Oracle® Fusion Middleware

Using WebLogic Server Multitenant

12*c* (12.2.1)

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This document describes the features and use of WebLogic Server Multitenant (MT). It describes domain partitions and how you can use them in your WebLogic Server MT environment.

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Preface

This preface describes the document accessibility features and conventions used in this guide—*Using WebLogic Server Multitenant*.

Documentation Accessibility

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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.
italic	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.

1 Introduction and Roadmap

This chapter describes the contents and organization of this guide - *Using WebLogic Server Multitenant*.

This chapter includes the following sections:

- Document Scope
- Document Audience
- Guide to this Document
- Related Information

1.1 Document Scope

This document describes the features and use of WebLogic Server Multitenant. It describes domain partitions and how you can use them in your WebLogic Server Multitenant (MT) environment.

1.2 Document Audience

This document is intended for system administrators. Fusion Middleware Control (FMWC) and WebLogic Server system administrators have complete access and control over the domain, including applications and resources within domain partitions.

Related responsibilities may include maintaining critical production systems, configuring and managing security realms, implementing authentication and authorization schemes for server and application resources, upgrading security features, and maintaining security provider databases. System administrators have in-depth knowledge of the Java security architecture, including Web services, Web application and EJB security, Public Key security, SSL, and Security Assertion Markup Language (SAML).

1.3 Guide to this Document

This document is organized as follows:

- This chapter, Introduction and Roadmap, describes the organization of this guide.
- WebLogic Server Multitenant introduces WebLogic Server Multitenant and its features.
- Configuring WebLogic Server Multitenant (MT): The Big Picture presents a high-level view of configuring WebLogic Server Multitenant.

- Configuring Virtual Targets describes how to configure virtual targets. Virtual targets define the access points to resources, such as one or more host names, a URI prefix, and the Managed Servers or cluster to which the virtual target is itself targeted.
- Configuring Resource Group Templates describes how to configure resource group templates, a named, domain-level collection of deployable resources intended to be used as a pattern by multiple resource groups.
- Configuring Security describes how to configure security in WebLogic Server MT.
- Configuring Oracle Traffic Director describes how to configure Oracle Traffic Director (OTD) in WebLogic Server Multitenant (MT) to employ OTD multitenant support.
- Configuring Domain Partitions describes how to create, configure, and manage domain partitions, an administrative and runtime slice of a domain.
- Configuring Resource Groups describes how to configure resource groups, a gathering of applications and the resources they use into a distinct administrative unit.
- Configuring Resource Overrides describes resource overrides and how to configure them, allowing administrators to customize resources at the partition level.
- Configuring Resource Consumption Management describes how to use Resource Consumption Management (RCM) to ensure the fairness of resource allocation and to reduce the contention of shared resources by collocated domain partitions in the server instance.
- Deploying Applications describes how to deploy applications and modules in a multitenant environment.
- Configuring the Shared Application Classloader describes how to use shared application classloaders in WebLogic Server MT.
- Configuring Coherence describes how to configure Coherence in WebLogic Server MT and how Coherence applications can take full advantage of the density and operational efficiencies that are provided by WebLogic Server MT.
- Configuring JDBC describes how to configure JDBC data sources in WebLogic Server MT.
- Configuring Messaging describes how to configure messaging, including persistent stores (file and JDBC stores), JMS servers, Store-and-Forward (SAF) agents, path services, messaging bridges, JMS system modules and JMS application modules, and JMS connection pools in WebLogic Server MT.
- Configuring and Programming JNDI describes how to configure foreign JNDI providers in WebLogic Server MT.
- Configuring Partition Work Managers describes Partition Work Managers and how to configure them to set thread usage policy among partitions.
- Configuring Partition Concurrent Managed Objects describes how to configure partition-level concurrent managed object templates and concurrent constraints in WebLogic Server MT.
- Configuring Partition Batch Job Runtime describes how to configure the batch runtime in WebLogic Server MT partitions.
- Configuring Resource Adapters describes how to configure connectors in WebLogic Server MT.

- Exporting and Importing Partitions describes how to export and import partitions in WebLogic Server MT.
- Managing Named Concurrent Edit Sessions describes how to manage concurrent named edit sessions in WebLogic Server MT.
- Configuring Transactions describes transaction processing in a multiple partition environment.
- Configuring Web Services describes how to configure the resources required to support advanced features for web services in WebLogic Server MT.
- Monitoring and Debugging Partitions describes how to monitor partitions in WebLogic Server MT.

1.4 Related Information

The following WebLogic Server documents contain information that is relevant to WebLogic Server MT:

- *Administering Oracle WebLogic Server with Fusion Middleware Control* - This document describes how to configure, manage, and monitor Oracle WebLogic Server and WebLogic Server MT using Fusion Middleware Control.
- *Deploying Applications to Oracle WebLogic Server* - This document describes deploying Java EE applications or application modules to WebLogic Server instances or clusters, including deploying to domain partitions, resource group templates, and resource groups.
- *Administering Security for Oracle WebLogic Server 12c (12.2.1)* - This document explains how to configure security for WebLogic Server.
- *Securing Resources Using Roles and Policies for Oracle WebLogic Server* - This document introduces the various types of WebLogic resources, and provides information that allows you to secure these resources using WebLogic Server. The current version of this document primarily focuses on securing URL (Web) and Enterprise JavaBean (EJB) resources.
- *Upgrading Oracle WebLogic Server* - This document provides procedures and other information you need to upgrade 6.x and earlier versions of WebLogic Server to the latest version. It also provides information about moving applications from a 6.x or earlier version. For specific information on upgrading WebLogic Server, see *Upgrading Oracle WebLogic Server*.

1.5 New and Changed Features In This Release

This book, *Using WebLogic Server Multitenant*, is new in WebLogic Server 12.2.1. 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

WebLogic Server Multitenant

WebLogic Server Multitenant enhances the Oracle Platform for Software-as-a-Service (SaaS) and Platform-as-a-Service (PaaS) and provides end-to-end lifecycle management—Web tier, middle tier, cache, and database.

This document introduces WebLogic Server Multitenant (MT) and describes its use in multitenant environments.

Topics:

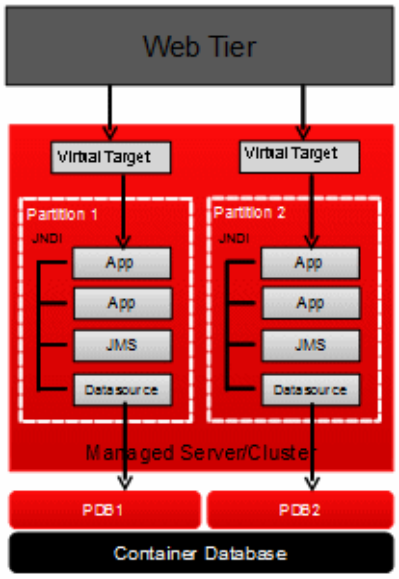
> **Note:** Many new WebLogic Server MT features such as resource groups, resource group templates, and deployment plan overrides are also available in the 12.2.1, non-MT version of WebLogic Server. This chapter notes when a given feature is available in the non-MT version and refers to the WebLogic Server documentation and online help where appropriate.

2.1 About WebLogic Server MT

Multitenancy in WebLogic Server provides a sharable infrastructure for use by multiple organizations. These organizations are a conceptual grouping of your own choosing, which you can think of as **tenants**. By allowing one domain to support multiple tenants, WebLogic Server MT improves density and achieves a more efficient use of resources while eliminating the hurdles typically present when trying to share multiple applications: runtime cross-application impact, security differences, data co-mingling, and administrative challenges.

WebLogic Server MT provides resource isolation within a **domain partition**, an administrative and runtime slice of a WebLogic domain that is dedicated to running application instances and related resources for a tenant. Domain partitions achieve greater density by allowing application instances and related resources to share the domain, WebLogic Server itself, the Java virtual machine, and the operating system while isolating tenant-specific application data, configuration, and runtime traffic, as shown in Figure 2–1.

Figure 2–1 WebLogic Server Domain Partitions



Each domain partition has its own runtime copy of the applications and resources. Changes in how WebLogic Server handles class loading provide both application isolation and efficiency. Deploying to multitenant environments requires no changes to your applications. For example, you could run multiple instances of a payroll application in different domain partitions without modifying the application.

WebLogic Server MT enables an end to end multitenant infrastructure, including multitenancy from the load balancer to the middle tier and cache tier, and to the database tier. WebLogic Server MT extends the Oracle WebLogic Server Enterprise Edition and Oracle WebLogic Suite products, and includes the following components:

- Oracle WebLogic Server MT, which enables the consolidation of applications into fewer domains (by allowing partitions within domains) while maintaining secure isolation
- WebLogic MT extensions to Java SE Advanced, which enables memory, CPU and I/O isolation, monitoring, and management for applications within a JVM
- Oracle WebLogic Coherence Enterprise Edition to Grid Edition option, which enables the consolidation of caches into fewer Oracle Coherence clusters while maintaining secure isolation
- Oracle Traffic Director, which provides WebLogic Server MT-aware and fully integrated tenant-aware local load balancing

For detailed licensing information, see "Oracle WebLogic Server Multitenant" in the *Oracle Fusion Middleware Licensing Information User Manual*.

2.1.1 WebLogic Server MT Supports Only Java EE Applications

In this release of WebLogic Server MT, only Java EE applications are supported. Products that depend on Oracle JRF (Java Required Files) are not supported.

Oracle JRF consists of those components not included in the WebLogic Server installation that provide common functionality for Oracle business applications and application frameworks. Oracle JRF consists of a number of independently developed libraries and applications that are deployed into a common location. The following components are considered part of Oracle JRF: Oracle Application Development

Framework, Oracle Fusion Middleware Audit Framework, Dynamic Monitoring Service, Fabric Common, HTTP Client, Infrastructure Security, Java Object Cache, JMX Framework, JPS, logging, MDS, OJSP.Next, Oracle Web Services, Oracle Web Services Manager, Oracle TopLink, UCP, XDK.

This means that WebLogic Server MT does not support the following products:

- Oracle Web Service Manager
- SOA Suite
- Application Development Framework (ADF)
- WebCenter
- Oracle Service Bus
- Oracle Enterprise Scheduler
- WebLogic SCA

2.2 Key Concepts in WebLogic Server MT

In addition to domain partitions, WebLogic Server MT includes these new concepts:

- **Tenants**—Tenants represent distinct user organizations, such as different external companies (for example, CompanyA and CompanyB), or different departments within a single company (for example, HR and Finance), that use applications and resources within a WebLogic domain.

  A tenant is a logical grouping of your own choosing; it is not a configurable object. That is, you manage domain partitions, not tenants.

  A tenant's identity is the association of a given user with a given tenant. For example, you might choose to associate the tenant Finance with a specific domain partition called *`Finance-partition`*.

  The system derives to which tenant a given user belongs from the user's identity as prescribed by the user identity store. Further, the user's identity helps the system enforce what that user will be authorized to do as they move throughout the system, including but not limited to which tenant the user belongs.

- **Resource Groups**—A named collection of (typically) related deployable resources, such as Java EE applications and the data sources, JMS artifacts, and other resources that the applications use.

  A traditional WebLogic Server domain may contain many types of deployable resources: Java EE applications, JMS servers and queues, data sources, and such. In this traditional model, if an application suite contains multiple Java EE applications and various resources that support those applications, the administrator defines these resources and deploys these applications individually rather than as a coherent unit.

  WebLogic Server MT introduces resource groups, simply as a convenient way to group together Java EE applications and the resources they use into a distinct administrative unit within the domain. The resources and applications are "fully qualified" in that the administrator provides all the information needed to start or connect to those resources, including credentials for connecting to a data source and targeting information for Java EE applications. A resource group will either contain these deployable resources directly or refer to a resource group template that defines the resources. Resource groups can be defined at the domain level, or be specific to a domain partition.

All the resources in or referenced by a resource group are targeted together (to the same target). Resource groups can be started and stopped.

- **Resource Group Templates**—A named, domain-level collection of deployable resources intended to be used as a pattern by (usually) multiple resource groups. Each resource group that refers to a given template will have its own runtime copies of the resources defined in the template. A resource group template is a convenient way to define and replicate resources for multiple tenants. Resource group templates make it very easy to deploy the same collection of applications and resources to multiple domain partitions.

  Resource group templates can define:

  - Application Deployments
  - Library Deployments
  - JDBC System Resources
  - JMS System Resources
  - Coherence System Resources
  - File Stores
  - JMS Servers
  - Messaging Bridges
  - Path Services
  - Persistent Stores
  - SAF Agents
  - Foreign JNDI Providers
  - Mail Sessions
  - WLDF Modules

  Resource group templates are defined at the domain level, and then referenced by one or more resource groups.

  Resource group templates are particularly useful in a SaaS environment where WebLogic Server MT activates the same applications and resources multiple times, once per domain partition. Some of the information about such resources is the same across all domain partitions, while some of it, such as the attributes of a JMS queue or of a DB connection, varies from one partition to the next. For example, the URL, username, and password used to connect to a data source would be different among different partitions. WebLogic Server MT will activate the application suite represented by the template differently for each partition. You can specify override configuration MBeans and resource deployment plans to override some attribute values in a partition. For more information, see Configuring Resource Overrides.

- **Virtual Targets**—Virtual targets encapsulate where a partition or resource group runs and how to route traffic to them, including addresses, protocol settings, and targeting. Request routing is determined by the host name and optional URI.

  May include:

  - Host name and port
  - Optional URI
  - Network Access Point/Channel

  - Protocol specific configuration
  - Target clusters and Managed Servers

  Virtual targets isolate a domain partition and the global (domain-level) runtime from the physical attributes of the target WebLogic Server instances so that your application does not have to know these details.

2.2.1 About Scope

When you deploy an application or library, you have four deployment scope options:

- **Global**. This is the equivalent of the domain level in a non-partitioned environment.
- **Resource group template**, which is always at the domain level. Whether the application or library you deploy to a resource group template is available at the domain level or a partition depends on the scope of the resource group that references the resource group template.
- **Resource group in a partition**. This is the only scope that is limited to a partition.
- **Resource group at the domain level**.

You cannot share an application or library between domain partitions: the application or library is available only within the partition. When you deploy the application or library, you specify the resource group in the partition. In FMW Control, applications and libraries that are deployed to a resource group in a partition display the name of the domain partition and the resource group within that partition where they are deployed.

The key difference between an application or class running at the domain level and an application or class running in the context of a partition is:

- Applications or classes running at the domain level are available across the domain and are *not* available in partitions.
- Applications or classes running in the context of a partition are available only within that partition.

Note: The recommended, best practice is that you deploy all applications and resources to domain partitions.

2.2.2 About Resource Isolation

Resource isolation is critically important within a partitioned environment. When you create a resource group in a domain partition, WebLogic Server MT creates runtime copies of all of the resources needed by the application, including JMS servers, JMS stores and JMS modules (including connection factories, queues, topics, and such), JCA adapters, and other associated resources.

When you deploy an application or library within a partition, any configuration changes you make are specific to that partition. WebLogic Server MT ensures that applications in one partition refer to the resources that apply to that partition only and not to resources associated with other partitions.

Resource isolation in WebLogic Server MT encompasses:

- Security—A unique security realm and identity domain for each domain partition.
- Administration:

  - Partition-specific administration
  - Independent deployment, configuration, and software updates
  - Partition-specific monitoring and troubleshooting
- Runtime:
  - Dedicated JNDI—WebLogic Server MT provides isolation between partitions at the JNDI level, which is partition-aware. Applications can bind named objects and retrieve them on a per-partition basis. Each resource is tagged (internally) with a partition-specific name, and is placed in a JNDI tree that is exclusive to the partition. Intra- and inter-application communication for a partition within a cluster is automatically isolated for the partition.
  - Isolated data—JMS, file system, and data sources
  - Resource isolation and fairness—Resource Consumption Managers (RCM) manage resources provided by the JVM or the OS. This allows system administrators to specify resource consumption management policies (including constraints, recourse actions and notifications) on resources such as CPU, heap, file, and network.
  - Partition Work Managers—Provide fairness of thread usage and prioritization of work requests among partitions that share the same WebLogic Server instance.

2.3 WebLogic Server MT Actors and Roles

Two main actors in WebLogic Server MT are WebLogic Server system administrators and partition administrators.

WebLogic Server system administrators create and delete partitions for tenants. Only system administrators can set or change the security characteristics of a partition (such as the security realm, SSL configuration), or reference a shared (domain-level) resource group or resource group template.

The significant difference between WebLogic Server system administrators and partition administrators is that partition administrators log in directly to a partition-specific security realm, as described in Administrative Roles for Configuration and Management.

Partition administrators manage partitions at the partition level, such as changing partition configuration, deploying applications, creating JMS resources, data sources, JDBC connections, and such, for each resource group in the partition.

Both system and partition administrators:

- Create, modify, and delete resource groups in partitions.
- Deploy and undeploy applications to resource groups in partitions.
- Start and stop partitions—all of the resource groups and all of the applications deployed to those resource groups are started or shut down.

Analogous to their WebLogic counterparts, partition-constrained roles exist for Deployers, Operators, and Monitors.

2.4 Understanding SaaS Multitenancy

In a SaaS environment, if an application cannot internally provide a per-tenant view or the necessary per-tenant isolation, you might instead deploy separate instances of the

application and its related server-side resources for each tenant. Each tenant might get its own stack that includes hardware capacity or Java virtual machines, WebLogic Server domains, Administration Servers, Managed Servers, clusters, and other related resources, such as web servers, data grids, networking, and storage. At the very least, this is inefficient.

The WebLogic Server MT SaaS model provides a way to get the most efficient use from server resources while still providing resource isolation. Each tenant gets an application instance plus resource instances on the targeted servers and clusters. The same application or applications run concurrently and independently on multiple domain partitions. No code changes to the applications are needed: WebLogic Server manages the domain partition identification and isolation.

In the SaaS model, you typically define one or more applications and the resources they depend on in a resource group template. You then reference this template from every domain partition in which you want to use the same applications. You make any domain partition-specific changes by editing the values of the associated resource group.

From a high-level view, the SaaS model procedural flow is:

1. The WebLogic Server system administrator creates the JMS resources, data sources, and other resources for a resource group template.
2. The WebLogic Server system administrator deploys the needed applications to the resource group template.
3. When ready to deploy for a tenant, the system administrator does the following:
    1. Creates a virtual target, if necessary.
    2. Creates a domain partition configuration, including the resource group, pluggable database (PDB) info, the virtual target, the security realm, and targets the partition to a cluster or set of Managed Servers.
    3. Overrides particular resource group and application deployment values.
    4. Starts the domain partition, which starts all of the applications deployed to the resource group for that partition.
4. After a domain partition is started, a partition administrator can view the runtime state of the partition applications and resources, view partition log entries, stop and restart the partition applications.

At deployment, the applications and resources in the resource group template are replicated and deployed for each domain partition in a resource group, with the following results:

- WebLogic infrastructure is shared among domain partitions.
- Separate application instances have their own JNDI tree and resources.
- Runtime traffic is isolated end-to-end. You accesses the application via the virtual target.
- Partition Work Managers provide fairness of thread usage and prioritization of work requests among partitions.
- Data is segregated with pluggable databases (PDBs). The data source implementation creates a separate physical connection pool for each domain partition to its assigned PDB.

2.4.1 Testing Applications in a Saas Environment

You might find that one of the many benefits of using domain partitions in a SaaS environment is to test new versions of applications in a controlled production environment.

For example, assume that a business-critical application is deployed to `Partition A`. If you make significant changes to this application, you would probably want to test it in your production environment before it is generally available to users. WebLogic Server MT provides an easy way to do this. You could create `Partition B` and deploy the updated application, without affecting the stable version of the application running in `Partition A`.

You can target the updated version of the application running in `Partition B` to real production clusters and datasources, test and tune performance metrics, and so forth, all in a controlled environment.

2.5 Understanding PaaS Multitenancy

The WebLogic Server MT PaaS model is synonymous with consolidation. Consolidation means that you can deploy different applications from many tenants into the same WebLogic infrastructure. WebLogic Server MT shares the infrastructure and underlying resources including the domain, clusters, Managed Servers, hardware, and network. In the SaaS use case, the WebLogic Server system administrator typically manages all the domain partitions and their resource instances. However, in the PaaS use case, partition administrators are more likely to administer their respective domain partitions and the resources within them, including configuring resources and deploying applications.

Consolidation:

- Makes it easy to deploy applications from many tenants into the same WebLogic infrastructure.
- Results in one domain to manage, one JVM consuming resources.
- Isolates management. WebLogic Server system administrators manage the infrastructure. Partition administrators manage domain partition deployments and related resources.
- Isolates the runtime, including domain partition-specific components: security realm (per tenant), virtual target (addresses), pluggable database, JNDI (internal traffic), JMS, Work Managers. Each tenant gets its own set of application instances and dedicated resources.

In the PaaS use case, each tenant would typically run different applications, and these applications may or may not overlap with the applications run by other tenants. When implementing a WebLogic Server MT PaaS solution, you would typically create self-contained resource groups that do not refer to resource group templates but instead represent applications and their related resources that are to be available only within that domain partition. However, even though a PaaS solution is less likely to use resource group templates, this does not mean you cannot use resource group templates in a PaaS solution if they fit your use case.

From a high-level view, the PaaS model procedural flow is:

1. The WebLogic Server system administrator creates a virtual target, if necessary.
2. The WebLogic Server system administrator creates a domain partition with a specified Partition Work Manager or quality of service (QoS) definition to manage the workload.

The Partition Work Manager defines the relative priority and underlying memory and CPU availability for the partition.

3. The WebLogic Server system administrator selects a security realm for the domain partition, and sets the list of available targets.

   Resources and applications in the domain partition are available only to users within the domain partition's security realm. Other tenants cannot see or access the resources or applications.

4. The WebLogic Server system administrator assigns the domain partition to a partition administrator.

   Resources and applications are managed by the partition administrator. (The underlying Managed Servers and clusters are not managed by a partition administrator.)

5. The partition administrator creates one or more resource groups for that domain partition and targets the resource group from the list of available targets.

6. The partition administrator creates different JMS resources, data sources, PDB info, application deployments, and such for each resource group in the domain partition.

7. The partition administrator starts the domain partition, which starts all of the applications deployed to the resource groups in the partition.

8. Repeat steps 1-4 for each additional tenant.

2.6 End-to-End Lifecycle Management

Enterprise deployments of Fusion Middleware can be complex. WebLogic Server MT simplifies consolidating many domains into one using partitions for isolation and introduces new levels of coordination between component configurations.

WebLogic Server MT lifecycle management links together partitions across different components to form one cohesive unit that serves a tenant's needs. To do this, the lifecycle manager provides configuration integration across components.

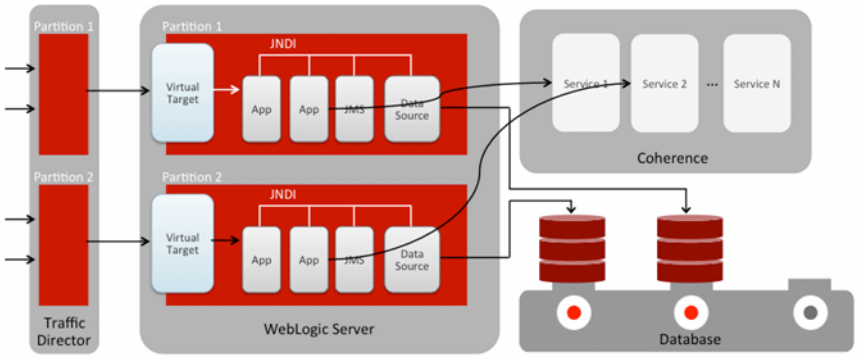
When a partition is created, updated, or deleted—either through REST, WLST, Fusion Middleware Control, or the WebLogic Server Administration Console—the lifecycle manager detects these "out of band" actions and synchronizes its configuration with the Administration Server's configuration. The lifecycle manager then informs registered plug-ins, such as the Oracle Traffic Director (OTD) plug-in, of these changes to keep the entire environment synchronized.

When a domain partition is created or updated in WebLogic Server MT, the changes are orchestrated across multiple tiers:

- The OTD configuration is updated and wired to the new partition.
- Applications are wired to Coherence caches or services.
- Data sources are wired to existing databases or pluggable databases (PDBs), or new PDBs are created.

Figure 2–2 depicts the end-to-end traffic segregation and flow from the Web tier to the database tier.

Figure 2–2 End-to-End Lifecycle Management



3

Configuring WebLogic Server Multitenant (MT): The Big Picture

This chapter describes a high-level view of configuring WebLogic Server MT. The chapter refers to the Fusion Middleware, Coherence, and Oracle Traffic Director documentation sets and online for additional information as appropriate.

3.1 How to Manage WebLogic Server MT

You can use your choice of the following four tools to manage WebLogic Server MT:

- Fusion Middleware Control, which is the preferred graphical user interface.
- WebLogic Server Administration Console
- WLST
- REST

For each task, this document presents:

- The main steps for accomplishing a given task, with a link to the related Fusion Middleware Control online help topic.
- A WLST example

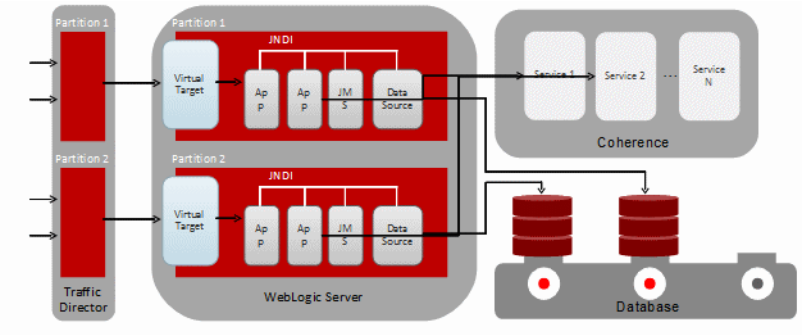
In some instances, there is a difference in how a feature is presented by Fusion Middleware Control and the WLS Administration Console. This document calls out those instances, and includes a link to the WLS Administration Console online help where appropriate.

3.2 Configuring WebLogic Server MT: The Big Picture

This section describes the high-level steps to configure WebLogic Server MT.

Consider the high-level view of WebLogic Server MT shown in Figure 3–1. This graphic shows the relationship of domain partitions, Oracle Traffic Director, a WebLogic Server domain, and Coherence.

Figure 3–1 WebLogic Server MT High-Level View



To configure WebLogic Server MT for Figure 3–1:

1. Install WebLogic Server for MT, as described in "Installing Oracle WebLogic Server and Coherence for WebLogic Server MT" in *Installing and Configuring Oracle WebLogic Server and Coherence*.

   Note: If you plan to use Oracle Traffic Director (OTD) to manage traffic to applications running in partitions, you must install WebLogic Server in the same path on any remote host where Managed Servers will run. New lifecycle management facilities require access to plugin JARs that must be available at the same relative path as installed on the Administration Server host.

2. To use Oracle Traffic Director (OTD) to manage traffic to your partitions, install OTD in collocated mode as described in *Oracle Traffic Director Installation Guide*.

   You can install OTD and WebLogic Server to different `Oracle_Home` locations on different systems (as shown in Figure 3–1), or to the same `Oracle_Home` on a single system.

3. To use OTD to manage traffic to your partitions, use the Configuration Wizard to create an OTD domain.

   Use the `Oracle Traffic Director - Restricted JRF` template to create the domain. This template automatically includes several other necessary templates.

4. Create a new domain, as described in "Creating a WebLogic Domain" in *Creating WebLogic Domains Using the Configuration Wizard*.

   Use the `Oracle Enterprise Manager - Restricted JRF` template to create the domain, as described in "Installing Oracle WebLogic Server and Coherence for WebLogic Server Multitenant" in *Installing and Configuring Oracle WebLogic Server and Coherence*. This template automatically includes several other necessary templates.

5. To use the WebLogic Server lifecycle manager feature to coordinate partition configuration changes with OTD, use WLST to enable Lifecycle Manager on the WebLogic Server domain:

```
edit()
startEdit()
cd("/")
lcmConfig=cmo.getLifecycleManagerConfig();
lcmConfig.setDeploymentType("admin")
lcmConfig.setOutOfBandEnabled(true)
```

6. Create any clusters and Managed Servers you want to use for domain partitions.

   If you use Fusion Middleware Control or the WLS Administration Console, there is nothing partition specific when creating a cluster. See "Setting up WebLogic Clusters" in *Administering Clusters for Oracle WebLogic Server*.

   However, if you use WLST to create Managed Servers (configured or dynamic), the required JRF template is not applied. Fusion Middleware Control requires the JRF template in order to enable domain monitoring.

   Therefore, for the WLST use case:

   1. Use WLST to create the cluster or Managed Server.
   2. Use the applyJRF command to apply the JRF template to the Managed Servers. For more information, see *WLST Command Reference for Infrastructure Components*.

7. Create one or more virtual targets, as described in Configuring Virtual Targets
8. Create and configure a resource group template (RGT), as described in Configuring Resource Group Templates.
9. Optionally, deploy applications to the resource group template, as described in Deploying Applications. Your applications might require partition-specific database connections.
10. Create a new security realm as described in Configuring Security.
11. To use OTD to manage traffic to your partitions, use Fusion Middleware Control to create an OTD instance.
12. Create domain partitions, as described in Configuring Domain Partitions.
13. Override resources such as JDBC connections, as described in Configuring Resource Overrides.
14. Optionally, configure Coherence, as described in Configuring Coherence.
15. Optionally, configure resource managers as described in Configuring Resource Consumption Management.
16. Monitor your domain partitions, as described in Monitoring and Debugging Partitions.

4

Configuring Virtual Targets

This chapter describes how to configure virtual targets. A virtual target is a prerequisite when creating a domain partition or a resource group. The chapter refers to the Fusion Middleware and Oracle Traffic Director documentation sets and online help for additional information as appropriate.

This chapter includes the following sections:

4.1 Configuring Virtual Targets: Overview

A **virtual target** represents a target for a resource group, both at the domain level and in a domain partition. It defines the access points to resources, such as one or more host names, a URI prefix, and the Managed Servers or cluster to which the virtual target is itself targeted.

Virtual targets are similar to virtual hosts in WebLogic Server. Like virtual hosts, virtual targets provide a separate HTTP server (web container) on each target.

A virtual target isolates a resource group from the physical attributes of where the container is running.

Each resource group requires one or more virtual targets. The virtual targets you can select depends on whether the resource group is at the domain level, or associated with a domain partition:

- For domain-level resource groups, you can select any existing virtual target that is not already assigned as an available target to a partition.
- For resource groups in a domain partition, you must select only from the existing virtual targets available to the partition.

Consider the following guidelines for using virtual targets:

- A virtual target can be used by only one partition at a time, or at the domain level. A virtual target is never shared by more than one partition, or by a partition and the domain level.
- A virtual target can be used by many resource groups within a partition, or by many resource groups at the domain level.
- A virtual target can be targeted to one cluster or one Managed Server.

- Many virtual targets can be targeted to the same cluster or Managed Server.
- If two virtual targets have the same host names, URI prefix, and port number, they must be targeted to different clusters or Managed Servers.

4.1.1 Components of a Virtual Target

A virtual target contains the following:

- Host names. The list of host names for which this virtual target will serve requests. The host names you specify must have DNS entries that resolve to the correct servers, or to a load balancer:
  - If you are not using Oracle Traffic Director (OTD) to load balance connections for a partition, specify the actual host name of the WebLogic Server cluster or Managed Server.
  - If you are using OTD to load balance connections for a partition, you access applications through OTD. The host names you specify for a virtual target must resolve to the location of the OTD Administration Server.

  If you do not specify a host name, it is the equivalent of using a wild card for the host name to match all incoming requests.

  The host name used by a client to access the resource group must exactly match one of the host names specified in the virtual target.

  You can specify multiple host names for the virtual target. You might find it convenient to specify both the simple and the fully qualified host name to ensure a match.
- Optional URI prefix for which this virtual target will serve requests. For example, if you enter `www.example.com` as the host name and `MyApp` as the URI prefix, this virtual target serves requests to `www.example.com/MyApp`, but not to `www.example.com` or `www.example.com/foo`.

  To extend this example, assume that your application root is `/app`. The resulting URL for the application would be `www.example.com/MyApp/app`.
- Target cluster and Managed Server from the list of the targets in the current domain. Targets must be either a single server or a single cluster.

There are two general approaches when using virtual targets: route by hostname (`http://partition1.com`, `http://partition2.com`), or by URI prefix (`http://server.com/partition1`, `http://server.com/partition2`). You might find it easier to manage your environment if you consistently use one approach, but there is no requirement that you do so.

You must specify at least one of host name, URI prefix, or port number.

4.1.2 Virtual Targets and Load Balancing

Virtual targets do not determine how a request gets to a particular server. DNS or a load balancer determine how requests get to a specific server instance. The host names used in the virtual target do not control the routing, but they must be consistent with it.

Virtual targets do determine what happens to a request once it enters a server. When a request enters a server it is matched against all of the virtual targets targeted to that server. If an incoming request matches the information on any of the virtual targets, it is assumed that the request is intended for that virtual target. If both hostnames and URI prefix are specified, then both must match. If two virtual targets match, the one

with the longest URI prefix match receives the request. If none match, the request is sent to the default HTTP server.

For example, assume that you have a virtual target with the host names `www.example1.com`, `www.example2.com`, and `www.example3.com`. The virtual target is targeted to `cluster1`. Requests sent to `www.example1.com`, `www.example2.com`, and `www.example3.com` all match that virtual target and are all sent to `cluster1`.

If you specify multiple virtual targets for a resource group, the virtual target matching works the same. There is no implicit load balancing among virtual targets.

For example, assume that in `PartitionA` you have a virtual target with the host name `www.example1.com` targeted to `cluster1`, and a second virtual target with the host name `www.example2.com` targeted to `cluster2`. Requests sent to `www.example1.com` match only that virtual target and are sent only to `cluster1`. Requests sent to `www.example2.com` match only that virtual target and are sent only to `cluster2`.

Use Oracle Traffic Director (OTD) if you require load balancing.

4.1.3 Using Partition Channels With Virtual Targets

You can optionally specify existing channel and port (explicit or offset) information to use as a reference for a partition-specific channel for a virtual target.

A network channel is a configurable resource that defines the attributes of a network connection to WebLogic Server. A network channel in a WebLogic Server instance is a combination of the following four attributes: communication protocol, listen address, listen port, and channel name. For more information, see "Understanding Network Channels" in *Administering Server Environments for Oracle WebLogic Server*.

The channel must exist on the selected target and be configured using the same protocol. If you specify a value for Partition Channel, you must specify either an explicit port or a port offset.

Allowable values for an explicit port are 1-65535, with 1-1023 (well-known or system ports) requiring system (or root) process privileges. The port must not already be bound by another process.

Consider the following example:

1. Create a virtual target with the host name `myexample.com` and the URI prefix `/foo`.
2. In the Partition Channel field, specify the existing channel `Channel-1` to use as a reference for creating a partition-specific channel.
3. `Channel-1` has a listen address and listen port of `127.0.0.1:7002` and an external address and listen port of `127.0.0.1:7002`.
4. Specify a port offset of 5. That results in `7002 +5` for the listen port.
5. `myexample.com` must resolve to 127.0.0.1.
6. To access this virtual target, use `myexample.com:7007/foo`.
7. If you create another virtual target that also uses `Channel-1`, you must use another port offset (or explicit port) or there will be a port conflict.
8. In all cases, specify either an explicit port value to use as-is, or an offset. Otherwise, there is no port assigned and the channel is not created and used.

You use the WLS Administration Console to create a channel. See "Configure custom network channels" in the WLS Administration Console online help.

Note: The partition channel is ignored if you use OTD to load balance the domain partition.

4.2 Creating Virtual Targets: Main Steps and Examples

Note: Do not configure a virtual target as host name: "", URI prefix: /, explicit port: 0, port offset: 0. This configuration makes the virtual target intercept all requests intended for the default HTTP server. This configuration is not allowed.

The main steps for creating a virtual target are as follows:

1. Enter a name for this virtual target.
2. Optionally, enter a URI prefix for this virtual target.
3. Add one or more host names for the virtual target. The host names you specify must resolve to the target cluster and Managed Servers you specify, or resolve to the OTD Administration Server if you are using OTD for load balancing.
4. Optionally, specify partition channel and port (explicit or offset) information to use for this virtual target, as described in Using Partition Channels With Virtual Targets. The channel must exist on the selected target and be configured using the same protocol. If you specify a value for Partition Channel, you must specify either an explicit port or a port offset.

   Note: These options are ignored if you use OTD to load balance the domain partition.

5. Select one target from the available targets. You can select a single Managed Server or a single cluster.
6. If you are using the WebLogic Server Administration Console, WLST, or REST to create the virtual target, additional HTTP configuration options are available for configuring the virtual web server. For more information, see "Configure HTTP for a virtual target" in *Oracle WebLogic Server Administration Console Online Help*.

To create a virtual target using Fusion Middleware Control, see "Create virtual targets" in the online help.

4.2.1 Creating Virtual Targets: WLST Example

The following example:

1. Creates a domain partition.
2. Creates a virtual target.
3. Sets the host name and URI prefix for the virtual target.
4. Targets the virtual target to the Administration Server. (You would typically not select the WebLogic Administration Server unless you have a special reason to do so.)
5. Adds the virtual target as an available target in the partition.
6. Creates the resource group.

7. Adds the virtual target to the resource group.
8. Activates the changes.
9. Starts the partition.

> **Note:** If this is the first partition created in production mode, you must restart the Administration Server before you can start the partition.

```
# Create virtual target
edit()
startEdit()
wls:/base_domain/edit/ !> domain=getMBean('/')
wls:/base_domain/edit/ !> peppart=domain.createPartition('Pep')
wls:/base_domain/edit/ !> vt=domain.createVirtualTarget('TestVT')
wls:/base_domain/edit/ !>
vt.setHostNames(jarray.array([String('localhost')],String))
wls:/base_domain/edit/ !> vt.setUriPrefix('/foo')
wls:/base_domain/edit/ !> tgt=getMBean('/Servers/AdminServer')
wls:/base_domain/edit/ !> vt.addTarget(tgt)
wls:/base_domain/edit/ !> peppart.addAvailableTarget(vt)
wls:/base_domain/edit/ !> peprg=peppart.createResourceGroup('TestRG')
wls:/base_domain/edit/ !> peprg.addTarget(vt)
wls:/base_domain/edit/ !> activate()
wls:/base_domain/edit/ !> startPartitionWait(peppart)
```

4.2.2 Creating Virtual Targets: REST Example

For an example of creating virtual targets using REST, see "Creating Partitions" in *Administering Oracle WebLogic Server with RESTful Management Services*.

In particular, see the section "Create a virtual target for the new partition."

4.3 Managing Virtual Targets: Main Steps and Examples

If you make a change to a virtual target that is in use by a running resource group in a running partition, you may need to restart the partition to have the change take effect.

The main steps for managing a virtual target are as follows:

1. Select the virtual target you want to manage.
2. Enter a URI prefix for this virtual target or modify the existing URI prefix
3. Add one or more host names for the virtual target. The host names you specify must resolve to the target cluster and Managed Servers you specify, or resolve to the OTD Administration Server if you are using OTD for load balancing.
4. If needed, delete one or more host names for the virtual target.
5. Optionally, specify partition channel and port (explicit or offset) information to use for this virtual target, as described in Using Partition Channels With Virtual Targets. The channel must exist on the selected target and be configured using the same protocol. If you specify a value for Partition Channel, you must specify either an explicit port or a port offset.

Note: These options are ignored if you use OTD to load balance the domain partition.

6. Select one target from the available targets. You can select a single Managed Server or a single cluster. (You would typically not select the WebLogic Administration Server unless you have a special reason to do so.)

   Deselect any target you do not want to use.

7. If you are using the WebLogic Server Administration Console, WLST, or REST to manage the virtual target, additional HTTP configuration options are available for configuring the virtual web server. See "Configure HTTP for a virtual target" in *Oracle WebLogic Server Administration Console Online Help* for more information.

8. If you made a change to a virtual target that is in use by a running resource group in a running partition, restart the partition to have the change take effect.

To manage a virtual target using Fusion Middleware Control, see "Configure virtual targets" in the online help.

4.3.1 Deleting Virtual Targets in Use by a Partition

You cannot delete a virtual target that is in use by a resource group in a partition. You must first remove it from the resource group.

To delete a virtual target that is in use by a partition:

1. Stop the partition.
2. Remove the virtual target from the resource group in that partition.
3. Remove the virtual target from the list of available targets for the partition.
4. If the virtual target is used by default with the partition, deselect this option.
5. Restart the partition.
6. Delete the virtual target.

To delete a virtual target using Fusion Middleware Control, see "Delete virtual targets in use by a partition" in the online help.

4.3.2 Delete Virtual Targets in Use by a Resource Group at the Domain Level

You cannot delete a virtual target that is in use by a resource group at the domain level. You must first remove it from the resource group.

To delete a virtual target that is in use by a resource group at the domain level:

1. Remove the virtual target you want to delete from the resource group.
2. Delete the virtual target.

To delete a virtual target see "Delete virtual targets in use by a resource group at the domain level" in the online help.

4.3.3 Managing Virtual Targets: WLST Example

The following example modifies the existing virtual target `TestVT` with the URI prefix `/app` and sets the host name to be `myhost.example.com`.

`myVT` is an instance of the VirtualTargetMBean.

```
cd('/')
edit()
startEdit()
cd('VirtualTargets')
cd ('TestVT')
cmo.setUriPrefix('/app')
cmo.setHostNames(jarray.array([String("myhost.example.com")],String))
activate()
```

You can also use the DomainMBean to look up a virtual target by name and return the VirtualTargetMBean.

```
domain=getMBean('/')
vt=domain.lookupVirtualTarget('TestVT')
vt.setUriPrefix('/app')
```

Delete a Virtual Target

The following example deletes the virtual target `TestVT`. It first removes the virtual target as an available target for the partition `Pep`.

```
cd('/')
edit()
startEdit()
domain=getMBean('/')
vt=domain.lookupVirtualTarget('TestVT')
part=domain.lookupPartition('Pep')
part.removeAvailableTarget(vt)
domain.destroyVirtualTarget(vt)
activate()
```

Retarget a Virtual Target

The following example:

1. Creates a domain partition.
2. Creates a virtual target.
3. Sets the host name and URI prefix for the virtual target.
4. Targets the virtual target to the Administration Server. (You would typically not select the WebLogic Administration Server unless you have a special reason to do so.)
5. Adds the virtual target as an available target in the partition.
6. Creates the resource group.
7. Adds the virtual target to the resource group.
8. Activates the changes.
9. Starts the partition.

> **Note:** If this is the first partition created in production mode, you must restart the Administration Server before you can start the partition.

10. Removes the Administration Server as a target.
11. Retargets the virtual target to Cluster-0.

```
# Create Pep partition and ResourceGroup
edit()
startEdit()
wls:/base_domain/edit/ !> domain=getMBean('/')
wls:/base_domain/edit/ !> peppart=domain.createPartition('Pep')
wls:/base_domain/edit/ !> vt=domain.createVirtualTarget('TestVT')
wls:/base_domain/edit/ !>
vt.setHostNames(jarray.array([String('localhost')],String))
wls:/base_domain/edit/ !> vt.setUriPrefix('/foo')
wls:/base_domain/edit/ !> tgt=getMBean('/Servers/AdminServer')
wls:/base_domain/edit/ !> vt.addTarget(tgt)
wls:/base_domain/edit/ !> peppart.addAvailableTarget(vt)
wls:/base_domain/edit/ !> peprg=peppart.createResourceGroup('TestRG')
wls:/base_domain/edit/ !> peprg.addTarget(vt)
wls:/base_domain/edit/ !> activate()
wls:/base_domain/edit/ !> startPartitionWait(peppart)
startEdit()
wls:/base_domain/edit/ !> vt.removeTarget(tgt)
wls:/base_domain/edit/ !> tgt=getMBean('/Clusters/Cluster-0')
wls:/base_domain/edit/ !> vt.addTarget(tgt)
wls:/base_domain/edit/ !> activate()
```

4.3.4 Managing Virtual Targets: REST Example

For an example of creating virtual targets using REST, see "Creating Partitions" in *Administering Oracle WebLogic Server with RESTful Management Services*.

In particular, see the section "View the default values for a new virtual target."

4.4 Configuring Virtual Targets: Related Tasks and Links

See the following sections for additional information:

- *Configuring Domain Partitions* for information on creating domain partitions.
- "Understanding Network Channels" in *Administering Server Environments for Oracle WebLogic Server* for information on network channels.

5 Configuring Resource Group Templates

This chapter describes how to configure resource group templates. The chapter refers to the Fusion Middleware, WebLogic Server, Coherence, and Oracle Traffic Director documentation sets and online for additional information as appropriate.

This chapter includes the following sections:

5.1 Configuring Resource Templates Groups: Overview

A resource group template is a named, domain-level collection of deployable resources intended to be used as a pattern by multiple resource groups. Each resource group that refers to ("references") a given template will have its own runtime copies of the resources defined in the template.

A resource group template is a convenient way to define and replicate resources for multiple tenants. Resource group templates make it very easy to deploy the same collection of applications and resources to multiple domain partitions.

Resource group templates are particularly useful in a SaaS environment where WebLogic Server Multitenant (MT) activates the same applications and resources multiple times, once per domain partition. Some of the information about such resources is the same across all domain partitions, while some of it, such as the attributes of a JMS queue or of a DB connection, varies from one partition to another.

You can create a resource group template in two ways:

- Create a new resource group template. This creates the basic structure for the resource group template. You must then edit this resource group template as needed.
- If you are using the WLS Administration Console, you can clone an existing resource group template. The configuration is copied from the template to the new resource group template. You must then edit and override values from the resource group template as needed.

This section describes the following topics:

5.1.1 What is the Difference Between a Resource Group Template and a Resource Group?

One major difference between resource group templates and resource groups is that resource group templates do not have targets. Because resource group templates are intended to be used as a pattern by multiple resource groups, possibly in many partitions, any target-specific information will most likely be unique to the resource group.

Therefore:

- If you deploy applications to the resource group template, you cannot start the applications until the resource group template is referenced by a resource group.
- You cannot start or stop a resource group template.

5.1.2 What is in a Resource Group Template?

Resource group templates are based on the ResourceGroupTemplateMBean and can include the following resources:

- General (name)
- Deployments
- Services
  - JDBC
  - Messaging
  - Mail sessions
  - Persistent stores
  - Foreign JNDI providers
  - OSGi frameworks
  - Diagnostics
- Notes

5.1.3 Resource Group Templates and Overrides

Resource overriding allows you to customize resources at the partition level.

You override resource settings that are derived from a resource group template as follows:

1. Create the resource group template.
2. Deploy applications to the resource group template as needed.
3. Define services in the resource group template as needed.
4. Create a partition and then create a resource group that references the resource group template.
5. Override values from the resource group template in the resource group.

You can override resource definitions in partitions using override configuration MBeans, resource deployment plans, and partition-specific application deployment plans. For a complete description of resource overrides, see Configuring Resource Overrides. For information on application overrides, see Deploying Applications to Partition Resource Groups.

5.1.3.1 Resource Group Template Example

Assume that you have a SaaS environment, and that you want to run an instance of a specific business application in three different partitions. This business application requires a pluggable database, which means you need one pluggable database per partition because each application instance needs it's own data isolated from the other application instances.

Assume further that the configuration for the pluggable databases will be identical for the three partitions, with the exception of the database name, user name, and password. For these values, you plan to use the values from Table 5–1.

Table 5–1 Example Pluggable Databases

PDB Name	Username/Password	For Use by
pdb1.example.com	pdbuser1/pdbuser1	Partition1
pdb2.example.com	pdbuser2/pdbuser2	Partition2
pdb3.example.com	pdbuser3/pdbuser3	Partition3

To configure your resource group template, follow these steps.

1. Create a resource group template.
2. Navigate to **Services** > **JDBC**.
3. Create a JDBC system data source. For the purpose of this example, create a generic data source.
4. Enter the configuration values for the JDBC data source.
5. For the connection properties, use the following values.

   You will override these values in the resource groups that reference this resource group template. However, by entering initial values here you can test the database connection.

   - Enter the database name. For example, from Table 5–1 enter `pdb1.example.com`.
   - Enter the database user name. For example, from Table 5–1 enter `pdbuser1`.
   - Enter the password. For example, from Table 5–1 enter `pdbuser1`.
6. Create your three partitions from Table 5–1, with resource groups based on the resource group template.
7. For `Partition1`, you do not have to override any of the JDBC data source values because you used the correct values in the resource group template.
8. For `Partition2` and `Partition3`, override the database name, user name, and password with the correct values from Table 5–1.

