Configure Concurrent Constraints](#)
- [Using MBeans to Configure Concurrent Constraints](#)

7.6.1 Using the Administration Console to Configure Concurrent Constraints

Concurrent constraints can be configured in the domain configuration, in specified server instances, and in server templates for dynamic clusters, using the Administration Console.

7.6.1.1 Domain-level Concurrent Constraints

To configure concurrent constraints for a domain:

1. In the **Domain Structure** tree, select the domain name at the top of the tree.
2. Select the **Configuration > Concurrency** tab.
3. On the **Concurrency** page, specify a value for any or all of the available options:
 - **Max Concurrent Long Running Requests** – The limit of concurrent long-running requests submitted to the Managed Executor Service or Managed Scheduled Executor Service. See [Setting Limits for Maximum Concurrent Long Running Requests](#).
 - **Max Concurrent New Threads** – The maximum number of concurrent new threads created by the Managed Thread Factory outside of the self-tuning thread pool. See [Setting Limits for Maximum Concurrent New Threads](#).
4. Click **Save**.

7.6.1.2 Server-level Concurrent Constraints

To configure concurrent constraints for specific server instances in a domain:

1. In the **Domain Structure** tree, expand **Environment** and click **Servers**.
2. In the **Summary of Servers** table, select a server instance.
3. On the **Concurrency** page, specify a value for any or all of the available options:
 - **Max Concurrent Long [Running] Requests** – The limit of concurrent long-running requests submitted to the Managed Executor Service or Managed Scheduled Executor Service. See [Setting Limits for Maximum Concurrent Long Running Requests](#).
 - **Max Concurrent New Threads** – The maximum number of concurrent new threads created by the Managed Thread Factory outside of the self-tuning thread pool. See [Setting Limits for Maximum Concurrent New Threads](#).
4. Click **Save**.

7.6.1.3 Dynamic Cluster-level Concurrent Constraints

To configure concurrent constraints for server templates in a dynamic cluster:

1. In the **Domain Structure** tree, expand **Environment**, expand **Clusters**, and click **Server Templates**.
2. In the **Summary of Server Templates** table, select a server template instance.
3. Select the **Configuration > Concurrency** tab.
4. On the **Concurrency** page, specify a value for any or all of the available options:
 - **Max Concurrent Long Requests** – The limit of concurrent long-running requests submitted to the Managed Executor Service or Managed Scheduled Executor Service. See [Setting Limits for Maximum Concurrent Long Running Requests](#).
 - **Max Concurrent New Threads** – The maximum number of concurrent new threads created by the Managed Thread Factory outside of the self-tuning thread pool. See [Setting Limits for Maximum Concurrent New Threads](#).
5. Click **Save**.

7.6.2 Using MBeans to Configure Concurrent Constraints

Concurrent constraints can be configured globally in the domain's configuration, in specified server instances, and in server templates for dynamic clusters using the following methods under the `DomainMBean`, `ServerMBean`, and `ServerTemplateMBean`:

- `maxConcurrentLongRunningRequests()` – See [Setting Limits for Maximum Concurrent Long Running Requests](#).
- `maxConcurrentNewThreads()` – See [Setting Limits for Maximum Concurrent New Threads](#).

For more information about using WebLogic Server MBeans, see *Accessing WebLogic Server MBeans with JMX in Developing Custom Management Utilities Using JMX for Oracle WebLogic Server*.

7.7 Querying CMOs

Global CMOs can be queried using these administrative tools:

- [Using the Administration Console to Monitor CMO Threads](#)
- [Using MBeans to Monitor CMOs](#)
- [Using MBeans to Monitor Concurrent Constraints](#)

7.7.1 Using the Administration Console to Monitor CMO Threads

CMOs can be monitored using the Administration Console.

To monitor the threads created by CMOs in a server instance:

1. In the **Domain Structure** tree, expand **Environment** and click **Servers**.

2. In the **Summary of Servers** table, select a server template instance.
3. On the **Settings** page, select the **Monitoring > Concurrency** tab.

The tab displays the statistics for CMO threads created in the global runtime.

