Oracle® Retail Predictive Application Server and Applications Cloud Edition

Security Guide

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Preface

This document serves as a guide for administrators, developers, and system integrators who securely administer RPASCE and RPASCE applications.

Audience

This document is intended to provide an overview of the security features of the RPASCE Platform and applications built upon it. It contains a set of best practices for administrators, developers, and system integrators who perform the following functions:

- Work with customers to configure and deploy RPASCE applications.
- Perform RPASCE Administration tasks such as user management, permissions, and system limits.

This document is not intended to describe in detail the processes of deploying and maintaining an RPASCE application. It is assumed that the readers have a general knowledge of administering the underlying technologies and applications.

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Related Documents

This document serves as a guide for administrators, developers, and system integrators who securely administer, customize, and integrate Oracle Retail Predictive Application Server Cloud Edition and RPASCE applications. Information on securing the following RPASCE applications is included in this guide:

For more information, see the documents in the following RPASCE documentation sets:

- Oracle Retail Item Planning Cloud Service
- Oracle Retail Merchandise Financial Planning Cloud Service
- Oracle Retail Merchandise Financial Planning Enterprise Edition Cloud Service

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- Exact error message received
- Screen shots of each step you take

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http://www.oracle.com/technetwork/documentation/oracle-retail-100266.html

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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.

Convention	Meaning
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

Overview

The Oracle Retail Predictive Application Server Cloud Edition (RPASCE) is a platform that provides a set of common components used by a number of applications (solutions). For these solutions, RPASCE provides the infrastructure needed to store, process, and produce information based on data input by the retailer.

This guide discusses security considerations pertaining to the end user maintenance of an RPASCE Server application and the users of an RPASCE application.

Terminology

The following section provides a brief introduction to RPASCE and its terminology.

RPASCE Concepts

- **RPASCE**: A platform that provides a foundation to run solutions used for retail planning. RPASCE provides those solutions with a common interface based on wizards, templates, workbooks, and batch processes.
- **RPASCE Solution**: An application running on top of RPASCE that provides solutions for retail activities such financial planning or forecasting demand.
- **RPASCE Domain**: A collection of server side directories and files containing the data and procedures required to execute a specific RPASCE solution. Domains may be:
  - **Global**: contains data above the partition level as well as settings and metadata that apply across all local domains
  - **Local**: contains data for a single partition (for example, for one department in the product hierarchy)

  Note: RPASCE users who are given access to only certain partitions may only have access to a subset of local domains. All users have access to the global domain.

RPASCE Applications

Users access an RPASCE solution through the RPASCE client, a web-based client.

In addition, Administrators can access the **Configuration Tools**. This is a Windows-based set of utilities used to configure and maintain a RPASCE solution.

Secure Deployment

Secure deployment refers to the security of the infrastructure used to deploy the SaaS application. Key issues in secure deployment include Physical Safeguards, Network Security, Infrastructure Security, and Data Security.

Physical Safeguards

RPASCE applications are deployed via Oracle Cloud Infrastructure datacenters. Access to Oracle Cloud data centers requires special authorization that is monitored and audited. The premises are monitored by CCTV, with entrances protected by physical barriers and security guards. Governance controls are in place to minimize the resources that are able to access systems. Physical security safeguards are further detailed in Oracle's Cloud Hosting and Delivery Policies.

http://www.oracle.com/us/corporate/contracts/ocloud-hosting-delivery-policies-3089853.pdf

General Security Principles

The following principles are fundamental to using any application securely.

Keep Software Up to Date

One of the principles of good security practice is to keep all software versions and patches up to date. Since all interactions with RPASCE applications occur through the web browser and the FTP client, these must be maintained at their latest release level for all client systems.

Follow the Principle of Least Privilege

The principle of least privilege states that users must be given the lowest privilege level required to perform their jobs. Overly ambitious granting of responsibilities, roles, grants, and so on, especially early on in an organization's life cycle when people are few and work must be done quickly, often leaves a system wide open for abuse. User privileges must be reviewed periodically to determine relevance to current job responsibilities.

Monitor System Activity

System security stands on three legs: good security protocols, proper system configuration, and system monitoring. Auditing and reviewing audit records address this third requirement. Each component within a system has some degree of monitoring capability. Follow the audit advice in this document and regularly monitor audit records.