   To do this using FMWC, navigate to **Domain Partitions** > **Partition** > **Resource Overrides**, as described in "WebLogic Server Resource Overrides" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

5.2 Creating Resource Group Templates: Main Steps and WLST Examples

To create a new resource group template:

1. Navigate to **Domain** > **Environment** > **Resource Group Templates**.
2. Create a new resource group template. The name must be unique in the domain.

These tasks are described in "Create resource group templates" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

The initial resource group template configuration is a basic skeleton and you must configure it before you can use it. The tasks include configuring JDBC system data sources, JMS servers and resources, foreign JNDI providers, and so forth.

See Configuring Resource Group Templates: Main Steps and WLST Examples for more information.

5.2.1 Creating Resource Groups: WLST Example

The following example:

1. Creates a domain partition.
2. Creates a virtual target.
3. Sets the host name and URI prefix for the virtual target.
4. Adds the virtual target as an available target in the partition.
5. Creates the resource group.
6. Adds the virtual target to the resource group.
7. Create a resource group template.
8. Associates the resource group with the resource group template.
9. Activates the changes.
10. Starts the partition.

> **Note:** If this is the first partition created in production mode, you must restart the Administration Server before you can start the partition.

```
# Create Pep partition resource group, and resource group template
edit()
startEdit()
wls:/base_domain/edit/ !> domain=getMBean('/')
wls:/base_domain/edit/ !> peppart=domain.createPartition('Pep')
wls:/base_domain/edit/ !> vt=domain.createVirtualTarget('VirtualTarget-0')
wls:/base_domain/edit/ !>
vt.setHostNames(jarray.array([String('localhost')],String))
wls:/base_domain/edit/ !> vt.setUriPrefix('/foo')
wls:/base_domain/edit/ !> peppart.addAvailableTarget(vt)
wls:/base_domain/edit/ !> peprg=peppart.createResourceGroup('TestRG')
wls:/base_domain/edit/ !> peprg.addTarget(vt)
wls:/base_domain/edit/ !> peprgt=domain.createResourceGroupTemplate('TestRGT')
wls:/base_domain/edit/ !> peprg.setResourceGroupTemplate(peprgt)
wls:/base_domain/edit/ !> activate()
wls:/base_domain/edit/ !> startPartitionWait(peppart)
```

5.3 Configuring Resource Group Templates: Main Steps and WLST Examples

This section describes how to configure resource group templates.

This section includes the following tasks:

- Configure Resource Group Template Deployment Settings
- Configure Resource Group Template Services Settings
- Configure Resource Group Template Notes

5.3.1 Configure Resource Group Template Deployment Settings

To view and define resource group template deployment settings:

1. Select the resource group template you want to configure.
2. You can take the following deployment actions:
   - Deploy
   - Redeploy
   - Undeploy
   - Fetch deployment plan
3. Save your changes.

These tasks are described in "Configure resource group template deployments" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

For more information, see Deploying Applications to Resource Group Templates.

5.3.2 Configure Resource Group Template Services Settings

This section describes how to configure resource group template services settings. The following topics are described:

- Configure Resource Group Template JDBC Settings
- Configure Resource Group Template JMS settings
- Configure Resource Group Mail Session Settings
- Configure Resource Group Persistent Store Settings
- Configure Resource Group Foreign JNDI Provider Settings
- Configure Resource Group Diagnostic System Module Settings

5.3.2.1 Configure Resource Group Template JDBC Settings

To view configuration settings for the JDBC system resources that have been created in this resource group template:

1. Select the resource group template you want to configure.
2. Navigate to **Services** > **JDBC**.

   The read-only JDBC information for a resource group includes:

   - Name
   - JNDI Name

- Type
- Algorithm Type
- Row Prefetch Enabled
- Row Prefetch Size
- Steam Chunk Size

3. Create or delete the system data sources as needed.
4. Save your changes.

For more information, see Configuring JDBC.

5.3.2.2 Configure Resource Group Template JMS settings

This section describes how to configure resource group template JMS settings.

This section includes the following tasks:

- Configure JMS Server Settings
- Configure SAF Agent Settings
- Configure JMS Resource Settings
- Configure JMS Module Settings
- Configure Messaging Bridges
- Configure JMS Bridge Destinations
- Configure Path Services

5.3.2.2.1 Configure JMS Server Settings To view configuration settings for the JMS servers that have been created for this resource group template:

1. Select the resource group you want to configure.
2. Navigate to **Services** > **Messaging** > **JMS Servers**.

   The following read-only information is available for JMS servers already configured in this resource group template:

   - Name
   - Health
   - Health Reason
   - Persistent Store
   - Temporary Template Name
   - Bytes Maximum
   - Messages Maximum
   - Bytes Threshold High
   - Bytes Threshold Low
   - Messages Threshold High
3. Create an delete JMS servers as needed.
4. Save your changes.

These tasks are described in "WebLogic Server Messaging" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

For more information, see Configuring Messaging.

5.3.2.2.2 Configure SAF Agent Settings To view configuration settings for the store-and-forward (SAF) agents that have been created for this resource group template:

1. Select the resource group template you want to configure.
2. Navigate to **Services** > **Messaging** > **SAF Agents**.

   The following read-only information is available for the SAF agents configured in this resource group template:

   - Name
   - Agent Type
   - Persistent Store
3. Create or delete SAF Agents as needed.
4. Save your changes.

These tasks are described in "Configure SAF Agent Settings" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

For more information, see Configuring Messaging.

5.3.2.2.3 Configure JMS Resource Settings To monitor the resource settings for a resource group template:

1. Select the resource group template you want to configure.
2. Navigate to **Services** > **Messaging** > **JMS Resources**.

   The following read-only information is available for the JMS resources configured in this resource group template:

   - Name
   - Type
   - JMS Module Name
   - JNDI Name
   - Subdeployment
3. Create or delete JMS resources as needed.
4. Save your changes.

These tasks are described in "Configure SAF Agent Settings" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

For information on configuring existing JMS resources, see Configuring Messaging.

5.3.2.2.4 Configure JMS Module Settings To configure the JMS modules for a resource group template:

1. Select the resource group template you want to configure.
2. Navigate to **Services** > **Messaging > JMS Modules** > **JMS Modules**.

The following read-only information is available for the JMS modules configured in this resource group template:

- Name
- Queues
- Topics
- Connection Factories
- Distributed Queues
- Distributed Topics
- Foreign Servers
- Quotas
- SAF Error Handlers
- SAF Imported Destinations
- SAF Remote Contexts
- Templates
- Uniform Distributed Queues
- Uniform Distributed Topics
- Destination Keys
- Type

3. Create or delete JMS modules as needed.
4. Save your changes.

These tasks are described in "Configure JMS module settings" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

For more information, see Configuring Messaging.

5.3.2.2.5 Configure Messaging Bridges To configure the messaging bridge settings for a resource group template:

1. Select the resource group template you want to configure.
2. Navigate to **Services** > **Messaging** > **Messaging Bridges**.

   The following read-only information is available for the messaging bridges configured in this resource group template:

   - Name
   - Source Bridge Destination
   - Target Bridge Destination

3. Create or delete messaging bridges as needed.
4. Save your changes.

These tasks are described in "Configure messaging bridges" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

For more information, see Configuring Messaging.

5.3.2.2.6 Configure JMS Bridge Destinations To configure the JMS bridge destination settings for a resource group template:

1. Select the resource group template you want to configure.
2. Navigate to **Services** > **Messaging** > **Bridge Destinations**.

   The following read-only information is available for the JMS bridge destinations configured in this resource group template:

   - Name
   - Adapter JNDI Name
3. Create or delete JMS bridge destinations as needed.
4. Save your changes.

These tasks are described in "Configure JMS bridge destinations" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

For more information, see Configuring Messaging.

5.3.2.2.7 Configure Path Services To configure the path services settings for a resource group template:

1. Select the resource group template you want to configure.
2. Navigate to **Services** > **Messaging** > **Path Services**.

   The following read-only information is available for the path services configured in this resource group template:

   - Name
   - Persistent Store
3. Create or delete path services as needed.
4. Save your changes.

These tasks are described in "Configure path services" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

For more information, see Configuring Messaging.

5.3.2.3 Configure Resource Group Mail Session Settings

To view configuration settings for the mail sessions that have been created in this resource group template:

1. Select the resource group template you want to configure.
2. Navigate to **Services** > **Mail**.

   The following read-only information is available for mail sessions configured in this resource group template:

   - Name
   - JNDI Name
3. Create or delete mail sessions as needed.
4. Save your changes.

These tasks are described in "WebLogic Server Mail Sessions" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

5.3.2.4 Configure Resource Group Persistent Store Settings

To view configuration settings for the persistent stores that have been created in this resource group template:

1. Select the resource group template you want to configure.
2. Navigate to **Services** > **Persistent Stores**.

   The following read-only information is available for the persistent stores configured in this resource group template:

   - Name
   - Type
3. Create or delete persistent stores as needed.
4. Save your changes.

These tasks are described in "WebLogic Server Persistent Stores" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

For more information, see Configuring Messaging.

5.3.2.5 Configure Resource Group Foreign JNDI Provider Settings

To view configuration settings for the foreign JNDI providers that have been created in this resource group template:

1. Select the resource group template you want to configure.
2. Navigate to **Services** > **Foreign JNDI Providers**.

   The following read-only information is available for the foreign JNDI providers configured in this resource group template:

   - Name
   - Initial Context Factory
   - Provider URL
   - User
   - Targets
3. Create or delete foreign JNDI providers as needed.
4. Save your changes.

These tasks are described in "WebLogic Server Foreign JNDI Providers" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

For more information, see Configuring and Programming JNDI.

5.3.2.6 Configure Resource Group Diagnostic System Module Settings

To view configuration settings for the diagnostic system modules that have been created in this resource group template:

1. Select the resource group template you want to configure.
2. Navigate to **Services** > **Diagnostics**.

   The following read-only information is available for the diagnostic system modules configured in this resource group template:

   - Name

- Description
- Targets

3. Create or delete diagnostic system modules as needed.
4. Save your changes.

These tasks are described in "WebLogic Server Diagnostics" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

For more information, see Monitoring and Debugging Partitions.

5.3.3 Configure Resource Group Template Notes

To create notes for a resource group template:

1. Select the resource group you want to configure.
2. Navigate to **Notes**.
3. Enter your notes.
4. Save your changes.

5.3.4 Configuring Resource Group Template: WLST Example

The following example:

1. Creates a domain partition.
2. Creates a virtual target.
3. Sets the host name and URI prefix for the virtual target.
4. Adds the virtual target as an available target in the partition.
5. Creates the resource group.
6. Adds the virtual target to the resource group.
7. Create a resource group template.
8. Deploys the application `MySimpleEjb` to the resource group template.
9. Associates the resource group with the resource group template.
10. Activates the changes.
11. Starts the partition.

> **Note:** If this is the first partition created in production mode, you must restart the Administration Server before you can start the partition.

```
# Create Pep partition resource group, and resource group template
edit()
startEdit()
wls:/base_domain/edit/ !> domain=getMBean('/')
wls:/base_domain/edit/ !> peppart=domain.createPartition('Pep')
wls:/base_domain/edit/ !> vt=domain.createVirtualTarget('VirtualTarget-0')
wls:/base_domain/edit/ !>
vt.setHostNames(jarray.array([String('localhost')],String))
wls:/base_domain/edit/ !> vt.setUriPrefix('/foo')
wls:/base_domain/edit/ !> peppart.addAvailableTarget(vt)
```

```
wls:/base_domain/edit/ !> peprg=peppart.createResourceGroup('TestRG')
wls:/base_domain/edit/ !> peprg.addTarget(vt)
wls:/base_domain/edit/ !> peprgt=domain.createResourceGroupTemplate('TestRGT')
wls:/base_domain/edit/ !> deploy(appName='MySimpleEJB',
path='c:/webservices/MySimpleEjb.jar', resourceGroupTemplate='TestRGT')
wls:/base_domain/edit/ !> peprg.setResourceGroupTemplate(peprgt)
wls:/base_domain/edit/ !> activate()
wls:/base_domain/edit/ !> startPartitionWait(peppart)
```

5.4 Deleting a Resource Group Template: Main Steps and WLST Examples

If a resource group template is referenced by resource groups, you need to remove the references before deleting this resource group template.

1. Select the resource group you want to delete.
2. Delete the resource group.

5.4.1 Deleting Resource Group Templates: WLST Example

The following example:

1. Creates a domain partition.
2. Creates a virtual target.
3. Sets the host name and URI prefix for the virtual target.
4. Adds the virtual target as an available target in the partition.
5. Creates the resource group.
6. Adds the virtual target to the resource group.
7. Create a resource group template.
8. Associates the resource group with the resource group template.
9. Unsets the resource group template from the resource group.
10. Deletes the resource group template from the domain.
11. Activates the changes.
12. Starts the partition.

> **Note:** If this is the first partition created in production mode, you must restart the Administration Server before you can start the partition.

```
# Create Pep partition resource group, and resource group template
edit()
startEdit()
wls:/base_domain/edit/ !> domain=getMBean('/')
wls:/base_domain/edit/ !> peppart=domain.createPartition('Pep')
wls:/base_domain/edit/ !> vt=domain.createVirtualTarget('VirtualTarget-0')
wls:/base_domain/edit/ !>
vt.setHostNames(jarray.array([String('localhost')],String))
wls:/base_domain/edit/ !> vt.setUriPrefix('/foo')
wls:/base_domain/edit/ !> peppart.addAvailableTarget(vt)
wls:/base_domain/edit/ !> peprg=peppart.createResourceGroup('TestRG')
```

```
wls:/base_domain/edit/ !> peprg.addTarget(vt)
wls:/base_domain/edit/ !> peprgt=domain.createResourceGroupTemplate('TestRGT')
wls:/base_domain/edit/ !> peprg.setResourceGroupTemplate(peprgt)
wls:/base_domain/edit/ !> peprg.unSet('ResourceGroupTemplate')
wls:/base_domain/edit/ !> domain.destroyResourceGroupTemplate(peprgt)
wls:/base_domain/edit/ !> activate()
wls:/base_domain/edit/ !> startPartitionWait(peppart)
```

5.5 Configuring Resource Group Templates: Related Tasks and Links

See the following sections for additional information related to resource group templates:

- Key Concepts in WebLogic Server MT
- Configuring Virtual Targets
- Configuring Resource Groups
- Configuring Messaging

6 Configuring Security

This chapter describes how to configure security in WebLogic Server Multitenant (MT). The chapter refers to the WebLogic Server documentation sets and online help for additional information as appropriate.

This chapter assumes that you have a working knowledge of the WebLogic Server security concepts and tasks described in *Understanding Security for Oracle WebLogic Server*.

This chapter includes the following sections:

6.1 New Security Features in a Domain Partition

WebLogic Server MT expands upon the traditional WebLogic Server security support in two significant ways:

- Multiple realms. WebLogic Server MT supports multiple active realms and allows each partition to execute against a different realm.

  As before, there is only one active "default realm" used at the global (domain) level.

- Identity domains. An identity domain is a logical namespace for users and groups, typically representing a discrete set of users and groups in the physical datastore. Identity domains are used to identify the users associated with particular partitions.

- Administrative roles for configuration and management when logged in directly to a partition. You can use WLST to connect directly to a domain partition instead of logging in to the domain level.

These changes are described in the sections that follow.

6.1.1 Domain Partition Security Realms: Overview

As described in "Security Realms" in *Understanding Security for Oracle WebLogic Server*, a security realm comprises mechanisms for protecting WebLogic resources. Each security realm consists of a set of configured security providers, users, groups, security roles, and security policies. You use realms to configure authentication, authorization, role mapping, credential mapping, auditing, and other services.

WebLogic Server traditionally supports multiple realms in a domain configuration, but only one realm—typically referred to as the "default realm" or "admin realm"—can be active at any given time.

In contrast, WebLogic Server MT supports multiple active realms and allows each partition to execute against a different realm.

This means that a partition can have unique security providers, users, groups, security roles, and security policies. Resources and applications in the domain partition are available only to users within the domain partition's security realm. Other tenants cannot see or access the resources or applications.

> **Note:** Partitions can share a security realm, with consequent loss of independence and isolation. In particular, if you do not specify a realm when you create a partition, the default realm is shared with the partition and there is no security isolation between the partition and the domain.

6.1.2 Identity Domains: Overview

> **Note:** Identity domains are an optional feature you should use only if your user store supports them. The structure, configuration, and management of the identity domain itself are outside of the control of and are opaque to WebLogic Server.

The purpose of an identity store is for a partition's users to able to access the partition, while other partitions' users cannot.

Identity domains distinguish users associated with different partitions.You can configure a partition with an identity domain that identifies the set of users associated with the partition. Access policies allow those users—but not users from other identity domains—to access the partition.

Identity domain names should be meaningful in your environment.

There is a generally a one-to-one mapping between partitions and identity domains. However, it is possible for multiple partitions to use the same identity domain. The result is to remove any distinction between users of those partitions, which may not be appropriate in your environment.

6.1.2.1 Types of Identity Domains

There are two types of identity domains:

- Administrative identity domain—The identity domain for the default security realm in the domain. The purpose of the administrative identity domain is to distinguish between global domain users and partition users. WebLogic Server system administrators belong to this administrative identity domain.

The administrative identity domain is shown on the WLS Administration Console **Domain** > **Security** page.

- Primary identity domain—The primary identity domain configured for a partition. The primary identity domain is used as the default identity domain when authenticating partition users and for determining ownership of partition resources.

  This primary identity domain is shown on the WLS Administration Console Authentication providers provider-specific pages.

The user store's representation of an identity domain can be anything supported by the underlying technology. For example:

- You can create a separate LDAP instance for each identity domain.
- An identity domain field can be added to user records in a database.
- Identity domains are represented as distinct sub-trees in the Users and Groups hierarchies of a single Oracle Internet Directory (OID) instance.

6.1.2.2 Default Identity Domain Values

WebLogic Server MT creates a default administrative identity domain and a default primary identity domain as follows:

- Administrative identity domain—WebLogic Server MT creates a default identity domain named `idd_DOMAIN` in the default security realm. The administrative identity domain is created when you create the first partition in a domain in production mode.

  If you create the first partition in a domain in development mode, the default value is `null`. (This is the only case in which null is considered a valid identity domain.)

- Primary identity domain—WebLogic Server MT creates the default identity domain for a partition with the name of the partition prefixed with `idd` when you create the partition.

  This primary identity domain is shown on the provider-specific WLS Administration Console page for the WebLogic Default Authenticator provider.

  The default primary identity domain is a convenience feature for the DefaultAuthenticator with the embedded LDAP. It is intended for testing and internal development use, not for a production environment. The embedded LDAP does not actually use identity domains.

6.1.3 Administrative Roles for Configuration and Management

You can use WLST to connect directly to a domain partition instead of logging in at the domain level, as described in Connecting Directly to a Domain Partition: WLST Example.

The configuration and management capabilities of the WebLogic administrative roles in a partitioned environment are shown in Table 6–1.

Table 6–1 Administrative Roles for Configuration and Management

Role	Logged in to Domain	Logged in to Partition via WLST
Administrator	Full control over domain resources, including partition configuration and management.	Write access to partition owned MBeans. Read-only access to own PartitionMBean.Realm and PartitionMBean.PrimaryIdentityDomain attributes. Read-only access to own RealmMBean and its children.
Deployer	Configure resources within the domain and partitions, deploy/redeploy/undeploy/start /stop applications within the domain and partitions.	Configure resources within the partition, deploy/redeploy/undeploy/start/stop applications within the partition.
Operator	Start/stop servers, partitions, resource groups.	Start/stop partition and resource group.
Monitor	Read-only access to domain and partition resources.	Read-only access to partition resources.

6.2 Configuring the Administrative Identity Domain: Main Steps and WLST Example

The administrative identity domain is shown on the WLS Administration Console **Domain** > **Security** page.

If you are using the default security realm with the Default Authenticator only to store WebLogic Server Administrator credentials, you can accept the default `idd_DOMAIN` value. Proceed to Configuring Security Realms and Primary Identity Domains: Main Steps and Examples.

However, if your chosen user store for the default realm supports identity domains, and you have configured an identity domain for WebLogic Server Administrators, you need to configure at least one Authentication provider in the default realm to match your administrative identity domain value.

Perform these steps from the WLS Administration Console:

1. Select the chosen Authentication provider in the default realm and specify an existing administrative identity domain.
   a. In the navigation pane, select **Security Realms**.
   b. Select the default security realm.
   c. Select the **Providers** page.
   d. Select the chosen Authentication provider.
   e. Select the **Provider Specific** page.
   f. Enter the name of a valid administrative identity domain in the **Identity Domain** field.
   g. Save your changes.
2. Navigate to the **Domain** > **Security** page and change the **Administrative Identity Domain:** value to the name of the administrative identity domain.
3. Save your changes.

4. Restart the Administration Server.

6.2.1 Configuring the Administrative Identity Domain: WLST Example

The following example:

1. Gets the domain MBean.
2. Gets the security configuration for the domain.
3. Sets the administrative identity domain for the security configuration.
4. Gets the default realm for the security configuration.
5. Looks up the default Authentication provider for the realm.
6. Sets the identity domain for the default Authentication provider.

> **Note:** You must restart the Administration Server. Setting the administrative identity domain value is a non-dynamic change and requires a server restart.

```
edit()
startEdit()
wls:/base_domain/edit/ !> domain=getMBean('/')

wls:/base_domain/edit/ !> ADMIN_IDD = "Admin-idd"
wls:/base_domain/edit/ !> secure=domain.getSecurityConfiguration()
wls:/base_domain/edit/ !> secure.setAdministrativeIdentityDomain(ADMIN_IDD)
wls:/base_domain/edit/ !> realm = secure.getDefaultRealm()
wls:/base_domain/edit/ !> defAtn =
realm.lookupAuthenticationProvider('DefaultAuthenticator')
wls:/base_domain/edit/ !> defAtn.setIdentityDomain(ADMIN_IDD)
```

6.3 Configuring Security Realms and Primary Identity Domains: Main Steps and Examples

You are not required to create a security realm. Partitions can share a security realm, or use the default realm. However, the best practice is to create a security realm for each partition. This is particularly true if you want to use identity domains in order to get isolation.

If your user store does support identity domains, configure the primary identity domain as described in this section.

Perform the following steps to configure security realms and identity domains in a domain partition. Note that some of the steps require the WLS Administration Console.

1. Create a security realm. The name must be unique within the domain.

   If you are using Fusion Middleware Control, navigate to **WebLogic Domain** > **Security** > **Security Realms**. The default providers are created on your behalf in the new realm.

   If you are using the WLS Administration Console, select **Security Realms** in the navigation pane. You will probably find it most convenient to select the option to create the default providers in the new realm.

2. Add partition-specific users to the security realm.

If you are using Fusion Middleware Control, navigate to **WebLogic Domain** > **Security** > **Users and Groups**. Select the security realm you just created and click **Create** on the **Users** and **Groups** pages to add users and groups to the realm.

If you are using the WLS Administration Console, select **Security Realms** in the navigation pane. Select the security realm you just created, and then the **Users and Groups** page. Click **New** on the **Users** and **Groups** pages to add users and groups to the realm.

3. Configure your providers in the security realm, as described in "Manage Security Providers" in the *Oracle WebLogic Server Administration Console Online Help*.

   Perform this step from the WLS Administration Console.

4. Optionally, select the Authentication provider you just created and specify an existing identity domain. Identity domains are an optional feature you can use only if your user store supports them.

   Perform this step from the WLS Administration Console.

   a. Select the **Provider Specific** page.

   b. Enter the name of a valid identity domain in the **Identity Domain** field.

   c. Save your changes.

5. When you later create a partition as described in Configuring Domain Partitions.

   a. Specify the security realm you created.

   b. Specify the identity domain you set for the Authentication provider.

      If you use Fusion Middleware Control to create the domain partition, specify the primary identity domain on the **Create Domain Partition: General** page. If you do not specify a value, WebLogic Server MT creates the default identity domain for a partition with the name of the partition prefixed with `idd` when you create the partition.

      If you use the WLS Administration Console to create the domain partition, WebLogic Server MT creates the default identity domain with the name of the partition prefixed with `idd`. After you create the partition, and before you activate your changes, navigate to the **Partition** > **General** page and change the default to your actual identity domain name.

6.3.1 Configuring Security Realms and Primary Identity Domains: WLST Example

The following example:

1. Gets the domain MBean.
2. Gets the security configuration for the domain.
3. Sets the administrative identity domain for the security configuration.
4. Gets the default realm for the security configuration.
5. Looks up the default Authentication provider for the realm.
6. Sets the identity domain for the default Authentication provider.
7. Creates a new realm for the partition.
8. Creates the required security providers for the new realm.
9. Creates a domain partition[1].
10. Creates a virtual target.

11. Sets the host name and URI prefix for the virtual target.
12. Adds the virtual target as an available target in the partition.
13. Sets the security realm for the partition.
14. Sets the primary identity domain for the partition.
15. Creates the resource group.
16. Adds the virtual target to the resource group.
17. Activates the changes.
18. Starts the partition[1].

```
edit()
startEdit()
wls:/base_domain/edit/ !> domain=getMBean('/')

wls:/base_domain/edit/ !> ADMIN_IDD = "Admin-idd"
wls:/base_domain/edit/ !> secure=domain.getSecurityConfiguration()
wls:/base_domain/edit/ !> secure.setAdministrativeIdentityDomain(ADMIN_IDD)
wls:/base_domain/edit/ !> realm = secure.getDefaultRealm()
wls:/base_domain/edit/ !> defAtn =
realm.lookupAuthenticationProvider('DefaultAuthenticator')
wls:/base_domain/edit/ !> defAtn.setIdentityDomain(ADMIN_IDD)


wls:/base_domain/edit/ !> partrealm=secure.createRealm('partrealm')


wls:/base_domain/edit/ !>
partrealm.createAuthenticationProvider("DefaultAuthenticator","weblogic.security.p
roviders.authentication.DefaultAuthenticator")
wls:/base_domain/edit/ !> defAtnP =
partrealm.lookupAuthenticationProvider('DefaultAuthenticator')
wls:/base_domain/edit/ !> defAtnP.setIdentityDomain('partID')
wls:/base_domain/edit/ !>
partrealm.createAuthenticationProvider("DefaultIdentityAsserter","weblogic.securit
y.providers.authentication.DefaultIdentityAsserter")
wls:/base_domain/edit/ !>
partrealm.createAuthorizer("XACMLAuthorizer","weblogic.security.providers.xacml.au
thorization.XACMLAuthorizer")
wls:/base_domain/edit/ !>
partrealm.createRoleMapper("XACMLRoleMapper","weblogic.security.providers.xacml.au
thorization.XACMLRoleMapper")
wls:/base_domain/edit/ !>
partrealm.createAdjudicator("DefaultAdjudicator","weblogic.security.providers.auth
orization.DefaultAdjudicator")
wls:/base_domain/edit/ !>
partrealm.createCredentialMapper("DefaultCredentialMapper","weblogic.security.prov
iders.credentials.DefaultCredentialMapper")
wls:/base_domain/edit/ !> cert =
partrealm.createCertPathProvider("WebLogicCertPathProvider","weblogic.security.pro
viders.pk.WebLogicCertPathProvider")
wls:/base_domain/edit/ !> partrealm.setCertPathBuilder(cert)
wls:/base_domain/edit/ !> pv =
partrealm.createPasswordValidator('SystemPasswordValidator','com.bea.security.prov
```

[1] **Note:** You must restart the Administration Server before you can start the partition. Setting the administrative identity domain value is a non-dynamic change and requires a server restart.

```
iders.authentication.passwordvalidator.SystemPasswordValidator')
wls:/base_domain/edit/ !> pv.setMinPasswordLength(8)
wls:/base_domain/edit/ !> pv.setMinNumericOrSpecialCharacters(1)


wls:/base_domain/edit/ !> peppart=domain.createPartition('Pep')
wls:/base_domain/edit/ !> vt=domain.createVirtualTarget('TestVT')
wls:/base_domain/edit/ !>
vt.setHostNames(jarray.array([String('localhost')],String))
wls:/base_domain/edit/ !> vt.setUriPrefix('/foo')
wls:/base_domain/edit/ !> peppart.addAvailableTarget(vt)
wls:/base_domain/edit/ !> peppart.setRealm(partrealm)
wls:/base_domain/edit/ !> peppart.setPrimaryIdentityDomain('partID')
wls:/base_domain/edit/ !> peprg=peppart.createResourceGroup('TestRG')
wls:/base_domain/edit/ !> peprg.addTarget(vt)
wls:/base_domain/edit/ !> activate()
wls:/base_domain/edit/ !> startPartitionWait(peppart)
```

6.3.2 Configuring Security Realms and Primary Identity Domains: REST Example

For an example of creating domain partitions from REST, see "Creating Partitions" in *Administering Oracle WebLogic Server with RESTful Management Services*.

This example demonstrates how to create a partition, including:

- A new security realm for the partition, including security providers and the primary identity domain.
- A virtual target for the cluster, on which the applications will run.
- A virtual target for the Administration Server, so that the Deployer can create system resources and deploy applications.
- A resource group for each virtual target.
- Partition users in the Administrator, Deployer, Monitor, and Operator roles.

6.4 Setting Identity Domain Aware Providers Required Control: Main Steps

The following WebLogic security providers must be identity-domain-aware to function correctly in an environment where identity domains are configured.

- Role Mapping
- Authorization
- Credential Mapping
- Audit

For example, an Authorization provider that does not understand identity domains cannot correctly distinguish between two users with the same name but different identity domains, and therefore cannot make valid authorization decisions.

The standard WebLogic Server security providers are identity-domain-aware. However, deprecated providers, such as DefaultRoleMapper and DefaultAuthorizer, are not identity-domain-aware.

If you have configured identity domains in your user store, you can force the use of identity-domain-aware providers by setting the **Identity Domain Aware Providers Required** control. Setting this control specifies that only role mapping, authorization,

credential mapping, and audit providers that support identity domains are used, even if no identity domains are configured.

Perform these steps from the WLS Administration Console:

1. Navigate to the **Domain** > **Security** page.
2. Set the **Identity Domain Aware Providers Required** control.
3. Save your changes.

6.5 Configuring SSL in a Domain Partition

SSL configuration is not partition-specific. All partitions use the standard WebLogic Server SSL configuration described in "Configuring SSL" in *Administering Security for Oracle WebLogic Server 12c (12.2.1)*.

However, note the following important differences:

- If you configure an explicit or offset port for the virtual target as described in Configuring Virtual Targets, SSL is not supported for that virtual target.

  This means that clients (for example, RMI clients) cannot communicate directly over SSL to a partition that uses port-based routing.
- CertPath providers configured in non-default security realms, such as security realms associated with one or more partitions, are not run as part of the extra SSL validation. Only the default security realm's CertPath provider is run.

6.6 Connecting Directly to a Domain Partition: WLST Example

You can use WLST to connect directly to a domain partition instead of logging in to the domain level. When you do this:

- The user name you specify is validated against the security realm for that partition.

  See Table 6–1 for the configuration and management capabilities of the WebLogic administrative roles when logged directly in to a partition.
- The initial view of the MBean hierarchy is partition-specific.

The WLST syntax is as follows. Note that only t3 connections are supported.

Using the partition name

```
wls:/offline>
connect('username','password',"t3://system:port/partitions/partition-na
me")
```

For example:

```
wls:/offline>
connect('weblogic','password',"t3://somehost:7001/partitions/Partition-0")

Connecting to t3://somehost:7001/partitions/Partition-0 with userid
weblogic ...
Successfully connected to partition "Partition-0".
wls:/base_domain/serverConfig/Partitions/Partition-0>
```

Using a virtual target

Specify a URL that matches a configured virtual target for the partition. For example, if you have a virtual target without a host name and a `uriPrefix` of `/foo`, you can connect as follows:

```
connect('weblogic','password',"t3://somehost:7001/foo")
```

MBean hierarchy is partition-specific

The MBean hierarchy after connecting is partition-specific:

```
wls:/base_domain/serverConfig/Partitions/Partition-0> ls()
dr--   AvailableTargets
dr--   CoherencePartitionCacheConfigs
dr--   DataSourceForJobScheduler
dr--   DataSourcePartition
dr--   DefaultTargets
dr--   JDBCSystemResourceOverrides
dr--   JMSSystemResourceOverrides
dr--   JTAPartition
dr--   MailSessionOverrides
dr--   ManagedExecutorServiceTemplates
dr--   ManagedScheduledExecutorServiceTemplates
dr--   ManagedThreadFactoryTemplates
dr--   PartitionLog
dr--   PartitionWorkManager
dr--   PartitionWorkManagerRef
dr--   ResourceGroups
dr--   ResourceManager
dr--   ResourceManagerRef
dr--   SelfTuning
dr--   SystemFileSystem
dr--   WebService

-r--   BatchJobsExecutorServiceName               null
-r--   DataSourceForJobScheduler                  null
-r--   GracefulShutdownTimeout                    0
-r--   IgnoreSessionsDuringShutdown               false
-r--   JobSchedulerTableName                      WEBLOGIC_TIMERS
-r--   MaxConcurrentLongRunningRequests           50
-r--   MaxConcurrentNewThreads                    50
-r--   Name                                       Partition-0
-r--   ParallelDeployApplicationModules           false
-r--   ParallelDeployApplications                 true
-r--   PartitionID                                085b48c2-6d70-434e-8200-f4eb
f28ca3a0
-r--   PartitionLifeCycleTimeoutVal               120
-r--   PartitionWorkManager                       null
-r--   PartitionWorkManagerRef                    null
-r--   PrimaryIdentityDomain                      idd_Partition-0
-r--   RCMHistoricalDataBufferLimit               250
-r--   ResourceDeploymentPlanPath                 null
-r--   ResourceManager                            null
-r--   ResourceManagerRef                         null
-r--   StartupTimeout                             0
-r--   Type                                       Partition
-r--   UploadDirectoryName                        C:\Oracle\Middleware\Oracle_
Home\user_projects\domains\base_domain/partitions/Partition-0/system\servers\Adm
inServer\upload\
```

6.7 Configuring Security in a Domain Partition: Related Tasks and Links

See the following topics for additional information:

- "Manage Security Providers" in the *Oracle WebLogic Server Administration Console Online Help*.
- "Create Users" in the *Oracle WebLogic Server Administration Console Online Help*.
- "Configuring SSL" in *Administering Security for Oracle WebLogic Server 12c (12.2.1)*

7

Configuring Oracle Traffic Director

This chapter describes how to configure Oracle Traffic Director (OTD) in WebLogic Server Multitenant (MT). You can use either Fusion Middleware Control (FMWC) or WLST to configure Oracle Traffic Director, as described in this chapter. The chapter refers to the Oracle Traffic Director documentation and online help for additional information as appropriate.

This chapter includes the following sections:

7.1 Configuring Oracle Traffic Director: Overview

In a typical deployment scenario, Oracle Traffic Director distributes incoming client requests to Oracle WebLogic Server. In a WLS MT environment, OTD distributes incoming client requests to WLS MT partitions by coordinating its configuration with WLS MT partition management, automatically and without any explicit user action. However, to employ OTD multitenant support, you must perform an initial, one-time OTD configuration as described in the following sections.

Consider the following deployment topologies:

- Oracle WebLogic Server MT and Oracle Traffic Director in separate domains

  In this topology, Oracle Traffic Director resides in a separate domain from the WebLogic Server MT domains. These domains can be on different hosts. The Oracle Traffic Director instance that exists in the OTD domain will distribute the client requests to multiple WebLogic Server MT domains that exist on different hosts. Even though Oracle Traffic Director is in separate domain, it must be collocated with WebLogic Server for its management. For more information, see "Selecting an Oracle Traffic Director Domain Configuration" in *Installing Oracle Traffic Director*.

- Oracle WebLogic Server MT and Oracle Traffic Director in a single domain

  In this topology, Oracle Traffic Director will be in the same domain as the WebLogic Server MT domain. The Oracle Traffic Director instance will exist in the same WebLogic Server MT domain and distribute the client requests to it. In this topology also, OTD must be collocated with WebLogic Server MT for its management. For more information, see "Selecting an Oracle Traffic Director Domain Configuration" in *Installing Oracle Traffic Director*.

In summary, you must:

- Install OTD, collocated with WLS MT, and create an OTD domain. For detailed information, see Creating the Domain for Oracle Traffic Director.
- Perform a one-time, initial OTD configuration to enable OTD multitenancy features. This includes creating an OTD MT configuration and instance, and registering the OTD runtime with the Lifecycle Manager (LCM). For detailed information, see Creating an Oracle Traffic Director MT Configuration and Instance and Registering the Oracle Traffic Director Runtime.
- Use the registered OTD runtime when creating a load balancer configuration for WLS MT partitions during partition creation. Upon completion, the LCM will coordinate the orchestration with OTD appropriately, as described in End-to-End Lifecycle Management.

7.1.1 Oracle Traffic Director Partitions

When you create a WLS MT partition using FMWC, a corresponding Oracle Traffic Director partition is created for you. The Oracle Traffic Director partition is simply a grouping with the same name as the partition and the resource group. Fusion Middleware Control provides a summary table with the list of Oracle Traffic Director partitions to identify the Oracle Traffic Director artifacts that are mapped to partitions and resource groups. You can also list the Oracle Traffic Director partitions using WLST. See `otd_listPartitions` and `otd_listResourceGroups` in *WebLogic Scripting Tool Command Reference for Oracle Traffic Director*.

Oracle Traffic Director artifacts map to WebLogic Server MT artifacts as follows:

- Each cluster maps to an origin-server pool.
- The host names of a virtual target that is associated with the partitions and/or resource groups map to a virtual server.
- The uri-prefix of the virtual target maps to a route within the virtual server corresponding to the host name of the virtual target.

For descriptions of Oracle Traffic Director artifacts, see "Oracle Traffic Director Terminology" in *Administering Oracle Traffic Director*.

7.1.1.1 Monitoring

Metrics are gathered for each partition. A system administrator can access the partition metrics using either Fusion Middleware Control or WLST. For more information, see "Methods for Monitoring Oracle Traffic Director Instances" in *Administering Oracle Traffic Director*.

7.1.1.2 Logging

Oracle Traffic Director has a separate access log for each partition. The access log file name for the partition is same as the partition name itself.

You can view and manage logs using Fusion Middleware Control and WLST. For more information, see "Viewing Logs Using Fusion Middleware Control" and "Viewing Logs Using WLST" in *Administering Oracle Traffic Director*.

7.2 Configuring Oracle Traffic Director: Main Steps

This section describes the main steps to create the domain and configuration for Oracle Traffic Director in a WLS MT environment. It contains the following sections:

- Creating the Domain for Oracle Traffic Director
- Creating an Oracle Traffic Director MT Configuration and Instance
- Registering the Oracle Traffic Director Runtime

7.2.1 Creating the Domain for Oracle Traffic Director

In order to create an Oracle Traffic Director MT configuration and instance, you must first create a WLS MT domain and extend it for OTD using the restricted JRF template. Then using either WLST or FMWC, you can create OTD configurations and instances.

Create an Oracle WebLogic Server MT domain as follows:

- In large enterprise deployments, where a single Oracle Traffic Director instance distributes client requests to multiple Oracle WebLogic Server MT domains, you will want to create separate domains for Oracle WebLogic Server MT and Oracle Traffic Director.

  For example, using two machines (`m1` and `m2`), if you want to have an OTD domain on `m1` and WLS MT domain on `m2`:

  Create the OTD domain on `m1` as follows:

  1. Install WLS MT+JRF in `$ORACLE_HOME`.
  2. Install OTD in the same `$ORACLE_HOME`.
  3. Invoke the Configuration Wizard.
  4. Select the Oracle Traffic Director - Restricted JRF template for OTD and proceed with the domain creation.

  With these steps you will be creating a WLS MT domain and extending it for OTD, so that you can proceed with OTD configurations and instances creation. Note that even in the OTD domain, WLS MT+JRF must be installed and the WLS MT domain must be created and extended for OTD.

  To create the WLS MT domain on `m2`:

  1. Install WLS MT in `$ORACLE_HOME` (there is no need for WLS MT+JRF).
  2. Invoke the Configuration Wizard.
  3. Create a basic WLS MT domain.

- In a collocated domain, you install Oracle Traffic Director into the same `ORACLE_HOME` where you have installed Oracle WebLogic Server MT.

  For example, if you want to have both OTD and WLS MT in a single domain on machine `m1`:

  1. Install WLS MT+JRF in `$ORACLE_HOME`.
  2. Install OTD in the same `$ORACLE_HOME`.
  3. Invoke the Configuration Wizard.
  4. Select the Oracle Traffic Director - Restricted JRF template for OTD and proceed with the domain creation.

  In this deployment scenario, both WLS MT and OTD are in the same domain and OTD will manage the WLS MT partitions that are created within this domain.

7.2.1.1 Domain Selection

When using the Configuration Wizard to create the domain, you must select to create a new domain, and in the Templates dialog, you must select the **Oracle Traffic Director - 12.2.1 Restricted JRF** template.

For detailed steps to install and configuration the domain, see *Oracle Traffic Director Installation Guide*.

7.2.2 Creating an Oracle Traffic Director MT Configuration and Instance

After creating the OTD domain (actually, a WLS MT domain that is extended for OTD), you must create a bootstrap Oracle Traffic Director configuration using Fusion Middleware Control or WLST, as described in the following sections.

7.2.2.1 Using Fusion Middleware Control to Create the Configuration and Instance

For detailed information on creating an Oracle Traffic Director MT configuration and instance using FMWC, see "Creating a Configuration Using Fusion Middleware Control" and "Creating Oracle Traffic Director Instances Using Fusion Middleware Control" in *Administering Oracle Traffic Director*.

7.2.2.2 Using WLST to Create the Configuration and Instance

For detailed information on creating an Oracle Traffic Director MT configuration and instance using WLST, see "Creating a Configuration Using WLST" and "Creating an Oracle Traffic Director Instance Using WLST" in *Administering Oracle Traffic Director*.

7.2.3 Registering the Oracle Traffic Director Runtime

Using Fusion Middleware Control, register the Oracle Traffic Director runtime to enable the lifecycle events or operations.

Note: The OTD runtime must be registered in the WLS MT domain. Using FMWC, login to the WLS MT domain before registering the OTD runtime.

---

1. From the **WebLogic Domain** drop-down menu, select **Environment** > **OTD Runtimes**.
2. Click **Register Runtime**.

   Specify a name for the new Oracle Traffic Director runtime and provide information (host, port and credentials) on where this runtime is located. You can specify any OTD runtime name, but you must select the same runtime name when creating a load balancer configuration for the WLS MT partition during partition creation.

   You also need to provide the name of an existing OTD configuration that will be used for MT. For example, if you wanted to use the configuration you created in Using Fusion Middleware Control to Create the Configuration and Instance, you would specify the same name that you specified during the OTD configuration creation.

Note: In the Register Runtime dialog, you must specify the Admin Server host and port details of the OTD domain and the (OTD domain) Admin Server credentials.

7.3 Configuring Oracle Traffic Director: Related Tasks and Links

Using the LCM orchestration, only the OTD artifacts that are required to successfully distribute incoming client requests to WLS MT partitions will be configured automatically. These artifacts include virtual servers, origin-server pools (including the origin servers) and routes. Apart from this, all other configurations, such as enabling SSL for OTD, creating and managing failover groups in OTD, and such, must be done explicitly using the OTD administration interfaces. For more information, see *Administering Oracle Traffic Director*.

7.4 Oracle Traffic Director: Troubleshooting

The following section provides general debugging tips, frequently asked questions, and corrective actions you can take if WLS MT and OTD components become unsynchronized.

Before associating OTD with a WLS MT partition, make sure of the following:

- The WLS MT Administration Server and Node Manager are up and running in an OTD domain.
- The WLS MT Administration Server is able to reach the Node Manager without any issues.
- You have created an OTD configuration and the corresponding instance to be used for MT. See Creating an Oracle Traffic Director MT Configuration and Instance.
- You have registered the correct OTD runtime with the Lifecycle Manager (LCM). See Registering the Oracle Traffic Director Runtime.

7.4.1 Frequently Asked Questions

The following responses address frequently asked questions and issues. These FAQs are relevant to configuring OTD for MT and partition management using LCM with OTD.

- Can I use an existing OTD configuration for MT?

  Yes. However, the existing configuration name must be specified while registering the OTD runtime with the LCM, using the runtime property called `configuration`. If it is not specified, the name will default to `mt`.

- How do I check whether OTD is successfully associated with a WLS MT partition?

  If the association is successful, OTD artifacts such as virtual server, route and such, will be created for the WLS MT partition in OTD.

  Invoke `otd_listPartitions` and `otd_listResourceGroups` WLST commands in the OTD domain to verify.

- Is it necessary to create an OTD partition explicitly if I use the low level REST APIs?

  Yes. Fusion Middleware Control implicitly creates the OTD partition, but the low level REST APIs do not.

The OTD partition name must be the same as the WLS MT partition name.

Note that the OTD partition is not a functional artifact. It is only used to logically group all the OTD artifacts that serve requests to a WLS MT partition.

- How can I determine whether OTD is notified by the LCM?

  The OTD plugin will log debug information if it is notified by the LCM. A sample log message:

  ```
  <[com.oracle.weblogic.lifecycle.plugin.otd.OTDUtil:log] OTDLifeyclePlugin :
  Associating OTD with the WLS MT partition>
  ```

- How do I enable debugging for the OTD plugin?

  Set the WLS MT Administration Server domain log level to `Debug`.

  – In the WLS Administration Console, select **Environment** > **Servers** > **Logging** > **Advanced** and set the required severity levels (Minimum severity to log, Log file severity level, and such) to `Debug`.

  – Using WLST: `cd('/Servers/AdminServer/Log/AdminServer')` and set the required severity levels to `Debug` (`cmo.setLoggerSeverity('Debug')`).

- I have changed the hostname and uri-prefix value of a virtual target that a WLS MT partition is targeted to but OTD did not get updated. Why?

  The hostname and uri-prefix of a virtual target are non-dynamic attributes which require a partition restart to be effective. Restart the WLS MT partition and OTD will get updated.

- I have added a new resource group to the existing WLS MT partition but OTD did not get updated. Why?

  This is a known issue. For more information, see "Oracle Traffic Director is Not Being Updated With Resource Group Changes" in *Release Notes for Oracle WebLogic Server*.

- How can I synchronize WLS MT and OTD if they become out of sync?

  Invoke the sync LCM REST API.

  ```
  curl -v \
  --user $WLS_DOMAIN_ADMIN_USERNAME:$WLS_DOMAIN_ADMIN_PASSWORD \
  -H X-Requested-By:MyClient \
  -H Accept:application/json \
  -H Content-Type:application/json \
  -X POST http://$WLS_DOMAIN_ADMIN_HOSTNAME:$WLS_DOMAIN_ADMIN_
  PORT/management/lifecycle/latest/environments/$ENVIRONMENT_NAME/sync
  ```

  Note that you must replace the `$` tokens appropriately.

- What if the sync REST API does not synchronize WLS MT and OTD?

  Dissociate and then re-associate the WLS MT partition with OTD.

  Using the REST APIs:

  To dissociate:

  ```
  curl -v \
  --user $WLS_DOMAIN_ADMIN_USERNAME:$WLS_DOMAIN_ADMIN_PASSWORD \
  -H X-Requested-By:MyClient \
  -H Accept:application/json \
  -H Content-Type:application/json \
  -d '{ "partition1Name": "$WLSPartition_Name", "partition1RuntimeName" : "$WLS_
  ```

```
RUNTIME_NAME", "partition2Name": "$OTDPartition_Name", "partition2RuntimeName":
"$OTD_RUNTIME_NAME", "properties" :[]}' \
-X POST http://$WLS_DOMAIN_ADMIN_HOSTNAME:$WLS_DOMAIN_ADMIN_
PORT/management/lifecycle/latest/environments/$ENVIRONMENT_
NAME/dissociatePartitions
```

To associate:

```
curl -v \
--user $WLS_DOMAIN_ADMIN_USERNAME:$WLS_DOMAIN_ADMIN_PASSWORD \
-H X-Requested-By:MyClient \
-H Accept:application/json \
-H Content-Type:application/json \
-d '{ "partition1Name": "$WLSPartition_Name", "partition1RuntimeName" : "$WLS_
RUNTIME_NAME", "partition2Name": "$OTDPartition_Name", "partition2RuntimeName":
"$OTD_RUNTIME_NAME", "properties" :[]}' \
-X POST http://$WLS_DOMAIN_ADMIN_HOSTNAME:$WLS_DOMAIN_ADMIN_
PORT/management/lifecycle/latest/environments/$ENVIRONMENT_
NAME/associatePartitions
```

In FMWC:

- Navigate to **Domain Partition** > **Administration** > **Load Balancer Configuration**.
- Deselect the check box **Use OTD for load balancing** to dissociate.
- Select the same check box to associate again.