7.7.1.1 Monitor JSR236 CMOs for All Deployed Applications and Modules

To monitor the statistics for all JSR236 CMOs in a domain:

1. In the **Domain Structure** tree, click **Deployments**.
2. In the **Summary of Deployments** page, select the **Monitoring > Concurrency** tab.

The tab displays the statistics for all the CMOs of all the deployed applications and modules in the domain by calling the relevant runtime MBeans.

7.7.1.2 Monitor JSR236 CMOs for a Deployed EAR or Module

To monitor the statistics for all JSR236 CMOs in a domain:

1. In the **Domain Structure** tree, click **Deployments**.
2. In the **Summary of Deployments** page, select the EAR or module that you want to monitor.
3. On the **Settings** page, select the **Monitoring > Concurrency** tab.

Depending on what type of application or module was selected, the tab displays the statistics from the corresponding runtime MBean:

- EAR Application – displays statistics for all the concurrent objects of that application (by calling `ApplicationRuntimeMBean`).
- Web app or EJB module within an EAR – Displays statistics for all the concurrent objects of that module (by calling `ComponentRuntimeMBean`).
- Standalone Web app or EJB module – displays statistics for all the concurrent objects of that Web app or module (by calling `ApplicationRuntimeMBean` and `ComponentRuntimeMBean`).

7.7.2 Using MBeans to Monitor CMOs

CMOs can be monitored using the following runtime MBeans under the `DomainMBean`.

- `ManagedExecutorServiceRuntimeMBean`

The `ManagedExecutorServiceRuntimeMBean` can be accessed from the following MBean attributes:

- `ApplicationRuntimeMBean.ManagedExecutorServiceRuntimes` – Provides statistics for all the Managed Executor Services of that application.
- `ComponentRuntimeMBean.ManagedExecutorServiceRuntimes` – Provides statistics for all the Managed Executor Services of that module.

See the [ManagedExecutorServiceTemplateMBean](#) in the *MBean Reference for Oracle WebLogic Server*

- `ManagedScheduledExecutorServiceRuntimeMBean`

The `ManagedScheduledExecutorServiceRuntimeMBean` can be accessed from the following MBean attributes:

- `ApplicationRuntimeMBean.ManagedScheduledExecutorServiceRuntimes` – Provides statistics for all the Managed Scheduled Executor Services of that application.
- `ComponentRuntimeMBean.ManagedScheduledExecutorServiceRuntimes` – Provides statistics for all the Managed Scheduled Executor Services of that module.

See the [ManagedScheduledExecutorServiceRuntimeMBean](#) in the *MBean Reference for Oracle WebLogic Server*

- `ManagedThreadFactoryRuntimeMBean`

The `ManagedThreadFactoryRuntimeMBean` can be accessed from the following MBean attributes:

- `ApplicationRuntimeMBean.ManagedThreadFactoryRuntimes` – Provides statistics for all the Managed Thread Factories of that application.
- `ComponentRuntimeMBean.ManagedThreadFactoryRuntimes` – Provides statistics for all the Managed Thread Factories of that module.

See the [ManagedThreadFactoryRuntimeMBean](#) in the *MBean Reference for Oracle WebLogic Server*

For more information about using WebLogic Server MBeans, see *Accessing WebLogic Server MBeans with JMX in Developing Custom Management Utilities Using JMX for Oracle WebLogic Server*.

7.7.3 Using MBeans to Monitor Concurrent Constraints

A server's concurrent constraints can be monitored using the `ConcurrentManagedObjectsRuntimeMBean`, which can be accessed from the following MBean attribute:

- `ServerRuntimeMBean.ConcurrentManagedObjectsRuntime` – Provides statistics for threads created by concurrent managed objects of global runtime.

See the [ConcurrentManagedObjectsRuntimeMBean](#) in the *MBean Reference for Oracle WebLogic Server*

For more information about using WebLogic Server MBeans, see *Accessing WebLogic Server MBeans with JMX in Developing Custom Management Utilities Using JMX for Oracle WebLogic Server*.

Using the Batch Runtime

This chapter describes the batch runtime implemented by WebLogic Server to provide support for defining, implementing, and running batch jobs, as defined for Java EE 7 in Batch Applications for the Java Platform (JSR 352).