Keep Up to Date on Latest Security Information

Oracle continually improves its software and documentation. Check this note yearly for revisions.

2

Responsibilities

As retailers migrate to the cloud, they must consider how the cloud, and more specifically Software-As-A-Service (SaaS), will impact their privacy, security, and compliance efforts. As the cloud service provider, Oracle Retail works together with customers to meet cloud security objectives.

Retailer Responsibilities

At a high level, retailers are responsible for:

- Understanding Oracle's security policies
- Implementing their own corporate policies via Oracle tools
- Creating and administering users via Oracle tools
- Ensuring data quality and enforcing end-user devices security controls, so that antivirus, malware, and other malicious code checks are performed on data and files before uploading data
- Ensuring that end-user devices meet the minimum security requirements
- Generating public/private key pairs as requested by Oracle Retail

To securely implement RPASCE, retailers and their implementation partners should read this document to understand Oracle's security policies. This document summarizes information and contains links to many other Oracle documents.

Oracle Responsibilities

As the cloud service provider, at the highest level Oracle Retail is responsible for:

- Building secure software
- Provisioning and managing secure environments
- Protecting the retailer's data

RPASCE fulfills its responsibilities by a combination of corporate level development practices and cloud delivery policies. Sections in this document will describe this information in great detail later in this document.

3

Client Tier Security

This chapter discusses security for the RPASCE Client.

Factors Affecting Security

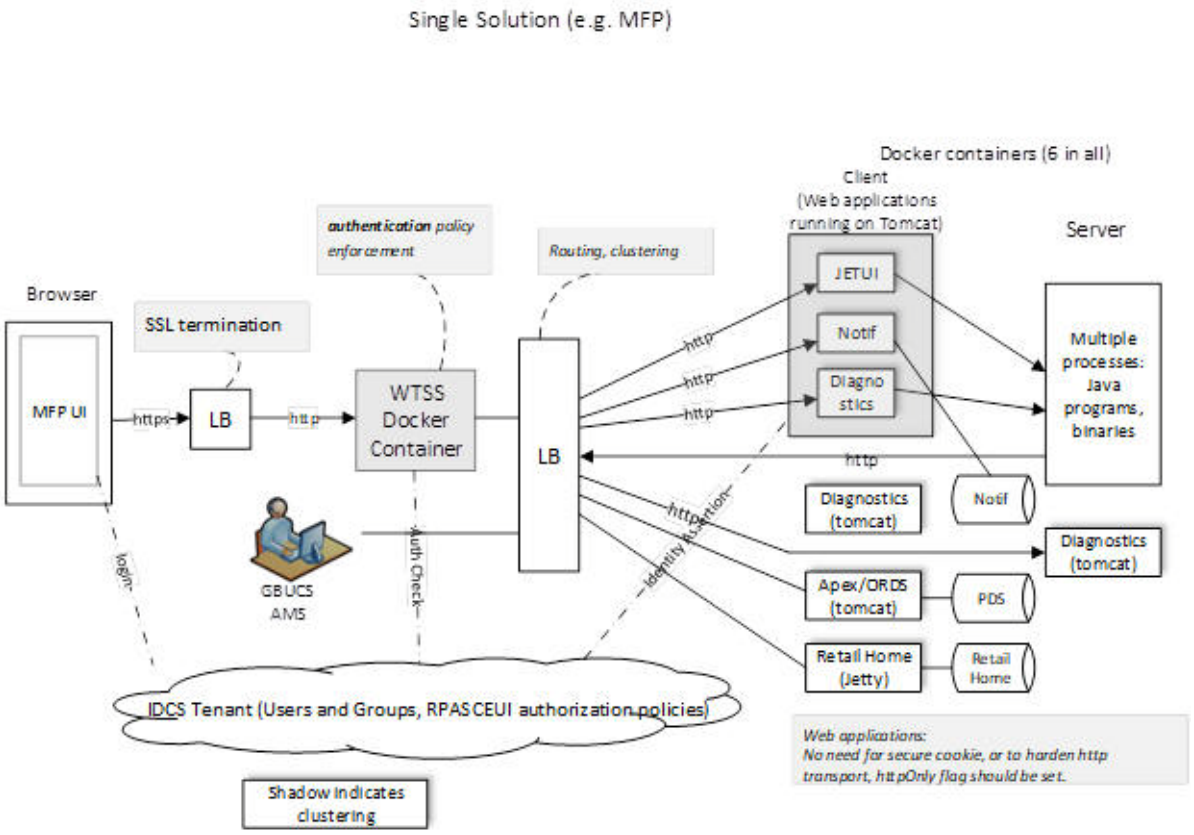
The factors affecting security are Authentication, Authorization, and Auditing.