- Is there a separate log file for each OTD partition?

  Yes. The partition log file name is the same as the partition name (for example, `<OTD_PARTITION_NAME>.log`) which is located at `<OTD_DOMAIN_HOME>/servers/<OTD_INSTANCE_NAME>/logs`.

  You can use the following WLST commands: `otd_getPartitionAccessLogProperties` and `otd_setPartitionAccessLogProperties`.

8 Configuring Domain Partitions

This chapter describes how to create, configure, and manage domain partitions. You can use either Fusion Middleware Control (FMWC), WLST, or REST, as described in this chapter. The chapter refers to the Fusion Middleware, Coherence, and Oracle Traffic Director documentation sets and online help for additional information as appropriate.

This chapter includes the following sections:

8.1 Configuring Domain Partitions: Overview

WebLogic Server Multitenant (MT) implements an administrative and runtime slice of a domain, called a **domain partition**. A domain partition is a portion of a Weblogic domain that is dedicated to running application instances and related resources.

You can create any number of domain partitions within a domain.

> **Note:** Oracle generally recommends no more than 10 partitions within a domain for best performance. However, your particular server environment may support a much higher number of partitions.

8.1.1 Creating Domain Partitions: Prerequisites

Before you can create a domain partition, you must satisfy the following prerequisites:

1. If you have not already done so, create the domain you plan to use.

   Use the Oracle Enterprise Manager - Restricted JRF template to create the domain. This template automatically includes several other necessary templates.

   The best practice is to create a new domain. If you plan to upgrade an existing domain, you must still create a new security realm as described in Configuring Security.

Note: If you use Fusion Middleware Control or the WLS Administration Console, there is nothing specific to WebLogic Server MT when creating a cluster.

However, if you use WLST to create Managed Servers (configured or dynamic), the required JRF template is not applied. When you subsequently use Fusion Middleware Control to monitor the domain, monitoring does not work for the servers without the JRF template.

Therefore, for the WLST use case:

1. Use WLST to create the cluster or Managed Server.
2. Use the applyJRF command described in *WLST Command Reference for Infrastructure Components* to apply the JRF template to the Managed Servers.

2. Set the deployment mode for lifecycle management. You can perform this step from the WLS Administration Console or WLST.

   From the WLS Administration Console:

   1. In the navigation pane, select the domain.
   2. Select the **Configuration** > **General** page.
   3. Expand the **Advanced** control.
   4. Change the **Lifecycle Management Services Availability** control to `Local Admin Server`.
   5. This is a non-dynamic change. Restart the Administration Server.

   From WLST:

   ```
   edit()
   startEdit()
   cd('/LifecycleManagerConfig/mydomain')
   cmo.setDeploymentType('admin')
   activate()
   ```

   This is a non-dynamic change. Restart the Administration Server.

3. If you have not already done so, create the security realm for the partition. Each partition must have a security realm. See Configuring Security for the steps to follow.
4. If you have not already done so, create one or more virtual targets. See Configuring Virtual Targets for the steps to follow.
5. If you want to use a resource group template with this domain partition, create the resource group template first. See Configuring Resource Group Templates for the steps to follow.
6. If you are using OTD for load balancing, register the OTD runtime configuration.

8.1.2 Oracle Traffic Director: WebLogic Server Plug-in Enabled Prerequisite

If you are using OTD for load balancing, you must set the **WebLogic Plug-in Enabled** control in the WLS Administration Console.

You can set this control at one of three levels. The levels have a hierarchy. Setting it at one level serves as the default for the level below; setting it at the level below overrides the setting at the higher level. The levels are:

- Domain level—setting it at the domain level sets it for each cluster and Managed Server within the domain.
- Cluster level—setting it at the cluster level applies it to all the Managed Servers that are a part of the cluster. This overrides the value at the domain level.
- Individual Managed Server level—setting it at the Managed Server level overrides the value set at the cluster or domain levels.

You may find it easiest to set the WebLogic Plug-in Enabled control at the domain level, so that any partitions for which you want to use Oracle Traffic Director are affected, regardless of which clusters or Managed Servers are involved. Or, if you know that the partition you want to use with Oracle Traffic Director will be targeted to only a specific cluster or Managed Server, you can choose to set the WebLogic Plug-in Enabled control at the cluster or Managed Server level.

Domain Level

Using the WLS Administration Console, to set the WebLogic Plug-in Enabled control at the domain level:

1. In the Navigation pane, select the domain.
2. Select the **Configuration** page, then **Web Applications**.
3. Set the **WebLogic Plug-in Enabled** control.
4. Save your changes.

Cluster Level

Using the WLS Administration Console, to set the WebLogic Plug-in Enabled control at the cluster level:

1. In the Navigation pane, expand **Environment**.
2. Select **Clusters**.
3. Select the cluster you want to manage.
4. Select the **General** page, then click **Advanced**.
5. Set the **WebLogic Plug-in Enabled** control.
6. Save your changes.

Managed Server Level

Using the WLS Administration Console, to set the WebLogic Plug-in Enabled control at the Managed Server level:

1. In the Navigation pane, expand **Environment**.
2. Select **Servers**.
3. Select the servers you want to manage.
4. Select the **General** page, then click **Advanced**.
5. Set the **WebLogic Plug-in Enabled** control.
6. Save your changes.

8.2 Creating Domain Partitions: Main Steps and Examples

The main steps to create a domain partition are as follows:

1. Enter the partition name. The partition name must be unique within the domain.
2. Select the security realm for this partition.

   The security realm can be unique to this partition, or shared by multiple partitions.
3. Optionally, enter a name for the primary identity domain for the partition. Or, you can choose to not enter a name and accept the default.
4. If you are using OTD for load balancing, select the OTD runtime configuration. You must have previously registered the OTD runtime.
5. Select one or more existing virtual targets to be available for this domain partition to use. Multiple partitions cannot use the same virtual target. You can use a virtual target only with one partition or at the global (domain) level.
6. Select one of the existing virtual targets to use as the default if a resource group in this partition does not explicitly identify one.
7. Create the resource group. You can create the resource group in two ways:
   - Create a new resource group. When you finish creating the partition you must then edit this resource group as needed.

     Enter the resource group name. The resource group name must be unique within the partition.
   - Create the new resource group based on a resource group template. (For information on resource group templates, see Configuring Resource Group Templates.) The configuration is copied from the template to the new resource group.

     Enter the resource group name. The resource group name must be unique within the domain.

     Select the resource group template to use.
8. Select the virtual targets that this resource group will use.
9. If this is the first partition you have created in this domain, and the domain is running in production mode, restart the WebLogic Administration Server.

   This step is needed only for the first partition you create for a domain, and only when the domain is running in production mode.
10. Start the partition. Partitions are created in a shutdown state and need to be started for the resources in them to be accessible.
11. If you did not create the resource group from a resource group template, edit the resource group as needed.

    Proceed to Configuring Resource Groups for the main steps to follow.

To create a domain partition using Fusion Middleware Control, see "Create domain partitions" in the online help.

8.2.1 Creating Domain Partitions: WLST Example

The following example creates a domain partition PartitionMBean called `pep` from the DomainMBean. It then:

1. Creates a domain partition.

2. Creates a virtual target.
3. Sets the host name and URI prefix for the virtual target.
4. Adds the virtual target as an available target in the partition.
5. Creates the resource group.
6. Adds the virtual target to the resource group.
7. Activates the changes.
8. Starts the partition.

> **Note:** If this is the first partition created in production mode, you must restart the Administration Server before you can start the partition.

```
# Create Pep partition and ResourceGroup
edit()
startEdit()
wls:/base_domain/edit/ !> domain=getMBean('/')
wls:/base_domain/edit/ !> peppart=domain.createPartition('Pep')
wls:/base_domain/edit/ !> vt=domain.createVirtualTarget('TestVT')
wls:/base_domain/edit/ !>
vt.setHostNames(jarray.array([String('localhost')],String))
wls:/base_domain/edit/ !> vt.setUriPrefix('/foo')
wls:/base_domain/edit/ !> peppart.addAvailableTarget(vt)
wls:/base_domain/edit/ !> peprg=peppart.createResourceGroup('TestRG')
wls:/base_domain/edit/ !> peprg.addTarget(vt)
wls:/base_domain/edit/ !> activate()
wls:/base_domain/edit/ !> startPartitionWait(peppart)
```

8.2.2 Creating Domain Partitions: REST Example

For an example of creating domain partitions using REST, see "Creating Partitions" in *Administering Oracle WebLogic Server with RESTful Management Services*.

8.3 Managing Domain Partitions: Main Steps and Examples

You perform most of the configuration required for a partition when you configure the resource group or resource group overrides. The tasks include configuring JDBC system data sources, JMS servers and resources, foreign JNDI providers, and so forth. These tasks are described in Configuring Resource Groups and Configuring Resource Overrides, respectively.

This section focuses on the management tasks you perform on the domain partition itself, and not on the associated resource groups.

The main steps for managing domain partitions include the following:

1. Select the domain partition you want to manage.
2. Monitor the partition's performance and use.
3. View and change the virtual targets available for this domain partition.
4. View and change the resource groups configured in this partition.

5. View and change any applications that are deployed to the partition. (Strictly speaking, you deploy an application to a resource group in a partition, not to the partition itself.)
6. If you are using OTD for load balancing, view and change the OTD runtime configuration used with this partition.
7. View and change any JDBC and JMS modules partition override configurations.
8. View and change any partition Work Manager and Resource Manager configured for this partition.
9. View and change the security realm and default target for this partition.
10. Optionally, use the Notes attribute to specify additional information about this partition.

To manage a domain partition using Fusion Middleware Control, see "Configure domain partitions" in the online help.

8.3.1 Managing Domain Partitions: WLST Example

The following example:

1. Creates a domain partition.
2. Creates a virtual target.
3. Sets the host name and URI prefix for the virtual target.
4. Adds the virtual target as an available target in the partition.
5. Creates the resource group.
6. Adds the virtual target to the resource group.
7. Activates the changes.
8. Starts the partition.

> **Note:** If this is the first partition created in production mode, you must restart the Administration Server before you can start the partition.

9. Deploys the application `MySimpleEjb` to the resource group.

```
# Create Pep partition and ResourceGroup
edit()
startEdit()
wls:/base_domain/edit/ !> domain=getMBean('/')
wls:/base_domain/edit/ !> peppart=domain.createPartition('Pep')
wls:/base_domain/edit/ !> vt=domain.createVirtualTarget('TestVT')
wls:/base_domain/edit/ !>
vt.setHostNames(jarray.array([String('localhost')],String))
wls:/base_domain/edit/ !> vt.setUriPrefix('/foo')
wls:/base_domain/edit/ !> peppart.addAvailableTarget(vt)
wls:/base_domain/edit/ !> peprg=peppart.createResourceGroup('TestRG')
wls:/base_domain/edit/ !> peprg.addTarget(vt)
wls:/base_domain/edit/ !> activate()

wls:/base_domain/edit/ !> startPartitionWait(peppart)

wls:/base_domain/edit/ !> deploy(appName='MySimpleEjb',
```

```
path='c:/webservices/MySimpleEjb.jar', partition='Pep', resourceGroup='TestRG',
deploymentOrder=10,securityModel='DDOnly')
:
Completed the deployment of Application with status completed
Current Status of your Deployment:
Deployment command type: deploy
Deployment State : completed
Deployment Message : no message
```

8.3.2 Managing Domain Partitions: REST Example

See the following REST examples:

- For an example of creating partition-scoped data sources and a JMS system resource using REST, see "Creating Partition-Scoped System Resources" in *Administering Oracle WebLogic Server with RESTful Management Services*.
- For an example of deploying partition-scoped applications using REST, see "Deploying Partition-Scoped Applications" in *Administering Oracle WebLogic Server with RESTful Management Services*.

8.4 Controlling Domain Partitions: Main Steps and Examples

You can reconfigure global and partition-specific resources without restarting the associated servers or clusters. Changes to one partition do not impact other partitions: you can create, start, stop, and delete partitions independently.

The main steps for controlling domain partitions are as follows:

1. Select the partition you want to control. You do not need to select a partition in order to import a partition.
2. Start the partition. All of the resource groups—and all of the applications deployed to those resource groups—are started.
3. Shut down the partition. All of the resource groups—and all of the applications deployed to those resource groups—are shut down. Shutting down a resource group causes the applications and resources in that resource group to stop running and to be removed from memory.

   Shutting down the partition is the runtime equivalent of undeploying the application or resource, except that the configuration for the application or resource is not removed from the configuration file as it would be in a true undeploy operation. The configuration delivered to a Managed Server is also not removed.
4. Suspend the partition. The suspend operation gracefully transitions the partition from the *RUNNING* to *ADMIN* states.
5. Resume the partition. The resume operation gracefully transitions the partition from the ADMIN to RUNNING states.
6. Import a partition. You can import a partition into another domain with only a minimal number of configuration changes being required. See Exporting and Importing Partitions.
7. Export a partition. You can export a partition from one domain (the source domain) and import it into another domain (the target domain). See Exporting and Importing Partitions.

8. Delete a partition. When you delete a partition, all of the resource groups in the partition are deleted and all of the applications deployed to the partition are undeployed.

Note: You must shut down a partition before you can delete it.

To control a domain partition using Fusion Middleware Control, see "Control domain partitions" in the online help.

8.4.1 Actions That Require a Partition Restart

The following actions require a partition restart:

- Any change to a non-dynamic attribute on a system resource in a resource group. For example, the URL of the JDBC database connection.
- Any override that effects a non-dynamic attribute on a system resource. For example, the connection URL of the JMS foreign server.
- Any non-targeting change to a virtual target that is in use by a running partition. For example, the URI prefix.
- Any change to a resource deployment plan.

8.4.2 Controlling Domain Partitions: WLST Example

For examples of importing and exporting partitions with WLST, see Exporting and Importing Partitions.

The following example uses the WLST `startPartitionWait()` command to start a domain partition called `pep` from the root DomainMBean. For complete information on `startPartitionWait()`, see *WLST Command Reference for WebLogic Server*.

`startPartitionWait()` requires the partition to start. You can obtain the PartitionMBean from `Domain.createPartition()` or `Domain.lookupPartition()`, for example.

```
edit()
startEdit()
domain=getMBean('/')
startPartitionWait(domain.lookupPartition("Pep"))
[MBeanServerInvocationHandler]com.bea:Name=_5_START,Type=PartitionLifeCycleTaskR
untime,PartitionLifeCycleRuntime=Pep
```

Full Control with PartitionLifeCycleRuntimeMBean

`startPartitionWait()` is a convenience command. For full control of a partition life cycle, including shutting down a partition, use the PartitionLifeCycleRuntimeMBean. For a description of the PartitionLifeCycleRuntimeMBean MBean, see the *MBean Reference for Oracle WebLogic Server*.

The following example gracefully shuts down partition `pep`.

```
domainRuntime()
cd('DomainPartitionRuntimes')
cd ('pep')
cd('PartitionLifeCycleRuntime')
cd ('pep')
cmo.shutdown()
```

```
[MBeanServerInvocationHandler]com.bea:Name=_3_SHUTDOWN,Type=PartitionLifeCycleTa
skRuntime,DomainPartitionRuntime=pep,PartitionLifeCycleRuntime=pep
```

The following example starts partition `pep`.

```
domainRuntime()
cd('DomainPartitionRuntimes')
cd ('pep')
cd('PartitionLifeCycleRuntime')
cd ('pep')
cmo.start()
[MBeanServerInvocationHandler]com.bea:Name=_4_START,Type=PartitionLifeCycleTaskR
untime,DomainPartitionRuntime=pep,PartitionLifeCycleRuntime=pep
```

The following example suspends partition `pep`.

```
domainRuntime()
cd('DomainPartitionRuntimes')
cd ('pep')
cd('PartitionLifeCycleRuntime')
cd ('pep')
cmo.suspend()
[[MBeanServerInvocationHandler]com.bea:Name=_5_SUSPEND,Type=PartitionLifeCycleTas
kRuntime,DomainPartitionRuntime=pep,PartitionLifeCycleRuntime=pep
```

8.4.3 Controlling Domain Partitions: REST Example

For an example of controlling domain partitions using REST, see "Starting and Stopping Partitions" in *Administering Oracle WebLogic Server with RESTful Management Services*.

8.5 Configuring Domain Partitions: Related Tasks and Links

See the following sections for additional information:

- WebLogic Server Multitenant
- Configuring Virtual Targets
- Configuring Resource Group Templates
- Configuring Resource Groups
- Configuring Resource Overrides
- Configuring Resource Consumption Management
- Configuring Coherence
- Configuring Partition Work Managers
- Exporting and Importing Partitions
- Monitoring and Debugging Partitions

9 Configuring Resource Groups

This chapter describes how to configure resource groups. The chapter refers to the Fusion Middleware and WebLogic Server documentation sets and online help for additional information as appropriate.

This chapter includes the following sections:

9.1 Configuring Resource Groups: Overview

Traditional WebLogic Server domains may contain many types of deployable resources: applications, JMS servers and queues, data sources, and such. In this traditional model, if an application suite contains multiple applications and various resources that support those applications, the administrator defines these resources and deploys these applications individually rather than as a coherent unit.

Resource groups gather together applications and the resources they use into a distinct administrative unit within the domain. Typically the resources in a given resource group are related in some way. For example, they make up a single application suite.

The resources and applications have all the information needed to start or connect to those resources, including credentials for connecting to a data source and targeting information for applications. Applications deployed to a resource group should be ready to be started.

You can create a resource group in two ways:

- Create a new resource group. This creates the basic structure for the resource group. You must then edit this resource group as needed.
- Create the new resource group based on a resource group template. (For information on resource group templates, see Configuring Resource Group Templates.) The configuration is copied from the template to the new resource group. You must then edit and override values from the resource group template as needed.

This section describes the following topics:

- What is in a Resource Group?
- Resource Groups and Overrides
- Resource Groups in Global Scope and Partitions
- Targeting a Resource Group to More Than One Target

9.1.1 What is in a Resource Group?

Resource groups are based on the ResourceGroupMBean and can include the following resources:

- General (name, scope, whether based on a resource group template)
- Deployments
- Services
  - JDBC
  - Messaging
  - Mail sessions
  - Persistent stores
  - Foreign JNDI providers
  - OSGi frameworks
  - Diagnostics
- Targets
- Monitoring features (JDBC, Messaging)
- Control features (JDBC, Messaging, migrate)
- Notes

9.1.2 Resource Groups and Overrides

Resource overriding allows you to customize resources at the partition level. You can override resource settings that are derived from a resource group template.

There are two principal types of overrides:

- You can override resource settings for certain resources using resource override configuration MBeans and resource deployment plans.
- You can override the default application configuration for applications and modules defined to the resource group template by specifying a different deployment plan. The application or module is then redeployed using the new deployment plan for its application configuration.

For a complete description of resource overrides, see Configuring Resource Overrides. For information on application overrides, see Deploying Applications to Partition Resource Groups.

9.1.3 Resource Groups in Global Scope and Partitions

You can create resource groups at the domain level, or specific to a domain partition. If you create the resource group at the domain level, it has a global scope, which is the

equivalent of the domain level in a non-partitioned environment. Applications or classes running at the domain level are available across the domain but are not available in partitions.

If you create the resource group at the partition level, it is scoped only to that partition. Applications or classes running at the partition level are available to the partition, but are not available at the domain level or in other partitions.

9.1.4 Targeting a Resource Group to More Than One Target

You can configure a resource group to have more than one virtual target. For example, you might target a resource group to virtual targets for `Cluster1`, `Cluster2`, and `Cluster3` so that the applications in the resource group run on all three clusters.

However, there are two notable restrictions:

- Some resource group configurations may have target-specific resources that do not apply across multiple targets. These resources include but are not limited to:
  - JMSServer
  - MessagingBridge
  - PathService
  - JMSBridgeDestination
  - FileStore
  - JDBCStore
  - JMSSystemResource

  If you try to target a resource group to multiple virtual targets and any of these resources are present, WebLogic Server MT generates an error.
- You cannot target a resource group to more than one virtual target if the virtual targets target the same physical server.

  For example, if resource group `RG` targets `VT1` and `VT2`, and both `VT1` and `VT2` target `Server1`, WebLogic Server MT generates an error.

9.2 Creating Resource Groups: Main Steps and Examples

To create a new resource group at the partition or global scope:

1. Navigate to the partition or the domain level, as needed.

   Note the following navigational differences:

   - If you are using Fusion Middleware Control, you can navigate to **WebLogic Domain** > **Environment** > **Resource Groups** and create a resource group at either the partition level or domain level.
   - If you are using the WebLogic Server Administration Console, navigate to **WebLogic Domain** > **Environment** > **Resource Groups** to create a resource group at the domain level.

     Navigate to **WebLogic Domain** > **Domain Partitions** > **Partition** > **Resource Groups** to create a resource group at the partition level.
2. Create a new resource group.
3. You can define the following configuration settings for your new resource group:

- Enter a name for the new resource group
- Select either partition level or domain level.
- Optionally, select a resource group template to use for this new resource group
- Select the targets for this new resource group.
- Enter notes for the new resource group

These tasks are described in "Create resource groups" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

If you did not create the resource group from a resource group template, the initial resource group configuration is a basic skeleton and you must configure it before you can use it. You perform most of the configuration required for a partition when you configure the resource group or resource group overrides. The tasks include configuring JDBC system data sources, JMS servers and resources, foreign JNDI providers, and so forth.

For more information, see Configuring resource groups: Main Steps and Examples.

9.2.1 Creating Resource Groups: WLST Example

The following example:

1. Creates a domain partition.
2. Creates a virtual target.
3. Sets the host name and URI prefix for the virtual target.
4. Adds the virtual target as an available target in the partition.
5. Creates the resource group.
6. Adds the virtual target to the resource group.
7. Activates the changes.
8. Starts the partition.

> **Note:** If this is the first partition created in production mode, you must restart the Administration Server before you can start the partition.

```
# Create Pep partition and ResourceGroup
edit()
startEdit()
wls:/base_domain/edit/ !> domain=getMBean('/')
wls:/base_domain/edit/ !> peppart=domain.createPartition('Pep')
wls:/base_domain/edit/ !> vt=domain.createVirtualTarget('TestVT')
wls:/base_domain/edit/ !>
vt.setHostNames(jarray.array([String('localhost')],String))
wls:/base_domain/edit/ !> vt.setUriPrefix('/foo')
wls:/base_domain/edit/ !> peppart.addAvailableTarget(vt)
wls:/base_domain/edit/ !> peprg=peppart.createResourceGroup('TestRG')
wls:/base_domain/edit/ !> peprg.addTarget(vt)
wls:/base_domain/edit/ !> activate()
wls:/base_domain/edit/ !> startPartitionWait(peppart)
```

9.2.2 Creating Resource Groups: REST Example

For an example of creating resource groups using REST, see "Creating Partitions" in *Administering Oracle WebLogic Server with RESTful Management Services*.

In particular, see the section "Create a resource group for the new partition."

9.3 Configuring resource groups: Main Steps and Examples

This section describes how to configure resource groups.

This section includes the following tasks:

- Configure Resource Group General Settings
- Configure Resource Group Deployment Settings
- Configure Resource Group Services Settings
- Configure Resource Groups Targets
- Configure Resource Group Notes

9.3.1 Configure Resource Group General Settings

To view and define general resource group settings:

1. Select the resource group you want to configure.
2. View and define general configuration settings for the resource group, such as:
   - Name
   - Scope
   - Resource Group Template
3. Save your changes.

These tasks are described in "Configure resource groups general settings" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

9.3.2 Configure Resource Group Deployment Settings

To view and define resource group deployment settings:

1. Select the resource group you want to configure.
2. You can take the following deployment actions:
   - Deploy
   - Redeploy
   - Undeploy
   - Fetch deployment plan
   - Add Override
   - Remove override
   - Start
   - Stop
3. Save your changes.

These tasks are described in "Configure resource group deployment settings" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

9.3.2.1 Deploy Applications to a Resource Group

Deploying an application makes its physical file or directory known to WebLogic Server.

To deploy an application to a resource group:

1. Select the resource group you want to configure.
2. Locate the application you want to deploy and choose whether to upload a deployment plan or create a new deployment plan.
3. Update the application attributes as desired. These attributes include:
   - Application Name
   - Distribution
   - Source Accessibility
4. Deploy the application.
5. Update the deployment settings or complete deployment of this application.

These tasks are described in "Deploy applications to a resource group" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

9.3.2.2 Redeploy Applications to a Resource Group

Redeploying an application redeploys the archive file or exploded directory. Redeploy an application if you have made changes to it and want to make the changes available to WebLogic Server clients.

To redeploy an application or module to a resource group:

1. Select the resource group you want to configure.
2. Select the application you want to redeploy.
3. Choose whether to upload a deployment plan or create a new deployment plan.
4. Update the application distribution as needed.
5. Optionally, edit the deployment plan to set more advanced deployment options, and save the deployment plan to your local disk.
6. Redeploy the application to complete redeployment of this application.

These tasks are described in "Redeploy applications to a resource group" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

9.3.2.3 Undeploy Applications From a Resource Group

Undeploying an application removes it from every target of the domain to which the application is deployed. Once you undeploy an application from the domain, you must deploy it again if you want to make it available to WebLogic Server clients. To temporarily make applications unavailable to WebLogic Server clients, you can stop them instead of undeploying them.

To undeploy an application from a partition resource group:

1. Select the resource group you want to configure.
2. Select the application you want to undeploy from the deployed applications.

3. Undeploy the application.
4. If you later want to deploy the removed application, see Deploy Applications to a Resource Group.

These tasks are described in "Undeploy applications from a resource group" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

9.3.3 Configure Resource Group Services Settings

This section describes how to configure resource group services settings. The following topics are described:

- Configure Resource Group JDBC Settings
- Configure Resource Group JMS settings
- Configure Resource Group Mail Session Settings
- Configure Resource Group Persistent Store Settings
- Configure Resource Group Foreign JNDI Provider Settings
- Configure Resource Group Diagnostic System Module Settings

9.3.3.1 Configure Resource Group JDBC Settings

To view configuration settings for the JDBC system resources that have been created in this resource group:

1. Select the resource group you want to configure.
2. Navigate to **Services** > **JDBC**.

   The read-only JDBC information for a resource group includes:

   - Name
   - JNDI Name
   - Type
   - Targets
   - Algorithm Type
   - Row Prefetch Enabled
   - Row Prefetch Size
   - Steam Chunk Size
3. Create or delete the system data sources as needed.
4. Save your changes.

These tasks are described in "Configure resource group JDBC Settings" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

For information on configuring the JDBC system data sources that have been created in this resource group, see Configuring JDBC.

9.3.3.2 Configure Resource Group JMS settings

This section describes how to configure resource group JMS settings.

This section includes the following tasks:

- Configure JMS Server Settings

- Configure SAF Agent Settings
- Configure JMS Resource Settings
- Configure JMS Module Settings
- Configure Messaging Bridges
- Configure JMS Bridge Destinations
- Configure Path Services

9.3.3.2.1 Configure JMS Server Settings To view configuration settings for the JMS servers that have been created for this resource group:

1. Select the resource group you want to configure.
2. Navigate to **Services** > **Messaging** > **JMS Servers**.

   The following read-only information is available for JMS servers already configured in this resource group:

   - Name
   - Health
   - Health Reason
   - Persistent Store
   - Temporary Template Name
   - Bytes Maximum
   - Messages Maximum
   - Bytes Threshold High
   - Bytes Threshold Low
   - Messages Threshold High
3. Create or delete JMS servers as needed.
4. Save your changes.

These tasks are described in "Configure JMS Server Settings" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

For information on configuring the JMS servers that have been configured in this resource group, see Configuring JMS Servers.

9.3.3.2.2 Configure SAF Agent Settings To view configuration settings for the store-and-forward (SAF) agents that have been created for this resource group:

1. Select the resource group you want to configure.
2. Navigate to **Services** > **Messaging** > **SAF Agents**.

   The following read-only information is available for the SAF agents configured in this resource group:

   - Name
   - Agent Type
   - Persistent Store
3. Create or delete SAF Agents as needed.

4. Save your changes.

These tasks are described in "Configure SAF Agent Settings" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

For information on configuring the store-and-forward agents that have been configured in this resource group, see Configuring Store-and-Forward (SAF) Agents.

9.3.3.2.3 Configure JMS Resource Settings To monitor the resource settings for a resource group:

1. Select the resource group you want to configure.
2. Navigate to **Services** > **Messaging** > **JMS Resources**.

   The following read-only information is available for the JMS resources configured in this resource group:

   - Name
   - Type
   - JMS Module Name
   - JNDI Name
   - Subdeployment
3. Create or delete JMS resources as needed.
4. Save your changes.

These tasks are described in "Configure SAF Agent Settings" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

For information on configuring existing JMS resources, see Configuring JMS System Resources and Application Scoped JMS Modules.

9.3.3.2.4 Configure JMS Module Settings To configure the JMS modules for a resource group:

1. Select the resource group you want to configure.
2. Navigate to **Services** > **Messaging > JMS Modules** > **JMS Modules**.

   The following read-only information is available for the JMS modules configured in this resource group:

   - Name
   - Queues
   - Topics
   - Connection Factories
   - Distributed Queues
   - Distributed Topics
   - Foreign Servers
   - Quotas
   - SAF Error Handlers
   - SAF Imported Destinations
   - SAF Remote Contexts

- Templates
- Uniform Distributed Queues
- Uniform Distributed Topics
- Destination Keys
- Type

3. Create or delete JMS modules as needed.
4. Save your changes.

These tasks are described in "Configure JMS module settings" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

For information on configuring existing JMS modules, see Configuring Messaging Components.

9.3.3.2.5 Configure Messaging Bridges To configure the messaging bridge settings for a resource group:

1. Select the resource group you want to configure.
2. Navigate to **Services** > **Messaging** > **Messaging Bridges**.

   The following read-only information is available for the messaging bridges configured in this resource group:

   - Name
   - Source Bridge Destination
   - Target Bridge Destination
3. Create or delete messaging bridges as needed.
4. Save your changes.

These tasks are described in "Configure messaging bridges" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

For information on configuring the messaging bridges that have been configured in this resource group, see Configuring Messaging Bridges.

9.3.3.2.6 Configure JMS Bridge Destinations To configure the JMS bridge destination settings for a resource group:

1. Select the resource group you want to configure.
2. Navigate to **Services** > **Messaging** > **Bridge Destinations**.

   The following read-only information is available for the JMS bridge destinations configured in this resource group:

   - Name
   - Adapter JNDI Name
3. Create or delete JMS bridge destinations as needed.
4. Save your changes.

These tasks are described in "Configure JMS bridge destinations" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

9.3.3.2.7 Configure Path Services To configure the path services settings for a resource group:

1. Select the resource group you want to configure.
2. Navigate to **Services** > **Messaging** > **Path Services**.

   The following read-only information is available for the path services configured in this resource group:

   - Name
   - Persistent Store
3. Create or delete path services as needed.
4. Save your changes.

These tasks are described in "Configure path services" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

For information on configuring existing path services, see Configuring Path Services to Support Using Unit-of-Order with Distributed Destinations.

9.3.3.3 Configure Resource Group Mail Session Settings

To view configuration settings for the mail sessions that have been created in this resource group:

1. Select the resource group you want to configure.
2. Navigate to **Services** > **Mail**.

   The following read-only information is available for mail sessions configured in this resource group:

   - Name
   - JNDI Name
3. Create or delete mail sessions as needed.
4. Save your changes.

These tasks are described in "WebLogic Server Mail Sessions" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

9.3.3.4 Configure Resource Group Persistent Store Settings

To view configuration settings for the persistent stores that have been created in this resource group:

1. Select the resource group you want to configure.
2. Navigate to **Services** > **Persistent Stores**.

   The following read-only information is available for the persistent stores configured in this resource group:

   - Name
   - Type
3. Create or delete persistent stores as needed.
4. Save your changes.

These tasks are described in "WebLogic Server Persistent Stores" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

For information on configuring existing persistent stores, see Configuring JDBC or File Persistent Stores.

9.3.3.5 Configure Resource Group Foreign JNDI Provider Settings

To view configuration settings for the foreign JNDI providers that have been created in this resource group:

1. Select the resource group you want to configure.
2. Navigate to **Services** > **Foreign JNDI Providers**.

   The following read-only information is available for the foreign JNDI providers configured in this resource group:

   - Name
   - Initial Context Factory
   - Provider URL
   - User
   - Targets
3. Create or delete foreign JNDI providers as needed.
4. Save your changes.

These tasks are described in "WebLogic Server Foreign JNDI Providers" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

For information on configuring existing foreign JNDI providers, see Configuring and Programming JNDI.

9.3.3.6 Configure Resource Group Diagnostic System Module Settings

To view configuration settings for the diagnostic system modules that have been created in this resource group:

1. Select the resource group you want to configure.
2. Navigate to **Services** > **Diagnostics**.

   The following read-only information is available for the diagnostic system modules configured in this resource group:

   - Name
   - Description
   - Targets
3. Create or delete diagnostic system modules as needed.
4. Save your changes.

These tasks are described in "WebLogic Server Diagnostics" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

For information on configuring existing diagnostic system modules, see Monitoring and Debugging Partitions.

9.3.4 Configure Resource Groups Targets

To specify the targets for this resource group:

1. Select the resource group you want to configure.

2. Navigate to **Targets**.
3. Specify one or more virtual targets to which this resource group is targeted.

   For important considerations when targeting a resource group to more than one virtual target, see Targeting a Resource Group to More Than One Target.

   A virtual target can be used by many resource groups within a partition, or by many resource groups at the domain level.
4. Save your changes.

These tasks are described in "Configure virtual targets" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

For information on configuring the actual virtual target, see Configuring Virtual Targets.

9.3.5 Configure Resource Group Notes

To create notes for a resource group:

1. Select the resource group you want to configure.
2. Navigate to **Notes**.
3. Enter your notes.
4. Save your changes.

9.3.6 Configuring Resource Groups: WLST Example

The following example:

1. Creates a domain partition.
2. Creates a virtual target.
3. Sets the host name and URI prefix for the virtual target.
4. Adds the virtual target as an available target in the partition.
5. Creates the resource group.
6. Adds the virtual target to the resource group.
7. Activates the changes.
8. Starts the partition.

> **Note:** If this is the first partition created in production mode, you must restart the Administration Server before you can start the partition.

9. Deploys the application `MySimpleEjb` to the resource group.

```
# Create Pep partition and ResourceGroup
edit()
startEdit()
wls:/base_domain/edit/ !> domain=getMBean('/')
wls:/base_domain/edit/ !> peppart=domain.createPartition('Pep')
wls:/base_domain/edit/ !> vt=domain.createVirtualTarget('TestVT')
wls:/base_domain/edit/ !>
vt.setHostNames(jarray.array([String('localhost')],String))
```

```
wls:/base_domain/edit/ !> vt.setUriPrefix('/foo')
wls:/base_domain/edit/ !> peppart.addAvailableTarget(vt)
wls:/base_domain/edit/ !> peprg=peppart.createResourceGroup('TestRG')
wls:/base_domain/edit/ !> peprg.addTarget(vt)
wls:/base_domain/edit/ !> activate()

wls:/base_domain/edit/ !> startPartitionWait(peppart)

wls:/base_domain/edit/ !> deploy(appName='MySimpleEjb',
path='c:/webservices/MySimpleEjb.jar', partition='Pep', resourceGroup='TestRG',
deploymentOrder=10,securityModel='DDOnly')
:
Completed the deployment of Application with status completed
Current Status of your Deployment:
Deployment command type: deploy
Deployment State : completed
Deployment Message : no message
```

9.3.7 Configuring Resource Groups: REST Example

For an example of configuring resource groups using REST, see "Creating Partitions" in *Administering Oracle WebLogic Server with RESTful Management Services*.

In particular, see the sections "View the new partition's resource groups" and "Demonstrate a partition deployer configuring system resources."

9.4 Deleting a Resource Group: Main Steps and WLST Example

You must first stop a resource group before you can delete it. Stopping the resource group causes applications and resources in the resource group to cease operating and to be removed from memory.

1. Select the resource group you want to delete.
2. Navigate to **Control** > **Stop**. You should generally choose to stop the resource group when work completes.
3. Stop the resource group.
4. Delete the resource group.

9.4.1 Deleting Resource Groups: WLST Example

The following example:

1. Creates a domain partition.
2. Creates a virtual target.
3. Sets the host name and URI prefix for the virtual target.
4. Adds the virtual target as an available target in the partition.
5. Creates the resource group.
6. Adds the virtual target to the resource group.
7. Unsets the resource group.
8. Deletes the resource group.
9. Creates a different resource group.
10. Adds the virtual target to that resource group.

11. Activates the changes.
12. Starts the partition.

> **Note:** If this is the first partition created in production mode, you must restart the Administration Server before you can start the partition.

```
# Create Pep partition and Resource Group. Remove Resouce Group
edit()
startEdit()
wls:/base_domain/edit/ !> domain=getMBean('/')
wls:/base_domain/edit/ !> peppart=domain.createPartition('Pep')
wls:/base_domain/edit/ !> vt=domain.createVirtualTarget('TestVT')
wls:/base_domain/edit/ !>
vt.setHostNames(jarray.array([String('localhost')],String))
wls:/base_domain/edit/ !> vt.setUriPrefix('/foo')
wls:/base_domain/edit/ !> peppart.addAvailableTarget(vt)
wls:/base_domain/edit/ !> peprg=peppart.createResourceGroup('TestRG')
wls:/base_domain/edit/ !> peprg.addTarget(vt)
wls:/base_domain/edit/ !> peppart.unSet('ResourceGroups')
wls:/base_domain/edit/ !> peprg=peppart.destroyResourceGroup(peprg)
wls:/base_domain/edit/ !> peprg=peppart.createResourceGroup('TestRG2')
wls:/base_domain/edit/ !> peprg.addTarget(vt)
wls:/base_domain/edit/ !> activate()
wls:/base_domain/edit/ !> startPartitionWait(peppart)
```

9.5 Controlling a Resource Group: Main Steps and WLST Example

To control a resource group:

1. Select the resource group you want to configure.
2. Navigate to **Control**.

   You can perform the following actions:

   - Start—causes application deployments and resources that are not currently running to become active.
   - Stop—causes applications and resources in the resource group to cease operating and to be removed from memory. It is the runtime equivalent to undeploying the application or resource, except that the configuration for the application or resource is not removed from `config.xml` as it would be in a true undeployment.

9.5.1 Controlling Resource Groups: WLST Example

Stopping a Resource Group

The following example builds on the WLST example shown in Creating Resource Groups: WLST Example. It shows navigation to the ResourceGroupLifeCycleRuntime MBean and stops the resource group `TestRG`.

```
wls:/base_domain/serverConfig/> domainRuntime()
wls:/base_domain/domainRuntime/> domain=cmo
wls:/base_domain/domainRuntime/> partrun = cmo.lookupDomainPartitionRuntime('Pep
')
wls:/base_domain/domainRuntime/> partliferun = partrun.getPartitionLifeCycleRunt
```

```
ime()
wls:/base_domain/domainRuntime/> rgliferun = partliferun.lookupResourceGroupLife
CycleRuntime('TestRG')
wls:/base_domain/domainRuntime/> rgliferun.shutdown()
[MBeanServerInvocationHandler]com.bea:Name=_2_SHUTDOWN,Type=ResourceGroupLifeCyc
leTaskRuntime,DomainPartitionRuntime=Pep,ResourceGroupLifeCycleRuntime=TestRG,Pa
rtitionLifeCycleRuntime=Pep
```

Starting a Resource Group

The following example builds on the WLST example shown in Creating Resource Groups: WLST Example. It shows navigation to the ResourceGroupLifeCycleRuntime MBean and starts the resource group `TestRG`.

```
wls:/base_domain/serverConfig/> domainRuntime()
wls:/base_domain/domainRuntime/> domain=cmo
wls:/base_domain/domainRuntime/> partrun = cmo.lookupDomainPartitionRuntime('Pep
')
wls:/base_domain/domainRuntime/> partliferun = partrun.getPartitionLifeCycleRunt
ime()
wls:/base_domain/domainRuntime/> rgliferun = partliferun.lookupResourceGroupLife
CycleRuntime('TestRG')
wls:/base_domain/domainRuntime/> rgliferun.start()
[MBeanServerInvocationHandler]com.bea:Name=_4_START,Type=ResourceGroupLifeCycleT
askRuntime,DomainPartitionRuntime=Pep,ResourceGroupLifeCycleRuntime=TestRG,Parti
tionLifeCycleRuntime=Pep
wls:/base_domain/domainRuntime/>
```

9.6 Migrating a Resource Group: Main Steps and WLST Example

When you migrate a resource group, you change the virtual target used by the resource group from one physical target (cluster/server) to another. After migration, the virtual target will point to the new physical target (cluster/server).

Note that this change affects any partition-level or domain-level resource group that uses this virtual target.

To use Fusion Middleware Control to migrate a resource group:

1. From the **WebLogic Domain** drop-down menu, select **Environment**, then select **Resource Groups**.

   The Resource Groups table displays information about each resource group that has been configured in the current domain.
2. In the Resource Groups table, select the resource group you want to configure.
3. Navigate to **Migrate**.
4. Choose a new target for the virtual target associated with the resource group. You can choose a single Managed Server or a single cluster.
5. Save your changes.

9.6.1 Migrating Resource Groups: WLST Example

The following example:

1. Creates a domain partition.
2. Creates a virtual target.
3. Sets the host name and URI prefix for the virtual target.

4. Targets the virtual target to the Administration Server. (You would generally not target the virtual target to the Administration Server unless you have a specific reason to do so.)
5. Adds the virtual target as an available target in the partition.
6. Creates the resource group.
7. Adds the virtual target to the resource group.
8. Activates the changes.
9. Starts the partition.

> **Note:** If this is the first partition created in production mode, you must restart the Administration Server before you can start the partition.

10. Removes the Administration Server as a target.
11. Migrates (targets) the virtual target to Cluster-0.

```
# Create Pep partition and ResourceGroup
edit()
startEdit()
wls:/base_domain/edit/ !> domain=getMBean('/')
wls:/base_domain/edit/ !> peppart=domain.createPartition('Pep')
wls:/base_domain/edit/ !> vt=domain.createVirtualTarget('TestVT')
wls:/base_domain/edit/ !>
vt.setHostNames(jarray.array([String('localhost')],String))
wls:/base_domain/edit/ !> vt.setUriPrefix('/foo')
wls:/base_domain/edit/ !> tgt=getMBean('/Servers/AdminServer')
wls:/base_domain/edit/ !> vt.addTarget(tgt)
wls:/base_domain/edit/ !> peppart.addAvailableTarget(vt)
wls:/base_domain/edit/ !> peprg=peppart.createResourceGroup('TestRG')
wls:/base_domain/edit/ !> peprg.addTarget(vt)
wls:/base_domain/edit/ !> activate()
wls:/base_domain/edit/ !> startPartitionWait(peppart)
startEdit()
wls:/base_domain/edit/ !> vt.removeTarget(tgt)
wls:/base_domain/edit/ !> tgt=getMBean('/Clusters/Cluster-0')
wls:/base_domain/edit/ !> vt.addTarget(tgt)
wls:/base_domain/edit/ !> activate()
```

9.7 Configuring Resource Groups: Related Tasks and Links

See the following sections for additional information related to resource groups:

- WebLogic Server Multitenant
- Configuring Virtual Targets
- Configuring Resource Group Templates
- Configuring Resource Overrides
- Configuring Messaging

10 Configuring Resource Overrides

This chapter describes resource overrides and how to configure them. You can use Fusion Middleware Control (FMWC), the WLS Administration Console, or WLST to configure resource overrides, as described in this chapter. The chapter refers to the Fusion Middleware and WebLogic Server documentation sets and online help for additional information as appropriate.

This chapter includes the following sections:

10.1 Resource Overrides: Overview

Resource overriding allows administrators to customize resources at the partition level. If you create a partition with a resource group that extends a resource group template, you can override settings for certain resources defined in that resource group template. If you create a resource group within the partition that does *not* extend a resource group template and then create resources within this resource group, you don't need overrides; you can just set partition-specific values for these resources. Overrides are used mainly when there is a common definition for the resource, such as in a resource group template.

Resource group templates are particularly useful in SaaS environments where WebLogic Server Multitenant activates the same applications and resources multiple times, once per domain partition. Some of the information about such resources is the same across all domain partitions, while some of it, such as JMS queues and database connections, varies from one partition to the next. For example, you would need to customize the URL, user name, and password used to connect to a data source among different partitions.

Administrators can override resource definitions in partitions using the following techniques:

- Resource override configuration MBeans—a configuration MBean which exposes a subset of attributes of an existing resource configuration MBean. Any attribute set on an instance of an overriding configuration MBean will replace the value of that attribute in the corresponding resource configuration MBean instance.
- Resource deployment plans—an XML file which identifies resources within a partition and overrides attribute settings on those resources.

- Partition-specific application deployment plans—similar to application deployment plans, it allows administrators to specify a partition-specific application deployment plan for each application deployment in a partition. For information about partition-specific application deployment plans, see Using Partition-Specific Deployment Plans.

Administrators can combine any of these resource overriding techniques. The system applies them in the following, ascending order of priority:

- `config.xml` and external descriptors, including partition-specific application deployment plans
- Resource deployment plans
- Overriding configuration MBeans

  If an attribute is referenced by both a resource deployment plan and an overriding configuration MBean, the overriding configuration MBean takes precedence.

10.1.1 Using Configuration MBean Overrides

Overriding configuration MBeans allow you to customize "frequently-tailored" attributes, such as the attributes of a JMS queue or of a DB connection. An attribute in an overriding configuration MBean might override the `config.xml` settings for the resource or it might override a setting from the resource's external descriptor, depending on where the attribute resides.

In this release, WebLogic Server MT provides the following resource override configuration MBeans:

- JDBCSystemResourceOverrideMBean
- JMSSystemResourceOverrideMBean
- ForeignServerOverrideMBean
- ForeignConnectionFactoryOverrideMBean
- ForeignDestinationOverrideMBean
- MailSessionOverrideMBean

Resource configuration override MBeans typically work by matching the name of the overriding configuration MBean with the name of the resource MBean. For more information, see Configuring Resource MBean Overrides: Main Steps and WLST Examples.

10.1.2 Using Resource Deployment Plans

A resource deployment plan is an XML file that overrides attributes for one or more resources within a single partition. Each partition can have at most one resource deployment plan which can override any resources in that partition. This includes resources defined in resource group templates to which the partition's resource groups refer as well as resources declared directly in the resource groups.

When a server restarts, changes to non-dynamic attributes from the resource deployment plan (and from overriding configuration MBeans), will be applied before the resource is active. Once a given resource is running, changes to the resource deployment plan that would affect non-dynamic attributes of that resource will not take effect until the partition is restarted.

Resource deployment plans can be used to with the following resources to override options that are configured in `config.xml` or external descriptor files:

- CoherenceClusterSystemResource
- FileStore
- ForeignJNDIProvider
- JDBCStore
- JDBCSystemResource
- JMSBridgeDestination
- JMSServer
- JMSSystemResource
- MailSession
- ManagedExecutorService
- ManagedScheduledExecutorService
- ManagedThreadFactory
- MessagingBridge
- PathService
- SAFAgent
- WLDFSystemResource

10.1.2.1 resource-deployment-plan Syntax

Resource deployment plans are based on the `weblogic-resource-deployment-plan.xsd` file and possess a similar syntax to WebLogic Server application deployment plans. Resource deployment plans identify the resource and attribute values to be changed; they support replacing values, adding new ones, and removing existing ones.

The following is a summary of the `resource-deployment-plan` syntax:

```
resource-deployment-plan (@global-variables)
  description
  version
  variable-definition
    variable*
      name
      value
  external-resource-override*
    resource-name
    resource-type
    root-element
    variable-assigment*
      name
      xpath
  config-resource-override*
    resource-name
    resource-type
    variable-assigment*
      name
      xpath
      operation
```

The @ symbol indicates an XML attribute, an asterisk (*) means the element can be repeated. The `operation` element is optional but allowed in any

variable-assignment, whether in an external-resource-override or a config-resource-override.

The basic elements in the resource deployment plan serve the following functions:

- resource-deployment-plan is the root element; it encapsulates all of the resource deployment plan's contents.
- variable-definition defines one or more variable elements. Each variable defines the name of a variable used in a plan and a value to assign (which can be null). The sample plan shown in Sample Resource Deployment Plan contains variable definitions for changes to the mail session user name, mail session JavaMail properties, and JDBC connection pool params, test table name properties.
- Each external-resource-override and config-resource-override element (and their child elements) does these three things:

  1. Identifies the resource to affect (resource-name and resource-type).

     The resources in a partition must have unique names within the partition.