This chapter includes the following sections:

- [About Batch Jobs](#)
- [Using the Default Batch Runtime Configuration with the Derby Database](#)
- [Configuring the Batch Runtime to Use a Dedicated Database](#)
- [Querying the Batch Runtime](#)
- [Troubleshooting Tips](#)

8.1 About Batch Jobs

Batch jobs are tasks that can be executed without user interaction and are best suited for non-interactive, bulk-oriented and long-running tasks that are resource intensive, can execute sequentially or parallel, and may be initiated ad hoc or through scheduling.

As described in the Java EE 7 Tutorial, the batch framework consists of:

- A job specification language based on XML.
- A set of batch annotations and interfaces for application classes that implement the business logic.
- A batch container that manages the execution of batch jobs.
- Supporting classes and interfaces to interact with the batch container.

For detailed information about batch jobs, batch processing, and the batch processing framework, see "Batch Processing" in *The Java EE 7 Tutorial*. Also see the Java Specification Request 352: Batch Applications for the Java Platform (<http://jcp.org/en/jsr/detail?id=352>). The specification defines the programming model for batch applications and the runtime for scheduling and executing batch jobs.

8.1.1 Batch 1.0 Code Examples in WebLogic Server

When you install WebLogic Server complete with the examples, the examples source code is placed in the `EXAMPLES_HOME\examples\src\examples` directory. The default path is `ORACLE_HOME\wlserver\samples\server`. From this directory, you can access the source code and instruction files for the Batch 1.0 examples without having to set up the samples domain.

The `ORACLE_HOME\user_projects\domains\wl_server` directory contains the WebLogic Server examples domain; it contains your applications and the XML configuration files that define how your applications and Oracle WebLogic Server will behave, as well as startup and environment scripts. For more information about the WebLogic Server code examples, see Sample Applications and Code Examples in *Understanding Oracle WebLogic Server*.

- **Using the Batch Job Operator** – demonstrates how to use the `javax.batch.operations.JobOperator` interface to submit batch jobs. The `JobOperator` interface provides a set of operations to start, stop, restart, and inspect jobs. This sample will also demonstrate how to use listeners to notify about specific event occurring during the batch processing execution.

`EXAMPLES_HOME/examples/src/examples/javaee7/batch/joboperator-api`

- **Using Batch Parallelization Model to Run Partitioned Job Steps** – demonstrates how to use the `PartitionMapper` interface to enable finer control over parallel processing.

`EXAMPLES_HOME/examples/src/examples/javaee7/batch/partition`

- **Avitek Medical Records (MedRec)** – A comprehensive educational sample application that demonstrates WebLogic Server and Java EE features, as well as best practices. For Java EE 7, Medrec showcases batch processing's capability by compiling drug statistics in the background for the administrator. The statistics sum up the cost by record, physician and drug perspectives with a start date and end date, altogether in one batch, but with three outputs.

Avitek Medical Records is optionally installed with the WebLogic Server installation. You can start MedRec from the `ORACLE_HOME/user_projects/domains/medrec` directory, where `ORACLE_HOME` is the directory you specified as the Oracle Home when you installed Oracle WebLogic Server.

Oracle recommends that you run these examples before programming your own applications that use batch.

8.2 Using the Default Batch Runtime Configuration with the Derby Database

Batch applications can be deployed and started on WebLogic Server out-of-the-box with no runtime configuration. This is useful for smaller development environments that do not process and store large amounts of data.

When no batch runtime configuration exists, WebLogic Server uses:

- The demo Derby database to create a data source needed to update the `JobRepository` to persist batch job details.
- The executor service that is bound to default JNDI name of `java:comp/DefaultManagedExecutorService` (as required by the Java EE 7 specification).

In order to access the default batch runtime configuration, WebLogic Server must be started using the `startWeblogic.sh` script.

For information about querying the batch runtime, see [Querying the Batch Runtime](#).

8.3 Configuring the Batch Runtime to Use a Dedicated Database

The batch runtime in WebLogic Server uses an XA-capable data source to access the JobRepository tables for batch jobs and a managed executor service to execute asynchronous batch jobs. The managed executor service processes the jobs and the JobRepository data source stores the status of current and past jobs.

The default batch runtime in a WebLogic domain can be used without any configuration, which is useful in development mode environments that only require the Derby demo database. For data-driven production environments that use a database schema, you can configure a dedicated JobRepository data source and managed executor service for the domain.

- [Prerequisite Steps Configure the JobRepository Tables, Batch Data Source, and Managed Executor Service](#)
- [Configuring the Batch Runtime Using the Administration Console](#)
- [Configuring the Batch Runtime Using WLST](#)

8.3.1 Prerequisite Steps Configure the JobRepository Tables, Batch Data Source, and Managed Executor Service

For enterprise-level production environments that process and store large amounts of data, a dedicated batch runtime can be configured to store the batch job details in a specific database.

8.3.1.1 Create the JobRepository Tables

The database administrator must create the JobRepository tables needed to persist batch job details. The schema name used to create these tables will be denoted by the `getSchemaName()` method in the `BatchConfigMBean` when configuring the batch runtime for the domain. See [Configure the Batch Runtime to Use a Dedicated Batch Data Source and Managed Executor Service](#).

The JobRepository tables can be created using the Repository Create Utility (RCU) or using SQL scripts for the databases supported for use with WebLogic Server 12c. Schemas for creating these tables are in the following location:

```
ORACLE_HOME/oracle_common/common/sql/wlservices/batch/dbname
```

Where `ORACLE_HOME` represents the top-level installation directory for Oracle WebLogic Server, and `dbname` represents the name of the database.

For information about the supported databases for WebLogic Server 12c, see the [Oracle Fusion Middleware Supported System Configurations](#) page on Oracle Technology Network.

8.3.1.1.1 Creating JobRepository Tables Using RCU

It is important to note the following when using RCU to create the JobRepository tables and schema owner:

1. On the **Select Components** page, select **WebLogic Services** as the component. Also, note that **Schema Owner** name will default to the schema prefix string you chose plus "WLS", such as `JBatch_WLS`. Write this name down because you will use it when you create the batch data source and the batch runtime.

2. On the **Schema Passwords** page, choose the **Select same password for all schemas** option.
3. When you click **Finish**, RCU will create tables and schemas for all WebLogic related components, including Batch, EJB Timers, Diagnostics, etc.

Now you can create the batch data source, as described in [Create a JDBC Data Source for the JobRepository](#). Remember that you must use the schema owner you chose on the **Select Components** page as the data source's user name.

Note:

The batch runtime caches the schema name and when it acquires a connection to update the JobRepository tables, it sets the schema name on the connection. Due to this limitation, it is not possible to use the same data source for both application and JobRepository (if they use separate schemas).

For more information about the Repository Clean Utility (RCU), see [Creating Schemas with the Repository Creation Utility](#).

8.3.1.1.2 Creating JobRepository Tables Using an SQL Script

If you are not using RCU utility to create the JobRepository tables for batch, you can use the SQL command-line utility and the provided `batch.sql` script to create them. For example, when you create JobRepository tables for Oracle Database and Oracle EBR (Edition-Based Redefinition), which require SQL to create the tables.

The `batch.sql` SQL script is provided for all supported databases (such as, `mysql`, `db2`, etc.) to create the JobRepository tables, and are in the following location:

```
ORACLE_HOME/oracle_common/common/sql/wlservices/batch/dbname
```

To use the `batch.sql` SQL script to create the tables, follow these steps:

1. Open an SQL command-line session for your database.
2. Create a new user called `jbatch` that will be identified by the `batch.sql` script.
3. Grant `Connect` privileges to user `jbatch`.
4. Grant `Resource` privileges to user `jbatch`.
5. Run the `batch.sql` script from the directory containing the Oracle database's SQL scripts. For example:

```
ORACLE_HOME/oracle_common/common/sql/wlservices/batch/oracle/  
batch.sql
```

Now you can create the batch data source, as described in [Create a JDBC Data Source for the JobRepository](#). Remember that you must use the `jbatch` schema owner you created as the data source's user name.