  2. Identifies where the attributes are defined.

     All the attributes in the config-resource-override element reside in the config.xml file. Attributes in the external-resource-override element are stored in external descriptor files. For resource deployment plans, the descriptor path is relative to the partition's config/ directory

  3. Specifies some number of attributes of that resource to override (variable-assignment elements).

     After the attributes for the resource are located, the variable-assignments are applied. An XPath expression tells where, relative to the identified resource's bean, the attribute to be affected appears in the bean tree. The name refers to a previously-defined variable definition. That variable also sets the value that should replace whatever is in the original attribute setting.

     By default, the values in variable-assignment elements are added to the values that are already defined in the descriptor. You can change this behavior and cause the variable-assignment element to replace or remove the values that are defined in the descriptor by setting the operation sub-element in the variable-assignment element to the value replace or remove, respectively.

For more information about the contents of a WebLogic Server resource deployment plan, see http://xmlns.oracle.com/weblogic/resource-deployment-plan/1.0/resource-deployment-plan.xsd. For more information about WebLogic Server application deployment plans, see "Understanding Deployment Plan Contents" in *Deploying Applications to Oracle WebLogic Server*.

10.1.2.2 Sample Resource Deployment Plan

The following shows a sample resource deployment plan.

```
<resource-deployment-plan
  xmlns="http://xmlns.oracle.com/weblogic/resource-deployment-plan"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema"
  xsi:schemaLocation="http://xmlns.oracle.com/weblogic/resource-deployment-plan
http://xmlns.oracle.com/weblogic/resource-deployment-plan/1.0/resource-deployment-
plan.xsd"
>
  <description>Example RDP</description>
  <variable-definition>
```

```
    <variable>
      <name>mailNewSessionUsername</name>
      <value>aaron</value>
    </variable>
    <variable>
      <name>mailNewProps</name>
      <value>mail.user=someoneElse;mail.host=myMailServer.oracle.com</value>
    </variable>
    <variable>
      <name>jdbcTableToTest</name>
      <value>JUNK_TABLE</value>
    </variable>
  </variable-definition>
  <external-resource-override>
    <resource-name>myjdbc</resource-name>
    <resource-type>jdbc-system-resource</resource-type>
    <root-element>jdbc-data-source</root-element>
    <variable-assignment>
      <name>jdbcTableToTest</name>
      <xpath>/jdbc-data-source/jdbc-connection-pool-params/test-table-name</xpath>
    </variable-assignment>
  </external-resource-override>
  <config-resource-override>
    <resource-name>myMail</resource-name>
    <resource-type>mail-session</resource-type>
    <variable-assignment>
      <name>mailNewSessionUsername</name>
      <xpath>/mail-session/session-username</xpath>
    </variable-assignment>
    <variable-assignment>
      <name>mailNewProps</name>
      <xpath>/mail-session/properties</xpath>
    </variable-assignment>
  </config-resource-override>
</resource-deployment-plan>
```

10.2 Configuring Resource MBean Overrides: Main Steps and WLST Examples

Prior to creating resource overrides in a domain partition, you must have first defined the resource you want to override in a resource group template.

10.2.1 Configuring a JDBC System Resource Override: Main Steps

The main steps for configuring a JDBC system resource override are as follows:

1. Create the JDBC system resource override with the name of the datasource that you want to override.
2. Optionally, provide partition-specific URL, user name, and password values.
3. If the resource is running, restart the partition for the overrides to take effect.

10.2.2 Configuring a JDBC System Resource Override: WLST Example

The following example shows how to configure a JDBC system resource override using WLST:

```
edit()
```

```
startEdit()
cd('/Partitions/myPartition')
cmo.createJDBCSystemResourceOverride('myGDS')

cd('/Partitions/myPartition/JDBCSystemResourceOverrides/myJDBCSystemResourceOverri
de')
cmo.setURL('jdbc:oracle:thin:@lcr01156:1521:wldevdb2')
cmo.setUser('admin')
setEncrypted('Password', 'Password_1440013198602', 'C:/Oracle/Middleware/Oracle_
Home/user_projects/domains/base_domain/Script1440013057535Config',
'C:/Oracle/Middleware/Oracle_Home/user_projects/domains/base_
domain/Script1440013057535Secret')
activate()
```

10.2.3 Configuring a JMS System Resource Override: Main Steps

The main steps for configuring a JMS system module/foreign server override are as follows:

1. Provide a name for the foreign server override.

   The system matches overrides using the name of the overriding configuration MBean with the name of the actual resource to be overridden.

2. Optionally, provide partition-specific initial context factory, connection URL, JNDI properties credential, and JNDI properties values.

3. If the resource is running, restart the partition for the overrides to take effect.

The main steps for configuring a JMS foreign server/foreign destination override are as follows:

1. Provide a foreign JMS destination name for the foreign destination override.

   The name of this foreign destination override must match the name of the actual resource to be overridden.

2. Optionally, provide a partition-specific remote JNDI name value.

3. If the resource is running, restart the partition for the overrides to take effect.

The main steps for configuring a JMS foreign server/foreign connection factory override are as follows:

1. Provide a foreign JMS connection factory name for the foreign connection factory override.

   The name of this foreign connection factory override must match the name of the actual resource to be overridden.

2. Optionally, provide partition-specific remote JNDI name, user name, and password values.

3. If the resource is running, restart the partition for the overrides to take effect.

10.2.4 Configuring a JMS System Resource Override: WLST Example

The following example shows how to configure a JMS system resource override using WLST:

```
edit()
startEdit()
cd('/Partitions/myPartition')
```

```
cmo.createJMSSystemResourceOverride('myJMSmoduleOverride')
activate()

startEdit()
cd('/Partitions/myPartition/JMSSystemResourceOverrides/myJMSmoduleOverride')
cmo.createForeignServer('newJMSforeignServer')

cd('/Partitions/myPartition/JMSSystemResourceOverrides/myJMSmoduleOverride/Foreign
Servers/newJMSforeignServer')
setEncrypted('JNDIPropertiesCredential', 'JNDIPropertiesCredential_1440013308523',
'C:/Oracle/Middleware/Oracle_Home/user_projects/domains/base_
domain/Script1440013057535Config', 'C:/Oracle/Middleware/Oracle_Home/user_
projects/domains/base_domain/Script1440013057535Secret')
cmo.setConnectionURL('java.naming.provider.url')
cmo.setInitialContextFactory('weblogic.jndi.WLInitialContextFactory')
activate()

startEdit()
cmo.createForeignDestination('myForeignDestinationOverride')
cd('/Partitions/myPartition/JMSSystemResourceOverrides/myJMSmoduleOverride/Foreign
Servers/newJMSforeignServer/ForeignDestinations/myForeignDestinationOverride')
cmo.setRemoteJNDIName('/remote')
activate()

startEdit()
cd('/Partitions/myPartition/JMSSystemResourceOverrides/myJMSmoduleOverride/Foreign
Servers/newJMSforeignServer')
cmo.createForeignConnectionFactory('myJMSconnectionFactoryOverride')

cd('/Partitions/myPartition/JMSSystemResourceOverrides/myJMSmoduleOverride/Foreign
Servers/newJMSforeignServer/ForeignConnectionFactories/myJMSconnectionFactoryOverr
ide')
setEncrypted('Password', 'Password_1440013370283', 'C:/Oracle/Middleware/Oracle_
Home/user_projects/domains/base_domain/Script1440013057535Config',
'C:/Oracle/Middleware/Oracle_Home/user_projects/domains/base_
domain/Script1440013057535Secret')
cmo.setUsername('wlsqa')
cmo.setRemoteJNDIName('/remote')
activate()
```

10.2.5 Configuring a Mail Session Override: Main Steps

The main steps for configuring a mail session override are as follows:

- Provide a name for the mail session override.

  The system matches overrides using the name of the overriding configuration MBean with the name of the resource MBean.

- Optionally, provide partition-specific session user name, session password, and JavaMail properties values.
- If the resource is running, restart the partition for the overrides to take effect.

10.2.6 Configuring a Mail Session Override: WLST Example

The following example shows how to configure a mail session override using WLST:

```
edit()
startEdit()
```

```
cd('/Partitions/myPartition')
cmo.createMailSessionOverride('myMailSessionOverride')
cd('/Partitions/myPartition/MailSessionOverrides/myMailSessionOverride')
cmo.setSessionUsername('wlsqa')
setEncrypted('SessionPassword', 'SessionPassword_1440013452297',
'C:/Oracle/Middleware/Oracle_Home/user_projects/domains/base_
domain/Script1440013057535Config', 'C:/Oracle/Middleware/Oracle_Home/user_
projects/domains/base_domain/Script1440013057535Secret')
cmo.setProperties({})
activate()
```

10.3 Configuring Resource Deployment Plans: Main Steps and WLST Example

The main steps for configuring a resource deployment plan are as follows:

1. Using an XML editor, create a resource deployment plan. See resource-deployment-plan Syntax and Sample Resource Deployment Plan.
2. Associate the resource deployment plan with a partition by providing the path to the resource deployment plan file.
3. If the resource is running, restart the partition.

The following shows the WLST commands for associating a resource deployment plan with a pre-existing partition:

```
edit()
startEdit()
partition=cmo.lookupPartition(partitionName)
partition.setResourceDeploymentPlanPath('/path/to/the/file.xml')
save()
activate()
```

10.4 Configuring Resource Overrides: Related Tasks and Links

For additional information, see the following:

- "WebLogic Server Resource Overrides" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.
- "JDBC Overrides," "Mail Session Overrides," and "JMS Overrides" in *Oracle WebLogic Server Administration Console Online Help*.

11

Configuring Resource Consumption Management

This chapter describes how to use Resource Consumption Management (RCM) to ensure the fairness of resource allocation and to reduce the contention of shared resources by collocated domain partitions in the server instance. You can create RCM policies using Fusion Middleware Control (FMWC) or WLST to provide consistent performance of domain partitions in MT environments.

This chapter includes the following sections:

11.1 Configuring Resource Consumption Management: Overview

Resource Consumption Management (RCM) provides a flexible, dynamic mechanism for WebLogic Server system administrators to manage shared resources and provide consistent performance of domain partitions in MT environments.

RCM policies are configured as resource managers. A resource manager can be created with a global scope at the domain level and then used as the RCM policy for any partition within the domain. You can also create a partition-scoped resource manager if the partition has RCM characteristics specific to that partition. See "Configuring Resource Consumption Management: Main Steps"

11.1.1 Why Do You Need Resource Consumption Management?

When applications are deployed to multiple domain partitions, sharing low-level resources such as CPU, heap, network and file descriptors can result in unfairness during resource allocation. Abnormal resource consumption requests may happen for various reasons such as high-traffic, application design, or malicious code. These

request types can overload the capacity of a shared resource, preventing another collocated domain partition's access to the resource. By employing appropriate RCM policies at the domain partition level, resource consumption management prevents applications in one partition from negatively affecting applications in other partitions.

11.1.2 Software Requirements for Using RCM

WebLogic RCM requires Oracle JDK 8u60 build 32 or higher.

11.1.3 How To Enable RCM

Set the following JVM arguments to enable WebLogic RCM in your environment:

```
-XX:+UnlockCommercialFeatures -XX:+ResourceManagement -XX:+UseG1GC
```

This flag must be applied on every server instance (JVM) where RCM is enabled.

An alternative method is to uncomment these `JAVA_OPTIONS` in the `startWeblogic.sh` file which gets created when a domain is created:

```
#JAVA_OPTIONS="-XX:+UnlockCommercialFeatures -XX:+ResourceManagement -XX:+UseG1GC
${SAVE_JAVA_OPTIONS}
```

You must do this on every server instance, and it must be done prior to starting the WebLogic Server instance.

If a Java Security Manager is used with WebLogic Server, WebLogic Resource Consumption Management requires the granting of the following permission in `weblogic.policy`:

```
permission RuntimePermission("jdk.management.resource.getResourceContextFactory")
```

For more information about using the Java Security Manager to protect resources in Weblogic, see "Using the Java Security Manager to Protect WebLogic Resources" in *Developing Applications with the WebLogic Security Service*.

11.1.4 Supported Resources for RCM

The following shared resources can be managed through RCM policies:

- `FileOpen`: The number of open file descriptors in use by a partition. This includes files opened through `FileInputStream`, `FileOutputstream`, `RandomAccessFile`, and `NIO File` channels.
- `HeapRetained`: The amount of heap (in MB) retained/in use by a partition.
- `CpuUtilization`: The percentage of CPU time utilized by a partition with respect to the available CPU time of the WebLogic process.

11.2 Configuring Resource Consumption Management: Main Steps

A system administrator specifies resource consumption management policies on shared resources for each partition in the domain using a resource manager. A resource manager consists of one or more policies for one or more shared resources. Each policy consists of a constraint value for a resource and a specified action a WebLogic Server instance takes when the constraint value is met.

The following RCM policy types are supported:

- Triggers

- Fair Share

11.2.1 Triggers

A trigger defines the static constraint value for the allowed usage for a resource. When the consumption of that resource exceeds the constraint value, a specified action is performed. This policy type is best suited for environments where the resource usage by a partition in the domain is predictable.

A system administrator can select the following actions when creating a trigger policy:

- `Notify`: A notification is provided to the system administrator that the constraint value has been reached. You can add more than one `Notify` trigger for a resource. For example, `Notify` when the `Open Files` go beyond 20; `Notify` when the `Open Files` go beyond 50. Also, you can use the WebLogic Diagnostic Framework (WLDF) to create watch rules to listen to log messages and provide advanced notifications.
- `Slow`: Slows the rate at which the resource is consumed. When a `Slow` action is triggered, the Partition Work Manager's fair share value is reduced which results in reducing the `thread-usage time` made available to the partition. For more information about Partition Work Managers, see Configuring Partition Work Managers.
- `Fail`: Fails resource consumption requests for a resource until usage is below the constraint value.

  Note: `Fail` is applicable only for `Open Files` and not for other resources.

  For example, to limit the number of open files in partition P1 to less than 100 files, create a resource manager with a trigger policy that has a constraint value of 100 units for the `Open Files` resource and a `Fail` action for the P1 partition.
- `Shutdown`: Initiates the shutdown of a partition while allowing cleanup. This action is useful when a partition exceeds a known constraint value and adverse impact of shared resources used by other partitions in the domain is expected. A partition is only shutdown in the Managed Server where the constraint value has been met, allowing continuous availability in clustered environments. `Fail` and `Shutdown` triggers should not be used together.

  Note: Policy actions may be implemented synchronously or asynchronously depending on the action type. For instance, the `Fail` action synchronously uses the thread that requested the file open. Other actions, such as the `Slow` action configured for a "Heap Retained" resource proceed asynchronously.

11.2.2 Fair Share

The fair share policy allows a system administrator to allocate a share (a percentage of the available resource) based on a representative load of each partition in the domain. Fair share policies are used when the exact usage requirements of a resource cannot be determined or are not practical to implement when using resource managers to provide the efficient and fair utilization of resources. When there is no contention between partitions in a domain for a given resource, each partition is able to utilize the amount of resource required for its immediate workload. If there is contention

between partitions for a given resource, then each partition is constrained to utilize only their fair share of the available resource. Ensure that limits are set such that overall memory consumption does not cross the maximum available memory resulting in an out of memory exception.

11.2.2.1 Determining Fair Share Allocations for a Resource

A share is an allocation to use a specified amount of a resource. A system administrator allocates a share to a partition by specifying an integer value between 1 and 1000 in the associated resource manager fair share policy. For a given partition, the ratio of its configured fair share value to the sum total of all fair share values for the same resource in the domain determines the amount of resource allocated.

For example, a system administrator specifies a fair share value of 150 for a resource in partition P1 and a value of 100 for the same resource partition P2. If the workload is heavy enough in both partitions to create contention for that resource, the resource allocation for partitions P1 is 150/(150+100) or 60 percent of the available resource.

11.2.3 How to Create a Resource Manager

A resource manager consists of one or more policies for one or more shared resources. Each policy consists of a constraint value for a resource and a specified action that a WebLogic Server instance takes when the constraint value is met.

To configure resource managers, see:

- "Create resource managers" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.
- Configuring Resource Consumption Management: WLST Example

11.2.4 Example RCM Configuration in config.xml

The following is an annotated RCM configuration similar to the WLST example displayed in Configuring Resource Consumption Management: WLST Example

Example 11–1 Example config.xml Configuration for Resource Consumption Management

```
<domain>
...
   <!--Define RCM Configuration -->
   <resource-management>
        <resource-manager>
            <name>Approved</name>
            <file-open>
                <trigger>
                    <name>Approved2000</name>
                    <value>2000</value><!-- in units-->
                    <action>shutdown</action>
                </trigger>
                <trigger>
                    <name>Approved1700</name>
                    <value>1700</value>
                    <action>slow</action>
                </trigger>
                <trigger>
                    <name>Approved1500</name>
                    <value>1500</value>
                    <action>notify</action>
```

```
                </trigger>
            </file-open>
            <heap-retained>
                <trigger>
                    <name>Approved2GB</name>
                    <value>2097152</value>
                    <action>shutdown</action>
                </trigger>
                <fair-share-constraint>
                    <name>FS-ApprovedShare</name>
                    <value>60</value>
                </fair-share-constraint>
        </heap-retained>
        </resource-manager>
        <resource-manager>
            <name>Trial</name>
            <file-open>
                <trigger>
                    <name>Trial1000</name>
                    <value>1000</value><!-- in units-->
                    <action>shutdown</action>
                </trigger>
                <trigger>
                    <name>Trial700</name>
                    <value>700</value>
                    <action>slow</action>
                </trigger>
                <trigger>
                    <name>Trial500</name>
                    <value>500</value>
                    <action>notify</action>
                </trigger>
            </file-open>
     ...
        </resource-manager>
    </resource-management>
    <partition>
        <name>Partition-0</name>
        <resource-group>
            <name>ResourceTemplate-0_group</name>
            <resource-group-template>ResourceTemplate-0</resource-group-template>
        </resource-group>
        ...
        <partition-id>1741ad19-8ca7-4339-b6d3-78e56d8a5858</partition-id>

        <!-- RCM Managers are
            then targetted to Partitions during partition creation time or later
            by system administrators -->
        <resource-manager-ref>Approved</resource-manager-ref>
    ...
    </partition>
..
</domain>
```

11.3 Dynamic Reconfiguration of Resource Managers

You can dynamically apply or remove a resource management policy from a domain partition. Changes to a resource management policy will be applied to all domain partitions that use that policy.

If a policy-update for an active domain partition sets trigger values for a resource that is lower than the current usage of that resource, subsequent usage of that resource would have the policy's recourse action applied. If a change to a policy would result in an immediate shutdown of an active domain partition based on the current usage value, the change would not be accepted as a dynamic reconfiguration change.

11.4 Configuring Resource Consumption Management: Monitoring Resource Utilization

Resource consumption metrics for shared resources in a partition are available through a PartitionResourceMetricsRuntimeMBean.

Use these metrics to:

- Monitor the current resource utilization in a partition.
- Profile and analyze the resource consumption of a partition to generate data such as representative loads, peak loads, and peak load times needed to create effective resource managers and WLDF watches and notifications.

To monitor resource managers in FMWC, see "Monitor resource managers" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

By default, eager registration of resource meters is turned off. As a result, they get created lazily the first time the resource consumption metrics are queried for a particular resource. In that case, where the resource accounting is started lazily, the values returned from the resource consumption metrics might be different from the actual values of the resource consumed by the partition.

To get a true reflection of the amount of a resource consumed by a partition, the meters should be registered eagerly on partition startup. To enable eager registration of the resource meters, set the property, `weblogic.rcm.enable-eager-resource-meter-registration`, to `true`, as a JVM argument, when starting the WebLogic Server instance.

11.5 Best Practices and Considerations When Using Resource Consumption Management

The following sections provide best practices and considerations for system administrators developing resource management policies.

- General Considerations
- Monitor Average and Peak Resource Utilization
- When to Use a Trigger
- When to Use Fair Share
- Use Complementary Workloads
- When to Use Partition-Scoped RCM Policies
- Managing CPU Utilization

- Managing Heap

11.5.1 General Considerations

Recourse actions must be selected carefully by a system administrator. A lot of resources have complex interactions between them. For instance, slowing down CPU utilization (resulting in fewer threads allocated to the domain partition) may result in increased heap residency, thereby impacting retained heap usage.

For a slow recourse action to be effective, applications must not create or manage threads. Oracle recommends that applications use any of the WebLogic Server provided capabilities like EJB Timers, Common J Work Manager and Timers, Managed Executor Service, Batch API and such, to manage the tasks, so that the slow recourse action will be effective.

11.5.2 Monitor Average and Peak Resource Utilization

Before specifying resource consumption management policies, Oracle recommends that system administrators monitor average and peak resource usage data and configure policies with sufficient headroom to balance efficient usage of resources and meeting their SLAs. See Configuring Resource Consumption Management: Monitoring Resource Utilization.

11.5.3 When to Use a Trigger

Use triggers when an administrator is aware of precise limits at which the corresponding trigger needs to be executed. The trigger will be executed after the configured threshold is exceeded for some resources like file, and may be delayed for some of the resources like heap and CPU.

11.5.4 When to Use Fair Share

A fair share policy is typically used by a system administrator to ensure that a bounded-size shared resource is shared effectively (yet fairly) by competing consumers. A fair share policy may also be employed by a system administrator when a clear understanding of the exact usage of a resource by a partition cannot be accurately determined in advance, and the system administrator would like efficient utilization of resources while ensuring fair allocation of shared resources to co-resident partitions. Use fair share policies in your environment when you have complementary workloads for a resource between partitions. See Use Complementary Workloads.

11.5.5 Use Complementary Workloads

When possible, maximize resource density by balancing the peak usage times between partitions so that there is no overlap in peak usage times and the sum of their averages is not above their maximum Peak value. Antagonistic workloads on the other hand have overlapping peak usage times and their sum of averages is greater than their maximum Peak values.

Also consider collocating partition workloads that exercise resources differently. For instance, hosting a partition that has a predominantly CPU-bound workload with another partition that has a memory-bound workload could help in achieving better density and improving overall resource utilization.

11.5.6 When to Use Partition-Scoped RCM Policies

Use partition-scoped (ad hoc) RCM policies if a partition has unique resource requirements. They facilitate easy import and export of partition RCM policies to and from existing domains.

If no resource management policies are explicitly set on a partition, that partition has unconstrained access to available shared resources.

11.5.7 Managing CPU Utilization

CPU utilization is an excellent metric to track contention of CPU by collocated domain partitions, and is especially useful in fair share policies for CPU-bound workloads. Consider the following when using RCM policies to maximize CPU utilization:

- When considering the workload of all the partitions in a domain (the consolidated workload), the peak CPU utilization should not greatly exceed the average CPU utilization. Minimizing the gap between peak CPU load and average CPU load maximizes the CPU utilization for the domain.
- Oracle recommends configuring RCM CPU policies so that about 75 percent of CPU utilization is used for applications housed in the partitions of a domain. The remaining 25 percent should be allocated approximately as: 10 percent for operational tasks (backup, scheduled tasks, and other administration) and 15 percent for cluster failover.

11.5.8 Managing Heap

Develop a memory utilization plan that supports the requirements of the partition applications while continuing to provide enough available heap (headroom) for the domain and other system work. When evaluating heap requirements for a domain, consider the low, average, steady-state and peak `Heap Retained` usage values for each partition's representative workload.

11.6 Limitations

Be aware of the following RCM limitations:

- Heap resource consumption tracking and management is supported only when run with the G1 garbage collector (there is no RCM support for other JDK collectors).
- There is no support to measure and account for resource consumption metrics for activities happening in JNI/native code.
- Measurements of Retained Heap and CPU Utilization are performed asynchronously and hence do not represent "current" (a "point-in-time") value.
- Discrimination of heap usage for objects in static fields, and singleton objects of classes loaded from system and shared classloaders are problematic and may not be accurately represented in the final accounting values. If an instance of a class loaded from system and shared classloaders is loaded by a partition, the instance's use of heap is accounted against that partition.
- Garbage collection activity is not isolated to specific domain partitions in WebLogic Server 12.2.1 with Oracle JDK 8u40.
- There is a performance impact to enabling the WebLogic Server RCM feature due to the additional tracking and management of resource consumption in the server instance.

11.7 Configuring Resource Consumption Management: WLST Example

You can implement and monitor Resource Consumption Management policies using WLST.

- RCM WLST Example: Overview
- RCM WLST Example: WLST Script

11.7.1 RCM WLST Example: Overview

The following is an example of a RCM configuration created using WLST. In this example, a system administrator has defined:

- A **Production** resource manager representing the set of resource consumption management polices the system administrator would like to establish for all production tiered domain partitions in the domain. The **Production** resource manager has policies for various resources.
  - For the `FileOpen` resource type, three triggers are specified. A Production2000 trigger ensures the partition is shutdown when the number of open file descriptors reaches 2000. A Production1700 trigger specifies that when the number of open file descriptors cross 1700, the domain partition must be slowed down. A Production1500 trigger specifies a notify action.
  - For the `HeapRetained` resource type, a Production2GB trigger is created to ensure that when the partition's retained heap value reaches 2GB, the partition must be shutdown. A fair share value of 60 is assigned to the **Production** resource manager.
- A **Trial** resource manager defines a similar but reduced set of policies.
- A partition named `Partition-0`.

At the completion of this script, `Partition-0` has been assigned the **Production** resource manager.

11.7.2 RCM WLST Example: WLST Script

The policy discussed in RCM WLST Example: Overview can be created using the following WLST script:

Example 11–2 WLST Example for Resource Consumption Management

```
startEdit()

cd('/ResourceManagement')
cd(domainName)
rm=cmo.createResourceManager('Approved')
fo=rm.createFileOpen('Approved-FO')
fo.createTrigger('Approved2000',2000,'shutdown')
fo.createTrigger('Approved1700',1700,'slow')
fo.createTrigger('Approved1500',1500,'notify')
hr=rm.createHeapRetained('Approved-HR')
hr.createTrigger('Approved2GB',2097152,'shutdown')
hr.createFairShareConstraint('FS-ApprovedShare', 60)


cd('/ResourceManagement')
cd(domainName)
rm=cmo.createResourceManager('Trial')
```

```
fo=rm.createFileOpen('Trial-FO')
fo.createTrigger('Trial1000',1000,'shutdown')
fo.createTrigger('Trial700',700,'slow')
fo.createTrigger('Trial500',500,'notify')

save()
activate()

startEdit()
cd('/Partitions')
cd(partition-0)
cmo.setResourceManagerRef(getMBean('/ResourceManagement/'+domainName+'/ResourceMan
ager/Approved'))
save()
activate()
```

11.8 Configuring Resource Sharing: Related Tasks and Links

This section provides additional information that may be useful when implementing RCM in your environment.

- The Garbage-First (G1) garbage collector is a server-style garbage collector, targeted for multi-processor machines with large memories. It meets garbage collection (GC) pause time goals with high probability, while achieving high throughput. See http://docs.oracle.com/javase/8/docs/technotes/guides/vm/G1.html.
- Other WebLogic Server features that provide resource isolation and management for co-resident applications:
  - Classloader-based isolation—Classes not belonging to shared libraries of applications are isolated from each other. See Configuring the Shared Application Classloader and "Understanding WebLogic Server Application Classloading" in *Developing Applications for Oracle WebLogic Server*.
  - The WebLogic Server Work Manager—Prioritizes the execution of its work by configuring a set of scheduling guidelines; this enables the Work Manager to manage the threads allocated to an application, manage scheduling Work Manager instances to those threads, and help maintain service-level agreements. See Configuring Partition Work Managers and "Using Work Managers to Optimize Scheduled Work" in *Administering Server Environments for Oracle WebLogic Server*

For additional information, see "Multitenancy Tuning Recommendations" in *Tuning Performance of Oracle WebLogic Server*.

12

Deploying Applications

This chapter describes how to deploy applications and modules in a multitenant environment. This chapter also describes how to override deployment parameters for applications, use partition-specific deployment plans, and enable parallel deployment for improved deployment performance.

> **Note:** Many new WebLogic Server Multitenant (MT) features, such as resource groups, resource group templates, and application overrides, are also available in the 12.2.1 version of WebLogic Server. This chapter refers to the WebLogic Server documentation where appropriate for these features.

You can deploy applications and libraries using common deployment tools, such as Fusion Middleware Control or WLST, to one of four deployment scope options:

- **Global.** This is the equivalent of the domain level in a non-partitioned environment.
- **Resource group template**, which is always at the domain level. Whether the application or library you deploy to a resource group template is available at the domain level or a partition depends on the scope of the resource group that references the resource group template.
- **Resource group in a partition.** This is the only scope that is limited to a partition.
- **Resource group at the domain level.**

For more information about deployment scopes, see About Scope.

This chapter includes the following sections:

12.1 Deploying Applications to Resource Group Templates

You can deploy a common set of applications and libraries to resource group templates to simplify application configuration across a domain or domain partitions. When a resource group references a resource group template, it obtains its own runtime copies of the resources defined in the template. All of the applications and libraries deployed to the resource group template then deploy to the resource group.

Resource group templates provide a convenient way to deploy the same collection of applications across multiple domain partitions. To customize application configuration, you can override the default resource group template configuration by specifying a different deployment plan for a particular application in a resource group.

For general information about deploying applications to resource group templates, including information about supported deployment operations and available deployment clients, see "Application Deployment with Resource Group Templates" in *Deploying Applications to Oracle WebLogic Server*.

12.1.1 Deploying Applications to Resource Group Templates: Main Steps

Only WebLogic Server system administrators can deploy applications and libraries to a resource group template. The main steps are as follows:

1. Specify the resource group template in which you want to deploy the application or library.
2. Specify the application or library name and directory path.
3. If using a deployment plan, specify the deployment plan path.
4. (Optional) Specify additional deployment options. Do not specify the `targets` option, as the application uses the targets associated with the referencing resource group.

   Once an application is deployed to a resource group template, you can perform additional deployment operations.
5. Redeploy or update the application.

   When you update an application, you can specify that WebLogic Server redeploys the original archive file or exploded directory, or you can specify that WebLogic Server deploy a new archive file in place of the original one. You can also change the deployment plan associated with the application.
6. Distribute the application.

   The distribute operation copies deployment files to the targets associated with the referencing resource groups (or the default targets at the partition level if no targets exist at the resource group level) and places the application in a prepared state. You can then start the application in administration mode so you can perform final testing without opening the application to external client connections or disrupting connected clients.
7. Undeploy the application.

   The undeploy operation removes the application from the resource group template and the targets associated with the referencing resource groups.

You cannot start or stop applications deployed to a resource group template, as you must perform these operations from the resource group that references the resource group template.

Note: Once you perform a deployment operation for a resource group template, the operation is immediately carried out across all resource groups that reference the template. For example, if you undeploy an application from a resource group template, the application is undeployed from all resource groups that reference that resource group template.

To deploy applications to a resource group template using Fusion Middleware Control, see "Configure resource group template deployments" in the online help.

12.1.2 Deploying Applications to Resource Group Templates: WLST Examples

The following examples demonstrate how to perform deployment operations with resource group templates using WLST.

12.1.2.1 Deploying Applications to Resource Group Templates: WLST Example

The following example deploys the `sampleapp` application to the resource group template `myRGT`.

```
edit()
startEdit()
deploy(appName='sampleapp', path='path_to_application',
resourceGroupTemplate='myRGT')
activate()
```

12.1.2.2 Redeploying Applications to Resource Group Templates: WLST Example

The following example redeploys the `sampleapp` application to the resource group template `myRGT` using the deployment plan file `plan.xml`.

```
edit()
startEdit()
redeploy(appName='sampleapp', planPath='path_to_plan.xml',
resourceGroupTemplate='myRGT')
activate()
```

12.1.2.3 Undeploying Applications from Resource Group Templates: WLST Example

The following example undeploys the `sampleapp` application from the resource group template `myRGT`.

```
edit()
startEdit()
undeploy (appName='sampleapp', resourceGroupTemplate='myRGT')
activate()
```

12.1.2.4 Updating Applications in Resource Group Templates: WLST Example

The following example updates the `sampleapp` application in the resource group template `myRGT` using the deployment plan file `plan.xml`.

```
edit()
startEdit()
updateApplication(appName='sampleapp', planPath='path_to_plan.xml',
resourceGroupTemplate='myRGT')
activate()
```

12.1.2.5 Distributing Applications to Resource Group Templates: WLST Example

The following example distributes the `sampleapp` application to the resource group template `myRGT`.

```
edit()
startEdit()
distributeApplication (appPath='path_to_sampleapp', resourceGroupTemplate='myRGT')
activate()
```

12.1.3 Deploying Applications to Resource Group Templates: Related Tasks and Links

See the following sections for additional information:

- "Configuring Resource Group Templates" for general information about resource group templates.
- "Application Deployment with Resource Group Templates" in *Deploying Applications to Oracle WebLogic Server* for general information about deploying applications to resource group templates.
- "Application Deployment" in *Administering Oracle WebLogic Server with Fusion Middleware Control* for online help about deploying applications using Fusion Middleware Control.
- "WebLogic Server Resource Group Templates" in *Administering Oracle WebLogic Server with Fusion Middleware Control* for online help about configuring resource group templates using Fusion Middleware Control.
- "weblogic.Deployer Command-Line Reference" in *Deploying Applications to Oracle WebLogic Server* for information about deploying applications using `weblogic.Deployer`.
- "Deployment Commands" in *WLST Command Reference for WebLogic Server* for information about deploying applications using WLST.
- "wldeploy Ant Task Attribute Reference" in *Developing Applications for Oracle WebLogic Server* for information about deploying applications using the `wldeploy` Ant task.
- "Maven Plug-In Goals" in *Developing Applications for Oracle WebLogic Server* for information about deploying applications using Maven.
- *Java API Reference for Oracle WebLogic Server* for information about deploying applications using the JSR-88 Deployment API.
- `"DeploymentManagerMBean"` in *MBean Reference for Oracle WebLogic Server* for information about deploying applications using the JMX Deployment API.

12.2 Deploying Applications to Partition Resource Groups

You can deploy applications and libraries to resource groups at the domain or partition level and perform deployment operations on those applications, including start and stop. Resource groups conveniently group together Java EE applications and their resources into a distinct administrative unit and can be defined at the domain level, or be specific to a domain partition. A resource group can either contain resources directly or reference a resource group template containing the resources.

The resources and applications in a resource group are "fully qualified," in that you provide all of the necessary information to start or connect to those resources. All of the applications deployed to a resource group use the targets associated with that resource group.

Partition resource groups allow each partition to contain a different set of resources and applications. You can perform the following deployment operations for applications and libraries with partition resource groups:

- deploy
- undeploy
- redeploy
- update
- distribute
- start
- stop

If the operation succeeds, the application or library deploys (or redeploys, starts, or so forth) to the targets associated with the specified partition resource group. If no targets exist for the partition resource group, the application or library deploys to the default targets for the partition.

Note the following considerations for application deployment with partition resource groups:

- When performing deployment operations, you specify the partition name with the `partition` option. The specified partition must exist or the operation fails.
- Application names must be unique within each partition.
- For `deploy` and `distribute` operations, you must specify the partition resource group name with the `resourceGroup` option, unless one and only one resource group exists in the partition, in which `resourceGroup` is optional.

  For other deployment operations, you do not specify the `resourceGroup` option. WebLogic Server derives the resource group from the partition name and unique application name. If the specified partition resource group does not exist, or you do not specify the `resourceGroup` option if required, then the deployment operation fails.
- The deployment operation fails if you specify the `targets` option when performing deployment operations for applications at the resource group level. You cannot target individual applications in the resource group, as applications use the targets associated with the resource group.
- You can only deploy a specific library to a partition once, as resources need to be unique across resource groups of a partition. Applications in the same partition resource group or other resource groups in the partition can reference the library if the targets match. Applications deployed to a partition cannot reference a library in another partition or a library in the domain.
- Resource groups can inherit application configuration from a resource group template. If a resource group references a resource group template, any applications or libraries deployed to the resource group template immediately deploy to the referencing resource group. If needed, you can override the default resource group template application configuration to customize a particular application in a resource group. For more information, see Overriding Application Configuration.
- Partition administrators can use WLST to perform deployment operations only on applications in their own partitions, not on global applications or applications in other partitions. The `partition` option is optional for partition administrators. If partition administrators use the `partition` option to specify a partition, and the

partition does not match their associated partition, the operation fails. For more information about deploying applications as a partition administrator using WLST, see "Configuring Security."

For information about deploying applications to domain resource groups, see "Application Deployment with Domain Resource Groups" in *Deploying Applications to Oracle WebLogic Server*.

12.2.1 Deploying Applications to Partition Resource Groups: Main Steps

The main steps for deploying applications and libraries to a resource group in a partition are as follows:

1. Specify the partition resource group in which you want to deploy the application or library.
2. Specify the application or library name and directory path.
3. If using a deployment plan, specify the deployment plan path.
4. (Optional) Specify additional deployment options. Do not specify the `targets` option, as the application uses the targets associated with the resource group. If no targets exist for the resource group, then the application uses the default targets for the partition.

   Once an application is deployed to a resource group, you can perform additional deployment operations.
5. Start or stop the application.

   Starting an application or module makes it available to WebLogic Server clients. Stopping an application or module makes it unavailable to WebLogic Server clients until you restart it.
6. Redeploy or update the application.

   When you update an application, you can specify that WebLogic Server redeploys the original archive file or exploded directory, or you can specify that WebLogic Server deploy a new archive file to replace the original one. You can also change the deployment plan associated with the application.
7. Distribute the application.

   The distribute operation copies deployment files to the targets associated with the resource group (or the default targets at the partition level if no targets exist at the resource group level) and places the application in a prepared state. You can then start the application in administration mode so you can perform final testing without opening the application to external client connections or disrupting connected clients.
8. Undeploy the application.

   The undeploy operation removes the application from the resource group and the targets associated with the resource group.

To deploy applications to a partition resource group using Fusion Middleware Control, see "Control domain partition application deployments" in the online help.

12.2.2 Deploying Applications to Partition Resource Groups: WLST Examples

The following examples demonstrate how to perform deployment operations to partition resource groups using WLST.

12.2.2.1 Deploying Applications to Partition Resource Groups: WLST Example

The following example deploys the `sampleapp` application to the resource group `myRG` in the partition `myPartition`.

```
edit()
startEdit()
deploy(appName='sampleapp', partition='myPartition', resourceGroup='myRG',
path='path_to_application')
activate()
```

12.2.2.2 Redeploying Applications to Partition Resource Groups: WLST Example

The following example redeploys the `sampleapp` application to the partition `myPartition` using the deployment plan file `plan.xml`.

You do not need to specify the partition resource group, as WebLogic Server derives the resource group from the unique application name and partition name.

```
edit()
startEdit()
redeploy(appName='sampleapp', planPath='path_to_plan.xml',
partition='myPartition')
activate()
```

12.2.2.3 Undeploying Applications from Partition Resource Groups: WLST Example

The following example undeploys the `sampleapp` application from the partition `myPartition`.

You do not need to specify the partition resource group, as WebLogic Server derives the resource group from the unique application name and partition name.

```
edit()
startEdit()
undeploy (appName='sampleapp', partition='myPartition')
activate()
```

12.2.2.4 Updating Applications in Partition Resource Groups: WLST Example

The following example updates the `sampleapp` application in the partition `myPartition` using the deployment plan file `plan.xml`.

You do not need to specify the partition resource group, as WebLogic Server derives the resource group from the unique application name and partition name.

```
edit()
startEdit()
updateApplication(appName='sampleapp', planPath='path_to_plan.xml',
partition='myPartition')
activate()
```

12.2.2.5 Distributing Applications to Partition Resource Groups: WLST Example

The following example distributes the `sampleapp` application to the resource group `myRG` in the partition `myPartition`.

```
edit()
startEdit()
distributeApplication (appPath='path_to_sampleapp', resourceGroup='myRG',
partition='myPartition')
activate()
```

12.2.2.6 Starting Applications on Partition Resource Groups: WLST Example

The following example starts the `sampleapp` application on the partition `myPartition`.

You do not need to specify the partition resource group, as WebLogic Server derives the resource group from the unique application name and partition name.

```
edit()
startEdit()
startApplication (appName='sampleapp', partition='myPartition')
activate()
```

12.2.2.7 Stopping Applications on Partition Resource Groups: WLST Example

The following example stops the `sampleapp` application on the partition `myPartition`.

You do not need to specify the partition resource group, as WebLogic Server derives the resource group from the unique application name and partition name.

```
edit()
startEdit()
stopApplication (appName='sampleapp', partition='myPartition')
activate()
```

12.2.3 Deploying Applications to Partition Resource Groups: REST Example

For an example of a partition user in the Deployer role deploying applications using the REST APIs, see "Deploying Partition-Scoped Applications" in *Administering Oracle WebLogic Server with RESTful Management Services*.

12.2.4 Deploying Applications to Partition Resource Groups: Related Tasks and Links

See the following sections for additional information:

- "Configuring Domain Partitions" for general information about partitions.
- "Configuring Resource Groups" for general information about resource groups.
- "Application Deployment with Domain Resource Groups" in *Deploying Applications to Oracle WebLogic Server* for information about deploying applications to resource groups at the domain level.
- "Application Deployment" in *Administering Oracle WebLogic Server with Fusion Middleware Control* for online help about deploying applications using Fusion Middleware Control.
- "WebLogic Server Domain Partitions" in *Administering Oracle WebLogic Server with Fusion Middleware Control* for online help about configuring partitions using Fusion Middleware Control.
- "WebLogic Server Resource Groups" in *Administering Oracle WebLogic Server with Fusion Middleware Control* for online help about configuring resource groups using Fusion Middleware Control.
- "weblogic.Deployer Command-Line Reference" in *Deploying Applications to Oracle WebLogic Server* for information about deploying applications using `weblogic.Deployer`.
- "Deployment Commands" in *WLST Command Reference for WebLogic Server* for information about deploying applications using WLST.
- "wldeploy Ant Task Attribute Reference" in *Developing Applications for Oracle WebLogic Server* for information about deploying applications using the `wldeploy` Ant task.

- "Maven Plug-In Goals" in *Developing Applications for Oracle WebLogic Server* for information about deploying applications using Maven.
- *Java API Reference for Oracle WebLogic Server* for information about deploying applications using the JSR-88 Deployment API.
- "`DeploymentManagerMBean`" in *MBean Reference for Oracle WebLogic Server* for information about deploying applications using the JMX Deployment API.

12.3 Deploying Applications as the Partition Administrator

Partition administrators can only perform deployment operations on applications in their own partition, not on global applications or applications from other partitions. Likewise, they can invoke deployment APIs only on applications in their partition. When invoking deployment APIs that return a list of applications or targets, only applications and targets in their partition will be returned.

WebLogic Server system administrators can deploy applications to partitions on behalf of partition administrators. When using the JMX API to deploy applications in a partition, you must obtain the `DeploymentManagerMBean` instance under the relevant partition (instead of using the domain-level `DeploymentManagerMBean` instance). The following examples show how system administrators and partition administrators perform deployment operations in a partition using the JMX Deployment API.

- When a system administrator connects to a global domain (for example, `t3://localhost:7001`):
  - The JMX lookup must include `DomainPartitionRuntime=`*`partition_name`* to get the `DeploymentManagerMBean` for the partition.
  - Using WLST, they must navigate to the partition's `DomainPartitionRuntimeMBean` to get the `DeploymentManagerMBean` for *`partition_name`*. For example:

```
connect('system_admin', 'gumby1234', 't3://localhost:7001')
domainRuntime()
cd('DomainPartitionRuntimes/partitionA')
cd('DeploymentManager/partitionA')
props=java.util.Properties()
props.setProperty("resourceGroup", "partitionAResourceGroup")
path="/scratch/user/foo.war"
cmo.deploy("foo", path, None, None, props)
```

- When a partition administrator connects to a domain partition (for example, `t3://localhost:7001/partitionA`):
  - The JMX lookup does not need to include `PartitionDomainRuntime=partitionA` to get the `DeploymentManagerMBean` for `partitionA`. It is added by the JMX container.
  - Using WLST, issuing the `domainRuntime()` command sets the `cmo` to the `DomainPartitionRuntimeMBean` for the partition.

```
connect('partitionA_admin', 'welcome1', 't3://localhost:7001/partitionA')
domainRuntime()
cd('DeploymentManager/partitionA')
props=java.util.Properties()
props.setProperty("resourceGroup", "partitionAResourceGroup")
path="/scratch/user/foo.war"
cmo.deploy("foo", path, None, None, props)
```

When using other deployment clients, the `partition` option is optional for partition administrators. Using `weblogic.Deployer`:

```
java weblogic.Deployer -deploy -adminurl <partition_url> -username <partition_
admin_user> -password <partition_admin_password> -name <application_name> path_to_
application
```

For example:

```
java weblogic.Deployer -deploy -username partition1_admin -password welcome1
-adminurl t3://localhost:7001/partition1 -name foo /scratch/user/foo.war
```

12.4 Overriding Application Configuration

When a resource group references a resource group template, it obtains its own runtime copy of the resources and applications defined in the resource group template. Since the resource group inherits the application configuration defined in the resource group template, you do not need to manually deploy and configure each application. Applications and libraries deployed to a resource group template immediately deploy to the referencing resource group (or undeploy, redeploy, and so forth, depending on the performed deployment operation).

If you need to customize a particular application in a resource group, you can override the default application configuration by specifying a different deployment plan. In that deployment plan, you override the resource group template deployment parameters with the values you want to use for the particular application. The entire deployment plan file is overridden, not an individual entry inside of the original deployment plan file. The application or module is then updated or redeployed using the new deployment plan for its application configuration instead of the values set in the resource group template.

Note: If you undeploy an application from a resource group template, any application configuration overrides defined in the referencing resource group are removed.

If you redeploy an application to a resource group template, any application configuration overrides defined in the referencing resource group from the previous deployment of that application are removed. In this scenario, you must re-override the application configuration for the resource group to preserve the override values.

Whether you update or redeploy the application to use the override deployment plan depends on the type of properties you are overriding. Use the `update` command when overriding dynamic properties only; the `update` command does not cause any disruption to the application. Use the `redeploy` command when overriding dynamic and nondynamic properties; the `redeploy` command does cause disruption to the application.

You can override application configuration for resource groups at the domain or partition level. For information about overriding application configuration for domain resource groups, see "Overriding Application Configuration" in *Deploying Applications to Oracle WebLogic Server*.

12.4.1 Overriding Application Configuration: Main Steps

The main steps for customizing a particular application in a resource group by overriding the default application configuration defined in the inherited resource group template are as follows:

1. Create a different deployment plan to use for the application you want to customize.
2. In the new deployment plan, define the values for the attributes you want to override for that application.
3. Specify the new override deployment plan when redeploying or updating the application.

The application now uses the override deployment plan for its configuration instead of the default template configuration.

If multiple resource groups reference the same resource group template, ensure you override the application configuration for all necessary resource groups.

12.4.2 Overriding Application Configuration: WLST Example

The following examples demonstrate:

1. Deploying the application `sampleapp` to the resource group template `myRGT` using the deployment plan file `plan.xml`.

   ```
   edit()
   startEdit()
   deploy(appName='sampleapp', resourceGroupTemplate='myRGT', path='path_to_
   application', planPath='path_to_plan.xml')
   activate()
   ```

2. Updating or redeploying the application `sampleapp` to use the override deployment plan `override_plan.xml`. for the referencing partition resource group in partition `myPartition`.

   You do not need to specify the partition resource group, as WebLogic Server derives the resource group from the unique application name and partition name.

   Use the `update` command only when overriding dynamic attributes for an application. Use the `redeploy` command when overriding dynamic or non-dynamic attributes for an application.

```
edit()
startEdit()
updateApplication(appName='sampleapp', planPath='path_to_override_plan.xml',
partition='myPartition')
activate()

edit()
startEdit()
redeploy(appName='sampleapp', planPath='path_to_override_plan.xml',
partition='myPartition')
activate()
```

12.4.3 Overriding Application Configuration: Related Tasks and Links

See the following sections for additional information:

- "Overriding Application Configuration" in *Deploying Applications to Oracle WebLogic Server* for information about overriding application configuration at the domain level.
- "Configuring Resource Overrides" for information about overriding resource configuration, such as JMS and JDBC.
- "Override application configuration" in *Administering Oracle WebLogic Server with Fusion Middleware Control* for online help about overriding application configuration using Fusion Middleware Control.
- "weblogic.Deployer Command-Line Reference" in *Deploying Applications to Oracle WebLogic Server* for information about overriding application configuration using `weblogic.Deployer`.
- "Deployment Commands" in *WLST Command Reference for WebLogic Server* for information about overriding application configuration using WLST.
- "wldeploy Ant Task Attribute Reference" in *Developing Applications for Oracle WebLogic Server* for information about overriding application configuration using the `wldeploy` Ant task.
- "Maven Plug-In Goals" in *Developing Applications for Oracle WebLogic Server* for information about overriding application configuration using Maven.
- *Java API Reference for Oracle WebLogic Server* for information about overriding application configuration using the JSR-88 Deployment API.
- "`DeploymentManagerMBean`" in *MBean Reference for Oracle WebLogic Server* for information about overriding application configuration using the JMX Deployment API.

12.5 Removing an Application Override

If you no longer need to customize a particular application in a resource group, you can remove an application override by removing the deployment plan containing the overridden attributes. The application configuration returns to its default configuration.

12.5.1 Removing an Application Override: Main Steps

The main steps for removing an application override from a resource group are as follows:

1. Select the application containing the override.
2. To remove existing overrides for dynamic attributes, update the application and specify the `removePlanOverride` option.
3. To remove existing overrides for dynamic and non-dynamic attributes, redeploy the application and specify the `removePlanOverride` option.

To remove an application override using Fusion Middleware Control, see "Remove application configuration overrides" in the online help.

12.5.2 Removing an Application Override: WLST Example

The following example redeploys the application `sampleapp` to remove an existing overridden deployment plan using the `removePlanOverride` option.

```
edit()
startEdit()
```

```
redeploy(appName='sampleapp', removePlanOverride, partition='myPartition')
activate()
```

12.5.3 Removing an Application Override: Related Tasks and Links

See the following sections for additional information:

- "Removing an Application Override" in *Deploying Applications to Oracle WebLogic Server* for information about removing an application override at the domain level.
- "Configuring Resource Overrides" for information about overriding resource configuration, such as JMS and JDBC.
- "Remove application configuration overrides" in *Administering Oracle WebLogic Server with Fusion Middleware Control* for online help about removing application overrides using Fusion Middleware Control.
- "weblogic.Deployer Command-Line Reference" in *Deploying Applications to Oracle WebLogic Server* for information about removing application overrides using `weblogic.Deployer`.
- "Deployment Commands" in *WLST Command Reference for WebLogic Server* for information about removing application overrides using WLST.
- "wldeploy Ant Task Attribute Reference" in *Developing Applications for Oracle WebLogic Server* for information about removing application overrides using the `wldeploy` Ant task.
- "Maven Plug-In Goals" in *Developing Applications for Oracle WebLogic Server* for information about removing application overrides using Maven.
- *Java API Reference for Oracle WebLogic Server* for information about removing application overrides using the JSR-88 Deployment API.
- "`DeploymentManagerMBean`" in *MBean Reference for Oracle WebLogic Server* for information about removing application overrides using the JMX Deployment API.

12.6 Using Partition-Specific Deployment Plans

You can use partition-specific deployment plans to customize an application deployed to a resource group template or resource group within a partition. Partition-specific deployment plans are especially useful in environments with different partitions that share the same set of applications, but require some customization for each partition.

You specify partition-specific deployment plans at the resource group level within a partition, not at the partition level. When WebLogic Server applies a partition-specific deployment plan to a specified application, the changes prescribed by the plan affect only the application deployment within that partition.

> **Note:** If you specify an application deployment plan in a resource group template, and specify a partition-specific deployment plan for the same application, then the partition-specific deployment plan overrides the resource group template plan and the partition-specific deployment plan is used.

To specify partition-specific application deployment plans, use the `redeploy` or `updateApplication` WLST commands.

12.6.1 Using Partition-Specific Deployment Plans: Main Steps

The main steps for using partition-specific deployment plans are as follows:

1. Create the partition-specific application deployment plan you want to use.
2. Use the `redeploy` or `updateApplication` WLST command to redeploy or update the application using the partition-specific deployment plan.

   Use the `redeploy` command when changes made to the application or module from the partition-specific deployment plan are non-dynamic or dynamic. Use the `updateApplication` command only when the changes made to the application or module from the partition-specific deployment plan are dynamic.
3. Identify the scope containing the application deployment for which you want to use the partition-specific deployment plan by specifying the corresponding WLST option:

Scope	WLST option
resource group template	`resourceGroupTemplate`
domain resource group	none You do not need to identify the resource group name for domain resource groups. Since application names must be unique within the domain, WebLogic Server derives the resource group from the application name.
partition resource group	`partition` You do not need to identify a resource group name for partition resource groups. Since application names must be unique within a partition, WebLogic Server derives the resource group from the application name and partition name.

4. Use the WLST options `planPath` and `appName` to identify the partition-specific deployment plan location and the name of the application deployment to modify.
5. Activate your changes.

   The specified application now uses the partition-specific deployment plan for its configuration.

12.6.2 Using Partition-Specific Deployment Plans: WLST Example

The following examples demonstrate:

1. Deploying the application `sampleapp` to the resource group template `myRGT`. The partition `myPartition` references the resource group template `myRGT`.

```
edit()
startEdit()
deploy(appName='sampleapp', resourceGroupTemplate='myRGT', path='path_to_
application')
activate()
```

2. Updating or redeploying the application `sampleapp` to use the partition-specific deployment plan `partition_plan.xml`. in partition `myPartition`.

   Use the `update` command only when changing dynamic attributes for an application. Use the `redeploy` command when changing dynamic or non-dynamic attributes for an application.

```
edit()
startEdit()
updateApplication(appName='sampleapp', planPath='path_to_partition_plan.xml',
partition='myPartition')
activate()

edit()
startEdit()
redeploy(appName='sampleapp', planPath='path_to_partition_plan.xml',
partition='myPartition')
activate()
```

12.6.3 Using Partition-Specific Deployment Plans: Related Links and Tasks

See the following sections for additional information:

- "Configuring Resource Overrides" for information about overriding resource configuration, such as JMS and JDBC.
- "Deployment Commands" in *WLST Command Reference for WebLogic Server* for information about removing application overrides using WLST.

12.7 Enabling Parallel Deployment in Multitenant Environments

Parallel deployment improves performance for use cases involving the deployment of multiple applications, the deployment of a single application with multiple modules, or the deployment of one or more applications across multiple partitions.

When an application is deployed to multiple partitions, WebLogic Server views each instance of the application as an independent application. Without parallel deployment enabled, each instance of the application is deployed to each partition sequentially.

To improve performance, you can enable parallel deployment so that the instances of the application deploy in parallel to each other:

- To enable parallel deployment of applications across partitions, configure the `ParallelDeployApplications` attribute of the `PartitionMBean`.

  With this attribute enabled, applications with the same deployment order will deploy in parallel of each other. The partition-level setting overrides the domain-level setting for applications in a partition.

  The overall deployment order of resources and applications remains unchanged, so deployment types that precede applications in the normal deployment order (for example, JDBC system resources and Java EE libraries) are guaranteed to be fully deployed before applications are deployed.
- To enable parallel deployment of modules within applications deployed in the partition, configure the `ParallelDeployApplicationModules` attribute of the `PartitionMBean`.
- To enable parallel deployment of modules on a per-application basis, configure the `ParallelDeployModules` attribute of the `AppDeploymentMBean`. Setting this attribute overrides the domain and partition value for an individual application.

For domains created with WebLogic Server 12.2.1 or above, the `ParallelDeployApplications` and `ParallelDeployApplicationModules` attributes are enabled by default. For domains created prior to WebLogic Server 12.2.1, these attributes are disabled by default.

Note: Only applications with no cross-dependencies should deploy in parallel. If an application depends on other applications, then this application needs to have a higher dependency order than the applications it depends on. Otherwise, parallel deployment may cause dependency failures when the dependent application attempts to deploy prior to the activation of applications on which it depends. Similarly, only enable parallel deployment of modules for applications that contain modules with no cross-dependencies.

For more information about parallel deployment, see "Enabling Parallel Deployment for Applications and Modules" in *Deploying Applications to Oracle WebLogic Server*.

13

Configuring the Shared Application Classloader

This chapter describes how to use the shared application classloaders in WebLogic Server Multitenant (MT). The chapter refers to the WebLogic Server documentation set and online help for additional information as appropriate.

This feature is intended for use only by application developers. This chapter assumes that you are familiar with WebLogic Server application classloading, as described in "Understanding WebLogic Server Application Classloading" in *Developing Applications for Oracle WebLogic Server*. Read that chapter first if you are not familiar with WebLogic Server application classloading.

This chapter includes the following sections:

13.1 Configuring the Shared Application Classloader: Overview

When running multiple instances of the same application in different partitions, you may want to optimize class loading memory across these instances. WebLogic Server MT includes a deployment-descriptor-based classloading feature for this purpose.

WebLogic Server MT includes two new types of classloaders:

- Partition classloader—a partition classloader is created on your behalf for each partition. This classloader loads classes that must be visible to the entire partition and only that partition, and not to the rest of the domain. (This includes **global connectors**.)

  Note: Global connectors are a certain type of connector modules that are configured to be visible and available for all the applications in the server. These modules may be deployed standalone or may be deployed as a module of an enterprise application (EAR).

- Shared application classloader—the shared application classloader is relevant only in the SaaS use case when an application is deployed to a resource group template. This classloader loads classes that should be visible to all the instances of an application across partitions, but not to other applications. Applications directly deployed to the domain (not to a partition) are not affected, even if partitions are configured.

WebLogic deployment descriptors support a new `shareable` configuration to identify JARs and classes under `APP-INF/classes` within the application packaging. These classes should be loaded from the shared application classloader.

The `shareable` configuration is only supported in the `weblogic-application.xml` file of enterprise applications, and only in production mode.

A new partition classloader is created when a partition is created and the first application for the partition is deployed to a resource group. An existing partition classloader is removed when a partition is removed and the last application for the partition is undeployed from a resource group.

A new shared application classloader may be created when an application (with shareable JARs configured) is deployed to a resource group template and the resource group template is referenced by a resource group in a partition.

An existing shared application classloader is removed when the relevant application is undeployed from the resource group template. When you undeploy an application from a resource group template, it is immediately undeployed from any resource groups that reference that template.

13.1.1 Shared Classloading Not Guaranteed

You cannot assume that class loading will be shared. Sharing may or may not be possible. For example, if filtering is set up such that different configurations for each partition are obtained, sharing is not possible. For information on filtering classloaders, see "Using a Filtering ClassLoader" in *Developing Applications for Oracle WebLogic Server*.

Therefore, you can indicate which JARs are shareable, but cannot assume that the classes from these JARs are loaded only once and shared.

13.2 Configuring the Shared Application Classloader: Main Steps

Using an XML editor, application developers can edit the `weblogic-application.xml` file and add one or more `shareable` elements inside a `<class-loading>` element when creating the application.

Consider the following example:

```
<class-loading>
  <shareable dir="APP-INF-LIB">
    <include>coupon-generator.jar</include>
    <include>group-discounts.jar</include>
  </shareable>
  <shareable dir="LIB-DIR">
    <exclude>program-guide.jar</exclude>
  </shareable>
</class-loading>
```

The `dir` attribute identifies the directory where subsequent patterns apply. The only supported values for `dir` are as follows:

- `APP-INF-LIB` identifies the WebLogic-style `APP-INF/lib` directory.
- `LIB-DIR` identifies the Java EE-style library directory.
- `APP-INF-CLASSES` identifies the WebLogic-style `APP-INF/classes`.

For APP-INF-LIB and LIB-DIR, the value you set in <include></include> elements identifies JAR files that you believe can be shared without any problems. The classes in these JARs cannot be dependent on:

- Classes in JARs that are not considered shareable.
- Partition-scoped classes such as global connectors.

Similarly, for APP-INF-LIB and LIB-DIR, the <exclude></exclude> elements helps identify JARs that must not be shared.

The following configuration rules apply:

- If APP-INF-LIB and LIB-DIR is identified without an include or exclude configuration, all the JARs of that directory are considered as shareable.
- If APP-INF-LIB and LIB-DIR is identified with an include configuration, only the JARs identified with the include pattern are considered shareable.
- If APP-INF-LIB and LIB-DIR is identified with an exclude configuration, all the JARs of the directory except the JAR identified by the exclude pattern are considered shareable.

APP-INF-CLASSES

For APP-INF-CLASSES, include and exclude configurations are ignored, even if present. If you identify APP-INF-CLASSES as shareable, all the classes are declared shareable.

APP-INF-CLASSES is a code source location and does not require include and exclude elements. The shared application classloader implementation does not allow including or excluding elements within code source locations.

APP-INF-CLASSES is valid only for the packaging unit the descriptor is in, application or library. You must declare it separately for the application and libraries.

13.3 Related Tasks and Links

For information on filtering classloaders, see "Using a Filtering ClassLoader" in *Developing Applications for Oracle WebLogic Server*.

14

Configuring Coherence

This chapter describes how to configure Coherence in WebLogic Server Multitenant (MT). You can use either Fusion Middleware Control (FMWC) or WLST to configure Coherence, as described in this chapter. The chapter refers to the Coherence documentation and online help for additional information as appropriate.

This chapter includes the following sections:

14.1 Configuring Coherence: Overview

Coherence applications can take full advantage of the density and operational efficiencies that are provided by Weblogic Server MT. All tenant instrumentation is automatically provided without any changes required to the application.

Multitenant domains use a single shared Coherence cluster that is available across all domain partitions. Application caches are isolated, and can also be shared, at the domain partition level. Common deployment tooling is used to deploy and manage Coherence Grid ARchives (GAR) modules and common partition lifecycle operations are used to manage the life cyle of Coherence services.

Understanding Coherence Setup in a Multitenant Domain

Coherence setup in a multitenant domain requires the use of managed Coherence servers. You must first create a Coherence cluster for the domain and configure all managed Coherence servers to be part of the cluster. Managed Coherence servers are typically set up in tiers using WebLogic Server clusters, which allows Coherence to easily scale up or scale down as required. For details, see *Administering Clusters for Oracle WebLogic Server*. In addition, Coherence applications must be packaged as GAR modules in order to be deployed to a multitenant domain, for details on packaging a Coherence application as a GAR module, see *Developing Oracle Coherence Applications for Oracle WebLogic Server*.

Understanding Cache Isolation in a Multitenant Domain

Cache isolation in a multitenant domain allows a single GAR to be deployed across multiple domain partitions and used by all tenants. Isolation is provided at the

domain partition level and is transparent to the application. When a GAR is deployed to a domain partition, a new cache service instance is created and is isolated to that domain partition. The GAR module generates the appropriate tenant-id and meta-data when bootstrapping the Coherence services. Some cache configuration properties may be overridden with different values for each domain partition.

Understanding Cache Sharing

Cache sharing allows a single cache instance to be used by multiple domain partitions. Each tenant has access to the same cache. Cache sharing is enabled at the partition level and must be set for each domain partition that accesses the cache. Cache sharing is transparent to the application.

Cache sharing provides the greatest amount of cache reuse and the most efficient use of resources. However, cache sharing should only be used when cache data is not specific to any one tenant.

14.2 Deploying Coherence Applications in Multitenant Domains

Coherence applications are deployed using the common deployment tools such as Fusion Middleware Control and WLST. For detailed instructions on deploying applications in a multitenant environment, see Deploying Applications.

When deploying Coherence applications, use the Scope field to specify the domain partition to which the application is deployed. Coherence applications can be deployed to a:

- Global scope—The global scope is equivalent to a non multitenant deployment and does not impose any cache isolation.
- Resource group template—Applications are deployed to the domain partitions that are configured to use the specified resource group template. Cache instances are isolated to each domain partition.
- Resource group for a partition—Applications are deployed to the partitions that are configured to use the specified resource group. Cache instances are isolated to each domain partition.

14.3 Overriding Cache Configuration Properties

Cache configuration properties can be specified for each domain partition. Partition-specific values are injected into the cache configuration when a GAR module is initialized. For example, a cache in one partition may be configured to expire entries after 5 minutes and for another domain partition the cache may be configured to expire entries after 10 minutes. In both cases, the same cache configuration file is deployed in the GAR module.

The main steps for overriding cache configuration properties are as follows:

1. Select a partition to edit its partition settings.
2. Update Coherence configuration settings by adding the property names and values to be overridden.

To override cache configuration properties using Fusion Middleware Control, see ”Configure domain partition Coherence caches” in the online help.

Using WLST

To override cache configuration properties, connect to the Weblogic Domain MBean server and execute the `createCoherencePartitionCacheProperty` operation to specify a property and the `setValue` operation to enter the property value. For example:

```
cd('/')
cd('/Partitions/MyPartition-1')
cmo.createCoherencePartitionCacheConfig('MyConfig')
cd('CoherencePartitionCacheConfigs/MyConfig')
cmo.createCoherencePartitionCacheProperty('expiry-delay')
cd('CoherencePartitionCacheProperties/expiry-delay')
cmo.setValue('3600s')
```

Cache configuration properties can also be deleted using the `destroyCoherencePartitionCacheConfig` operation. For example:

```
cd('/')
cd('/Partitions/MyPartition-1')
cmo.createCoherencePartitionCacheConfig('MyConfig')
cd('CoherencePartitionCacheConfigs/MyConfig/CoherencePartitionCacheProperties/
   expiry-delay')
property = cmo
cd('..')
cmo.destroyCoherencePartitionCacheProperty(property)
```

14.4 Enabling Cache Sharing Across Partitions

Cache sharing must be explicitly set for each partition where the cache is deployed. Enabling cache sharing on a cache in one partition does not automatically share the cache for all partitions.

Note that the same cache scheme cannot be used for both shared and non-shared caches in a multitenant domain. However, a cache scheme can use scheme references in order to reuse the same scheme definition. For example:

```
<caching-scheme-mapping>
   <cache-mapping>
      <cache-name>example</cache-name>
      <scheme-name>ExamplesPartitioned-NonShared</scheme-name>
   </cache-mapping>
   <cache-mapping>
      <cache-name>example-shared</cache-name>
      <scheme-name>ExamplesPartitioned-Shared</scheme-name>
   </cache-mapping>
</caching-scheme-mapping>
<caching-schemes>
   <distributed-scheme>
      <scheme-name>ExamplesPartitioned-NonShared</scheme-name>
      <scheme-ref>ExamplesPartitionedScheme</scheme-ref>
   </distributed-scheme>
   <distributed-scheme>
      <scheme-name>ExamplesPartitioned-Shared</scheme-name>
      <scheme-ref>ExamplesPartitionedScheme</scheme-ref>
   </distributed-scheme>
   <distributed-scheme>
      <scheme-name>ExamplesPartitionedScheme</scheme-name>
      <service-name>ExamplesPartitionedCache</service-name>
      <backing-map-scheme>
         <local-scheme>
```

```
            <high-units>32M</high-units>
            <unit-calculator>binary</unit-calculator>
          </local-scheme>
        </backing-map-scheme>
        <autostart>true</autostart>
    </distributed-scheme>
</caching-schemes>
```

The main steps for enabling cache sharing are as follows:

1. Select a partition to edit its partition settings.
2. Add a Coherence cache to the partition.
3. Specify that the cache is shared.
4. Repeat the process for each partition that shares the cache. Configuration values must be the same for each partition.

To enable cache sharing using Fusion Middleware Control, see "Configure domain partition Coherence caches" in the online help.

Using WLST

To enable cache sharing across partitions, connect to the Weblogic Domain MBean server and execute the `setShared` operation with a `true` parameter. For example:

```
cd('/')
cd('/Partitions/MyPartition-1')
cmo.createCoherencePartitionCacheConfig('MyConfig')
cd('CoherencePartitionCacheConfigs/MyConfig')
cmo.setShared(true)

cd('/')
cd('/Partitions/MyPartition-2')
cmo.createCoherencePartitionCacheConfig('MyConfig')
cd('CoherencePartitionCacheConfigs/MyConfig')
cmo.setShared(true)
```

14.5 Securing Coherence Applications in Multitenant Domains

Coherence applications use the authorization features that are available with WebLogic Server. Authorization roles and policies are configured for caches and services and should be set for each partition. For details about security in multitenant domains, see Configuring Security. For details about Coherence security in WebLogic Server, see *Securing Oracle Coherence*.

> **Note:** Shared caches are owned by the global partition and authorization is based on the global realm.

14.6 Configuring Coherence: Related Tasks and Links

- For a detailed example of using Coherence with multitenancy, see the Managed Coherence Servers - multitenant example that is included in the WebLogic Server Code Examples.
- For details about creating Coherence clusters, see *Administering Clusters for Oracle WebLogic Server*.

- For details about packaging Coherence applications, see *Developing Oracle Coherence Applications for Oracle WebLogic Server*.
- For details about securing Oracle Coherence in Oracle WebLogic Server, see *Securing Oracle Coherence*

15 Configuring JDBC

This chapter describes how data source resource definitions are supported in WebLogic Server Multitenant (MT).

Prior to configuring JDBC in a multitenant environment, it is assumed that you have already created:

- A virtual target. For more information, see Configuring Virtual Targets.
- A domain partition. For more information, see Configuring Domain Partitions.
- A security realm that is specific to the partition, if necessary. For more information, see Configuring Security.
- A resource group template, if necessary. For more information, see Configuring Resource Group Templates.
- A resource group. For more information, see Configuring Resource Groups.

This chapter assumes familiarity with existing WebLogic Server data sources. For more information, see *Administering JDBC Data Sources for Oracle WebLogic Server*.

This chapter includes the following sections:

15.1 About Supported Data Source Types

When working in a non-multitenant WebLogic Server environment, a data source may be defined as a system resource or deployed at the domain level. When using WebLogic Server MT in a multitenant environment, a data source may also be defined in the following scopes:

- As part of a resource group that is created at the domain level. The referenced data source must be qualified with the appropriate database credentials, URL, driver properties, and attributes for the domain-level scope. A data source referenced by a resource group at the domain level is a global system resource. A data source

module descriptor may only be referenced by a single domain-level resource group.

- As part of a resource group that is created at the partition level. The referenced data source must be qualified with the appropriate database credentials, URL, driver properties, and attributes for the partition. A data source descriptor can only be referenced by a single resource group in a partition.
- As part of a resource group template that is created at the domain level. Such definitions are considered a template data source definition that is fully qualified by individual partitions that reference the resource group template.
- As part of a resource group at the partition level that is based on a resource group template. Because template resource descriptors referenced by a resource group template may be incomplete, by lacking or having an incorrect URL, credentials, or both, the resources defined by each resource group need to have the appropriate overrides specified for deployment to the partition runtime.

  You can use a `JDBCSystemResourceOverrideMBean` to override the user, password, and URL for a resource group based on a resource group template that is defined at the partition level. These three attributes represent data source settings that would typically be qualified on a per-partition basis for SaaS use cases where most template data source settings are common across partitions. If you use override MBeans, you must define a separate override MBean for each data source referenced by the resource group. Configuration changes to these attributes that are made at runtime (post data source deployment) require that the partition data source be restarted for the changes to take effect. A resource deployment plan may be specified for a resource group that allows overriding arbitrary attributes of any data source descriptor referenced by the resource group. The single deployment plan is defined in an external file whose path is specified in the partition configuration and applies to all data sources in the partition. The resource deployment plan is processed before applying override attributes to the resource group-referenced data source. If a given data source attribute is specified in both a resource deployment plan and an override MBean, the override MBean value takes precedence. For more information, see Configuring Resource Overrides.
- As part of a deployed object at the partition-level. This includes a packaged data source in an EAR or WAR file, in a standalone data source module, or a Java EE data source definition defined in a Java annotation or a descriptor file in an application. Each of these objects can be deployed to a partition. Packaged and standalone data sources can be updated using application deployment plans, the same as the corresponding non-partitioned data sources. There is no override mechanism for Java EE data source definitions.

To summarize, the data source component supports the following data source deployment types.

Data Source Deployment Type	Parameter Override Support
Domain-level system resource, optionally scoped in a resource group	No override support; change the data source directly.
Resource group template system resource	Change the data source directly or override in the resource group derived from the resource group template.
Partition-level system resource in a resource group	No override support; change the data source directly.

Data Source Deployment Type	Parameter Override Support
Partition-level system resource in a resource group based on a resource group template	JDBC system resource override or resource deployment plan.
Application scoped/packaged data source deployed to a domain or partition	Application deployment plan.
Standalone data source module deployed to a domain or partition	Application deployment plan.
Data source definitions (Java EE 6) deployed to a domain or partition	No override support.

The domain structure related to data sources is as follows:

- Domain
  - Data source with global scope
  - Domain-level resource group with data source with global scope
  - Domain-level resource group template with data source
  - Partition
    * Partition-level resource group with data source
    * Partition-level resource group based on resource group template
    * Partition-level JDBC system resource override
    * Partition-level resource deployment plan
    * Object deployed at the partition level

The resource group template references system resource definitions such as data source module descriptors. The partition defines one or more resource groups that may reference a system resource definition directly, a resource group template, or both.

15.2 Configuring JDBC Data Sources: Related Considerations

The following sections describe considerations when configuring data sources in a multitenant environment.

15.2.1 Data Source Scope

Creating a data source that is scoped to a domain-level resource group or in a partition is similar to creating a domain-level system resource. The only additional step is to specify the scope. In the WLS Administration Console and Fusion Middleware Control (FMWC), there is a drop-down menu in the first step of the creation process that lists the available scopes in which to create a data source. In WLST, it is necessary to create the data source using `createJDBCSystemResource` on the owner MBean (the MBean for the domain, resource group, or resource group template).

When editing a data source, the data source must be looked up in the proper scope. There are no additional changes to updating a data source.

15.2.2 Runtime Monitoring

The existing data source runtime MBeans are supported for partition-scoped data source deployments and are accessible to JMX-based management clients. The runtime MBean type depends on the data source type deployed. For example, a generic data source is represented by a `JDBCDataSourceRuntimeMBean` type.

The `DataSourceRuntimeMBean` created for a partition-scoped data source deployment is parented by the `JDBCPartitionRuntime MBean` of the partition and provides statistics and runtime operations that are specific to the partition's data source instance.

Partition-scoped data source runtime MBeans have a name attribute similar to the following:

```
com.bea:ServerRuntime=myserver,Name=ds,Type=JDBCDataSourceRuntime,
JDBCPartitionRuntime=Partition1,PartitionRuntime=Partition1
```

The parent attribute is set to:

```
com.bea:ServerRuntime=myserver,Name=Partition1,Type=JDBCPartitionRuntime
```

Note that in the above example the partition-scoped data source name is "`ds`", the partition name is "`Partition1`" and the server name is "`myserver`".

The data source runtime MBeans reside in the runtime MBean hierarchy under `serverRuntime/PartitionRuntimes/partition/JDBCPartitionRuntime`. Whereas the runtime MBeans for non-partition-scoped data source deployments reside under `serverRuntime/JDBCServiceRuntime`.

MBeans defined at the domain level are not visible to partition users. If a non-dynamic parameter is updated in a partition, the change does not take effect immediately but occurs the next time that the data source in the partition is restarted or the partition itself is restarted. It is not necessary to re-start the server.

15.2.3 Security

Security roles and policy definitions related to partition data source configuration is the responsibility of the system administrator. For more information, see Configuring Security. It is optional to configure a security realm that is specific to the partition. Otherwise, configuring security for a partition-scoped data source is similar to a global data source. For more detailed information on data source security, see "Security for WebLogic Server MBeans" and "Understanding Data Source Security".

Data source authorization checks are supported for partition-scoped deployments using the partition-specific security realm where applicable.

There is support for defining credential mapper entries for use with data source security features for partition-scoped deployments. Data source credential mapper entries are used with data source security options: identity-based pooling, Set Client Identifier, and proxy authentication. Credential mapper entries should be created in the WLS Administration Console (they are not supported in FMWC).

15.2.4 Transactions Scope

The scope of XA transactions are at the domain level and span access to partition-level resources. Partition-scoped resource names are qualified with the partition name so that resources are unique to the transaction manager and managed independently.

For more information on transaction configuration and restrictions, see Configuring Transactions.

15.2.5 Partition Life Cycle

A data source that is associated with a partition is started during a partition start and shutdown during a partition shutdown or forced shutdown. Partition start and shutdown can be performed by the WebLogic Server system administrator and operator, the partition administrator, and the partition operator.

15.2.6 Diagnostic Image Source

You can limit the scope of a diagnostic image to a partition. For diagnostic image capture requests that specify a partition, the data source output is restricted to that of data sources that are scoped to the target partition. For more information, see Configuring Partition Scope Diagnostic Image Capture.

15.2.7 Logging

Partition-scoped data source log messages are qualified with the partition ID and name when the domain log format is not configured for backward compatibility with pre-12.2.1 logging. For more information on logging, see Monitoring and Debugging Partitions.

15.2.8 JNDI Bindings

A data source is bound into the appropriate JNDI context at deployment time under the name or names specified in the data source module descriptor.

Data Source Scope	JNDI Namespace
Application	Application
Partition resource group	Partition
Domain resource group	Global

Note that a data source instance obtained from a JNDI namespace preserves its scope even if accessed under a different partition context.

Cross-partition access occurs when an application running in one partition accesses a resource in another partition. This also applies to partition level access to the domain level and vice versa. Cross partition data source access occurs when an application running in one partition performs a JNDI lookup of a data source defined in another partition by using either the partition URL, or the "`domain:`" or "`partition:`" syntax. In WebLogic Server 12.2.1, this causes a warning to be generated in the log so that applications know that a change is required.

15.2.9 Deprecated Drivers Not Supported

The three WebLogic Server driver types that are registered under the JDBC URL prefix `jdbc:weblogic:pool`, `jdbc:weblogic:rmi`, and `jdbc:weblogic:jts` are deprecated and are not supported with partition-scoped data sources. Existing JDBC client logic that specifies the `connectionPoolID` property with the data source name, does not fail to find the data source in a partition. Applications that use the pool, JTS, or RMI drivers must modify their configurations to specify data source JNDI names instead to work in a partition configuration.

Related to this, an EJB RDBMS Bean descriptor cannot use `<pool-name>` to access a partition-scoped data source in a JDBC session. Using a JNDI name is supported in this situation.

15.3 Configuring JDBC Data Sources: WLST Example

The following is a sample WLST program that shows using a WebLogic Server data source in an multitenant environment. It creates two virtual targets, one for the domain and one for the partition. It creates one partition. It then creates a resource group, a resource group template, and a resource group based on the resource group template in the partition. It then creates the same data source in four scopes:

- Resource group template
- Resource group using the resource group template and a system override
- Resource group
- Domain

Last, it starts the partition.

```
import sys, socket
import os
hostname = socket.gethostname()
partition='partition1'
connect("weblogic","welcome1","t3://"+hostname+":7001")
edit()
startEdit()
serverBean = getMBean('/Servers/myserver')
realmBean=cmo.getSecurityConfiguration().getDefaultRealm()
pB = cmo.lookupPartition(partition)
if pB != None:
   print "[ERROR] Partition with Name '%s' already exits" % partition
   cancelEdit('y')
   exit('y')
host='%s.us.company.com' %hostname
def createVirtualTarget(name, host, domain, target, prefix):
    print "Creating virtual target " + name
    domain=getMBean('/')
    vt=domain.createVirtualTarget(name)
    vt.addTarget(target)
    vt.setHostNames(jarray.array([String(host)],String))
    vt.setUriPrefix(prefix)
    return vt
def createJDBCSystemResource(owner, resourceName):
    systemResource=owner.createJDBCSystemResource(resourceName)
    systemResource.setName(resourceName)
    jdbcResource=systemResource.getJDBCResource()
    jdbcResource.setName(resourceName)
    driverParams=jdbcResource.getJDBCDriverParams()
    driverParams.setDriverName('oracle.jdbc.OracleDriver')
    driverParams.setUrl('jdbc:oracle:thin:@dbhost:1521/otrade')
#    driverParams.setDriverName('org.apache.derby.jdbc.EmbeddedDriver')
#    driverParams.setUrl('jdbc:derby:memory:mydb\;create=true')
    properties = driverParams.getProperties()
    properties.createProperty('user', 'dbuser')
    driverParams.setPassword('MYPASSWD')
    jdbcDataSourceParams=jdbcResource.getJDBCDataSourceParams()
    jdbcDataSourceParams.addJNDIName(resourceName)
    jdbcDataSourceParams.setGlobalTransactionsProtocol('None')
    return systemResource
def createJDBCSystemResourceOverride(partition, dsname, url, user, password):
   oMBean=partition.createJDBCSystemResourceOverride(dsname)
   oMBean.setURL(url)
   oMBean.setUser(user)
```

```
   oMBean.setPassword(password)
vtname='partition1'
vtBean=createVirtualTarget(vtname+'-vtarget', host, getMBean('/'),
  getMBean('/Servers/myserver'), '/' + vtname)
vtname='domain'
vtBean1=createVirtualTarget(vtname+'-vtarget', host, getMBean('/'),
  getMBean('/Servers/myserver'), '/' + vtname)
print 'Creating partition partition1'
domain = getMBean("/")
partition1MBean=domain.createPartition('partition1')
partition1MBean.addDefaultTarget(vtBean)
partition1MBean.setRealm(realmBean)
partition1MBean.addAvailableTarget(vtBean)
print 'Creating resource group template rgt'
rgtBean=cmo.createResourceGroupTemplate('rgt')
print 'Creating resource group partition1-rg in partition1'
partitionrgMBean=partition1MBean.createResourceGroup('partition1-rg')
partitionrgMBean.addTarget(vtBean)
print 'Creating resource group partition1-rg-with-template in partition1'
partition1rgitMBean=partition1MBean.createResourceGroup('partition1-rg-with-templa
te')
partition1rgitMBean.setResourceGroupTemplate(getMBean('/ResourceGroupTemplates/rgt
'))
print 'Creating domain resource group global-rg'
cd('/')
cmo.createResourceGroup('global-rg')
cd("/ResourceGroups/global-rg")
cmo.addTarget(vtBean1)
save()
activate()
# Create 4 data sources
startEdit()
print "Creating datasource ds-in-template in rgt"
createJDBCSystemResource(owner=rgtBean, resourceName='ds-in-template')
activate()
startEdit()
print "Creating datasource ds-using-template in rg using rgt"
createJDBCSystemResource(owner=partition1rgitMBean,
resourceName='ds-using-template')
activate()
startEdit()
print "Creating override for datasource ds-in-template"
createJDBCSystemResourceOverride(partition1MBean, 'ds-in-template',
     jdbc:oracle:thin:@dbhost:1521/otrade2', 'scott', 'tiger')
activate()
startEdit()
print "Creating datasource ds in partition1-rg"
createJDBCSystemResource(owner=partitionrgMBean, resourceName='ds')
activate()
# You cannot creating datasource directly in partition
# createJDBCSystemResource(owner=partition1MBean, resourceName='ds')
startEdit()
print "Creating datasource ds in domain"
createJDBCSystemResource(owner=domain, resourceName='ds')
cd('/SystemResources/' + "ds" )
set('Targets',jarray.array([ObjectName('com.bea:Name=' + 'AdminServer' +
',Type=Server')], ObjectName))
save()
activate()
startPartitionWait(partition1MBean)
```

Note that the `createJDBCSystemResource` method is unusual in that it does not have many different parameters to create the data source. Instead, the same parameters are used each time.

The following sample WLST output shows a global system resource data source deployment under the server runtime and the three partition-scoped data source deployments under the partition runtime.

```
> ls('JDBCSystemResources')
dr--   ds
> ls('Partitions')
drw-   partition1
> serverRuntime()
> ls('JDBCServiceRuntime/AdminServer/JDBCDataSourceRuntimeMBeans')
dr--   ds
> ls(
''PartitionRuntimes/partition1/JDBCPartitionRuntime/partition1/JDBCDataSourceRunti
meMBeans')
dr--   ds
dr--   ds-in-template
dr--   ds-using-template
```

15.4 Configuring JDBC Data Sources: WLS Administration Console Example

The following sections show the results of the Configuring JDBC Data Sources: WLST Example in the WLS Administration Console.

15.4.1 Configuring JDBC Data Sources

From the WLS Administration Console Home page, select **Data Sources** to display a summary table which lists all the system resource data sources that are configured in all scopes (domain, resource group templates, and resource groups). The table displays the scope and partition name where applicable.

Click on the name of a data source. The **Configuration > General** page displays the configuration attributes unaffected by any existing JDBC system resource overrides. The overrides do not appear at this level.

Select **Security > Credential Mappings** and click **New**. Enter the WLS User, Remote User, and Remote Password values for credential mappings associated with the data source.

On the data sources summary page, click **New** and select **Generic Data Source**. From the **Scope** drop-down menu, you can specify a global data source or whether to create the data source in an existing resource group template or resource group (the names of all the available scopes appears in the drop-down menu).

From the WLS Administration Console Home page, select **Domain Partitions** to display the domain partitions summary table which lists all the configured partitions. The information for each partition will include the nested resource groups, the default targets, and the state.

To configure a specific partition, click on its name. Select **Resource Overrides > JDBC System** to display a summary table which lists the existing JDBC overrides. To create a new JDBC system resource override, click **New**. The **Data Source** drop-down menu lists the available data sources for creating the override. The WLS Administration

Console lists the data sources from all the resource groups in the partition, however, only resource groups derived from resource group templates would need an override. Non-derived resource groups can be updated directly; overriding them is not recommended. For each existing override, the table displays the name of the override, the data source, and the URL. Clicking on the override name displays a configuration page where you can update any of the override values (URL, user, or password).

15.4.2 Monitoring JDBC Data Sources

You can monitor data sources at various levels. On the domain level, from the Home page, select **Data Sources > Monitoring** to view all running data sources in all scopes.

On the partition level, select **Domain Partitions** and click on a specific partition name. Select **Resource Groups**, click on a specific resource group name, then select **Services > JDBC** to view the data sources defined in this scope.

15.4.3 JDBC Data Source Diagnostics

To produce a partition-scoped diagnostics image, from the Home page, select **Diagnostics Images**. Click on the plus sign (+) for the desired server to expand the list. Select the radio button for a specific partition name and then click **Capture Image**. The Diagnostic Image Properties page specifies the Destination Directory location for the image ZIP file. Open the ZIP file to view a `JDBC.txt` file that might look like the following sample. Note that resource names are decorated with `$partitionname`.

```
Dumping Resource Pool:ds-in-template$partition1
Resource Pool:ds-in-template$partition1:dumpPool Current Capacity = 1
Resource Pool:ds-in-template$partition1:dumpPool dumping available resources,
#entries = 1
Resource Pool:ds-in-template$partition1:dumpPool available[0] =
autoCommit=true,enabled=true,isXA=false,isJTS=false,vendorID=100,connUsed=false,do
Init=false,'null',destroyed=false,poolname=ds-in-template$partition1,appname=null,
moduleName=null,connectTime=862,dirtyIsolationLevel=false,initialIsolationLevel=2,
infected=false,lastSuccessfulConnectionUse=0,secondsToTrustAnIdlePoolConnection=10
,currentUser=null,currentThread=null,lastUser=null,currentError=null,currentErrorT
imestamp=null,JDBC4Runtime=true,supportStatementPoolable=true,needRestoreClientInf
o=false,defaultClientInfo={},supportIsValid=true
Resource Pool:ds-in-template$partition1:dumpPool dumping reserved resources,
#entries = 0
Resource Pool:ds-in-template$partition1:dumpPool # dead resources = 0
Dumping Resource Pool: ds-in-template$partition1 complete
Dumping Resource Pool:ds$partition1
Resource Pool:ds$partition1:dumpPool Current Capacity = 1
Resource Pool:ds$partition1:dumpPool dumping available resources, #entries = 1
Resource Pool:ds$partition1:dumpPool available[0] =
autoCommit=true,enabled=true,isXA=false,isJTS=false,vendorID=100,connUsed=false,do
Init=false,'null',destroyed=false,poolname=ds$partition1,appname=null,moduleName=n
ull,connectTime=1277,dirtyIsolationLevel=false,initialIsolationLevel=2,infected=fa
lse,lastSuccessfulConnectionUse=0,secondsToTrustAnIdlePoolConnection=10,currentUse
r=null,currentThread=null,lastUser=null,currentError=null,currentErrorTimestamp=nu
ll,JDBC4Runtime=true,supportStatementPoolable=true,needRestoreClientInfo=false,def
aultClientInfo={},supportIsValid=true
Resource Pool:ds$partition1:dumpPool dumping reserved resources, #entries = 0
Resource Pool:ds$partition1:dumpPool # dead resources = 0
Dumping Resource Pool: ds$partition1 complete
Dumping Resource Pool:ds-using-template$partition1
Resource Pool:ds-using-template$partition1:dumpPool Current Capacity = 1
Resource Pool:ds-using-template$partition1:dumpPool dumping available resources,
#entries = 1
```

```
Resource Pool:ds-using-template$partition1:dumpPool available[0] =
autoCommit=true,enabled=true,isXA=false,isJTS=false,vendorID=100,connUsed=false,do
Init=false,'null',destroyed=false,poolname=ds-using-template$partition1,appname=nu
ll,moduleName=null,connectTime=467,dirtyIsolationLevel=false,initialIsolationLevel
=2,infected=false,lastSuccessfulConnectionUse=0,secondsToTrustAnIdlePoolConnection
=10,currentUser=null,currentThread=null,lastUser=null,currentError=null,currentErr
orTimestamp=null,JDBC4Runtime=true,supportStatementPoolable=true,needRestoreClient
Info=false,defaultClientInfo={},supportIsValid=true
Resource Pool:ds-using-template$partition1:dumpPool dumping reserved resources,
#entries = 0
Resource Pool:ds-using-template$partition1:dumpPool # dead resources = 0
Dumping Resource Pool: ds-using-template$partition1 complete
```

15.4.4 Partition-Scoped Deployments

As with non-partition scoped deployments, from the Home page, you select **Deployments**, click **Install** and then locate the EAR or WAR file that you want to deploy. On the first page of the Install Application Assistant, for deployment scope, you can select either the global scope or one of the existing resource group templates or resource groups.

After deploying the EAR or WAR file, you can view the associated modules and scope by clicking on the associated link in the console. Initially there is no deployment plan. To create an application deployment plan Oracle recommends using the WLS Administration Console which will create it for you. Select the deployed data source, change the configuration, and save the changes. The console creates the associated deployment plan and specifies the deployment plan name. The following is a sample application deployment plan.

```
<?xml version='1.0' encoding='UTF-8'?>
<deployment-plan xmlns="http://xmlns.oracle.com/weblogic/deployment-plan"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="http://xmlns.oracle.com/weblogic/deployment-plan
http://xmlns.oracle.com/weblogic/deployment-plan/1.0/deployment-plan.xsd">
  <application-name>ds-jdbc.xml</application-name>
  <variable-definition>
    <variable>
      <name>JDBCConnectionPoolParams_InitialCapacity_14417323945070</name>
      <value>1</value>
    </variable>
    <variable>
       <name>JDBCConnectionPoolParams_MinCapacity_14417323945071</name>
      <value>1</value>
    </variable>
    <variable>
      <name>JDBCConnectionPoolParams_StatementCacheSize_14417323945072</name>
      <value>10</value>
    </variable>
    <variable>
      <name>JDBCConnectionPoolParams_MaxCapacity_14417323945073</name>
      <value>20</value>
    </variable>
    <variable>
      <name>JDBCConnectionPoolParams_StatementCacheType_14417323945074</name>
      <value>LRU</value>
    </variable>
  </variable-definition>
  <module-override>
    <module-name>ds-jdbc.xml</module-name>
```

```
    <module-type>jdbc</module-type>
    <module-descriptor external="false">
      <root-element>jdbc-data-source</root-element>
      <uri>.</uri>
      <variable-assignment>
        <name>JDBCConnectionPoolParams_InitialCapacity_14417323945070</name>

<xpath>/jdbc-data-source/jdbc-connection-pool-params/initial-capacity</xpath>
      </variable-assignment>
      <variable-assignment>
        <name>JDBCConnectionPoolParams_MinCapacity_14417323945071</name>
        <xpath>/jdbc-data-source/jdbc-connection-pool-params/min-capacity</xpath>
      </variable-assignment>
      <variable-assignment>
        <name>JDBCConnectionPoolParams_StatementCacheSize_14417323945072</name>

<xpath>/jdbc-data-source/jdbc-connection-pool-params/statement-cache-size</xpath>
      </variable-assignment>
      <variable-assignment>
        <name>JDBCConnectionPoolParams_MaxCapacity_14417323945073</name>
        <xpath>/jdbc-data-source/jdbc-connection-pool-params/max-capacity</xpath>
      </variable-assignment>
      <variable-assignment>
        <name>JDBCConnectionPoolParams_StatementCacheType_14417323945074</name>

<xpath>/jdbc-data-source/jdbc-connection-pool-params/statement-cache-type</xpath>
      </variable-assignment>
    </module-descriptor>
  </module-override>
  <config-root>D:\tmp1221\partition1\ds-jdbc.xml\app\plan</config-root>
</deployment-plan>
```

15.4.5 Resource Deployment Plan

If you want to override attributes of a resource group template-derived partition data source other than the user, password, or URL values, you will need to create a resource deployment plan. For more information, see Configuring Resource Deployment Plans: Main Steps and WLST Example.

The following is a sample resource deployment plan. Note that the `descriptor-file-path`, `resource-type`, and the `resource name` elements are used to identify where the descriptor resides.

```
<resource-deployment-plan
 xmlns="http://xmlns.oracle.com/weblogic/resource-deployment-plan"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="http://xmlns.oracle.com/weblogic/resource-deployment-plan

http://xmlns.oracle.com/weblogic/resource-deployment-plan/1.0/resource-deployment-
plan.xsd">
  <variable-definition>
    <variable>
      <name>JDBCConnectionPoolParams_InitialCapacity_14423700625350</name>
      <value>2</value>
    </variable>
    <variable>
      <name>JDBCConnectionPoolParams_MinCapacity_14423700625511</name>
      <value>5</value>
    </variable>
```

```
    <variable>
      <name>JDBCConnectionPoolParams_StatementCacheSize_14423700625512</name>
      <value>10</value>
    </variable>
    <variable>
      <name>JDBCConnectionPoolParams_StatementCacheType_14423700625513</name>
      <value>LRU</value>
    </variable>
  </variable-definition>
  <external-resource-override>
    <resource-name>ds-in-template</resource-name>
    <resource-type>jdbc-system-resource</resource-type>
    <root-element>jdbc-data-source</root-element>
    <descriptor-file-path>resource-group-templates/rgt/jdbc</descriptor-file-path>
    <variable-assignment>
      <name>JDBCConnectionPoolParams_InitialCapacity_14423700625350</name>

<xpath>/jdbc-data-source/jdbc-connection-pool-params/initial-capacity</xpath>
    </variable-assignment>
    <variable-assignment>
      <name>JDBCConnectionPoolParams_MinCapacity_14423700625511</name>
      <xpath>/jdbc-data-source/jdbc-connection-pool-params/min-capacity</xpath>
    </variable-assignment>
    <variable-assignment>
      <name>JDBCConnectionPoolParams_StatementCacheSize_14423700625512</name>

<xpath>/jdbc-data-source/jdbc-connection-pool-params/statement-cache-size</xpath>
    </variable-assignment>
    <variable-assignment>
      <name>JDBCConnectionPoolParams_StatementCacheType_14423700625513</name>

<xpath>/jdbc-data-source/jdbc-connection-pool-params/statement-cache-type</xpath>
    </variable-assignment>
  </external-resource-override>
</resource-deployment-plan>
```

To associate the resource deployment plan with a partition, provide the path to the resource deployment plan on the on the partition's **Configuration > General** page.

15.5 Configuring JDBC Data Sources: Fusion Middleware Control Example

You can use Fusion Middleware Control (FMWC) to configure JDBC overrides in a manner similar to using the WLS Administration Console but with a different user interface and navigation paths. However, you must use the WLS Administration Console to configure data source security since it is not currently available in FMWC.

From the **WebLogic Domain** drop-down menu, select **JDBC Data Sources** to display a list of existing data sources with their associated type, scope, and if applicable, resource group, resource group template and partition names.

To edit an existing data source, click on its name.

To create a new data source, click **Create** and select the type of data source you want to create. On the Data Source Properties page, use the **Scope** drop-down menu to specify the data source scope.

From the **WebLogic Domain** drop-down menu, select **Environments > Domain Partitions** and click on a partition name to edit the partition attributes.

To create JDBC system resource overrides, click on the partition name. From the left-side **Domain Partition** drop-down menu, select **Administration > Resource Overrides**. Use this page to view every resource group that is derived from a resource group template along with the resource type and the name of the resource group template. If there is no existing override, the **Has Overrides** column will be blank. Click the **Edit Overrides** icon to create an override. If the **Has Overrides** column has a check mark in it, click the **Edit Overrides** icon to update the existing overrides.

15.6 Configuring JDBC Data Sources: REST Example

All of the JDBC configuration and runtime information is available using REST. For more information, see *Administering Oracle WebLogic Server with RESTful Management Services*.