8.3.1.2 Create a JDBC Data Source for the JobRepository

For a dedicated batch runtime within a domain, the WebLogic administrator must configure an XA-capable data source for the database that will contain the JobRepository tables. When a Java EE component submits a batch job, the batch

runtime updates the JobRepository tables using this XA data source, which is obtained by looking up the data source's JNDI name.

When you create the batch data source using Administration Console or WLST, you must use the schema owner created with RCU (e.g., `jbatch_wls`) or the SQL script `jbatch`, as described in [Create the JobRepository Tables](#).

For instructions on configuring JDBC data source, see *Creating a JDBC Data Source in Administering JDBC Data Sources for Oracle WebLogic Server*.

8.3.1.3 Optionally, Create a Managed Executor Service Template

For optimum performance, the batch runtime can be configured to use application-scoped Managed Executor Services by configuring Managed Executor Service Templates (MES Template) that use the same name as the batch runtime `setBatchJobsManagedExecutorServiceName()`. If no MES Template is specified when configuring the batch runtime, it will instead use the default Java EE Managed Executor Service that is bound to `(java:comp/DefaultManagedExecutorService)`.

When a new instance of a Managed Executor Service is created for each MES template, it will then run batch jobs that are submitted for applications that are deployed to the domain. For example, if there are two MES Templates named `MES1` and `MES2` in a domain, then when `BatchApp1` and `BatchApp2` are deployed, each application will get an instance of `MES1` and `MES2`.

However, if you have set the `setBatchJobsExecutorServiceName("MES2")`, then all batch jobs submitted from `BatchApp1` or `BatchApp2` (or from any application deployed to the domain), will use `MES2`.

For instructions on configuring a Managed Executor Service Template, see [Configuring Concurrent Managed Objects](#).

8.3.2 Configure the Batch Runtime to Use a Dedicated Batch Data Source and Managed Executor Service

The JobRepository data source and Managed Executor Service you created in [Prerequisite Steps Configure the JobRepository Tables, Batch Data Source, and Managed Executor Service](#) can now be used to configure a dedicated batch runtime using any of these WebLogic administrative tools:

- [Configuring the Batch Runtime Using the Administration Console](#)
- [Configuring the Batch Runtime Using WLST](#)

Tip:

The schema name used in [Create the JobRepository Tables](#) must be specified when following the configuration steps in these sections. For example when using MBeans, the schema name must be denoted by `getSchemaName()` in the `BatchConfigMBean` for the domain.

8.3.2.1 Configuring the Batch Runtime Using the Administration Console

A dedicated batch runtime can be configured for a domain scope using the Administration Console. In the **Settings for *domain-name*** page, open the **Batch** page and complete these configuration fields:

- **Data Source JNDI Name** – Select the JNDI name of the batch runtime's JobRepository data source, which will be used to store data for batch jobs submitted from applications deployed to the domain.
- **Schema Name** – Enter the schema name used when the JobRepository tables were created by RCU or the JBatch SQL script, as described in [Create the JobRepository Tables](#).

Note that if the data source is shared by applications then this schema name must be the same name that the application expects.

- **Executor Service Template** – Select the managed executor service (MES) template that will be used to run batch jobs that are submitted from applications deployed in the domain. A MES template by the same name must exist and be targeted to the domain scope when a batch jobs is submitted.

If an MES template is not selected, then the batch runtime will use the default Java EE ManagedExecutorService that is bound to the default JNDI name of: `java:comp/DefaultManagedExecutorService`.

To configure a Managed Executor Service Template in the domain configuration using the WebLogic Server Administration Console, use the **Environment -> Concurrent Templates** page. For more information, see [Configuring Concurrent Managed Objects](#).