This is an example that gets all of the data sources in the partition, `partition1`.

```
curl --user weblogic:welcome1 -H X-Requested-By:MyClient \
  -H Accept:application/json \
  -H Content-Type:application/json -X GET \
  http://host:7001/management/weblogic/latest/serverRuntime/\
partitionRuntimes/partition1/JDBCPartitionRuntime/JDBCDataSourceRuntimeMBeans
```

The following is an abbreviated output:

```
{
...
    "items": [
        {
....
            "identity": [
                "partitionRuntimes",
                "partition1",
                "JDBCPartitionRuntime",
                "JDBCDataSourceRuntimeMBeans",
                "ds-in-template"
            ],
            "connectionsTotalCount": 1,
...
        },
        {
...
            "identity": [
                "partitionRuntimes",
                "partition1",
                "JDBCPartitionRuntime",
                "JDBCDataSourceRuntimeMBeans",
                "ds-using-template"
            ],
...
        },
        {
...
            "identity": [
                "partitionRuntimes",
                "partition1",
                "JDBCPartitionRuntime",
                "JDBCDataSourceRuntimeMBeans",
                "ds"
            ],
            "connectionsTotalCount": 1,
```

```
...
        }
    ]
}
```

The following shell script creates a new data source, `ds3`, in a resource group, `partition1-rg`, in a partition, `partition1`, using REST.

```
host=myhost
cmd="curl --user weblogic:welcome1 \
  -H X-Requested-By:MyClient \
  -H Accept:application/json \
  -H Content-Type:application/json "
echo "Start a config txn"
${cmd} -d '{}' \
-X POST \
 http://${host}:7001/management/weblogic/latest/edit/changeManager/startEdit

echo "\nCreate the JDBCSystemResource - note - can't save the changes yet"
echo "because we still need to set its JDBCResource's name too."
${cmd} -d "{
      name: 'ds3'
   }" -X POST \
   http://${host}:7001/management/weblogic/\
latest/edit/partitions/partition1/\
resourceGroups/partition1-rg/JDBCSystemResources?saveChanges=false
echo "\nSet the JDBCSystemResource's JDBCResource's name and let the changes be"
echo "saved automatically."
${cmd} -d "{
     name: 'ds3'
  }" -X POST \
  http://${host}:7001/management/weblogic/latest/\
edit/partitions/partition1/resourceGroups/partition1-rg/\
JDBCSystemResources/ds3/JDBCResource
echo "\nSet the Data Source Params"
${cmd} -d "{
    globalTransactionsProtocol: 'EmulateTwoPhaseCommit',
    JNDINames: [ 'ds3' ]
  }" -X POST \
  http://${host}:7001/management/weblogic/latest/\
edit/partitions/partition1/resourceGroups/partition1-rg/\
JDBCSystemResources/ds3/JDBCResource/JDBCDataSourceParams
echo "\nSet the Driver Params"
${cmd} -d "{
    driverName: 'oracle.jdbc.OracleDriver',
    password: 'MYPASSWD',
    url: 'jdbc:oracle:thin:@dbhost:1521/otrade'
  }" -X POST \
  http://${host}:7001/management/weblogic/latest/\
edit/partitions/partition1/resourceGroups/partition1-rg/\
JDBCSystemResources/ds3/JDBCResource/JDBCDriverParams
echo "\nSet the Properties Params"
${cmd} -d "{
    value: 'dbuser',
    name: 'user'
  }" -X POST \
  http://${host}:7001/management/weblogic/latest/\
edit/partitions/partition1/resourceGroups/partition1-rg/\
JDBCSystemResources/ds3/JDBCResource/JDBCDriverParams/properties/properties
echo "\nActivate the changes"
${cmd} -d '{}' \
```

```
-X POST \
 http://${host}:7001/management/weblogic/latest/edit/changeManager/activate
```

15.7 Configuring JDBC Data Sources: Related Tasks and Links

For additional information, see the following:

- "WebLogic Server JDBC Data Sources" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.
- "Configure Data Sources" in *Oracle WebLogic Server Administration Console Online Help*.
- For an example of configuring JDBC system resources using REST, see "Configuring System Resources" and "Creating Partition-Scoped System Resources" in *Administering Oracle WebLogic Server with RESTful Management Services*.

16

Configuring Messaging

This chapter describes how messaging is supported in WebLogic Server Multitenant (MT) and includes:

- Persistent stores (file and JDBC stores)
- JMS servers
- Store-and-Forward (SAF) agents
- Path services
- Messaging bridges
- JMS system modules and JMS application modules
- JMS connection pools

This chapter also describes approaches for accessing partitioned JMS resources from other partitions in the same WebLogic server instance or cluster, and from remote client or server JVMs.

Prior to configuring JMS in a multitenant environment, it is assumed that you are familiar with and have already created:

- A virtual target. For more information, see Configuring Virtual Targets.
- A domain partition. For more information, see Configuring Domain Partitions.
- A security realm that is specific to the partition, if necessary. For more information, see Configuring Security.
- A resource group template, if necessary. For more information, see Configuring Resource Group Templates.
- A resource group. For more information, see Configuring Resource Groups.

This chapter assumes familiarity with existing WLS messaging configuration. See the following books:

- *Administering JMS Resources for Oracle WebLogic Server*
- *Administering the WebLogic Persistent Store*
- *Administering the WebLogic Messaging Bridge for Oracle WebLogic Server*
- *Administering the Store-and-Forward Service for Oracle WebLogic Server*
- *Developing Message-Driven Beans for Oracle WebLogic Server*

This chapter includes the following sections:

16.1 About Messaging Configuration Scopes

When working with WebLogic Server in non-partitioned environments, you can configure and deploy JMS artifacts at the domain level. Examples of JMS artifacts include persistent stores (file or JDBC stores), JMS servers, store-and-forward agents, path services, and messaging bridges, which are directly configured in a WebLogic Server domain `config.xml` file using a JMX PersistentStoreMBean, JMSServerMBean, SAFAgentMBean, PathServiceMBean, and MessagingBridgeMBean.

In addition, JMS resources, such as connection factories and destinations are configured in an external descriptor file called a JMS module. JMS modules are most commonly configured as a JMS system resource (using a JMSSystemResourceMBean). Less commonly, JMS modules can be embedded as a standalone or application scoped XML file that is part of a deployed application (called standalone and application scoped modules respectively), or indirectly by Java EE 7 connection factory and destination annotations (which have the same basic semantics as external resources defined in an application scoped module).

When working in WebLogic Server MT, all of the above JMS artifacts can be defined and deployed in the following scopes:

- Domain scoped—using the exact same configuration as in a non-partitioned WLS environment.
- Resource group scoped—as part of a resource group that is created at the partition level or at the domain level.
- Resource group template scoped—as part of a resource group template that is created at the domain level.

A resource group can optionally inherit a resource group template scoped JMS configuration. No more than one resource group per partition can reference a particular resource group template, and similarly, no more than one domain level resource group can reference a resource group template.

To summarize, the domain configuration structure for JMS messaging artifacts is as follows:

- Domain-level JMS configuration
- Domain-level resource group with JMS configuration
- Domain-level resource group template with JMS configuration
- Domain-level resource group based on a resource group template
- Partition
  - Partition-level resource group with JMS configuration

– Partition-level resource group based on a resource group template

16.2 About Configuration Validation and Targeting Rules

Validation and targeting rules ensure that WebLogic Server MT JMS configuration is isolated, self contained, and easy to manage. These rules help achieve the following goals:

- A resource group can shut down or migrate independently without causing failures in other resource groups or domain-level resources.
- A resource group template is a fully encapsulated, independent configuration unit without direct dependencies on resource groups, domain configuration, or other resource group templates.
- The same configuration is valid regardless of whether a resource group is single server targeted, cluster targeted, or not targeted.
- There is no change in behavior for any domain-level configuration that was valid in previous releases. For example, non-resource group/resource group template, domain-level behavior remains unchanged for backwards compatibility.

One basic, high-level rule that helps accomplish these goals is that a JMS configuration MBean may only reference another configuration MBean that is in the same scope. For example, a resource group template-defined JMS server can only reference a store that is also defined in the same resource group template. These rules are enforced by configuration validation checks and by errors and warnings that are logged at runtime.

16.3 Configuring Messaging Components

The following sections describe considerations when configuring JMS artifacts in a multitenant environment.

16.3.1 Configuring JDBC or File Persistent Stores

Creating a persistent store is a required step before configuring a JMS server, SAF agent, or path service. This is because resource group and resource group template scoped JMS servers, SAF agents, and path services must reference an existing persistent store.

Creating a custom file or JDBC persistent store inside a resource group that is either scoped to a domain or to a partition is similar to creating a persistent store at the domain level. However, an additional step is that you must specify the scope. In the WLS Administration Console and Fusion Middleware Control (FMWC), there is a **Scope** drop-down menu in the first step of the creation process that lists the available scopes in which to create a persistent store. In WLST, you must create the persistent store using `createPersistentStore` on the owner MBean (the MBean for the domain, resource group, or resource group template).

The following Distribution and Migration Policy rules apply to all resource group and resource group template scoped persistent stores:

- A resource group or resource group template scoped store that will be used to host JMS server distributed destinations or SAF agent imported destinations must specify a `Distributed` Distribution Policy (the default). This setting instantiates a store instance per WebLogic Server instance in a cluster. Furthermore, a resource group or resource group template scoped store with a `Distributed` Distribution

Policy may optionally be configured with an `On-failure` or `Always` Migration Policy.

- A resource group or resource group template scoped store that will be used by a path service or that will be used to host JMS server standalone (non-distributed) destinations must specify a `Singleton` Distribution Policy. This setting instantiates a single store instance in a cluster. Furthermore, a resource group or resource group template scoped store with a `Singleton` Distribution Policy must have either `On-failure` or `Always` as its Migration Policy instead of `Off`. `Off` is the default.
- A cluster targeted store with an `On-failure` or `Always` Migration Policy requires that the cluster be configured with either database leasing or cluster leasing where database leasing is recommended as a best practice.

These policies control the distribution and high availability behavior of stores and any JMS artifacts that target a cluster. For more information, see "Simplified JMS Cluster and High Availability Configuration" in *Administering JMS Resources for Oracle WebLogic Server*.

The following are the enforced configuration validation and targeting rules for both file and JDBC stores:

- A resource group or resource group template-level JMS server, SAF agent, or path service must reference a configured store; they cannot reference null.
- A resource group template scoped JMS server, SAF agent, or path service may only reference a store that is defined in the same resource group template. It cannot reference a store defined at the child resource group level.
- A resource group scoped JMS server, SAF agent, or path service may only a reference a store that is defined in the same resource group, or in the resource group template optionally referenced by the resource group.
- A domain-level JMS server, SAF agent, or path service may only reference a store in the domain scope.

The following are additional rules that are specific to JDBC stores.

- A resource group template scoped JDBC store may only reference a data source that is in the same resource group template.
- A resource group scoped JDBC store may only reference a data source that is in the same resource group, or in the resource group template, optionally referenced by the resource group.
- A domain scoped JDBC store may only reference a data source in the domain scope.

16.3.2 Configuring JMS Servers

Creating a JMS server that is scoped to a domain-level resource group or in a partition is similar to creating a JMS server at the domain level. One additional step is to specify the scope. In the WLS Administration Console and Fusion Middleware Control (FMWC), there is a **Scope** drop-down menu in the first step of the creation process that lists the available scopes in which to create a JMS server. In WLST, you must create the JMS server using `createJMSServer` on the owner MBean (the MBean for the domain, resource group, or resource group template).

Another required step is to configure the JMS server so that it references a persistent store that is configured in the same scope as the JMS server.

Finally, if the JMS server is going to be used to host distributed destinations, its store must be configured with a `Distributed` Distribution Policy. If the JMS server is going to host standalone (non-distributed) destinations, the store must be configured with a `Singleton` Distribution Policy.

16.3.3 Configuring Store-and-Forward (SAF) Agents

Creating a SAF agent that is scoped to a domain-level resource group or in a partition is similar to creating a SAF agent at the domain level. One additional step is to specify the scope. In the WLS Administration Console and Fusion Middleware Control (FMWC), there is a **Scope** drop-down menu in the first step of the creation process that lists the available scopes in which to create an SAF agent. In WLST, you must create the SAF agent using `createSAFAgent` on the owner MBean (the MBean for the domain, resource group, or resource group template).

Another required step is to configure the SAF agent so that it references a persistent store that is configured in the same scope as the SAF agent. This store must be configured with a `Distributed` Distribution Policy (the default).

Note: A resource group or resource group template-level SAF agent with service type `Receiving Only` is not allowed. An exception will be thrown or an error message will be logged on an attempt to setup such a configuration. This mode is specific to "old style" JAX-RPC web services reliable messaging. Use JAX-WS RM instead.

16.3.4 Configuring Path Services to Support Using Unit-of-Order with Distributed Destinations

A path service must be configured in a resource group or resource group template if the resource group or resource group template also configures any distributed destinations that will be used to host Unit-of-Order (UOO) messages. In addition, such distributed destinations need to be configured with a Unit of Order routing policy set to `PathService` instead of `Hash` since hash-based UOO routing is not supported in a resource group or resource group template scope. Resource group or resource group template scoped distributed destinations will only use a path service that is configured in the same resource group or resource group template for routing UOO messages. Attempts to send messages to a resource group or resource group template scoped distributed destination that does not configure a `PathService` Unit of Order routing policy will fail with an exception.

Creating a path service that is scoped to a domain-level resource group or in a partition is similar to creating a path service at the domain level. One additional step is to specify the scope. In the WLS Administration Console and Fusion Middleware Control (FMWC), there is a **Scope** drop-down menu in the first step of the creation process that lists the available scopes in which to create a path service. In WLST, you must create the path service using `createPathService` on the owner MBean (the MBean for the domain, resource group, or resource group template).

Another required step is to configure the path service so that it references a persistent store that is configured in the same scope as the path service. This store must be configured with a `Singleton` Distribution Policy and an `Always` or `On-Failure` Migration Policy.

16.3.5 Configuring Messaging Bridges

Creating a messaging bridge that is scoped to a domain-level resource group or in a partition is similar to creating a messaging bridge at the domain level. One additional step is to specify the scope. In the WLS Administration Console and Fusion Middleware Control (FMWC), there is a **Scope** drop-down menu in the first step of the creation process that lists the available scopes in which to create a messaging bridge. In WLST, you must create the messaging bridge using `createMessagingBridge` on the owner MBean (the MBean for the domain, resource group, or resource group template).

The following Distribution and Migration Policy rules apply to all resource group or resource group template scoped messaging bridges:

- Specify a `Distributed` Distribution Policy (the default) on a bridge to cause a cluster targeted bridge to deploy an instance per server in a cluster. A messaging bridge with a `Distributed` Distribution Policy may optionally also configure an `On-failure` Migration Policy to add support for high availability.
- Specify a `Singleton` Distribution Policy on a bridge to cause a cluster targeted bridge to limit itself to deploying one instance per cluster. A messaging bridge with a `Singleton` Distribution Policy must have an `On-failure` Migration Policy instead of `Off`. `Off` is the default.
- A cluster targeted bridge with an `On-failure` Migration Policy requires that the cluster be configured with either database leasing or cluster leasing, where database leasing is recommended as a best practice.

These policies control the high availability behavior and distribution behavior of messaging bridges that target a cluster. For more information about distribution and migration policies, see "Simplified JMS Cluster and High Availability Configuration" in *Administering JMS Resources for Oracle WebLogic Server*.

The following are the configuration validation rules that are specific to a messaging bridge:

- A resource group template scoped messaging bridge can only reference messaging bridge destinations in the same scope.
- A resource group scoped messaging bridge can only reference messaging bridge destinations in the same resource group, or in the resource group template optionally referenced by the resource group.
- A domain scoped messaging bridge may only reference messaging bridge destinations in the domain scope.

16.3.6 Configuring JMS System Resources and Application Scoped JMS Modules

Creating a JMS system resource that is scoped to a domain-level resource group or in a partition is similar to creating a JMS system resource at the domain level. One additional step is to specify the scope. In the WLS Administration Console and Fusion Middleware Control (FMWC), there is a **Scope** drop-down menu in the first step of the creation process that lists the available scopes in which to create a JMS system resource. In WLST, you must create the JMS system resource using `createJMSSystemResource` on the owner MBean (the MBean for the domain, resource group, or resource group template).

Creating an application scoped JMS module that has a domain-level resource group scope or is in a partition is similar to creating one for the domain level. An application

deployment may contain a JMS module file, or an application EAR file that in turn contains JMS module files. One additional step is to specify the resource group or resource group template scope. For more information, see Deploying Applications.

Note: If you create a JMS server and deploy an application that specifies a submodule target to this JMS server all within the same configuration edit session, the deployment may not succeed. Oracle recommends that you configure the JMS server in a separate edit session.

Note: Oracle strongly recommends configuring JMS using system resource modules instead of embedding the configuration in application resource modules. Unlike application scoped configuration, system resource configuration can be dynamically tuned and easily monitored by an administrator or developer using the WLS Administration Console, WLST, or MBeans.

The following are the configuration validation and targeting rules associated with resources in a resource group or resource group template scoped JMS module.

Subdeployment Definitions

- A resource group or resource group template scoped subdeployment can only target nothing (null), a single JMS server, or a single SAF agent.
- A resource group template scoped subdeployment can only reference a JMS server or SAF agent that is defined in the same resource group template.
- A resource group scoped subdeployment can only reference a JMS server or SAF agent that is defined in the same resource group or in the resource group template optionally referenced by the resource group.

JMS Module Resources

The following table shows JMS module resource types targeting rules.

Resource Type	Using a Subdeployment	Using Default Targeting
Standalone (Singleton) Destination	May only target a subdeployment which targets a JMS server which in turn references a store with a `Singleton` Distribution Policy.	Will only deploy if there is a single configured JMS server in the same resource group or resource group template scope that references a `Singleton` Distribution Policy store. In which case, the destination will deploy on this particular JMS server. JMS servers that reference `Distributed` Distribution Policy stores are ignored, and JMS servers defined outside the scope, for example, at the domain level or in another resource group or resource group template, are also ignored.

Resource Type	Using a Subdeployment	Using Default Targeting
Uniform Distributed Destination*	May only target a subdeployment which targets a JMS server which in turn references a store with a `Distributed` Distribution Policy	Will only deploy if there is a single configured JMS server in the same resource group or resource group template scope that references a `Distributed` Distribution Policy store. In which case, the destination will deploy on this particular JMS server. JMS servers that reference `Singleton` Distribution Policy stores are ignored, and JMS servers defined outside the scope, for example, at the domain level or in another resource group or resource group template, are also ignored.
SAF Imported Destination	May only target a subdeployment which targets a SAF agent.	Will only deploy when there is a single configured SAF agent in the same resource group or resource group template scope. SAF agents defined outside the scope, for example, at the domain level or in another resource group or resource group template, are also ignored.
Connection Factory	May target any subdeployment.	Will deploy to all WLS server instances that are encompassed by the resource group's target.
Foreign Server	May only target a subdeployment which targets a JMS server which in turn references a store with a `Distributed` Distribution Policy. Best practice is to use Default Targeting instead	Will deploy to all WLS server instances that are encompassed by the resource group's target.

* **Note**: Resource group or resource group template scoped uniform distributed topics must specify a `Partitioned` Forwarding Policy. For example, they must be a Partitioned Distributed Topic (PDT). Be aware that the word "Partitioned" in a PDT does not have the same meaning as the word "partition" in a WebLogic Server MT partition. PDTs and WebLogic Server MT partitions are two independent concepts. For information about the trade-offs for using PDTs, see Limitations.

16.4 Configuring Partition Specific JMS Overrides

Resource group template scoped JMS configuration artifacts might not be complete because they lack or have incorrect values that are specific to partitions that use the resource group template. Each partition may need to have the appropriate override values specified to customize the template-derived values for correct deployment to the partition runtime. Partition specific, resource group scoped JMS configuration can be customized on a per-partition basis using resource deployment plans or application deployment plans. In addition, JMS foreign server configuration within a JMS system module can be customized using JMSSystemResourceOverrideMBeans.

Resource overriding allows system administrators to customize JMS resources and other resources such as data sources at the partition level. If you create a partition with a resource group that extends a resource group template, you can override settings for certain resources defined in that resource group template. If you create a resource group within the partition that does not extend a resource group template and then

create resources within this resource group, you don't need overrides; you can just set partition-specific values for these resources.

Overrides are used mainly when there is a common definition for a resource, such as in a resource group template, that needs each partition that uses the resource to isolate its remotely stored state. For example, the same JMS server, JDBC store, data source, and JMS module configuration can be deployed to multiple partitions in the same cluster by configuring them in a single resource group template and configuring a resource group in each partition to reference the resource group template. The partition resource groups can then be overridden on a per-partition basis to ensure that their respective data sources connect to different databases or to different schemas within the same database.

In detail, system administrators can override resource definitions in partitions using the following specific techniques:

- Resource override configuration MBeans—a configuration MBean which exposes a subset of attributes of an existing resource configuration MBean. Any attribute set on an instance of an overriding configuration MBean will replace the value of that attribute in the corresponding resource configuration MBean instance. Foreign JMS server and related configuration artifacts in a JMS system module can use override MBeans to override the user, password and provider URL settings. If you use override MBeans, you must define a separate override MBean for each corresponding foreign JMS server and related deployment Beans. Configuration changes to these attributes that are made at runtime after a JMS module has already been deployed require that the partition or JVM be restarted for the changes to take effect.
- Resource deployment plans—an XML file which identifies arbitrary configured resources within a partition and overrides attribute settings on those resources. Persistent stores, JMS servers, SAF agents, messaging bridges, bridge destinations, and path services use the `config-resource-override` element in a resource deployment plan, while JMS resources in a JMS system module, such as queues, topics, and connection factories, use the `external-resource-override` element.
- Partition-specific application deployment plans—similar to existing application deployment plans, this allows administrators to specify a partition-specific application deployment plan for each application deployment in a partition. For information about partition-specific application deployment plans, see Using Partition-Specific Deployment Plans.

Administrators can combine any of these resource overriding techniques. The system applies them in the following, ascending order of priority:

- `config.xml` and external descriptors, including partition-specific application deployment plans.
- Resource deployment plans.
- Overriding configuration MBeans.

  If an attribute is referenced by both a resource deployment plan and an overriding configuration MBean, the overriding configuration MBean takes precedence.

For more information about overrides, see Configuring Resource Overrides.

16.5 Accessing Partition Scoped Messaging Resources Using JNDI

In order to access JMS resources in a partition, an application first needs to establish a JNDI initial context to the partition. Once you create a context for a partition, the

context object sticks to the partition's namespace so that all subsequent JNDI operations occur within the scope of the partition. When the context is created with a `java.naming.provider.url` property set, JNDI is partition-aware by looking up the partition information from the provider URL value. The following four different URL types will associate the context with a particular partition:

- Specifying no URL.
- Using a URL that specifies a partition's virtual host or URI.
- Using a URL that specifies a partition's dedicated port.
- Using a special `local:` URL. See Local Cross-Partition Use Cases Using `local:` URLs or Decorated JNDI Names.

In addition, an existing context can be used to reference a resource in another partition by prepending special scoping strings to JNDI names.

Each of these methods are described in the following sections.

16.5.1 Specifying No URL

An application that is running in a partition on a WebLogic Server instance can access JMS resources in its own local partition simply by creating a local initial context without specifying any provider URL. This approach is the best practice for creating locally scoped contexts.

16.5.2 Specifying a Partition Virtual Host or Partition URI

If a context URL matches a virtual host URL or URI that is configured for a partition, then JNDI creates the context for that partition and all requests from the context are delegated to the partition's JNDI name space.

A JMS application can therefore access a WLS JMS resource that is running in a different JVM or WLS cluster using the `t3` or `HTTP` protocol by supplying a URL of the form:

- `t3://virtualhost:port`
- `t3://host:port/URI`

> **Note:** A misspelled or non-existent URI may cause a context to scope to the domain level without warning.

16.5.3 Specifying a Dedicated Port URL

It is possible to dedicate a specific port or address to a channel in a partition, in which case the URL format becomes `t3://host:port`.

This is the only supported method for pre-12.2.1 clients to interoperate with partition scoped resources.

For more information, see Configuring Virtual Targets.

> **Note:** This method doesn't currently support SSL when used for interoperability with previous releases.

16.5.4 Local Cross-Partition Use Cases Using `local:` URLs or Decorated JNDI Names

An application in one partition can access another partition on the same WebLogic Server instance or in the same cluster using one of the URLs described in the previous section.

However, in order to support access across partitions that reside on the same server more efficiently without a need to specify a specific host, port, or URI, an application has the following options.

- Create a context with a `local:` protocol URL:
  - `local://`—Creates the context on the current partition, which can be either a partition or the domain.
  - `local://?partitionName=DOMAIN`—Creates the context on the domain.
  - `local://?partitionName=partition_name`—Creates the context on the partition *partition_name*.
- Create a context without specifying a URL, and then prefix an explicit scope when specifying a JNDI name:
  - `domain:<JNDIName>`—Looks up the JNDI entry in the domain level.
  - `partition:<partition_name>/<JNDIName>`—Looks up the JNDI entry in the specified partition.

16.6 Partition Associations in JMS

The following sections describe various JMS partition associations.

16.6.1 Partition Association Between Connection Factories and Their Connections or JMS Contexts

JMS client connections and JMS contexts are permanently associated with the partition from which their connection factory was obtained, and will not change their partition based on the partition associated with the current thread.

16.6.2 Partition Association with Asynchronous Callbacks

When JMS pushes messages or exceptions to an asynchronous listener, or similarly pushes events to a destination availability listener or an asynchronous send completion listener, the listener's local partition ID (instead of the destination's partition) will be associated with the callback thread. The local partition ID is the partition associated with the thread that created the asynchronous listener.

16.6.3 Connection Factories and Destinations Need Matching Scopes

A connection factory can only interact with a destination defined in the same partition as the connection factory. For example a QueueBrowser, MessageConsumer/JMSConsumer, TopicSubscriber, or MessageProducer/JMSProducer client object can only communicate with a destination if the connection factory that was used to create these client objects was defined in the same partition as the destination. Furthermore a connection factory can only interact with a destination that is obtained from the same cluster or server JVM as the connection factory.

16.6.4 Temporary Destination Scoping

Prior to the 12.2.1 release, JMS servers could only be deployed at the domain level and a temporary destination could only be hosted by JMS servers that both:

- Set `Hosting Temporary Destinations` to true (the default).
- Are hosted on the same WLS server instance or in the same cluster as the connection factory used to create the temporary destination.

The behavior for creating a temporary destination in WebLogic Server MT is:

- As in WLS (non-MT), a temporary destination can only be hosted by any JMS server that has `Hosting Temporary Destinations` enabled and that is hosted on the same WLS server instance or in the same cluster as the connection factory used to create the temporary destination.
- If a JMS connection was created using a connection factory that is configured in a resource group or resource group template scope (including domain resource groups), its temporary destinations will only be hosted by a JMS server that is configured in the same scope.
- If a JMS connection was created using a non resource group or resource group template scoped partition-level connection factory, it is allowed to create temporary destinations on any JMS server from the same partition as the connection factory. The non resource group or resource group template scoped partition-level connection factories are simply the default connection factories, for example the connection factories with JNDI names `weblogic.jms.ConnectionFactory` or `weblogic.jms.XAConnectionFactory`.
- If a JMS connection was created using a non resource group or resource group template scoped domain-level connection factory, it is allowed to create temporary destinations on any JMS server at the domain level including JMS servers that are scoped to domain-level resource groups.

If there is no qualified JMS server found within the allowed scope, an attempt to create a temporary destination will return an exception.

16.7 Managing Partition Scoped Messaging Components

The following sections describe managing certain aspects of partition scoped messaging.

16.7.1 Runtime Monitoring and Control

All existing messaging runtime MBeans are supported for monitoring and controlling partition scoped JMS configuration and deployments and are accessible to JMX-based management clients. Partition scoped JMS runtime MBeans are located under their corresponding ParititionRuntimeMBean instances.

For example:

- The JMS Server, Connection, and PooledConnection runtime MBeans are placed in the runtime MBean hierarchy under `serverRuntime/PartitionRuntimes/partition/JMSRuntime`
- The SAF runtime MBeans are placed in the runtime MBean hierarchy under `serverRuntime/PartitionRuntimes/partition/SAFRuntimeMBean`
- The messaging bridge and path service runtime MBeans are placed in the runtime MBean hierarchy directly under `serverRuntime/PartitionRuntimes/partition`

For more information, see Monitoring and Debugging Partitions.

16.7.2 Managing Partition Scoped Security

Security roles and policy definitions related to partition messaging configuration is the responsibility of the WLS system administrator.

WebLogic Server MT expands upon the traditional WebLogic Server security support in two significant ways:

- Multiple realms—WebLogic Server MT supports multiple active security realms and allows each partition to execute against a different realm.
- Identity domains—an identity domain is a logical namespace for users and groups, typically representing a discrete set of users and groups in the physical datastore. Identity domains are used to identify the users associated with particular partitions.

Otherwise, configuring security for a partition scoped messaging is similar to setting up security for domain-level messaging. For more information, see Configuring Security.

16.7.3 Managing Transactions

All JTA transactions in a JVM are serviced by a single JTA transaction manager regardless of scope. Partition scoped XA resource manager names are automatically qualified with their partition name so that the resource managers are uniquely identified to the transaction manager and are managed independently. One example of a resource manager is a persistent store.

For more information on transaction configuration and restrictions, see Configuring Transactions.

16.7.4 Managing Partition and Resource Group Lifecycle Operations

A JMS artifact that is associated with a partition or resource group can be started and shutdown by starting and shutting down its partition or resource group. Permissions to perform these operations are automatically supplied to the WLS system administrator and operator.

16.7.5 Partition Scoped JMS Diagnostic Image Sources

The messaging component does not support the ability to scope a diagnostic image to a partition. For more information, see Configuring Partition Scope Diagnostic Image Capture.

16.7.6 Partition Scoped JMS Logging

Partition scoped JMS log messages are qualified with the partition ID and name when the domain log format is not configured. For more information on logging, see Monitoring and Debugging Partitions.

16.7.7 Message Lifecycle Logging

Optionally enabled, JMS server and SAF agent message lifecycle logging is placed in locations that are different when these services are scoped to a partition. The logging files are in their partition's directory. Furthermore, the log file names of different

runtime JMS server and SAF agent instances of a cluster-targeted JMS server or SAF agent are guaranteed to be disambiguated.

The expected new log locations are summarized below when configuring an absolute path, a relative path, or the default.

	Nothing Configured (default)	/<absolute-path>/<file>	/<relative-path>/<file>
Domain Level	<domain-log>/<log-suffix>/<instance>-jms.messages.log	/<absolute-path>/<instance>-<file>	<domain-log>/<relative-path>/<instance>-<file>
Partition	<partition-log>/<log-suffix>/<instance>-jms.messages.log	Same as <relative-path>*	<partition-log>/<relative-path>/<instance>-<file>

* **Note** that partition scoped configuration treats absolute paths as relative paths.

<domain-log> = <domain>/servers/*<wl-server-name>*

<partition-log> = <domain>/partitions/*<partition-name>*/system/servers/*<wl-server-name>*

<log-suffix> = logs/jmsservers/*<configured-name>* (for JMS servers)

<log-suffix> = logs/safagents/*<configured-name>* (for SAF agents)

<instance> =

- *<configured-name>*, when JMS server or SAF agent is single server targeted.
- *<configured-name>_<wl-server-name>*, when cluster targeted and store's Distribution Policy=Distributed.

  (Note that an instance keeps its old name even as it migrates from one WLS server instance to another.)
- *<configured-name>_01*, when cluster targeted and store's Distribution Policy=Singleton.

16.7.8 Admin Helpers

There are two JMS specific Java administration programming utilities that provide helper methods for configuring and monitoring JMS resources.

The JMSModuleHelper contains helper methods for locating JMS runtime MBeans (for monitoring) as well as methods to manage (locate/create/delete) JMS module configuration entities (descriptor beans) in a given module.

The JMSRuntimeHelper provides convenient methods for obtaining the corresponding JMX runtime MBean given a JMS object such as a connection, destination, session, message producer, or message consumer.

In 12.2.1, the enhanced version of the helpers are provided to handle both domain scoped and resource group or resource group template scoped JMS resources.

The existing JMSRuntimeHelper is enhanced to be partition aware. When calling a runtime helper method, it is required that the specified JNDI context and the specified JMS object must belong to the same partition (otherwise an exception is thrown).

The enhanced JMSModuleHelper is scope-aware and contains the following interface and classes.

- `weblogic.jms.extensions.IJMSModuleHelper`—an interface that defines all helper methods.
- `weblogic.jms.extensions.JMSModuleHelper`—the pre-12.2.1 version of the JMS module helper, which only handles domain-level JMS resources.
- `weblogic.jms.extensions.JMSModuleHelperFactory`—a factory which creates an instance of a JMS module helper that works in a specific scope given an initial context to the Administration Server, a scope type (domain, resource group or resource group template), and the name of the scope.

The following code snippet demonstrates how to create a JMS module helper for each of the three different scopes.

```
Context ctx = getContext(); // get an initial JNDI context

JMSModuleHelperFactory factory = new JMSModuleHelperFactory();

   // create a JMS module helper for domain level

IJMSModuleHelper domainHelper = factory.getHelper(ctx,
IJMSModuleHelper.ScopeType.DOMAIN, null);

   // create a JMS module helper for Resource Group "MyResourceGroup"

IJMSModuleHelper rgHelper = factory.getHelper(ctx,
IJMSModuleHelper.ScopeType.RG, "MyResourceGroup");

   // create a JMS module helper for Resource Group Template
"MyResourceGroupTemplate"

IJMSModuleHelper rgtHelper = factory.getHelper(ctx,
IJMSModuleHelper.ScopeType.RGT, "MyResourceGroupTemplate");
```

Once a JMS module helper instance is created, you can use it to create JMS resources that are scoped to the corresponding scope. For example, the following example code creates a JMS system resource with a JMSQueue on JMS server `MyJMSServer` in the resource group `MyResourceGroup`. (It assumes that the JMS server and resource group have already been created.)

```
String jmsServer = "MyJMSServer";

String jmsSystemModule = "MyJMSSystemModule";

String queue = "MyQueue";

String queueJNDI = "jms/myQueue";

rgHelper.createJMSSystemResource(jmsSystemModule, null);

rgHelper.createQueue(jmsSystemModule, jmsServer, queue, queueJNDI, null);
```

16.7.9 File Locations

Persistent stores create a number of files in the file system for different purposes. Among them are file store data files, file store cache files (for file stores with a DirectWriteWithCache Synchronous Write Policy), and JMS server and SAF agent paging files.

Pre-12.2.1 file location behavior remains the same for the domain scoped persistent stores. This ensures that persisted data is recovered after an upgrade and that it is stored in the expected location. For partition scoped configuration, these files are placed in isolated directories within the partition file system in order to prevent file collisions among same-named stores in different partitions.

Here is a summary of the location of various files used by the file store system in WebLogic Server MT, where `partitionStem` = `partitions/<partitionName>/system`

Store Type	Store Path Not Configured	Relative Store Path	Absolute Store Path	File Name
custom file	<domainRoot>/<partitionStem>/store/<storeName>	<domainRoot>/<partitionStem>/store/<relativePath>/<storeName>	<absolutePath>/<partitionStem>/store/<storeName>	<storeName>NNNNNN.DAT
cache	${java.io.tmpdir}/WLStoreCache/${domainName}/<partitionStem>/tmp	<domainRoot>/<partitionStem>/<tmp>/<relativePath>	<absolutePath>/<partitionStem>/tmp	<storeName>NNNNNN.CACHE
ejb timers	<domainRoot>/<partitionStem>/store/_WLS_EJBTIMER_<serverName>	<domainRoot>/<partitionStem>/store/<relativePath>/_WLS_EJBTIMER_<serverName>	<absolutePath>/<partitionStem>/store/_WLS_EJBTIMER_<serverName>	_WLS_EJBTIMER_<serverName>NNNNNN.dat
paging	<domainRoot>/<partitionStem>/paging	<domainRoot>/<partitionStem>/paging/<relativePath>	<absolutePath>/<partitionStem>/paging	<jmsServerName>NNNNNN.TMP <safAgentName>NNNNNN.TMP

Here is a summary of how each of the above store types configure their directory location.

Store Type	Directory Configuration
custom file	The directory configured on a file store.
cache	The cache directory configured on a file store that has a DirectWriteWithCache Synchronous Write Policy.
default ejb timer store	The directory configured on the WLS default store's configuration. (Partition EJB timer default stores copy their configuration from the default store.)
paging	The paging directory configured on a SAF agent or JMS server.

16.8 Best Practices

This section provides advice and best practices for beginning JMS users as well as advanced JMS users in an MT environment.

- For MT-related known issues, Oracle recommends that all users review "Configuration Issues and Workarounds" in *Release Notes for Oracle WebLogic Server*.
- If for any reason, newly created or updated JMS resources are not accessible in a running partition, review the WebLogic Server log files for warning and error log messages. If the server log messages do not provide helpful information, a

partition restart may often resolve the issue. Note that a newly created partition has to be explicitly started before any of the resources are externally accessible.

- The following rules always apply in a resource group and resource group template scope:
  - Use a `Distribution Policy=Singleton` store for path services, and for JMS servers that host standalone destinations.
  - Use a `Distribution Policy=Distributed` store for SAF agents, and for JMS servers that host distributed destinations.
  - Configure cluster leasing in clusters which have:
    * `Distribution Policy=Singleton` stores or bridges.
    * `Migration Policy=On-Failure` or `Always` stores or bridges.
- For more general best practices related to using JMS, see "Best Practices for JMS Beginners and Advanced Users" in *Administering JMS Resources for Oracle WebLogic Server*.

16.9 Limitations

The following features in JMS or a related component are not currently supported in WebLogic Server MT:

- Client SAF forwarding into a partition.
  - The behavior is undefined.
  - Note that there is support for server-side SAF agents to forward into a partition.
- C client accessing resource group or resource group template scoped JMS resources; the behavior is undefined.
- .NET client—an exception is thrown if a .NET client accesses JMS resources in a partition.
- Replicated Distributed Topics (RDT)
  - The deployment of a JMS module to a resource group or resource group template that contains Replicated Distributed Topics (RDTs) will fail with an exception.
  - RDTs are the default type of uniform distributed topic and are configured with a Forwarding Policy of `Replicated`.
  - Workarounds include:
    * Configure a standalone (singleton) topic.
    * Configure a Partitioned Distributed Topic (PDT).

      *A PDT is configured by setting its Forwarding Policy to `Partitioned`.

      *For the advantages and limitations of a PDT, see "Configuring Partitioned Distributed Topics" in *Administering JMS Resources for Oracle WebLogic Server*.

      *Be aware that the word "Partitioned" in a PDT does not have the same meaning as the word "partition" in a WebLogic Server MT partition; PDTs and WebLogic Server MT partitions are two independent concepts.
- Default store

  - Using the WebLogic Server's default store in partitions is not allowed.
  - All JMS servers, SAF agents and path services in a resource group or resource group template are required to reference a custom store.
- Weighted Distributed Destinations (WDD)
  - The deployment of a JMS module to a resource group or resource group template that contains WDDs will fail with an exception.
  - Note that WDDs are deprecated.
- Connection Consumer and Server Session Pool
  - An attempt to create a partition scoped Connection Consumer or Server Session Pool will fail.
  - Note that a best practice is to use a Message Driven Bean (MDB), as MDBs serve a similar purpose.
- Logging Last Resource Data Sources (LLR)
  - The transaction system does not support the LLR feature in the partition scope.
  - For more information, including a potential workaround, see Configuring Transactions.
- Client interoperability using a dedicated partition channel using SSL
  - Old clients can only interoperate with a partition by configuring a dedicated channel for the partition.
  - This method does not currently support SSL.

17

Configuring and Programming JNDI

This chapter describes how to configure foreign JNDI providers in WebLogic Server Multitenant (MT). This chapter also describes programming JNDI in a partitioned domain, including resource-scoped, object-based partition association, binding and obtaining partition information, accessing resources over partitions, and clustered JNDI in partitions.

This chapter includes the following sections:

17.1 Configuring Foreign JNDI Providers: Overview

WebLogic Server provides a foreign JNDI API that enables you to access objects on a remote JNDI tree without having to connect directly to the remote tree.

In a partitioned environment, you can access objects on a JNDI tree either locally (in another partition on the same machine) or remotely.

By creating and configuring a foreign JNDI provider with the properties of the other partitions, you can look up and use an object that exists outside of a given partition. The properties you set for the foreign JNDI provider are used to create a new context that internally does the actual lookup and bind operations.

17.2 Configuring Foreign JNDI Providers: Prerequisites

Prior to creating and configuring a foreign JNDI provider for a partition, you must:

1. Create one or more virtual targets. See Configuring Virtual Targets
2. Create a resource group in the partition to use as the scope for the foreign JNDI provider in the partition. When creating the resource group, select one or more available virtual targets for the resource group. See Creating Resource Groups: Main Steps and Examples.

17.3 Configuring Foreign JNDI Providers: Main Steps

The procedure for configuring a foreign JNDI provider for a partition is the same as configuring one for a domain, with the following exceptions:

- Set the scope of the foreign JNDI provider to a resource group in the partition.
- If the foreign JNDI provider exists in a partition on another machine, set the provider URL like a common remote client. For example, for the t3 protocol, `t3://hostname:port/partition_name`.

To complete the foreign JDNI provider configuration, create one or more foreign JNDI links to associate local JNDI names with JNDI names on remote nodes.

17.4 Creating Foreign JNDI Providers: WLST Example

Example 17–1 shows how to use WLST to create a foreign JNDI provider and configure the username, password, provider URL and InitialContextFactory for the provider. It also shows how to create a foreign JNDI link for the provider.

Example 17–1 Creating and Configuring a Foreign JNDI Provider and Link

```
# connect to the Administration Server
connect('adminusername','adminpassword','t3://hostname:port')

# start an edit session
edit()
startEdit()

# change to the appropriate resource group directory for the partition for which
# you are creating the foreign JNDI provider.
cd('/Partitions/partition_name/ResourceGroups/resource_group_name')
cmo.createForeignJNDIProvider('provider_name')

cd('ForeignJNDIProviders/provider_name')
set('Password', 'password')
cmo.setUser('username')
cmo.setProviderURL('t3://hostname:port')
cmo.setInitialContextFactory('initialContextFactory')
# create a foreign JNDI link and configure it
cmo.createForeignJNDILink('link_name')
cd('ForeignJNDILinks/link_name')
cmo.setLocalJNDIName('local_JNDI_name')
cmo.setRemoteJNDIName('remote_JNDI_name')
save()
activate()
```

17.5 Creating Foreign JNDI Providers: Related Tasks and Links

See the following sections and documentation for additional information:

- Configuring Virtual Targets
- Configuring Resource Groups
- *Developing JNDI Applications for Oracle WebLogic Server*

17.6 Programming JNDI in a Partitioned Environment

WebLogic Server MT supports multiple partitions running in one domain. A given WebLogic Server instance may have several partitions running in parallel. JNDI resources in a partition are isolated per partition. JNDI resources with the same JNDI name may reside in multiple partitions.

This section describes key points to be aware of when programming JNDI in a partitioned environment versus a non-partitioned environment. It includes the following sections:

- Introduction to Partition-Scoped and Domain-Scoped JNDI Resources
- Object-Based Partition Association
- Obtaining the Partition Information of a Context
- Accessing JNDI Resources Remotely and Across Partitions
- Clustered JNDI in a Partitioned Environment
- Life Cycle of a Partitioned JNDI Resource

For additional information about programming JNDI, see *Developing JNDI Applications for Oracle WebLogic Server*.

17.6.1 Introduction to Partition-Scoped and Domain-Scoped JNDI Resources

In WebLogic Server, there is only one global JNDI tree that serves all requests for global JNDI resources. In WebLogic Server MT, however, there is a global JNDI tree for the domain and a global JNDI tree for each partition. JNDI resources in a partition are, by default, available only to the partition itself, although you can access such resources across partitions as described in Accessing JNDI Resources Remotely and Across Partitions. Therefore, by default, applications deployed at the partition level have access only to the JNDI resources within the partition and cannot access JNDI resources for other partitions or the domain.

For example, if you deploy an EJB with the global JNDI name `java:global/foo` to the domain and to multiple partitions on the same server, this results in `java:global/foo` being bound to the global JNDI tree for each of these partitions and to the global JNDI tree for the domain. This results in the following behavior:

- When you perform a lookup of `java:global/foo` from one partition, by default, JNDI returns the instance that is bound in the global JNDI tree for that partition.
- When you perform a lookup of `java:global/foo` from the domain, JNDI returns the instance that is bound to the global JNDI tree for the domain.

Here are some additional examples:

- `mail.MedRecMail Session` is bound to partitionA, partitionB, and the domain. JNDI lookup requests from an application in partitionA will get the session for partitionA, while JNDI lookup requests from an application in partitionB will get the session for partitionB. JNDI lookup requests from an application deployed in the domain will get the session for the domain.
- `weblogic.transaction.resources.dsXA` is bound only to partitionB. Lookup requests from applications deployed in partitionB will get the RmiDataSource. Requests from applications deployed in other partitions or the domain will get a `NameNotFoundException`.
- `java:global/wm/default` is bound only at the domain level. Only applications deployed in the domain can access it by default.

Note: Requests such as lookup or bind to application-scoped JNDI resources are isolated naturally because they are delegated to the application.

17.6.2 Object-Based Partition Association

When you create a JNDI context within a partition, the context object sticks to the partition namespace so that all subsequent JNDI operations are done within the context of the partition. When the JNDI context is created, the association to a specific partition is established by the specified provider URL property. If you create the JNDI context with the `java.naming.provider.url` property set, JNDI is partition-aware by looking up the partition information from the provider URL value. If you set the provider to be the virtual target URL that is configured for the partition, then JNDI creates the context for that partition and all requests from the context are delegated to the partition's JNDI resources.

Once the object-based context has been created, its operations are done using the partition JNDI tree.

17.6.3 Obtaining the Partition Information of a Context

Partition information is bound to the partition global JNDI tree when the partition tree is initialized. You can obtain the partition information of a context by looking up:

- `weblogic.partitionName`, which returns the context-based partition's partitionName. This will either be a partition name or `Domain` if it is a domain-scoped context.
- `weblogic.partitionId`, which returns the partition's partitionId. This will be zero, `0`, if it is a domain or a value greater than 0 if it is a partition.

17.6.4 Accessing JNDI Resources Remotely and Across Partitions

Partition JNDI resources can be accessed from remote, standalone Java code using the WebLogic Server client or code that resides on a remote WebLogic Server. This is done by setting the provider URL in the same way as you would do if you were accessing a remote single server JNDI tree.

WebLogic Server JNDI also enhances foreign JNDI providers to allow one partition to declare only a local JNDI name but actually point to other partition JNDI resources. You can configure a link entry to associate a local JNDI name with a partition JNDI resource.

17.6.4.1 Cross-Partition Authentication

JNDI context authentication is done when the context is being created. WebLogic Server JNDI makes sure that the authentication is processed in the partition to which the provider URL is associated, not the current partition. If no provider URL is set when creating the context, then the authentication is processed in the security realm associated with the current partition. The authenticated context is then pushed into the thread context for a permission check on the context in subsequent operations.

17.6.5 Clustered JNDI in a Partitioned Environment

The JNDI tree representing a cluster appears to the client as a single global tree. The tree containing the cluster-wide services is actually replicated across each WebLogic Server instance or partition in the cluster.

In a multitenant environment, when setting replicate binding to a JNDI resource, the bind, unbind, and rebind events are advertised to all cluster nodes.

17.6.6 Life Cycle of a Partitioned JNDI Resource

WebLogic Server maintains the life cycle of partition JNDI resources according to the partition life cycle:

- When a partition is created and started, the partition JNDI tree is created with the partition root node and becomes available.
- When a partition is shutting down, the entire partition JNDI tree is destroyed.

18

Configuring Partition Work Managers

This chapter describes Partition Work Managers and how to configure them. You can use Fusion Middleware Control (FMWC), the WLS Administration Console, WLST, or the REST APIs. The chapter refers to the Fusion Middleware and WebLogic Server documentation sets and online help for additional information as appropriate.

This chapter includes the following sections:

18.1 Partition Work Managers: Overview

Partition Work Managers set thread usage policy among partitions. You can configure them to limit the number of Work Manager threads in each partition, as well as to manage thread usage allocation based on thread usage time for each partition. The importance of regulating the relative thread usage is to provide proper quality of service (QoS) and fairness among various partitions that share the same WLS instance. Without it, a rogue application from one partition could starve thread resources from other partitions preventing them from functioning properly.

Partition Work Managers provide resource management within partitions. Administrators know about the runtime environment and how it will be shared. They configure Partition Work Managers at the domain level and assign them to partitions as they are created. These predefined Partition Work Managers let administrators standardize Work Manager configuration; for example, all partitions with business-critical applications can reference the business-critical Partition Work Manager.

Administrators might also want to customize the Partition Work Manager for a specific partition, or maybe for every partition. In this scenario, they configure the Partition Work Manager within (embedded in) the partition configuration. There is no need to predefine Partition Work Manager configurations for this use case.

You can define a Partition Work Manager in the domain to use with multiple domain partitions, or you can define Partition Work Manager attributes in the domain partition itself for use in that partition only. If no Partition Work Managers are defined, default values for Partition Work Manager settings are applied.

Partition Work Managers can be used in more than one domain partition. However, a domain partition can be associated with only one Partition Work Manager.

A partition configuration can include one of the following:

- `<partition-work-manager-ref>`—to refer to a Partition Work Manager that is configured at the domain level.
- `<partition-work-manager>`—to embed the Partition Work Manager settings within the partition configuration.
- Neither `<partition-work-mananger>` nor `<partition-work-manager-ref>`—to apply the default values for Partition Work Manager settings.

18.2 Configuring Partition Work Managers: Main Steps

Partition Work Managers define a set of policies that limit the usage of threads by Work Managers in partitions only. They do not apply to the domain.

The main steps for configuring a Partition Work Manager are as follows:

1. Enter a name for the Partition Work Manager.
2. Optionally, enter a Fair Share value, the desired percentage of thread usage for the partition compared to the thread usage of all partitions. Oracle recommends that the sum of this value for all partitions running in a WLS domain add up to 100. By default, a partition has a fair share value of 50.
3. Optionally, enter a Minimum Threads Constraint, the upper limit on the number of standby threads that can be created for satisfying the minimum threads constraints configured in the partition.

   A minimum threads constraint guarantees the number of threads the server will allocate to a Work Manager to avoid deadlocks. This could result in a Work Manager receiving more thread use time than its configured fair share, and thus, a partition getting more thread usage time than it should compared to other partitions in the same WLS server instance.

   You can optionally provide a limit on the minimum threads constraint value for each partition configured in the WLS domain. If configured, this imposes an upper limit on the minimum threads constraint values configured in a partition. If the sum of the configured values of all minimum threads constraints in a partition exceeds this configured value, a warning message will be logged and WLS will reduce the number of threads the thread pool will allocate for the constraints.

   There is no minimum threads constraint limit set on a partition by default.
4. Optionally, enter a Maximum Threads Constraint, the maximum number of concurrent requests that the self-tuning thread pool can process for a partition at any given time.

   A maximum threads constraint can be useful to prevent a partition from using more than its fair share of thread resources, especially in abnormal situations such as when threads are blocked on I/O, waiting for responses from a remote server that is not responding. Setting a maximum threads constraint in such a scenario would help ensure that some threads would be available for processing requests from other partitions in the WLS instance.
5. Optionally, enter a Shared Capacity Constraint, the total number of requests that can be present in the server for a partition as a percentage.

   The partition-shared capacity for Work Managers limit the number of work requests from a partition. This limit includes work requests that are either running or queued waiting for an available thread. When the limit is exceeded, WLS will start rejecting certain requests submitted from the partition. The value is expressed

as a percentage of the capacity of the entire WLS server as configured in the `sharedCapacityForWorkManagers` option of the `OverloadProtectionMBean` that throttles the number of requests in the entire WLS server instance. The partition-shared capacity for Work Managers must be a value between 1 and 100 percent.

18.3 Defining Partition Work Managers: WLST Example

The following examples show how to define Partition Work Managers using WLST.

18.3.1 Configuring Domain-Level Partition Work Managers: WLST Example

The following example creates and configures the domain-level Partition Work Manager, `myPartitionWorkManager`.

```
# Creates a Partition Work Manager at the domain level
edit()
startEdit()
cd('/')
cmo.createPartitionWorkManager('myPartitionWorkManager')
activate()

# Configures the Partition Work Manager
startEdit()
cd('/PartitionWorkManagers/myPartitionWorkManager')
cmo.setSharedCapacityPercent(50)
cmo.setFairShare(50)
cmo.setMinThreadsConstraintCap(0)
cmo.setMaxThreadsConstraint(-1)
activate()
```

18.3.2 Associating Partition Work Managers With Partitions: WLST Example

Partition Work Managers can be used in more than one domain partition. However, a domain partition can be associated with only one Partition Work Manager. The following example associates the domain-level Partition Work Manager, `myPartitionWorkManager` with the partition, `Partition-0`.

```
# Associate a domain-level Partition Work Manager with a Partition
edit()
startEdit()
cd('/Partitions/Partition-0')
cmo.destroyPartitionWorkManager(None)
cmo.setPartitionWorkManagerRef(getMBean('/PartitionWorkManagers/myPartitionWorkMan
ager'))
activate()
```

18.3.3 Defining Partition Work Manager Attributes in a Partition: WLST Example

The following example defines Partition Work Manager attributes in the domain partition, `Partition-1`, for use in that partition only.

```
# Defines Partition Work Manager attributes within the partition
edit()
startEdit()
cd('/Partitions/Partition-1')
```

```
cmo.createPartitionWorkManager('Partition-1-PartitionWorkManager')

cd('/Partitions/Partition-1/PartitionWorkManager/Partition-1-PartitionWorkManager'
)
cmo.setSharedCapacityPercent(50)
cmo.setFairShare(50)
cmo.setMinThreadsConstraintCap(0)
cmo.setMaxThreadsConstraint(-1)
activate()
```

In the `config.xml` file, notice the Partition Work Manager element defined in `Partition-0` and `Partition-1`:

```
  <partition>
    <name>Partition-0</name>
    <resource-group>
      <name>default</name>
    </resource-group>
    <default-target>VirtualTarget-0</default-target>
    <available-target>VirtualTarget-0</available-target>
    <realm>myrealm</realm>
    <partition-id>318e0d69-a71a-4fa6-bd7e-3d64b85ec2ed</partition-id>
    <system-file-system>
      <root>C:\Oracle\Middleware\Oracle_Home\user_projects\domains\base_
domain/partitions/Partition-0/system</root>
      <create-on-demand>true</create-on-demand>
      <preserved>true</preserved>
    </system-file-system>

<partition-work-manager-ref>myPartitionWorkManager</partition-work-manager-ref>
  </partition>
  <partition>
    <name>Partition-1</name>
    <resource-group>
      <name>default</name>
    </resource-group>
    <default-target>VirtualTarget-1</default-target>
    <available-target>VirtualTarget-1</available-target>
    <realm>myrealm</realm>
    <partition-id>8b7f6bf7-5440-4edf-819f-3674c630e3f1</partition-id>
    <system-file-system>
      <root>C:\Oracle\Middleware\Oracle_Home\user_projects\domains\base_
domain/partitions/Partition-1/system</root>
      <create-on-demand>true</create-on-demand>
      <preserved>true</preserved>
    </system-file-system>
    <partition-work-manager>
      <name>Partition-1-PartitionWorkManager</name>
      <shared-capacity-percent>50</shared-capacity-percent>
      <fair-share>50</fair-share>
      <min-threads-constraint-cap>0</min-threads-constraint-cap>
      <max-threads-constraint>-1</max-threads-constraint>
    </partition-work-manager>
  </partition>
  <partition-work-manager>
    <name>myPartitionWorkManager</name>
    <shared-capacity-percent>50</shared-capacity-percent>
    <fair-share>50</fair-share>
    <min-threads-constraint-cap>0</min-threads-constraint-cap>
    <max-threads-constraint>-1</max-threads-constraint>
```

```
  </partition-work-manager>
</domain>
```

18.4 Configuring Partition Work Managers: Related Tasks and Links

For additional information, see the following:

- "WebLogic Server Partition Work Managers" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.
- "Partition Work Managers" in *Oracle WebLogic Server Administration Console Online Help*.

19

Migrating a WebLogic Server Domain to a Domain Partition

This chapter describes how to migrate a WebLogic Server domain to a domain partition. The Domain to Partition Conversion Tool (D-PCT) provides the ability to migrate existing applications and resources from a non-multitenant domain to a multitenant domain partition.

This chapter includes the following sections:

19.1 Migrating a WebLogic Server Domain to a Domain Partition: Overview

WebLogic Server Multitenant (MT) supports multiple independent partitions within a WebLogic Server domain. Partitions provide isolation of applications, resources, security, and so on, from other partitions in the same domain. For information about configuring WebLogic Server MT, see Configuring WebLogic Server Multitenant (MT): The Big Picture.

The Domain to Partition Conversion Tool (D-PCT) provides the ability to migrate an existing WebLogic Server release 10.3.6, 12.1.2, 12.1.3 or 12.2.1 domain to a partition in a WebLogic Server 12.2.1 domain. It consists of two tools: an export tool, which is used on the WebLogic Server installation that hosts the source domain; and an import tool, which is used on the target WebLogic Server 12.2.1 installation.

You can use D-PCT to create and configure partitions, resource groups, and resource group templates. By default, D-PCT moves all applications, libraries, and resources to the new partition. Optionally, it also provides a mechanism for selecting individual applications, libraries, and resources.

Note: The domain's cluster and server configurations are not applicable to a partition. Therefore, they are not mapped to the new 12.2.1 partition.

19.2 Migrating a WebLogic Server Domain to a Domain Partition: Prerequisites

Before you configure D-PCT, you must fulfill the following prerequisites:

- The target domain must be configured on a WebLogic Server 12.2.1 installation.
- You must download and install JDK 8 on the host machine of the source domain. This is required for running the export tool on WebLogic Server 10.3.6.
- Download and install patch `22644507` on the target WebLogic Server 12.2.1 installation. This patch enables the correct operation of the partition importing functionality. You can download this patch by specifying the patch ID from My Oracle Support at `http://support.oracle.com`.

  Oracle recommends using OPatch to install this patch. For more information, see "About OPatch" in *Patching with OPatch*.
- The target WebLogic Server 12.2.1 domain must be up and running.
- For a straightforward conversion from a domain to a partition and to ensure correct operation of the import tool to create a virtual target based on the JavaScript Object Notation (JSON) file, it is important that the target and source domains have identical cluster and server names.

  By default, the import tool creates virtual targets with the specified name and target in the JSON file. However, Oracle recommends that you manually configure virtual targets before the import operation. If you preconfigure virtual targets before using the import tool, then you must ensure that you modify the `partition` attribute of the JSON file, where you must specify the name of the existing virtual target that you created at the target domain for this partition to use.
- Before using the import tool to create a new partition, you must ensure that the new domain is configured the same as the source domain with regard to servers, clusters, virtual targets, and security realms. For information about importing partitions, see Exporting and Importing Partitions.

19.3 Migrating a WebLogic Server Domain to a Domain Partition: Main Steps

The main steps for configuring the Domain to Partition Conversion Tool (D-PCT) are as follows:

- Preparing to Export the WebLogic Server Domain Applications Environment
- Exporting the WebLogic Server Domain Applications Environment
- Using the JSON File to Override Defaults During Import
- Importing an Applications Archive File to a Domain Partition

19.3.1 Preparing to Export the WebLogic Server Domain Applications Environment

Perform the following tasks to prepare to export the WebLogic Server domain application environment:

1. Download the domain export tool zip distribution to the host machine where the source WebLogic Server domain is configured. The domain export tool is available for download from Oracle Technical Network at the following location:

http://www.oracle.com/technetwork/middleware/weblogic/downloads/wls-for-dev-1703574.html

2. Unzip the `wls1221_D-PCTx.zip` file that you downloaded. You can unzip this file to any preferred directory. Oracle recommends creating a separate directory for the export tool. You must unzip the export tool zip distribution into this directory, and then run the export tool script from it as well.

   This zip distribution consists of the following files:

   - `README.txt` -a file that contains documentation for installing and running the Domain to Partition Conversion Tool (D-PCT).
   - `exportDomainForPartition.sh` - a UNIX script that executes at the source WebLogic Server domain to export domain applications.
   - `exportDomainForPartition.cmd` - a Windows script that executes at the source WebLogic Server domain to export domain applications.
   - `com.oracle.weblogic.management.tools.migration.jar` - a JAR file that contains the Python script and Java classes used for exporting the source domain to a domain archive file.

   Note: The classes in `com.oracle.weblogic.management.tools.migration.jar` are built with JDK 8. Therefore, to run the export tool on WebLogic Server 10.3.6, the export script must be run with JDK 8 which might not be the JDK version used normally with WebLogic Server 10.3.6 installation. Before running the export script, ensure that you set the JAVA_HOME variable accordingly.

3. Create a key file that contains a string to use as the encryption key to encrypt attributes in the partition archive file. The path must be reachable by the Administration Server. The size of the key string must range between 1to 32 characters.

19.3.2 Exporting the WebLogic Server Domain Applications Environment

To export the WebLogic Server domain applications, you must run the export script on the host machine where the source WebLogic Server domain Administration Server resides.

- The syntax for the arguments passed to this script on UNIX is:

```
exportDomainForPartition.sh ORACLE_HOME DOMAIN_HOME [keyFile] [TOOL_JAR] [app_
name] [INCLUDE_APP_BITS={true|false}]
```

- The syntax for the arguments passed to this script on Windows is:

```
exportDomainForPartition.cmd ORACLE_HOME DOMAIN_HOME [keyFile] [TOOL_JAR] [app_
name] [INCLUDE_APP_BITS={true|false}]
```

Before running the script on Windows, perform the following tasks:

1. Open a command shell and change to the directory where you unzipped the export tool distribution.
2. Set the `JAVA_HOME` environment variable to the path of your JDK 8 installation as shown in the following example:

```
C:\> set JAVA_HOME=C:\jdk1.8.0
```

Note: Oracle recommends that you do not make any configuration changes at the source domain during the export operation.

This script accepts the arguments described in the following table.

Argument	Description
ORACLE_HOME	The name of the Oracle home directory where WebLogic Server is installed. This argument can be specified as the `name=value` pair. For example, `ORACLE_HOME=/Oracle/Middleware/Oracle_Home`.
DOMAIN_HOME	The full path to the source WebLogic Server domain. This argument can be specified as the `name=value` pair. For example, `DOMAIN_HOME=/Oracle/Middleware/Oracle_Home/user_projects/domains/medrec`.
keyFile	Optional. The full path to a file containing a string to use as the encryption key to encrypt attributes in the partition archive file. The Administration Server must have access to this path.
TOOL_JAR	Path to the `com.oracle.weblogic.management.tools.migration.jar` file. This argument is optional if the JAR file is located in the same directory as the `exportDomainForPartition.sh` script.
app_name	Optional. The list of application names to export. If not specified, all applications in the domain are exported.
`INCLUDE_APP_BITS`	Optional. A flag to indicate whether the application binary files are included in the archive file. This value defaults to `true`, which means the binary files are included. If `false`, then those files are excluded.

Exporting the WebLogic Server Domain Applications: Examples

Example 19–1 Running the Export Domain Script on UNIX

In UNIX, the following example exports the domain from the path, `/Oracle_Home/user_projects/domains/base_domain`. The argument `/usr/myUserKeyFile` is the path to the encryption key file and `download/com.oracle.weblogic.management.tools.migration.jar` is the path to the export tool JAR file.

```
exportDomainForPartition.sh /Oracle_Home /Oracle_Home/user_projects/domains/base_
domain /usr/myUserKeyFile
/download/com.oracle.weblogic.management.tools.migration.jar
```

Example 19–2 Running the Export Domain Script on Windows

In Windows, the following example exports the domain from the path, `Oracle_Home\\user_projects\\domains\\base_domain`. The argument `myKeyfile` is the encryption key file and `oracle.weblogic.management.tools.migration.jar` is the export tool JAR file.

```
exportDomainForPartition.cmd C:\\Oracle_Home C:\\Oracle_Home\\user_
```

```
projects\\domains\\base_domain myKeyfile
C:\\com.oracle.weblogic.management.tools.migration.jar
```

Note: While running the export domain script on a Windows command shell, you *must* escape the path separators.

19.3.3 Using the JSON File to Override Defaults During Import

During the operation of exporting the WebLogic Server domain applications, a JSON text file is generated and stored both as an archive file and a separate file that can be edited and modified. This file specifies default values for the partition that is created during the import operation. However, you can edit the JSON file to override the default values. For instance, the JSON file specifies a default virtual target name. If you want to create a virtual target with a different name, then you can edit the JSON file to alter the value in the `virtual-target` section.

The following example shows a sample JSON file that is generated by the export tool and illustrates both the JSON file objects and attributes, and how they can be overridden:

```
 {
 "virtual-target" :
    [ { "name":"${PARTITION_NAME}-AdminServer-virtualTarget" ,
"target":"AdminServer" , "uri-prefix":"/${PARTITION_NAME}" } ]
 "app-deployment":
    [{"name":"testApp1","exclude-from-import":"false"}],
 "persistence-store":
    [{"name":"WseeSoapjmsFileStore_auto_
1","exclude-from-import":"false"},{"name":"WseeSoapjmsFileStore_auto_
2","exclude-from-import":"false"}],
 "jms-server":
    [{"name":"WseeSoapjmsJmsServer_auto_
1","exclude-from-import":"false"},{"name":"WseeSoapjmsJmsServer_auto_
2","exclude-from-import":"false"}],
 "jms-system-resource":
    [{"name":"testJMSModule", "exclude-from-import":"false",

"sub-deployment":[{"name":"testJmsServer","exclude-from-import":"false"}]},
     {"name":"WseeSoapjmsJmsModule","exclude-from-import":"false",

"sub-deployment":[{"name":"WseeSoapjmsJmsServer649564037","exclude-from-import":"f
alse"}]}],

 "resource-group-template" : { "name":"${PARTITION_NAME}-RGTemplate"  },

 "partition" : {
          "default-target" : [ {"virtual-target":{ "name":"${PARTITION_
NAME}-AdminServer-virtualTarget" }} ],
          "jdbc-system-resource-override" : [ { "name":"MedRecGlobalDataSourceXA"
,
                                               "url":"__EXISTING_VALUE__" ,
                                               "user" : "__EXISTING_VALUE__" ,
                                               "password-encrypted" : "__
EXISTING_VALUE__" } ],
          "jms-system-resource-override":[
                                      {"name":"testJMSModule",
                                       "foreign-server-override":[
                                                  {"name":"ForeignServer1",
                                                   "foreign-destination-override":[
```

```
{"name":"ForeignDestination1",
                                                                "remote-jndi-name":"__
EXISTING_VALUE__"},

{"name":"ForeignDestination2",
                                                                "remote-jndi-name":"__
EXISTING_VALUE__"}],
                                        "foreign-connection-factory-override":[

{"name":"ForeignConnectionFactory1",
                                                                  "remote-jndi-name":"__
EXISTING_VALUE__",
                                                                  "username":"__EXISTING_
VALUE__" }]
                                                                }]
                                    }],
          "realm":"__EXISTING_VALUE__",
          "available-target":[ {"virtual-target":{ "name":"${PARTITION_
NAME}-AdminServer-virtualTarget" }} ]
     }
 }
```

The following table describes the objects and attributes that can be edited or modified in the JSON file.

Objects and Attributes in the JSON File that Can Be Edited	Notes
Root level object `"virtual-target"`	By default, the import tool creates virtual targets as shown in the sample file. Oracle recommends that you manually configure virtual targets before the import operation. For information about configuring virtual targets, see Configuring Virtual Targets. Ensure that you remove this object and any related value to prevent the automatic creation of virtual targets during the import operation.
Object `"partition"`	This object specifies elements and values required for the creation of the partition. If you have already manually created virtual targets for this partition, then replace the `"virtual-target"` value (within `"default-target"` and `"available-target"`) with the name of the existing virtual target.
Object `"resource-group-template"`	To override the default resource group template name, edit the `"name"` value.
Attribute `"exclude-from-import"`	This attribute determines whether to exclude a particular object or resource from importing to a partition. See Migrating a WebLogic Server Domain to a Domain Partition: Limitations for restrictions on JMS and JDBC resource targeting in partitions. Set this value to `true` to prevent an object or a resource from importing to a partition. The default value is `false`.

19.3.4 Importing an Applications Archive File to a Domain Partition

Prior to importing the domain application archive file ensure that the target WebLogic Server 12.2.1 domain is up and running.

To create a new partition in the WebLogic Server 12.2.1 domain and import the applications archive file to the newly created domain partition, perform the following steps using WLST commands in the online mode.

1. Connect to the target WebLogic Server domain where you want to import the domain archive file, as shown in the following example:

   ```
   connect('user', 'mypassword', 't3://myserver:7001')
   ```

2. Run the `importPartition` command using the following syntax:

   ```
   importPartition( archiveFileName , partitionName , createRGT=true|false ,
   userKeyFile )
   ```

   The command is asynchronous and returns the MBean `ImportExportPartitionTaskMBean`. This command can be used to obtain the result of the import operation in the following manner:

   ```
   result = importPartition( .... )
   ```

   You can use `print result.getState()` to obtain the import result state or `print result.getError()` to see the error message in case the import operation fails. For more information about this command, see *WLST Command Reference for WebLogic Server*.

   The following table describes the arguments that must be specified for the `importPartition` command.

Argument	Description
archiveFileName	The full path to the domain archive file you want to import. This command looks for the <*domain name*>`-attributes.json` file in the specified location of the domain archive file. If this file already exists in the specified location, then the values in this file are overwritten by the values in the archive file.
partitionName	The name for the partition that is created in the target domain.
createRGT	A flag that indicates whether to create a resource group template for all the resources in the archive file. Set to `true` if you want to create a resource group template, or set to `false` if you want all resources to be added directly to the resource group of the new partition.
userKeyFile	The absolute path to the user key file containing the same clear-text passphrase specified during the export operation. This file is used to decrypt attributes in the archive file.

Importing an Applications Archive File to a Domain Partition: WLST Example

The following WLST command imports the `outDir/<domain>.zip` archive file to the new partition called `testPartition`. It also creates a resource group template and uses `/usr/myUserKeyFile` as the encryption key.

```
wls:/wsDomain/> importPartition( '/outDir/<domain>.zip', 'testPartition',  true,
'/usr/myUserKeyFile' )
```

19.4 Migrating a WebLogic Server Domain to a Domain Partition: Limitations

The limitations for configuring the Domain to Partition Conversion Tool (D-PCT) are as follows:

- While the tools support the migration of a WebLogic Server 12.2.1 domain to a WebLogic Server 12.2.1 domain partition, any existing resource groups in the source domain are omitted and not included.
- The domain upgrade of libraries and resources to a new release is not supported at import. Administrators and users are responsible for possible necessary domain upgrades from the source domain before exporting the archive file.
- Neither the application runtime state nor the application specific runtime configuration is exported to the archive file. For example, the JMS messages in queues or users in an embedded LDAP realm are not exported.
- The remote clients compiled with WebLogic Server versions prior to 12.2.1 are not able to look up JNDI resources deployed on a partition. They need to be recompiled with the WebLogic Server releases 12.2.1 or later.
- Limitations when importing JMS and JDBC resources targeted to a cluster or migratable-targets in their source domain:
  - Multiple JMS resources in a resource group cannot be targeted to more than one virtual target; all JMS file stores must use the same distribution policy.
  - JDBC does not support the use of the Logging Last Resource (LLR) feature in WebLogic Server Multitenant. Data sources with this option need to be converted to use a substitute setting that may or may not be an adequate replacement.

  To avoid errors, the JMS and JDBC resources that fall within these limitations must be excluded from the import operation by using the `exclude-from-import` attribute in the JSON file. Such resources must be manually created within the partition as needed by the application.

19.5 Migrating a WebLogic Server Domain to a Domain Partition: Use Cases

The following table lists the use cases that are supported and not supported for migrating a WebLogic Server domain to a partition.

Table 19–1 Use Cases for Migration

Source	Target	Status
A single Server with no JMS servers	A virtual target targeted to a single server	Supported
A single Server with a JMS server	A virtual target targeted to a single server	Supported
A single Server with no JMS servers	A virtual target targeted to a cluster	Supported
A single Server with a JMS server	A virtual target targeted to a cluster	Supported
A cluster with no JMS servers	A virtual target targeted to a single server	Supported

Table 19–1 (Cont.) Use Cases for Migration

Source	Target	Status
(Windows) A cluster with no JMS servers	A virtual target targeted to a cluster	Supported
Cross platform domain migration from Windows to Linux	A virtual target targeted to a single server	Supported
A cluster with JMS servers	A virtual target targeted to a single server	Not Supported
A cluster with JMS servers	A virtual target targeted to a cluster	Not Supported

20

Configuring Partition Concurrent Managed Objects

This chapter describes how to configure partition-level *concurrent managed object templates* and *concurrent constraints* in WebLogic Server Multitenant (MT). You can use the WebLogic Server Administration Console to configure partition CMOs, as described in this chapter.

This chapter includes the following sections:

20.1 Configuring Partition Concurrent Managed Templates: Overview

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. In WebLogic Server, concurrent managed objects (CMOs) provide concurrency capabilities to Java EE applications. You can configure concurrent managed objects and then make them available for use by application components.

In addition to providing support for domain and server-level CMOs, WebLogic Server also provides partition-level CMO templates to perform partition scoped task execution. This document will only discuss CMO templates as they apply to partitions.

20.1.1 Concurrent Managed Object Components

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).

20.1.2 Partition-Level Asynchronous Task Management by CMOs

In WebLogic Server, asynchronous task management is provided by four types of CMOs, as summarized in Table 20–1.

Table 20–1 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.	Only short-running tasks are dispatched to the single self-tuning thread pool by a specified Work Manager.	When Work Manager is shutting down, all the unfinished task will be canceled.	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.
Managed Scheduled Executor Service (MSES)	Contexts are propagated based on configuration.	Same behavior as MES.	Same behavior as MES.	Same behavior as MES.
Context Service	Contexts are propagated based on configuration.	n/a	n/a	n/a
Managed Thread Factory (MTF)	Contexts are propagated based on configuration.	Threads returned by the `newThread()` method are not from the single self-tuning thread pool and will not be put into the thread pool when the task is finished.	Threads created by the `newThread()` method will be interrupted when the MTF is 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.

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, server, and partition level configuration by using the WLS Administration Console and configuration MBeans.

Note: This document only discusses Global CMO Templates as they apply to domain partitions For detailed conceptual information about Default Java EE CMOs and Customized CMOs in Configuration Files, see "Configuring Concurrent Managed Objects" in *Administering Server Environments for Oracle WebLogic Server*.

Similar to Work Managers, global CMO templates can be defined at the domain, server, and partition level using the WLS Administration Console or configuration MBeans. For more information about configuring CMOs at the partition level, see Configuring Partition CMO Templates: Main Steps.

20.1.3 Partition-Level MES Template Configuration Elements

This section defines the configuration elements for a partition-level MES template.

Table 20–2 Managed Executor Service Configuration Elements

Name	Description	Required	Default Value	Range
name	Name of the MES. ▪ The name should not be DefaultManagedExecutorService, otherwise the server cannot be started normally. ▪ Partition-level MES with the same name can NOT be configured in the same partition, otherwise the server cannot be started normally. ▪ An ManagedExecutorService can have the same name as other types of managed objects such as a ContextService in any partition with no relationship between them. ▪ An partition-level MES and a JSR236 MES can have the same name with no relationship between them. ▪ If a partition-level MES with the same name is defined in both <resource-group-template> and one partition's <resource-group>, then the <resource-group> definition will override <resource-group-template> definition in that partition.	Yes	n/a	An arbitrary non-empty string.
dispatch-policy	Name of the Work Manager. The partition-level Work Manager will be picked by this name. If the Work Manager does not exists, use the partition-level default Work Manager.	No	Default Work Manager	n/a
max-concurrent-long-running-requests)	Maximum number of concurrent long running tasks.	No	10	[0-65534]. When out of range, the default value will be used.
long-running-priority	An integer that specifies the long-running daemon thread's priority. If specified, all long-running threads will be affected.	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.

20.1.4 Partition-Level MSES Template Configuration Elements

This section defines the configuration elements for a partition-level MSES template, which are similar to a partition-level MES template.

Table 20–3 Managed Scheduled Executor Service Configuration Elements

Name	Description	Required	Default Value	Range
name	The name of the MSES. For naming convention rules, see Table 20–2.	Yes	n/a	An arbitrary non-empty string.
dispatch-policy	The name of the Work Manager. For Work Manager usage rules, see Table 20–2.	No	Default Work Manager	n/a
max-concurrent-long-running-requests	Maximum number of concurrent long running tasks.	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.	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.

20.1.5 Partition-Level MTF Template Configuration Elements

This section defines the configuration elements for a partition-level MTF template.

Table 20–4 Managed Thread Factory Configuration Elements

Name	Description	Required	Default Value	Range
name	The name of the MTF. For naming convention rules, see Table 20–2.	Yes	n/a	An arbitrary non-empty string.
priority	The priority to assign to the thread. (The higher the number, the higher the priority.)	No	5 `Thread.NORM_PRIORITY`	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 `run()` method of the tasks.	No	10	[0-65534] When out of range, the default value is used.

This section defines the configuration elements for a partition-level MTF.

Table 20–5 Managed Thread Factory Configuration Elements

Name	Description	Required	Default Value	Range
name	The name of the MTF. For naming convention rules, see Table 20–2.	Yes	n/a	An arbitrary non-empty string.
priority	The priority to assign to the thread. (The higher the number, the higher the priority.)	No	5 `Thread.NORM_PRIORITY`	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 `run()` method of the tasks.	No	10	[0-65534] When out of range, the default value is used.

20.1.6 Partition-Level CMO Constraints for Long-Running Threads

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.

20.1.6.1 Setting Limits for Maximum Concurrent Long-Running Requests

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

Table 20–6 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 20–6 Limit of Concurrent Long-Running Requests in Partitions

Scope	Deployment Descriptor	Description	<max-concurrent-long-running-requests> Element Details
Partition	In `config.xml`: As the sub-element of `<domain><partition>` for common partition. As the sub-element of `<domain>` for global runtime.	Limit of concurrent long-running requests specified for that partition in that server.	Optional Range: [0-65534]. When out of range, the default value will be used Default value: 50

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 20–1 demonstrates how the value specified for the `max-concurrent-long-running-requests` element in `config.xml` can affect the maximum number of long-running requests.

Example 20–1 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)
    <partition>
        <name>mypartition</name>
    <max-concurrent-long-running-requests>5</max-concurrent-long-running-requests>
(place 3)

    </partition>
    <server-template>
        <name>mytemplate</name>

<max-concurrent-long-running-requests>50</max-concurrent-long-running-requests>
(place 4)
    </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. It does not affect partition-level MES and MSES. All the MES and MSES running in the domain can create a maximum of 10 long-running-requests in total.
- `place 3`—Only affects MES & MSES defined in *mypartition*. All the MES & MSES running in partition *mypartition* can create maximally 5 long-running-requests in total.
- `place 4`—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 20–2 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 20–2 Sample Configurations of max-concurrent-long-running-requests

```
server1(100)
    |---partition1(50)
         |---application1
              |---managed-scheduled-executor-service1(not specified)
              |---module1
                   |---managed-executor-service1(20)
                   |---managed-scheduled-executor-service2(not specified)
        |---application2
    |---partition2(70)
```

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`, 40 are being executed by `application2`, if one more long-running task is submitted to `application1` or `application2`, then the limit of `partition1` is exceeded.
- Assume 10 long-running tasks are being executed by `application1`, 30 are being executed by `application2`, 60 are being executed by `partition2`, if one more long-running task is submitted to `application1`, or `application2`, or `partition2`, then the limit of `server1` is exceeded.

20.1.6.2 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 cannot 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 20–7 summarizes the limit of concurrent new running threads with an element `<max-concurrent-new-threads>` that can be defined in the deployment descriptors.

Table 20–7 Limit of Concurrent New Running Threads

Scope	Deployment Descriptor	Description	<max-concurrent-long-running-requests> Element Details
Partition	in `config.xml`: As the sub-element of `<domain><partition>` for common partition. As the sub-element of `<domain>` for global runtime.	Limit of concurrent new running threads specified for that partition in that server.	Optional Range: [0-65534], when out of range default value will be used Default value: 50

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 Sample Configurations of max-concurrent-long-running-requests.

20.2 Configuring Partition CMO Templates: Main Steps

You can define global CMOs as templates in the partition's configuration by using the WLS Administration Console and configuration MBeans. CMO templates can be assigned to any application, or application component in the partition.

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

- 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 partition.

20.2.1 Using the WLS Administration Console to Configure a Partition-Scoped CMO Template

CMO templates can be configured and scoped to a partition using the WLS 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.
   - See Partition-Level MES Template Configuration Elements.
   - See Partition-Level MSES Template Configuration Elements
   - See Partition-Level MTF Template Configuration Elements.
4. Click **Next**.
5. Select the partition that you want to target the concurrent template to.

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

For more detailed information about configuring CMO templates for a domain and server scope, see "Global CMO Templates" in *Administering Server Environments for Oracle WebLogic Server*.

20.2.2 Using MBeans to Configure CMO Templates

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

- ManagedExecutorServiceTemplateMBean
- ManagedScheduledExecutorServiceTemplateMBean
- ManagedThreadFactoryTemplateMBean

For more information, see the "PartitionMBean" section in the *MBean Reference for Oracle WebLogic Server*.

20.3 Configuring Partition Concurrent Constraints: Main Steps

Constraints can also be defined for a partition scope using the WLS Administration Console and configuration MBeans.

- Using the WLS Administration Console to Configure Concurrent Constraints for a Partition
- Using MBeans to Configure Concurrent Constraints

20.3.1 Using the WLS Administration Console to Configure Concurrent Constraints for a Partition

Concurrent constraints can be configured per partition using the WLS Administration Console.

1. In the **Domain Structure** tree, click **Domain Partitions**.
2. In the **Summary of Domain Partitions** table, select the partition you want to configure.
3. In the **Settings for *partition-name*** page, open the **Configuration > Concurrency** page for the partition
4. Specify a value for any or all of the concurrent constraint options:
   - **Max Concurrent Long Running Requests**—The maximum number of concurrent long-running requests that can be submitted to all of the Managed Executor Services or Managed Scheduled Executor Services in the partition scope.

     See Setting Limits for Maximum Concurrent Long-Running Requests.
   - **Max Concurrent New Threads**—The maximum number of concurrent new threads that can be created by all of the Managed Thread Factories in the partition scope.

     See Setting Limits for Maximum Concurrent New Threads.
5. Click **Save**.

20.3.2 Using MBeans to Configure Concurrent Constraints

Concurrent constraints can be configured per partition using the following methods under the `PartitionMBean`:

- `maxConcurrentLongRunningRequests()`—The maximum number of concurrent long-running requests that can be submitted to all of the Managed Executor Services or Managed Scheduled Executor Services in the partition scope.

See Setting Limits for Maximum Concurrent Long-Running Requests.

- `maxConcurrentNewThreads()`—The maximum number of concurrent new threads that can be created by all of the Managed Thread Factories in the partition scope.

  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*.

20.4 Configuring Partition Concurrent Managed Objects: Related Tasks and Links

See the following sections for additional information:

- "Configuring Concurrent Managed Objects" in *Administering Server Environments for Oracle WebLogic Server*.
- For more information about CMO-related configuration and runtime MBeans, see the ManagedExecutorServiceTemplateMBean, ManagedScheduledExecutorServiceTemplateMBean, ManagedThreadFactoryTemplateMBean, and the PartitionMBean 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*.
- "Sample Applications and Code Examples" in *Understanding Oracle WebLogic Server*
- "Concurrency Utilities for Java EE" in *The Java EE 7 Tutorial*
- The Java Specification Request 236: Concurrency Utilities for Java EE 1.0 (http://jcp.org/en/jsr/detail?id=236).

21

Configuring Partition Batch Job Runtime

This chapter describes how to configure the batch runtime in WebLogic Server partitions. You can use either the WLS Administration Console or WLST to configure a partition-level batch job runtime, as described in this chapter.

21.1 Configuring Partition Batch Runtime: Overview

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 in parallel, and may be initiated ad hoc or through scheduling.

WebLogic Server supports batch runtimes that are scoped to partitions. Using the batch runtime in partitions requires the configuration of a dedicated data source for each partition to access the JobRepository tables for batch jobs. When a Java EE component deployed to the partition submits a batch job, the batch runtime updates the JobRepository tables using this data source.

Optionally, a partition batch runtime can be configured to use an application-scoped managed executor service (MES) by configuring MES templates at the domain level, but which are scoped to partitions. The MES processes the jobs asynchronously and the JobRepository data source stores the status of current and past jobs. However, if no MES template is targeted to the partition, the batch runtime will use the MES that is bound to the default JNDI name of `java:comp/DefaultManagedExecutorService` (as required by the Java EE 7 specification).

For detailed information about configuring and managing batch runtime for a domain scope, such as the steps for creating the JobRepository tables, see "Configuring the Batch Runtime" in *Administering Server Environments for Oracle WebLogic Server*.

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.

21.2 Configuring Partition Batch Runtime: Steps

In order to configure a batch runtime in a partition, you must complete these steps:

- If necessary, create the JobRepository tables to store the batch jobs.
- Configure a JDBC data source for the partition.
- Optionally, create a MES template and target it to the partition.
- Configure the partition batch runtime using either the WLS Administration Console or WLST.

21.2.1 Prerequisites

In order to configure a batch runtime in a partition, the following prerequisites must be completed at the domain level:

- **JobRepository tables must already exist**—The batch runtime does not create JobRepository tables automatically. The DB administrator must create the tables prior to activating the partition.

  For information on configuring JobRepository tables, see "Configuring the Batch Runtime" in *Administering Server Environments for Oracle WebLogic Server*.

  For information about the databases supported for containing the JobRepository tables, see the Oracle Fusion Middleware Supported System Configurations page on the Oracle Technology Network.

- **Configure a JDBC data source for the partition**—Each partition must have a dedicated JDBC data source created for batch jobs. The batch data source's JNDI name must be set using `PartitionMBean.setBatchJobsDataSourceJndiName`. When a Java EE component submits a batch job, the batch runtime updates the JobRepository tables using this data source, which is obtained by looking up the data source's JNDI name.

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

- **Optionally, create a MES template**—For optimum performance, the batch runtime in a partition can be configured to use an application-scoped MES by configuring MES templates at the domain level, but which are scoped to partitions. This way, a new MES instance is created for each MES template, which will then run batch jobs that are submitted for Java EE components that are deployed to the partition.

  However, if no name is set, then the batch runtime will use the default Java EE MES that is bound to the default JNDI name of: `java:comp/DefaultManagedExecutorService`.

  For information on configuring a MES template, see "Global CMO Templates" in *Administering Server Environments for Oracle WebLogic Server*.

21.2.2 Configuring Partition Batch Runtime Using the WLS Administration Console

A dedicated batch runtime can be configured per partition using the WLS Administration Console. In the **Settings for *partition-name*** page, open the **Configuration > General** page for the partition and complete these configuration fields:

- **Executor Service Template**—The name of the application-scoped MES instance that will be used to run batch jobs that are submitted from applications deployed to the partition.

  A MES template by the same name must exist and be scoped to the partition when a batch job is submitted to the partition. If no name is set, then the batch runtime will use the default Java EE MES that is bound to the default JNDI name of: `java:comp/DefaultManagedExecutorService`.

- **Data Source JNDI Name**—The JNDI name of the batch runtime's data source, which will be used to store data for batch jobs submitted from applications deployed to the partition. When a Java EE component submits a batch job, the batch runtime updates the batch JobRepository tables using this data source, which is obtained by looking up the data source's JNDI name.

21.2.3 Configuring Partition Batch Runtime: WLST Example

A dedicated batch runtime can be configured per partition using WLST.

You can use WLST with the `BatchRuntimeConfigMBean` and `PartitionMBean` to configure the batch runtime to use a specific database for the JobRepository:

```
def update_partition_batch_config(partitionName, jndiName, schemaName):
    connect('admin','passwd')
    edit()
    startEdit()
    cd('/Partitions/' + <partitionName>)
    cmo.setDataSourceJndiName(jndiName)
    cd('/BatchConfig/')
    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_partition_batch_config('<partitionName>','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 a specific MES for batch job execution. However, you must first create an MES template at the domain level and the name of the MES must be provided to the `PartitionMBean`.

```
connect('admin','passwd')
 edit()
 startEdit()
 cd('/Partitions'/ + <partitionName>)
 cmo.setBatchJobsExecutorServiceName('mesName')
 save()
 activate()
```

where *`mesName`* is the name of the MES template that has already been created (and targeted) to this partition.

The batch runtime can be configured to use different MESs using the `getBatchJobsManagedExecutorServiceName()` method in the `PartitionMBean`. However, a MES template by the same name must exist and be scoped to the partition when a batch job is submitted.

For more information, see the BatchConfigMBean and the PartitionMBean 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*.

21.3 Querying the Batch Runtime

The batch runtime's JobRepository can be queried per partition scope using these administrative tools:

- Using the WLS 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 WLS Administration Console.

21.3.1 Using the WLS Administration Console to Query the Batch Runtime

A JobRepository can be queried using the WLS Administration Console to obtain details about batch jobs in a partition.

21.3.1.1 Get Details of All Batch Jobs

In the **Settings for *partition-name*** page, open the **Monitoring > Batch Jobs** page to view details about all the jobs submitted by applications deployed to the partition.

Table 21–1 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.
End Time	The completion time of the job.
Exit Status	The exit status of the job.

21.3.1.2 Get Details About a Job's Execution

You can view step execution details about a job by selecting it and clicking **View**.

Table 21–2 Job Executions Details

Element Name	Description
Job Name	The name of the batch job.
Instance ID	The instance ID.

Table 21–2 (Cont.) Job Executions Details

Element Name	Description
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.

21.3.1.3 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 21–3 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.

21.3.2 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 partition.

For more information, see BatchJobRepositoryRuntimeMBean in the *MBean Reference for Oracle WebLogic Server*.

21.3.2.1 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 21–4 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 (`java.util.Date`).
END_TIME	The completion time of the job (`java.util.Date`).

Table 21–4 (Cont.) Elements in getJobDetails() Attribute

Element Name	Description
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()
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   AppName InstanceID  ExecutionID   BatchStatus       StartTime
EndTime                   ExitStatus
PayrollJob     lab1   9           9         COMPLETED   Fri Apr 24 10:11:00 PDT 2015   Fri Apr 24
10:11:01 PDT 2015   COMPLETED
PayrollJob     lab1   8           8         COMPLETED   Fri Apr 24 10:11:00 PDT 2015   Fri Apr 24
10:11:01 PDT 2015   COMPLETED
PayrollJob     lab1   7           7         COMPLETED   Fri Apr 24 10:11:00 PDT 2015   Fri Apr 24
10:11:01 PDT 2015   COMPLETED
PayrollJob     lab1   6           6         COMPLETED   Fri Apr 24 10:11:00 PDT 2015   Fri Apr 24
10:11:01 PDT 2015   COMPLETED
PayrollJob     lab1   5           5         COMPLETED   Fri Apr 24 10:10:57 PDT 2015   Fri Apr 24
10:10:58 PDT 2015   COMPLETED
PayrollJob     lab1   4           4         COMPLETED   Fri Apr 24 10:10:56 PDT 2015   Fri Apr 24
10:10:56 PDT 2015   COMPLETED
PayrollJob     lab1   3           3         COMPLETED   Mon Apr 20 11:32:12 PDT 2015   Mon Apr 20
11:32:12 PDT 2015   COMPLETED
PayrollJob     lab1   2           2         COMPLETED   Mon Apr 20 11:32:10 PDT 2015   Mon Apr 20
11:32:11 PDT 2015   COMPLETED
PayrollJob     lab1   1           1         COMPLETED   Mon Apr 20 11:25:26 PDT 2015   Mon Apr 20
11:25:26 PDT 2015   COMPLETED
```

21.3.2.2 Get Details of a Job Execution Using `getJobExecutions`

The `getJobExections` attribute returns details about a particular job execution. Each entry in the collection contains an array of the following elements:

Table 21–5 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 (`java.util.Date`).
END_TIME	The completion time of the job (`java.util.Date`).
EXIT_STATUS	The exit status of the job (String).

Here is an example of using `getJobExectuions()` 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')
partitionRuntime()
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
```

21.3.2.3 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 21–6 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).
BATCH_STATUS	The batch status of this job (String).
START_TIME	The start time of the job (`java.util.Date`).
END_TIME	The completion time of the job (`java.util.Date`).
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 Step Execution ID: `getStepExecutions(6)`. To get a list of all Execution IDs, use the `getJobDetails()` method.

```
connect('admin', 'admin123')
partitionRuntime()
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
```

21.4 Configuring Partition Batch Runtime: Related Tasks and Links

See the following sections for additional information:

- "Configuring the Batch Runtime" in *Administering Server Environments for Oracle WebLogic Server*
- For information on configuring a Managed Executor Service Template, see "Global CMO Templates" in *Administering Server Environments for Oracle WebLogic Server*.
- For instructions on configuring a JDBC data source, see "Creating a JDBC Data Source" in *Administering JDBC Data Sources for Oracle WebLogic Server*.
- For more information about batch-related configuration and runtime MBeans, see the BatchConfigMBean, BatchJobRepositoryRuntimeMBean, and the PartitionMBean 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*.
- "Sample Applications and Code Examples" in *Understanding Oracle WebLogic Server*
- "Batch Processing" in *The Java EE 7 Tutorial*
- Java Specification Request 352: Batch Applications for the Java Platform (http://jcp.org/en/jsr/detail?id=352)

22

Configuring Resource Adapters

This chapter describes how to configure resource adapters (connectors) in Oracle WebLogic Server Multitenant (MT).

This chapter includes the following sections:

- Configuring Resource Adapters in a Domain Partition: Overview
- Best Practices and Considerations When Using Resource Adapters in a Domain Partition

22.1 Configuring Resource Adapters in a Domain Partition: Overview

Oracle WebLogic Server Multitenant allows standalone and embedded resource adapters to be deployed in a domain partition through resource groups and resource group templates. For more information about deploying applications, see Deploying Applications.

When a resource adapter is deployed in a partition, all of its resources such as the resource adapter beans, connection pools, and administered objects are registered in the JNDI namespace of the partition, and their JNDI names and class loaders are isolated from other partition's applications. Therefore, only those applications in the same partition can access the services provided by the resource adapter and only those applications in the same partition can access the classes of resource adapter.

When a resource adapter is deployed in a domain, all of its resource adapter beans, connection pools, and administered objects are registered in the domain's JNDI namespace. These resources are only visible to applications deployed in the domain.

22.1.1 Example config.xml for Domain-Level Resource Adapter

You can configure a resource adapter in a resource group template and then reference it by the resource group of a partition.

In this example, a standalone resource adapter is defined in a resource group template. Each of the two partitions, `HR` and `Finance`, defines a resource group that inherits the applications and resources from the resource group template. In this case, each partition has its own resource adapter.

Example 22–1 Example config.xml for Domain-Level Connector

```
<domain>
...
<resource-group-template>
      <name>RGT1</name>
      <app-deployment>
```

```
            <name>my_ra</name>
            <module-type>rar</module-type>
            <source-path>/some/directory/mail-connector.rar</source-path>
            <deployment-order>120</ deployment-order >
            ...
         </app-deployment>
         ...
      </resource-resource-template>

      <partition>
          <name>HR</name>
          <resource-group>
             <name>RG1</name>
             <resource-group-template>RGT1</resource-group-template>
          </resource-group>
          ...
      </partition>
      <partition>
          <name>Finance</name>
          <resource-group>
             <name>RG2</name>
             <resource-group-template>RGT1/resource-group-template>
          </resource-group>
          ...
      </partition>
...
</domain>
```

22.1.2 Example config.xml for Partition-Level Resource Adapter

In this example, there are two partitions, `HR` and `Finance`, defined in the domain. The `HR` partition has a resource group that defines a standalone resource adapter. In this case, the resource adapter deployed in the `HR` partition is invisible to the `Finance` partition.

Example 22–2 Example config.xml for Partition-Level Connector

```
<domain>
...
<partition>
      <name>HR</name>
      <resource-group>
          <name>HR Apps and Resources</name>
          <app-deployment>
             <name>mailra</name>
             <module-type>rar</module-type>
             <source-path>/some/directory/mail-connector.rar</source-path>
             <deployment-order>120</ deployment-order >
             ...
          </app-deployment>
          ...