8.3.2.2 Configuring the Batch Runtime Using WLST

You can use WLST with the `BatchRuntimeConfigMBean` and `DomainMBean` to configure the batch runtime to use a specific database for the JobRepository:

```
def update_domain_batch_config(domainName, jndiName, schemaName):
    connect('admin','passwd')
    edit()
    startEdit()
    cmo.setDataSourceJndiName(jndiName)
    cd('/BatchConfig/' + domainName)
    cmo.setSchemaName(schemaName)
    save()
    activate()
```

In this example, if the administrator has created a data source with the JNDI name `jdbc/batchDS`, then, calling

```
update_domain_batch_config('mydomain', 'jdbc/batchDS', 'BATCH')
```

will configure the batch runtime to store all the JobRepository tables in the schema 'BATCH' in the database that is pointed by the data source that is bound to the `jndiName: 'jdbc/batchDS'`.

You can use WLST to configure the batch runtime to use specific Managed Executor Services for batch job execution. However, you must first create an Managed Executor Service and the name of the Managed Executor Service must be provided to the `DomainMBean`.

```
connect('admin','passwd')
edit()
startEdit()
cmo.setBatchJobsExecutorServiceName('mesName')
save()
activate()
```

where `mesName` is the name of the Managed Executor Service that has already been created (and targeted) to this domain.

The batch runtime can be configured to use different Managed Executor Services using the `getBatchJobsManagedExecutorServiceName()` method in the `DomainMBean`. However, a Managed Executor Service Template by the same name must exist and be targeted to the domain scope when a batch job is submitted.

For more information, see the [BatchConfigMBean](#) and [DomainMBean](#) in the *MBean Reference for Oracle WebLogic Server*.

For more information about using WLST commands, see WebLogic Server WLST Online and Offline Command Reference in the *WLST Command Reference for WebLogic Server*.

8.4 Querying the Batch Runtime

The batch runtime's `JobRepository` can be queried for domain scope using these administrative tools:

- [Using the Administration Console to Query the Batch Runtime](#)
- [Using Runtime MBeans to Query the Batch Runtime](#)

Note:

Make sure that the database that contains the batch `JobRepository` is running. For example, the default Derby database is not automatically started when you boot WebLogic Server using the `java weblogic.Server` command. If your database is not running, an exception will be thrown by the Batch RI when you submit a batch job or when you access the `BatchJobRepositoryRuntimeMBean`, either through WLST or the Administration Console. For more information, see [Troubleshooting Tips](#).

8.4.1 Using the Administration Console to Query the Batch Runtime

A `JobRepository` can be queried using the Administration Console to obtain details about batch jobs in a domain.

8.4.1.1 Get Details of all Batch Jobs

In the **Settings for *domain-name*** page, open the **Monitoring -> Batch Jobs** page to view details about all the jobs submitted by applications deployed to the domain.

Table 8-1 All Batch Jobs

Element Name	Description
Job Name	The name of the batch job.
Application Name	The name of the application that submitted the batch job.
Instance ID	The instance ID.
Execution ID	The execution ID.
Batch Status	The batch status of this job.
Start Time	The start time of the job.

Table 8-1 (Cont.) All Batch Jobs

Element Name	Description
End Time	The completion time of the job.
Exit Status	The exit status of the job.

8.4.1.2 Get Details about a Job's Execution

You can view step execution details about a job by selecting it and clicking **View**.

Table 8-2 Job Executions Details

Element Name	Description
Job Name	The name of the batch job.
Instance ID	The instance ID.
Execution ID	The execution ID.
Batch Status	The batch status of this job.
Start Time	The start time of the job.
End Time	The completion time of the job.
Exit Status	The exit status of the job.

8.4.1.3 Get Details about a Job's Step Execution

You can view metrics about each step in a job execution by selecting it and clicking **View**.

Table 8-3 Step Executions Details

Element Name	Description
Step Name	The name of the batch job step.
Step ID	The step ID.
Execution ID	The execution ID.
Batch Status	The batch status of this job.
Start Time	The start time of the job.
End Time	The completion time of the job.
Exit Status	The exit status of the job.

8.4.2 Using Runtime MBeans to Query the Batch Runtime

The JobRepository can be queried using WLST using the BatchJobRepositoryRuntimeMBean to obtain details about batch jobs in a domain.

For more information, see [BatchJobRepositoryRuntimeMBean](#) in the *MBean Reference for Oracle WebLogic Server*.