      </resource-group>
   </partition>

   <partition>
      <name>Finance</name>
      ...
   </partition>
...
```

```
</domain>
```

22.2 Best Practices and Considerations When Using Resource Adapters in a Domain Partition

This section describes best practices and considerations for system administrators developing resource adapters for a multitenant environment.

22.2.1 Defining the Classloading Behavior for Partition-Level Resource Adapters

Partition-level standalone resource adapter will be loaded by the partition class loader, which is a sub class loader of domain `/lib` class loader, and the parent of all application class loaders for a partition.

The `<enable-global-access-to-classes>` element in the `weblogic-ra.xml` deployment descriptor determines the classloading behavior of resource adapter classes in a partition.

For more information, see "weblogic-ra.xml Schema" in *Developing Resource Adapters for Oracle WebLogic Server*.

- If `<enable-global-access-to-classes>` is set to false, the classloading behavior of the partition resource adapter classes will be same as the domain-level resource adapter classes.
- If `<enable-global-access-to-classes>` is set to true:
  - When the resource adapter is deployed to a domain, the resource adapter classes will be loaded by the domain class loader. Therefore, the resource adapter classes are isolated from applications in other partitions.
  - When the resource adapter is deployed to a partition, the resource adapter classes will be loaded by the partition class loader. Therefore, the resource adapter classes are isolated from applications in domain partition and other partitions.

22.2.2 Overriding Application Configuration for a Partition

Each partition can specify a deployment plan which can be used to override the configuration defined in the resource group template. The resource adapter application should apply this deployment plan during deployment.

For more information, see Overriding Application Configuration.

A deployment plan file can be specified at the application level via the `plan-path` attribute of the `AppDeploymentConfigMBean` to override resource adapter's configuration. When a resource group of a partition references a resource adapter of a resource group template, it can override the resource group configuration via macro substitution for the specified deployment plan at the application level.

The following example shows a resource group template with a macro for the deployment plan file name. There are two partitions, `HR` and `Finance`.

```
<domain>
    <resource-group-template>
        <name>RGT1</name>
        <app-deployment>
            <name>mailra</name>
                 <name>my_ra</name>
                 <module-type>rar</module-type>
```

```
                <source-path>/some/directory/sample_connector.rar</source-path>
                <deployment-order>120</ deployment-order >
            <plan-path>${MYRA-PLAN-FILE}</plan-path>
        </app-deployment>
        ...
    </resource-group-template>

    <partition>
        <name>HR</name>
        <resource-group>
            <name>RG1</name>
            <resource-group-template>RGT1</resource-group-template>
        </resource-group>
        <partition-properties>
            <partition-property>
                <name>MYRA-PLAN-FILE</name>
                <value>/apps/plans/hr/my_ra-plan.xml</value>
            </partition-property>
        </partition-properties>
        ...
    </partition>

    <partition>
        <name>Finance</name>
        <resource-group>
            <name>RG2</name>
            <resource-group-template>RGT1</resource-group-template>
        </resource-group>
        <partition-properties>
            <partition-property>
                <name>MYRA-PLAN-FILE</name>
                <value>/apps/plans/Finance/my_ra-plan.xml</value>
            </partition-property>
        </partition-properties>
        ...
    </partition>
</domain>
```

22.2.3 Considerations for Resource Adapter Resource Definitions

You can use the `@ConnectorResourceDefinition` and `@AdministeredObjectDefinition` annotations for defining resource adapter resources in your web module, EJB module, or equivalent application deployment descriptor. When you use these annotations, the following conditions apply in a multitenant environment:

- If `@ConnectorResourceDefinition` and `@AdministeredObjectDefinition` or equivalent deployment descriptor are defined in the domain-level application, its related resource adapter should be deployed at the domain level.
- If `@ConnectorResourceDefinition` and `@AdministeredObjectDefinition` or equivalent deployment descriptor are defined in the partition-level application, its related resource adapter should be deployed in the same partition.

22.2.4 Resource Group Migration and Resource Adapters

A standalone resource adapter is shared across resource groups in the same partition. It can be defined in a resource group, but it is not occupied exclusively by that

resource group. Suppose resource group RG1 depends on a standalone resource adapter RA2 which is defined in resource group RG2, if RG2 is migrated to new cluster, then RG1 has to be migrated to that cluster at the same time. Otherwise RG1 will not work.

Oracle recommends that you define a resource adapter and all related applications in the same resource group if you want to do resource group migration.

23

Exporting and Importing Partitions

This chapter describes how to export and import partitions in WebLogic Server Multitenant (MT). You can use either Fusion Middleware Control (FMWC), the WLS Administration Console, or WLST to export and import partitions, as described in this chapter. The chapter refers to the Fusion Middleware and WebLogic Server documentation sets and online for additional information as appropriate.

This chapter includes the following sections:

23.1 Exporting and Importing Domain Partitions: Overview

Using WLST (online or offline), a REST API (online only), or an administration console (online only), administrators can export a domain partition and then import a previously exported partition into a different domain.

Exporting and importing partitions lets you easily move partitions from one domain to another, including the applications that are deployed to the partition. This feature is useful for replicating partitions across domains and for moving domains from a development to a production environment.

23.1.1 About Exporting Partitions

When a partition is exported from the source domain it is packaged in a partition archive which includes:

- The partition configuration.
- Any resource groups contained in the partition.
- Any resource group templates referred to by those resource groups.
- The contents of the partition's file system, `<partition-file-system>/config` directory.
- Optionally, application binaries and configurations for applications deployed to the partition.

No application runtime state, nor application-specific runtime configuration is included in the partition archive. Other examples of what would not be exported are JMS messages in queues and users in an embedded LDAP realm.

23.1.1.1 Creating the Partition Archive

You can use the WLST `exportPartition` command to create a partition archive, `<PartitionName>.zip`. It copies a partition's configuration into the archive file as well as (optionally) the partition's applications and libraries. This command also creates the `attributes.json` file that you can use to modify the partition's configuration on import.

The command syntax is:

```
exportPartition(partitionName, expArchPath, [includeAppsNLibs], [keyFile])
```

Where *partitionName* is the name of the partition to export, *expArchPath* is the full path to the directory in which to save the partition archive, *includeAppsNLibs*, optionally, specifies whether to include application and library binaries in the partition archive, and *keyFile*, optionally, provides the full path to a file containing a string to use as the encryption key to encrypt attributes in the partition archive. See Exporting Domain Partitions: WLST Example.

23.1.1.2 Partition Archive Contents

A partition archive is a ZIP file containing these specific partition-related files:

Files and Directories	Description
`partition-config.xml`	Contains the partition configuration and resource group templates configuration from `config.xml`.
`MANIFEST.MF`	Includes a time stamp and domain information for the archive.
`<PartitionName>-attributes.json`	Contains the MBean attributes and properties which can be changed by the administrator while importing the partition. In addition to being contained in the archive, a copy of this file is also located with the archive in the file system to make it easier to update.
`expPartSecret`	Contains the encrypted secret key used for encrypting and decrypting encrypted attributes.
`domain/config/resource-group-templates/<resource_template_name>/*`	If there is a resource group template associated with this partition, then the files related to the resource group template are copied to this location.
`domain/config/partitions/<partition-name>/*`	All the configuration files under `domain/config/partitions/<partition-name>/config/*`.
`pfs/config/*`	Contains the `<partition-file-system>/config` directory content. This would also include system resources (JMS, JDBC, and such) descriptor files.
`domain/upload/resource-group-templates/<resource_template_name>/<application_name>/`	Contains resource group template-level binaries.
`pfs/upload/<application_name>/`	Contains resource group-level application binaries.

23.1.2 About Importing Partitions

A prerequisite to importing a partition is that the server instance must already have a domain configured. When a partition is imported into a new domain some external systems may need to be configured to be aware of the newly imported partition. While importing a partition archive the system administrator may need to update the dependencies on the domain (like virtual targets, security realms, and resource group

templates) and also optionally update other attributes in the partition configuration to make it valid, such as partition properties, JDBC, JMS, and other resources in resource groups. In addition, applications and system resources need to be deployed for the new partition.

During the import, the system administrator can override specific portions of the partition configuration by supplying a `<PartitionName>-attributes.json` file with modified attributes suitable for the target domain. However, changing the value of the `name` attribute is not supported; for example, `"name" : "P1"` in the following sample `<PartitionName>-attributes.json` cannot be changed.

```
{
    "partition" : {
         "name" : "P1",
         "jdbc-system-resource-override" : {
                "URL" : "url.com",
                "Id" : "0",
                "name" : "test123",
                "CachingDisabled" : "false",
                "Registered" : "false",
                "User" : "test123",
                "DynamicallyCreated" : "false",
                "DataSourceName" : "test-source"
         },
    "resource-group-template" : {
         "name" : "RGT1",
         "jdbc-system-resource" : {
            "name" : "jdbc1",
            "descriptor-file-name" : "jdbc/P1DB1-8882-jdbc.xml"
        }

         "jms-server-resource" : {
            "name" : "jms1",
            "PagingDirectory" : ""
        }


 }
}
```

In the above example, all the `JDBCSystemResourceOverrideMBean` attributes are copied to the `<PartitionName>-attributes.json` file along with their current values.

If a resource group template already exists in the target domain, you must use the `createNew` option to overwrite the existing resource group template and create a new one using a new name. (See step 2 in Importing Domain Partitions: Main Steps.)

23.1.3 Exporting and Importing Applications

When a partition is exported, whether or not application binaries are included in the partition archive is determined by the value of the `includeApps` option on the export operation. If `includeApps` is `true`, the binaries are included. If `false`, they are excluded. The `<PartitionName>-attributes.json` file contains attributes for the application or library source path, deployment plan path, and staging mode. You can change these attributes in the `<PartitionName>-attributes.json` file.

The `includeApps` option also effects how the application is deployed upon being imported:

- If `true` (default), the deployment files are copied over to `<domain-dir>/<server>/upload` or `<partition-dir>/<server>/upload`, depending on whether it's a resource group template-level application or resource group-level application, and deployed using the original staging mode. If the staging mode is `NOSTAGE` or `EXTERNAL` (on the targeted server), then the system administrator is responsible for making the application available from the correct location in the target domain.
- If `false`, the system administrator is responsible for making the application available from the correct location in the target domain.

23.1.4 Exporting and Importing Encrypted Attributes

During the export operation, a new secret key is generated and stored in the `expPartSecret` file in the exported `<PartitionName>.zip` file. All the encrypted attributes in `partition-config.xml` and any system resource descriptors that are part of `<PartitionName>.zip` will be encrypted using the new secret key in the `expPartSecret` file. Alternatively, you can provide your own secret key by using the `keyFile` option.

During the import operation, after the entire partition is read and the attributes changed in accordance with the `<PartitionName>-attributes.json` file, the following steps are used to process encrypted attributes:

- First, the secret key in the `expPartSecret` file in the exported ZIP is read.
- Then the secret key is decrypted using a second key that is either the default key in the WLS source, or the key provided using the `keyFile` option to import. The user provided key must match the key used on import.
- Then, all the encrypted attributes in the partition MBean (read and modified in the exporting operation) are decrypted using the key read from `expPartSecret`.
- Then, all the encrypted attributes in the partition MBean are encrypted with the domain-specific key (`SerializedSystemIni.dat`) for the imported domain.

23.2 Exporting and Importing Domain Partitions: Main Steps and WLST Examples

You can export a domain partition (the source domain) with its entire configuration and data, as a partition archive. With few configuration changes, you can then import the partition archive into another instance of multitenant WLS (the target domain). You might need to update domain dependencies, such as virtual targets and security realms, and optionally update other attributes in the partition configuration to make it valid.

23.2.1 Exporting Domain Partitions: Main Steps

Prior to exporting a domain partition, you must first have created or imported one.

The main steps for exporting domain partitions are as follows:

1. Select the domain partition you want to export.
2. Provide the full path to the directory in which to save the partition archive.

   Each domain partition should be located in its own directory. The domain partition archive will be overwritten if it already exists in the specified location. Other files in the directory may be overwritten as well.

3. Optionally, select to include the installed application and library binaries in the exported partition archive.
4. Optionally, enter the full path to a file containing a string to use as the encryption key to encrypt attributes in the partition archive.

   If you do not provide your own key, a new secret key will be generated and stored in the `expPartSecret` file in the exported `<PartitionName>.zip` file.

23.2.2 Exporting Domain Partitions: WLST Example

The following WLST command exports `partition-1` to the `/var/tmp` directory. Application and library binaries are not included. `/home/foo/mykeyfile` is the path to the `mykeyfile` encryption key.

```
wls:/mydomain/serverConfig> exportPartition("partition-1", "/var/tmp/", false,
"/home/foo/mykeyfile")
```

23.2.3 Importing Domain Partitions: Main Steps

Prior to importing a domain partition:

- You must have previously exported a domain partition (the source domain) to a partition archive file.
- The server instance must already have a domain configured (the target domain).

The main steps for importing domain partitions are as follows:

1. Provide the full path to the partition archive file you want to import.
2. Optionally, select the overwrite existing resource group templates if the resource group template already exists in the target domain and you want to create a new one using a new name.

   All resource group templates used by the source domain partition are contained in the partition archive and are imported along with the partition into the target domain. If the resource group template already exists in the target domain and you do not specify to overwrite the existing resource group template, the import operation will fail.
3. Optionally, specify a name to use for the partition when it is created in the target domain. This defaults to the original name of the partition.
4. Optionally, enter the full path to a file containing the key to decrypt attributes in the partition archive.

23.2.4 Importing Domain Partitions: WLST Example

The following WLST command imports the `partition-1` archive located in the `/var/tmp` directory. Application and library binaries are not included. The file `/home/foo/mykeyfile` is used as the encryption key.

```
wls:/mydomain/serverConfig> importPartition("/var/tmp/partition-1.zip",
keyFile="/home/foo/mykeyfile")
```

23.3 Exporting and Importing Domain Partitions: Related Tasks and Links

For additional information, see the following:

- "Export domain partitions" and "Import domain partitions" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.
- "Export partitions" and "Import partitions" in *Oracle WebLogic Server Administration Console Online Help*.

24

Managing Named Concurrent Edit Sessions

This chapter describes how to manage concurrent named edit sessions in WebLogic Server Multitenant (MT). You can use either Fusion Middleware Control (FMWC), the WLS Administration Console, or WLST to manage edit sessions, as described in this chapter. The chapter refers to the Fusion Middleware and WebLogic Server documentation sets and online help for additional information as appropriate.

This chapter includes the following sections:

24.1 Named Concurrent Edit Sessions: Overview

In previous releases, WebLogic Server configuration edit sessions supported only one active edit session at a time. The system administrator got a global edit lock, made changes, and then activated them. Other administrators could not make changes at the same time. In this release, there are situations in which more than one administrator may need to make configuration changes. A multitenant WLS domain contains multiple partitions each with its own administrator. Partition administrators must be able to make configuration changes to the partition configuration and resources deployed in the partition without affecting other partition administrators or the WLS system administrator. Therefore, WLS has enabled multiple, concurrent edit sessions which support one or more configuration edit sessions per partition plus global configuration edit sessions.

With this feature, an administrator creates a named edit session, makes changes, and then activates the changes. Another administrator also creates a named edit session in parallel. If there are conflicts between the edit session from the first administrator and the changes made by a second administrator, the second administrator will receive an error when activating their changes. The second administrator can then resolve the conflicts and activate their changes. See Managing Named Concurrent Edit Sessions: Main Steps.

24.2 Managing Named Concurrent Edit Sessions: Main Steps

The main steps for managing named concurrent edit sessions are as follows:

1. Administrators create (and destroy) named edit sessions.

You use the `ConfigurationManagerMBean` API to start an edit session, activate changes, show changes, undo changes, and so forth.

Each edit session has its own configuration files and `ConfigurationManagerMBean` instance.

2. Changed configuration files are persisted to an edit-session-specific directory:
   - Global named edit session changes are persisted to a sub-directory of a new edit directory at the domain level: `<domain-directory>/edit/<edit-session-name>`, where edit-session-name is a version of the edit session name specified at create-edit-session time.
   - Partition-specific named edit session changes are persisted to a sub-directory of the partition directory: `<partition-directory>/edit/<edit-session-name>`, where edit-session-name is a version of the edit session name specified at create-edit-session time.
3. Conflicts may occur between parallel edit sessions when changes are activated. If any conflicts occur during activation, then the activate operation will fail and you must resolve the conflicts manually.

   Use the `resolve` method to apply any concurrently applied configuration changes to the current edit session.

   After calling the `resolve` method, you can then proceed with the activation of pending changes in the edit session.

   To resolve conflicts, administrators can use these informational messages:
   - Each conflict contains a description including the identification of MBeans and/or properties in conflict.
   - Each conflict also contains a message describing the resolve operation for this conflict.
   - Resolve log messages contain short descriptions of each resolve and merge step. Administrators can use the resolve log message to identify what was modified and how it was modified in the current edit session.

24.3 Managing Named Concurrent Edit Sessions: WLST Example

The following shows an example of managing configuration edit sessions using WLST:

```
connect("username", "password")

# Enter existing named edit session or create one and enter it
edit("foo")
startEdit()
cmo.createServer("Server-1")

# Create a different edit session
edit("bar")
startEdit()
ls("Servers") #Server-1 is not printed because it is created in an independent
edit session foo
s1=cmo.createServer("Server-1")
s1.setListenPort(5555) # Conflicting modification - the same server with a
different port

# Back to edit session foo and activate
```

```
edit("foo")
activate()

# List edit sessions / list with details
showEditSession() # Lists all edit sessions
showEditSession("bar") # More detailed information about edit session bar

# Back to edit session bar and activate
edit("bar")
activate() # Conflict occurs

# Resolve conflicts based on standard resolve strategy
resolve()
activate()

# Edit sessions can also be destroyed
destroyEditSession("foo")
destroyEditSession("bar")
```

The following example shows the edit session conflict resolution in detail:

```
wls:/wls/edit(foo)/> showEditSession() # Lists all edit sessions
List of named edit sessions [for details use showEditSession(<name>)]:
 default
 bar
 foo
wls:/wls/edit(foo)/> showEditSession("bar") # More detailed information about edit
session bar
bar
 Creator: wls
 Editor (lock owner): wls
 Resolve recommended: Yes
 Contains unactivated changes: Yes

wls:/wls/edit(foo)/> # Back to edit session bar and activate
wls:/wls/edit(foo)/> edit("bar")
You already have an edit session in progress and hence WLST will
continue with your edit session.
Other configuration changes were activated. Call resolve() to merge it into this
edit tree.
wls:/wls/edit(bar)/ !> activate() # Conflict occurs
Activating all your changes, this may take a while ...
The edit lock associated with this edit session is released once the activation is
completed.
Traceback (innermost last):
  File "<console>", line 1, in ?
  File "<iostream>", line 471, in activate
  File "<iostream>", line 553, in raiseWLSTException
WLSTException: Error occurred while performing activate : Error while Activating
changes. : 1 conflict:
[1]
 [wls]/Servers[Server-1] - a bean with the same qualified name has already been
added to [wls].
Description of resolve operation:
 A bean added by this session will override the one present in the current
configuration.

wls:/wls/edit(bar)/> # Resolve conflicts based on standard resolve strategy
wls:/wls/edit(bar)/> resolve()
1 conflict:
[1]
```

```
 [wls]/Servers[Server-1] - a bean with the same qualified name has already been
added to [wls].
Description of resolve operation:
 A bean added by this session will override the one present in the current
configuration.
Patch:
No difference
wls:/wls/edit(bar)/ !> activate()
Activating all your changes, this may take a while ...
The edit lock associated with this edit session is released once the activation is
completed.
Activation completed

wls:/wls/edit(bar)/> # Edit sessions can also be destroyed
wls:/wls/edit(bar)/> destroyEditSession("foo")

wls:/wls/edit(bar)/> destroyEditSession("bar")
Current edit tree is being removed; redirecting WLST cursor location to the config
runtime tree.
```

24.4 Managing Named Concurrent Edit Sessions: Related Tasks and Links

For additional information, see the following:

- "Manage edit sessions" and "View and resolve conflicts" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.
- "View pending changes" and "Resolve conflicts" in *Oracle WebLogic Server Administration Console Online Help*.

25

Configuring Transactions

This chapter describes how to configure transactions in Oracle WebLogic Server Multitenant (MT). The chapter refers to the Oracle Fusion Middleware and WebLogic Server documentation sets and online help for additional information as appropriate.

This chapter includes the following sections:

25.1 Configuring Transactions in a Domain Partition: Overview

WebLogic Server MT supports transaction processing in a multiple partition environment. The scope of the transactions can be either at the domain level or at the partition level. For more information, see "About Scope".

Most of the attributes that define a transaction environment are defined at the global (domain) level. However, the Timeout Seconds for JTA need to be configured at the partition level. For more information, see the *Oracle WebLogic Server Administration Console Online Help*.

25.2 Configuring LLR Data Source, JDBC TLog Data Source, and a Determiner Resource in a Domain Partition: Limitations

A Logging Last Resource (LLR) data source, JDBC TLog data source, or a Determiner Resource cannot be registered in a partition. In this release of WebLogic Server, any attempt to register these resources at the partition level will result in a SystemException.

This restriction is because a WebLogic Server instance cannot start if any of these resources are not available. Therefore, in a multitenant environment, an inaccessible resource owned by one partition prevents the startup of a server that is shared by other partitions. If a server is allowed to start despite the inaccessibility of a resource (and hence its commit records), the recovery of resources enlisted in transactions that also enlisted those resources may be non-atomic as the lack of a commit record would result in a rollback of those resources.

If you still want to use LLR for the resource commit ordering it inherently provides, use the "first resource commit" functionality provided in the WebLogic Server 12.2.1 release. As this feature entails using a true XA resource rather than the local-transaction based LLR resource, it does not provide the performance benefits that LLR offers and it does not require an LLR table. LLR datasources are pinned to the server they are deployed on but XA datasources are not. Therefore, in the case where

multiple servers are enlisted in a transaction, the two-phase commit flow may be slightly different. For more information, see "First Resource Commit Ordering" in *Developing JTA Applications for Oracle WebLogic Server*.

26

Configuring Web Services

This chapter describes how to configure the resources required to support advanced web services and SOAP over JMS in WebLogic Server Multitenant (MT) using WLST scripts. It also provides specific configurations that are required when using web services in a WebLogic Server MT environment.

This chapter includes the following sections:

26.1 Configuring Web Services: Overview

WebLogic Server includes two WLST scripts that provide the ability to configure the resources required for the following JAX-WS web service features in a WebLogic Server MT environment:

- `wlsws-advanced-jaxws-mt-config.py`—Configures advanced JAX-WS web services including asynchronous messaging, web services reliable messaging, message buffering, web services atomic transactions, and security using WS-SecureConversation.
- `wlsws-soapjms-mt-config.py`—Configures SOAP over JMS transport.

Both scripts are located in the *`oracle_home`*`/oracle_common/webservices/bin/` directory, where *`oracle_home`* is the directory you specified as Oracle Home when you installed WebLogic Server.

26.2 Configuring Web Services: Main Steps

To configure web service resources in a WebLogic Server MT environment:

1. If you have not already done so, create a domain partition. See Configuring Domain Partitions.
2. If you have not already done so, create a resource group in the partition. See Configuring Resource Groups.
3. At the domain level, create a user configuration file and an associated key file using the `storeUserConfig` WLST command. See "storeUserConfig" in *WLST Command Reference for WebLogic Server*.

4. Execute one or both of the WLST scripts from the *JAVA_HOME*/bin/java directory. Note that you must include the location of the weblogic.jar file in the classpath.

   For example, to configure the resources required for the WebLogic Server MT advanced web services for JAX-WS, use the following command:

   ```
   JAVA_HOME/bin/java -classpath weblogic.jar_location weblogic.WLST
   ./wlsws-advanced-jaxws-mt-config.py
   -myUserConfigFile userConfigFile -myUserKeyFile userKeyFile
   -myURL AdminServer_t3_url -partitionName partitionName
   -rgName resourceGroupName -isCluster true_or_false
   -middlewareHome middlewareHomeDir
   ```

   To configure the resources required in WebLogic Server MT for SOAP over JMS transport, use the following command:

   ```
   JAVA_HOME/bin/java -classpath weblogic.jar_location weblogic.WLST
   ./wlsws-soapjms-mt-config.py
   -myUserConfigFile userConfigFile -myUserKeyFile userKeyFile
   -myURL AdminServer_t3_url -partitionName partitionName
   -rgName resourceGroupName -isCluster true_or_false
   -middlewareHome middlewareHomeDir
   ```

   Both scripts require the command options described in Table 26–1.

Table 26–1 Required Options for Advanced Web Services WLST Scripts

Option	Description
-myUserConfigFile	Name of the file you specified for the userConfigFile argument when you executed the storeUserConfig WLST command in step 3. This file stores the user configuration.
-myUserKeyFile	Name of the file you specified for the userKeyFile argument when you executed the storeUserConfig WLST command in step 3 above. This file stores the key information that is associated with the specified user configuration file.
-myURL	T3 protocol URL for the Administration Server for the partition, for example t3://*host*:*port*.
-partitionName	Name of the partition in which the resources are being configured.
-rgName	Name of the resource group in the partition.
-isCluster	Argument that indicates if the partition is in a cluster. Valid values are: ■ true—Partition is in a cluster. ■ false—Partition is not in a cluster.
-middlewareHome	Location of the directory that you specified as the Oracle Home directory when you installed WebLogic Server.

26.3 Configuring Web Services: Using Partitioned Distributed Topics with SOAP over JMS

SOAP over JMS supports both queues and topics as the JMS destination type. The type that you use is determined by the application.

When using a uniform distributed topic as the request destination for SOAP over JMS in a WebLogic Server MT environment, you must use a partitioned uniform distributed topic.

In WebLogic JMS, distributed topics can be configured as replicated distributed topics or partitioned distributed topics. While replicated distributed topics work with `topicMessageDistributionMode` settings of `Compatibility`, `One-Copy-Per-Server`, or `One-Copy-Per-Application`, partitioned distributed topics only work with `One-Copy-Per-Server` or `One-Copy-Per-Application`.

To configure a partitioned uniform distributed topic for SOAP over JMS in WebLogic Server MT, configure the `@JMSTransportService` annotation as follows:

Set the `topicMessageDistributionMode` configuration property on the `activationConfig` property to `One-Copy-Per-Server` or `One-Copy-Per-Application`. The `Compatibility` value is not supported for partitioned distribution topics.

For example:

```
@JMSTransportService(targetService="poNotifyService"
                ,
destinationName="com.oracle.webservices.jms.SoapJmsRequestTopic"
                , destinationType=JMSDestinationType.TOPIC
                , activationConfig =
"topicMessagesDistributionMode=One-Copy-Per-Application"
                , jndiURL = "t3://@wls-server@"
```

For more information, see "Using SOAP Over JMS Transport" in *Developing JAX-WS Web Services for Oracle WebLogic Server*.

> **Note:** You must configure the JMS topic before deploying the SOAP over JMS application using the partitioned distributed topic. For more information, see "Configuring Partitioned Distributed Topics" in *Administering JMS Resources for Oracle WebLogic Server.*

26.4 Configuring Web Services: Related Tasks and Links

See the following sections for additional information related to advanced web services:

- Configuring Domain Partitions
- Configuring Resource Groups
- *Developing JAX-WS Web Services for Oracle WebLogic Server*
- "storeUserConfig" in *WLST Command Reference for WebLogic Server*
- "Creating and Configuring Servlets" in *Developing Web Applications, Servlets, and JSPs for Oracle WebLogic Server*

27

Monitoring and Debugging Partitions

This chapter describes how to monitor and debug partitions in WebLogic Server Multitenant (MT). You can use either Fusion Middleware Control (FMWC) or WLST to monitor partitions, as described in this chapter. The chapter refers to the Fusion Middleware, Coherence, and Oracle Traffic Director documentation sets and online help for additional information as appropriate.

This chapter includes the following sections:

27.1 Monitoring Domain Partitions: Overview

The WebLogic Diagnostics Framework (WLDF) provides the following partition scope diagnostic capabilities:

- Logging

  The logs for several WebLogic Server components, such as partition scope JMS, SAF, and servlet resources, are available in the partition file system directory. In a multitenant environment, partition users can configure partition scope loggers and control the levels of these loggers without affecting other partitions. See Section 27.3, "Configuring Partition Scope Logging".

  Note: The logs for server and domain scope resources, such as the server scope HTTP access log, the Harvester component, the Instrumentation component, and also the server and domain logs, are only available from the WLDF data accessor. For information, see Section 27.6, "Accessing Diagnostic Data".

- Debugging

  In coordination with the domain system administrator, a partition user can set debug flags on WebLogic Server components so that debug messages can be emitted on behalf of work performed for that partition, without affecting other partitions. See Section 27.4, "Configuring Partition Scope Debugging".

- Monitoring of partition resources

  Diagnostic system modules can be configured in a resource group, or in a resource group template, to enable harvesting of partition-specific metrics and to configure policies and actions on partition scope resources. See Section 27.5, "Configuring Diagnostic System Modules".

  WLDF also provides the ability to gather partition scope resource consumption metrics, which are surfaced as attributes on the `PartitionResourceMetricsRuntimeMBean`. See Section 27.7, "Monitoring Resource Consumption Management"

- Viewing log data

  Partition administrators do not have file-level access to log files, but they can use the WLDF data accessor and supported WLST functions. See Section 27.6, "Accessing Diagnostic Data".

- Instrumenting Application instrumentation

  Applications deployed within a partition may be instrumented using WLDF instrumentation. See Section 27.8, "Instrumenting Partition Scope Applications".

- Diagnostic image capture

  Image capture can be initiated either manually by a partition scope user, or by a policy configured in a partition scope diagnostic system module. Only the content specific to the partition is included in the generated diagnostic image. See Section 27.9, "Configuring Partition Scope Diagnostic Image Capture".

27.2 Partition Log and Diagnostics Data

WebLogic Server maintains the following log and diagnostics data files to track events and activity performed on behalf of partitions. Partition-specific log files are located in the `partitions/<partition>/system/servers/<server-name>` directory.

Log File	Contents
ServerLog	Log records for Weblogic Server events generated when doing work within the scope of a partition. The server log is not available within the partition file system — it is available only through the WLDF data accessor.
DomainLog	Log records domain-scope events generated on behalf of a partition. The domain log is not available within the partition file system — it is available only through the WLDF data accessor.
HTTPAccessLog (partition scope virtual target access log)	The `access.log` file for each virtual target's web server is maintained in separately for each partition and can be accessed by the partition user.
HarvestedDataArchive	MBean metrics applicable to a partition are collected by the WLDF Harvester component. This file is available only through the WLDF data accessor.

Log File	Contents
EventsDataArchive	Events generated by the WLDF Instrumentation component. This file is available only through the WLDF data accessor.
JMSMessageLog (partition scope)	Log records for partition scope JMS resources. An individual log file is maintained for each partition and may be accessed by the partition user.
JMSSAFMessageLog (partition scope)	Log records for partition scope SAF agent resources. An individual log file is maintained for each partition and may be accessed by the partition user.
DataSourceLog	Data source profile records generated when doing work within the scope of a partition.
WebAppLog (partition scope)	Servlet context logs from partition scope applications. An individual log file is maintained for each partition and may be accessed by the partition user.
ConnectorLog (partition scope)	Java Connector Architecture resource adapter logs from partition scope resource adapters. An individual log file is maintained for each partition and may be accessed by the partition user.

27.3 Configuring Partition Scope Logging

WebLogic Server MT allows configuration of levels for `java.util.logging` loggers that are used by applications deployed to a partition. Within a WebLogic domain, different partitions may contain copies of the same application. In such cases, different instances of the application may use `java.util.logging` loggers with same name. The application may have dependencies on libraries that use `java.util.logging` loggers and that are on the system classpath. In a multitenant environment, partition users can control the levels of these loggers within the scope of their partition without affecting other partitions.

The ability to configure `java.util.logging` logger levels for partition scope resources is enabled by the following:

- A custom log manager, `WLLogManager`, which the domain system administrator must configure as the global log manager for the domain
- The `PartitionLogMBean.PartitionLoggerLevels` attribute, which partition users can configure by specifying key-value pairs consisting of logger names and the corresponding `java.util.logging.Level` names

To enable the ability for partition users to configure partition scope logger levels:

1. The domain system administrator must configure `WLLogManager` for the domain by including the following `weblogic.Server` option in the WebLogic Server start command:

   ```
   -Djava.util.logging.manager=weblogic.logging.WLLogManager
   ```

2. The partition user configures key-value pairs in the `PartitionLogMBean.PartitionLoggerLevels` attribute.

Example 27–1 shows using WLST to configure partition scope logging and debugging on partition `p1`.

Example 27–1 Configuring Partition Scope Logging and Debugging

```
startEdit()
cd('/')
```

```
p1 = cmo.createPartition('p1')
plog = p1.getPartitionLog()
plog.addEnabledServerDebugAttribute('DebugJNDI')
props = java.util.Properties()
props.put('foo.bar.logging','WARNING')
plog.setPlatformLoggerLevels(props)
save()
activate()
```

For information about debugging, see Configuring Partition Scope Debugging.

27.4 Configuring Partition Scope Debugging

WebLogic Server MT supports debugging of partition scope resources by the following means:

- The `ServerDebugMBean` includes the `PartitionDebugLoggingEnabled` attribute. This attribute controls whether partition scope debugging is enabled, and may be accessed only by the WebLogic domain administrator.

  This attribute is disabled by default. When enabled, partition scope debugging is available for all partitions in the domain.

- The `PartitionLogMBean` includes the `EnabledServerDebugAttributes` attribute, for which a partition user can define, as an array of `Strings`, any of the debug flags available for the `ServerDebugMBean`.

- When debugging is enabled in the domain and configured in a partition, debug messages that are emitted by a system resource doing work on behalf of the partition are sent to that partition.

> **Note:** Oracle strongly recommends that when troubleshooting a server problem, the partition user and the WebLogic domain administrator should consult one another prior to enabling server-level debugging for a partition. Furthermore, partition scope debugging should be enabled only for a short period of time.

A typical use case for partition scope debugging involves consultation with Oracle Support, who identifies the specific debug flags that the partition user should configure on the `PartitionLogMBean.EnabledServerDebugAttributes` attribute.

See Example 27–1 for an example WLST script that shows configuring partition scope debugging.

27.5 Configuring Diagnostic System Modules

You can include WLDF diagnostic system modules in resource groups and resource group templates to allow partition specific monitoring. Note that not all functionality provided by domain scope diagnostic system modules is enabled when scoped to a partition. In particular, the server-level instrumentation, which affects the server as a whole, is not available at the partition level.

The following sections explain how to configure partition scope diagnostic system modules:

- Metrics Harvesting
- Configuring Policies and Actions

27.5.1 Metrics Harvesting

The WLDF Harvester component periodically samples JMX run-time MBean attributes consistent with its configuration in a diagnostic system module and stores the data in the Archive. This capability is available within the scope of a partition, but the diagnostic system module:

- May access the run-time MBeans for resources within the same partition only. Partition users have read-only access to certain monitoring information from MBeans at the global scope. These MBean attributes can be harvested from a partition scope WLDF diagnostic system module.
- May not access run-time MBeans for resources in other partitions
- May configure the Harvester in a partition-neutral manner. In other words, the `partition-id` or `partition-name` need not be hard-wired in the configuration. This allows WLDF configurations to be portable regardless of the partitions to which they are assigned.

Partition scope data that is saved in the Archive is tagged with partition-specific identifiers so that the data is accessible to domain system administrators and users of that partition, but not to others.

For a list of the WLST commands that partition administrators can use for diagnostic system modules, see Section 27.10, "WLST Diagnostic Commands for Partition Administrators".

27.5.2 Configuring Policies and Actions

You can use the WLDF Policies and Actions component within a diagnostic system module to create policies that evaluate common JMX run-time MBean metrics, log records, and instrumentation events. This functionality is available at the partition level within the following constraints:

- Policies may access only those MBean attributes that are visible to partitions.
- Log policies are evaluated only for server and domain log records that are specific to the partition.
- SNMP actions are not supported.
- SMTP actions require that the mail session that is used must be visible to the partition in JNDI.
- All policy expressions in partition scope diagnostic system modules must use Java Expression Language (EL). For more information, see "Policy Expression" in *Configuring and Using the Diagnostics Framework for Oracle WebLogic Server*.
- Scaling actions (scale up and scale down) are not supported within the scope of a partition.

27.6 Accessing Diagnostic Data

As a partition administrator, you do not have file level access to all log files in the domain, particularly those that are server or domain scope. However, you can selectively access log content pertaining to your partition by using the WLDF data accessor and supported WLST functions.

The domain system administrator, who has full access to all log files in the domain, is responsible for configuring the appropriate security policies for log files to ensure the following:

- You are authenticated when you attempt to access a log record.
- You are able to access log records that are specific to your partition.
- You are denied access to log records not pertaining to your partition.

You can access log records for your partition by using the following MBeans that are created under your partition's `WLDFPartitionRuntimeMBean`, which is a child of the `PartitionRuntimeMBean`:

MBean	Description
`WLDFPartitionAccessRuntimeMBean`	Discovers log files that are available to your partition. Log files that are not available to your partition are not exposed.
`WLDFDataAccessRuntimeMBean`	Accesses log file records specific to your partition. Log records that do not pertain to your partition are not exposed.

27.6.1 Shared Log Files

The following logs and diagnostic data are shared by all partitions in the domain, and the partition administrator can access records within these logs that pertain to their partition:

Log Type	Content Description
Server	Log events from server and application components pertaining to the partition and that are recorded in the server log file.
Domain	Log events collected centrally from all server instances in the domain pertaining to the partition and that are recorded in the domain log file.
Data source	Data source log events pertaining to the partition and that are recorded in the data source log file.
Harvested data archive	Metric data gathered by the WLDF Harvester from MBeans pertaining to the partition and that are recorded in the harvested data archive.
Events data archive	WLDF Instrumentation events that are generated by applications deployed in the partition and that are recorded in the events data archive.

When partitions are configured in the domain, each record created in these shared log files includes the following two attributes:

- `partition-name` — a human-readable partition name
- `partition-id` — a unique, automatically generated identifier of the partition

The harvested data archive and events data archive include two additional table columns, PARTITION_ID and PARTITION_NAME, in which these attributes are listed.

> **Note:** When partitions are configured in the domain, log records generated on behalf of server or domain scope work are assigned the `partition-id` value `0`, and the `partition-name` value `DOMAIN`.

The following example shows a log record entry in a server log file. The `partition-id` and `partition-name` attributes are highlighted in **bold**.

```
####<Oct 2, 2015 1:20:28 PM EDT> <Notice> <Partition Lifecycle>
 <tiger-mac.local> <partitionAdmin> <[ACTIVE] ExecuteThread: '2' for queue:
 'weblogic.kernel.Default (self-tuning)'> <system> <>
```

```
 <cfd4d584-ee45-49a6-ae91-9c12551330d8-000000af> <1443806428565> <[severity-value:
32] [rid: 0]
[partition-id: d75a4899-ca61-4ed8-b519-317b0ec15061] [partition-name: p1] >
<BEA-2192303> <The partition lifecycle operation "START" for partition "p1" is
initiated.>
```

When the data accessor obtains log records pertaining to a specific partition, it filters them based on the `partition-id` value.

> **Note:** The JFR flight recording, which includes events from the JVM and from any other event producer, such as WebLogic Server and Oracle Dynamic Monitoring System (DMS), can include `partition-id` and `partition-name` attributes to distinguish data among partitions. However, only the domain system administrator may have access to the JFR data that contains the partition information that can be used to diagnose multi tenancy issues.

27.6.2 Partition-Specific Log Files

The following log files are specific to each partition and are available to the partition administrator. These log files are stored in the `partitions/<partition>/system/servers/<server-name>` directory.

Log Type	Content Description
HTPP access log	Log events of all HTTP transactions from the partition's virtual target web server, which are stored in the file `access.log`.
JMS server	JMS server message life cycle events for JMS server resources that are defined within a resource group, or resource group template, and that are scoped to the partition.
SAF agent	SAF agent message life cycle events for SAF agent resources that are defined within a resource group, or resource group template, and that are scoped to the partition.
Connector	Log data generated by Java Connector Architecture resource adapter modules that are deployed to a resource group, or resource group template, within the partition.
Servlet context	Servlet context log data generated by Java EE web application modules that are deployed to a resource group, or resource group template, within the partition.

27.6.3 Using the WLDF Data Accessor

Using the WLDF data accessor, you can perform data lookups by type, component, and attribute. You can filter by severity, source, and content. You can also access diagnostic data in tabular form. For complete details about the data accessor, see "Accessing Diagnostic Data With the Data Accessor" in *Configuring and Using the Diagnostics Framework for Oracle WebLogic Server*.

The following table lists the logical names for each of the log and diagnostic data files you can view using the data accessor. You use the logical name as a key to refer to a log type when using the `WLDFDataAccessRuntimeMBean` or WLST.

Log Type	Logical Name
Server log	`ServerLog`

Log Type	Logical Name
Domain log	`DomainLog`
JDBC log	`DataSourceLog`
Harvested data archive	`HarvestedDataArchive`
Events data archive	`EventsDataArchive`
HTTP access log	`HTTPAccessLog/<WebServer-Name>`
JMS server	`JMSMessageLog/<JMSServer-Name>`
SAF agent	`JMSSAFMessageLog/<SAFAgent-Name>`
Servlet context	`WebAppLog/<WebServer-Name>/context-path`
Connector	`ConnectorLog/connection-Factory-jndiName$partition-name`

As a partition administrator, you can use the following tools to access log and diagnostic data for your partition:

- Fusion Middleware Control

  You can use Fusion Middleware Control to view records from both shared and partition-specific log files. For information, see "Monitor domain partitions" in *Administering Oracle WebLogic Server with Fusion Middleware Control*.

- WebLogic Scripting Tool

  For a list of the WLST commands that partition administrators can use for using the data accessor, see Section 27.10, "WLST Diagnostic Commands for Partition Administrators". For the syntax and examples of these commands, see "Diagnostics Commands" in *WLST Command Reference for WebLogic Server*.

The WebLogic Server Administration Console does not support viewing partition log and diagnostic data.

27.7 Monitoring Resource Consumption Management

Resource Consumption Management (RCM) provides a flexible, dynamic mechanism for WebLogic Server system administrators to manage shared resources and provide consistent performance of domain partitions in MT environments. WebLogic Server supports the ability to monitor resource consumption management (RCM) within a partition scope.

For more information about RCM, see Chapter 27, "Monitoring and Debugging Partitions".

27.7.1 Configuring RCM

For information about configuring RCM, see Section 11.2, "Configuring Resource Consumption Management: Main Steps".

27.7.2 Partition Scope RCM Metrics

Table 27–1 lists and summarizes the attributes on the `PartitionResourceMetricsRuntimeMBean` that can provide partition scope RCM metrics:

Table 27–1 PartitionResourceMetricsRuntimeMBean Attributes for RCM

Attribute	Description
`RCMMetricsDataAvailable`	Boolean value indicating whether RCM metrics data is available for this partition.
`CpuTimeNanos`	Total CPU time spent in the context of a partition in the time since server start or partition creation, whichever is later.
`AllocatedMemory`	Total allocated memory in bytes in the context of a partition in the time since server or partition creation, whichever is later.
`RetainedHeapHistoricalData`	Snapshot of the historical data for retained heap memory usage for the partition. Data is returned as a two-dimensional array for the usage of retained heap scoped to the partition over time. Each item in the array contains a tuple of `[timestamp (long), retainedHeap(long)]` values.
`CpuUtilizationHistoricalData`	Snapshot of the historical data for CPU usage for the partition. CPU utilization percentage indicates the percentage of CPU utilized by a partition with respect to available CPU to Weblogic Server. Data is returned as a two-dimensional array for the CPU usage scoped to the partition over time. Each item in the array contains a tuple of `[timestamp (long), cpuUsage(long)]` values.
`ThreadCount`	Number of threads currently assigned to the partition.
`TotalOpenedSocketCount`	Total number of sockets opened in the context of a partition in the time since server start or partition creation, whichever is later.
`CurrentOpenSocketCount`	Number of sockets currently open in the context of a partition.
`NetworkBytesRead`	Total number of bytes read from sockets for a partition in the time since server start or partition creation, whichever is later.
`NetworkBytesWritten`	Total number of bytes written to sockets for a partition in the time since server start or partition creation, whichever is later.
`TotalOpenedFileCount`	Total number of files opened in the context of a partition in the time since server start or partition creation, whichever is later.
`CurrentOpenFileCount`	Number of files currently open in the context of a partition.
`FileBytesRead`	Total number of bytes read in the context of a partition in the time since server start or partition creation, whichever is later.
`FileBytesWritten`	Total number of bytes written in the context of a partition in the time since server start or partition creation, whichever is later.
`TotalOpenedFileDescriptorCount`	Total number of file descriptors opened in the context of a partition in the time since server start or partition creation, whichever is later.
`CurrentOpenFileDescriptorCount`	Number of file descriptors currently open in the context of a partition.

For general RCM configuration requirements, see Configuring Resource Consumption Management.

27.8 Instrumenting Partition Scope Applications

The Instrumentation component of the WebLogic Diagnostics Framework (WLDF) provides a mechanism for adding diagnostic code to WebLogic Server instances and the applications running on them. For complete details about this feature, see "Configuring Instrumentation" in *Configuring and Using the Diagnostics Framework for Oracle WebLogic Server*.

WebLogic Server MT supports the ability to instrument an application that is deployed within a partition by using the deployment descriptor (`META-INF/weblogic-diagnostics.xml`) or a deployment plan. This capability is supported with the following conditions:

- The domain system administrator must configure the diagnostic system module at the system level and target it to the appropriate Managed Server instance at the global level (that is, not partition scoped), and its instrumentation component must be enabled.
- The instrumented application must contain the `META-INF/weblogic-diagnostics.xml` deployment descriptor and its instrumentation component must be enabled.
- The application must not be configured in such a way that it shares class loaders with application instances in other partitions.

27.9 Configuring Partition Scope Diagnostic Image Capture

Diagnostic image contains relevant data from various subsystems of WebLogic Server as it exists when a diagnostic image capture is initiated. You can initiate diagnostic image capture manually initiated with any of the following tools:

- WebLogic Server Administration Console
- Fusion Middleware Control
- WLST
- JMX
- WLDF Policies and Actions component

When a partition user initiates a diagnostic image capture, the contents of the image is limited to the partition scope resources only. When a diagnostic image capture is initiated by invoking an operation on the `WLDFPartitionImageRuntimeMBean` that corresponds to a partition, the generated image contain data pertaining to that partition only. For partition scoped diagnostic images, the `partition-id` and `partition-name` is encoded into the file names.

Note that only the domain system administrator may have access to the JFR data containing the information corresponding to a partition.

When scoped to a partition, the following components can generate partition-specific records into the diagnostic image capture:

- Connector
- Instrumentation
- JDBC

- JNDI
- JVM
- Logging
- RCM
- Work Manager
- JTA

For a list of the WLST commands that partition administrators can use for diagnostic image capture, see Section 27.10, "WLST Diagnostic Commands for Partition Administrators".

27.10 WLST Diagnostic Commands for Partition Administrators

The following table lists the WLST diagnostics commands that are available to partition administrators for accessing partition scope logging and diagnostics data. These commands are presented in three categories:

- Data accessor — commands for using the WLDF data accessor to access partition scope diagnostic data from various sources, including log records, data events, and harvested metrics
- Diagnostic image capture — commands for capturing, saving, and accessing diagnostic image capture
- Diagnostic modules — commands for exporting metric data collected by a diagnostic system module within a specific time interval

Each of these commands includes a *partition* argument for specifying the partition name.

Command	Category	Summary
exportDiagnosticDataFromServer	Data accessor	Executes a query on the server side and retrieves the exported WLDF data.
getAvailableDiagnosticDataAccessorNames	Data accessor	Gets the logical names of diagnostic data accessor instances currently available on a server or partition, and returns them as an array of string values.
captureAndSaveDiagnosticImage	Diagnostic image	Captures a diagnostic image and download it to the client.
getAvailableCapturedImages	Diagnostic image	Returns, as an array of strings, a list of the previously captured diagnostic images that are stored in the image destination directory configured on the server.
saveDiagnosticImageCaptureEntryFile	Diagnostic image	Downloads a specific entry from the diagnostic image capture that is located on the server to which WLST is currently connected.
saveDiagnosticImageCaptureFile	Diagnostic image	Downloads the specified diagnostic image capture from the server to which WLST is currently connected.
purgeCapturedImages	Diagnostic image	Purges the diagnostic image files on the server as per the age criteria specified from the server's configured image destination directory.

Command	Category	Summary
`exportHarvestedTimeSeriesData`	Diagnostic module	Exports harvested metric data from the diagnostic archive for a particular server-scoped or partition-scoped diagnostic system module.

For more information about the WLST commands available for diagnostics, see "Diagnostics Commands" in *WLST Command Reference for WebLogic Server*.