8.4.2.1 Get Details of all Batch Jobs Using `getJobDetails`

The `getJobDetails()` attribute returns details about all the jobs submitted by applications deployed to the domain. Each entry in the collection contains an array of the following elements:

Table 8-4 Elements in `getJobDetails()` Attribute

Element Name	Description
JOB_NAME	The name of the batch job.
APP_NAME	The name of the application that submitted the batch job (String).
INSTANCE_ID	The instance ID (long).
EXECUTION_ID	The execution ID (long).
BATCH_STATUS	The batch status of this job (String).
START_TIME	The start time of the job (<code>java.util.Date</code>).
END_TIME	The completion time of the job (<code>java.util.Date</code>).
EXIT_STATUS	The exit status of the job (String).

Here is an example of a WLST script that uses `getJobDetails()` to print a list of all batch jobs deployed in a domain.

```
connect('admin', 'admin123')
domainRuntime()
cd('BatchJobRepositoryRuntime')
cd('myserver')
executions=cmo.getJobDetails(6)
print "JobName AppName InstanceID ExecutionID BatchStatus StartTime EndTime ExitStatus"
print e[0], " ", e[1], " ", e[2], " ", e[3], " ", e[4], " ", e[5], " ", e[6], " ", e[7]
```

Here is sample output after running `getJobDetails()`:

```
JobName InstanceID ExecutionID BatchStatus StartTime
EndTime ExitStatus
PayrollJob 6 6 COMPLETED Fri Apr 24 10:11:00 PDT 2015 Fri Apr 24 10:11:01
PDT 2015 COMPLETED
PayrollJob 5 5 COMPLETED Fri Apr 24 10:10:57 PDT 2015 Fri Apr 24 10:10:58
PDT 2015 COMPLETED
PayrollJob 4 4 COMPLETED Fri Apr 24 10:10:56 PDT 2015 Fri Apr 24 10:10:56
PDT 2015 COMPLETED
PayrollJob 3 3 COMPLETED Mon Apr 20 11:32:12 PDT 2015 Mon Apr 20 11:32:12
PDT 2015 COMPLETED
PayrollJob 2 2 COMPLETED Mon Apr 20 11:32:10 PDT 2015 Mon Apr 20 11:32:11
PDT 2015 COMPLETED
PayrollJob 1 1 COMPLETED Mon Apr 20 11:25:26 PDT 2015 Mon Apr 20 11:25:26
PDT 2015 COMPLETED
```

8.4.2.2 Get Details of a Job Execution Using `getJobExecutions`

The `getJobExecutions` attribute returns details about a particular job execution. Each entry in the collection contains an array of the following elements:

Table 8-5 Elements in `getJobExecutions()` Attribute

Element Name	Description
JOB_NAME	The name of the batch job (String).
INSTANCE_ID	The instance ID (long).
EXECUTION_ID	The execution ID (long).
BATCH_STATUS	The batch status of this job (String).
START_TIME	The start time of the job (<code>java.util.Date</code>).
END_TIME	The completion time of the job (<code>java.util.Date</code>).
EXIT_STATUS	The exit status of the job (String).

Here is an example of using `getJobExecutions()` in a WLST script to get details for a given ExecutionID: `getJobExecutions(6)`. To get a list of all ExecutionIDs, use the `getJobDetails()` method.

```
connect('admin', 'admin123')
domainRuntime()
cd('BatchJobRepositoryRuntime')
cd('myserver')
executions=cmo.getJobExecutions(6)
print "JobName InstanceID ExecutionID BatchStatus StartTime EndTime ExitStatus"
for e in executions
    print e[0], " ", e[1], " ", e[2], " ", e[3], " ", e[4], " ", e[5], " ", e[6]
```

Here is sample output after running `getJobExecutions()`:

```
JobName InstanceID ExecutionID BatchStatus StartTime
EndTime ExitStatus
PayrollJob 6 6 COMPLETED Fri Apr 24 10:11:00 PDT 2015 Fri Apr 24 10:11:01
PDT 2015 COMPLETED
```

8.4.2.3 Get Details of a Job Step Execution Using `getStepExecutions`

The `getStepExecutions` attribute returns metrics about each step in a Job execution. Each entry in the collection contains an array of the following elements:

Table 8-6 Elements in `getStepExecutions()` Attribute

Element Name	Description
STEP_NAME	The name of the batch job step (String).
STEP_ID	The step ID (long).
EXECUTION_ID	The execution ID (long).

Table 8-6 (Cont.) Elements in `getStepExecutions()` Attribute

Element Name	Description
BATCH_STATUS	The batch status of this job (String).
START_TIME	The start time of the job (<code>java.util.Date</code>).
END_TIME	The completion time of the job (<code>java.util.Date</code>).
EXIT_STATUS	The exit status of the job (String).

Here is an example of using `getStepExecutions()` in a WLST script to get details for a given `StepExecutionID`: `getStepExecutions(6)`. To get a list of all `ExecutionIDs`, use the `getJobDetails()` method.

```
connect('admin', 'admin123')
domainRuntime()
cd('BatchJobRepositoryRuntime')
cd('myserver')
executions=cmo.getStepExecutions(6)
print "StepName StepExecutionID BatchStatus StartTime EndTime ExitStatus"
print e[0], " ", e[1], " ", e[2], " ", e[3], " ", e[4], " ", e[5], "
```

Here is sample output after running `getStepExecutions()`:

```
StepName StepExecutionID BatchStatus StartTime
EndTime ExitStatus
PayrollJob 6 6 COMPLETED Fri Apr 24 10:11:00 PDT 2015 Fri Apr 24 10:11:01
PDT 2015 COMPLETED
```

8.5 Troubleshooting Tips

This section contains some tips about configuring and using the batch runtime with WebLogic Server.

8.5.1 Make Sure the Database Containing the JobRepository Tables is Running

A common mistake made by users of the Batch RI (reference implementation) is to neglect starting the database that contains the `JobRepository` tables. For example, if you boot WebLogic using the `java weblogic.Server` command, the Derby database is not automatically started. If the DB isn't running, then when you submit a batch job or access the `JobRepositoryRuntimeMBean` (either through WLST or through the Administration Console), that job will fail and a cryptic exception will be thrown by the Batch RI:

```
[1] Exception thrown by Reference Implementation (from IBM):
```

```
Caused by: weblogic.common.resourcepool.ResourceSystemException: Cannot load driver
class org.apache.derby.jdbc.ClientDataSource for datasource '<<<Data Source name>>>'
```

Here is another error message that could be thrown by the Batch RI when the `JobRepository`'s database isn't running:

```
Caused By: com.ibm.jbatch.container.exception.PersistenceException:
weblogic.jdbc.extensions.ConnectionDeadSQLException:
weblogic.common.resourcepool.ResourceDeadException:
0:weblogic.common.ResourceException: Could not create pool connection for datasource
```

```
'_com_oracle_weblogic_batch_connector@_com_oracle_weblogic_batch_connector_impl@_com_oracle_weblogic_batch_connector_impl_WLSDatabaseConfigurationBean@_com_oracle_batch_internal_derby_batch_DataSource'.
```

```
The DBMS driver exception was: java.net.ConnectException : Error connecting to server localhost on port 1,527 with message Connection refused.
```

```
    at
com.ibm.jbatch.container.services.impl.JDBCPersistenceManagerImpl.getConnectionToDefaultSchema(JDBCPersistenceManagerImpl.java:354)
    at
com.ibm.jbatch.container.services.impl.JDBCPersistenceManagerImpl.isDerby(JDBCPersistenceManagerImpl.java:182)
    at
com.ibm.jbatch.container.services.impl.JDBCPersistenceManagerImpl.init(JDBCPersistenceManagerImpl.java:143)
    at
com.ibm.jbatch.container.servicesmanager.ServicesManagerImpl
$ServiceLoader.getService(ServicesManagerImpl.java:404)
    at
com.ibm.jbatch.container.servicesmanager.ServicesManagerImpl$ServiceLoader.access
$300(ServicesManagerImpl.java:388)
```

If you see these errors, make sure that the database that contains the Batch JobRepository is running.