Authentication

It is a requirement that user names and passwords for RPASCE users must be created in an Identity Cloud Service (IDCS) or Oracle Cloud Infrastructure Identity and Access Management (OCI IAM) instance. RPASCE Client uses perimeter authentication. The Oracle software product, Web Tier Security Service (WTSS), is used to field all HTTP requests. WTSS redirects the browser to an IDCS or OCI IAM login page if a request lacks the IDCS or OCI IAM session cookie.

Figure 3–1 shows the complete deployment topology of RPASCE, including the authentication enforcement point.

Figure 3–1 RPASCE Deployment Topology



RPASCE Docker Deployment

As can be seen in Figure 3–1, RPASCE is deployed as a stack of Docker containers. The deployment process is controlled by some configured properties and other files such as credential-bearing mkstore wallets.

User groups that are set up in the IDCS or OCI IAM are authorized to access the RPASCE Client during the deployment process. The rpasce.properties file has entries that control which user group(s) can access the RPASCE client UI and web services.

Users can be added through the IDCS or OCI IAM Admin Console, and can be added in bulk using a CSV file. For more information on using IDCS or OCI IAM, see the Oracle Identity Cloud Service online help at `https://docs.oracle.com/en/cloud/paas/identity-cloud/index.html` or Oracle Cloud Infrastructure Identity and Access Management at `https://docs.oracle.com/en-us/iaas/Content/Identity/home.htm`.

When working with the optional Atomic User Management feature, user accounts will be automatically created and deleted from RPASCE in response to changes in IDCS or OCI IAM.

When not working with Atomic User Management, you must separately add users to RPASCE. This can be done through the RPASCE Client UI or using an XML file that must be uploaded and executed through the sftp interface, as described in the "System Administration" chapter of the *Oracle Retail Predictive Application Server Cloud Edition Administration Guide*. You must also delete users from RPASCE when deleting them from IDCS or OCI IAM.

Web Service Authentication

RPASCE authenticates web services using OAUTH2.0 via IDCS or OCI IAM. The user acquires an OAuth 2.0 access token from IDCS or OCI IAM first, using a combination of IDCS or OCI IAM client credentials and the user's own userid/password credentials. The token is then used to invoke the RPASCE web service.

Authorization

Authorization refers to the selective provisioning of data and the functional access to different classes of users.

Authorization Within the RPASCE UI

No external configuration is available for this. Authorization data is managed within RPASCE. To administer authorizations, the customer must use the RPASCE Client UI itself.

Two authorization roles are available in RPASCE: admin and non-admin. After the server installation, a bootstrap admin user can be added to the RPASCE domain. Once this occurs, other users (admin and non-admin) can be added through the RPASCE Client UI. It is also possible to add users to RPASCE in bulk using a command line utility.

Note that the user groups in IDCS or OCI IAM have nothing to do with authorization (as defined above), except in the limited sense that, to access the RPASCE UI, the user must be a member of an authorized group in rpasce.properties.

Authorization for PDS Web Services

Users must be a member of the IDCS or OCI IAM group called "PDS_SERVICES". Cloud Engineering will create this group and other groups that have been defined for the specific RPASCE solution.

Authorization for Retail Home Metric Tiles

For each RPASCE solution, there is a Retail Home configuration file. This file defines the metadata for the Retail Home metric tiles, including the assignment of IDCS or OCI IAM user groups to tiles.

The visible metric tiles in the Retail Home dashboard are the ones assigned to the user's groups.

Password Policies

The customer administrator user can define password complexity and rotation rules. All application user maintenance is performed by Customer Administrators via IDCS or OCI IAM.

The following guidelines are useful.

- Automatic lock out occurs after a certain number of failed login attempts.
- Password expiration may be enabled.
- The password reuse time can be set.

Browser Security

Note the following:

Update the browser when new versions are released; they often include new security features.

Check the browser for built-in safety features.

Setting Policy For Unattended PC Sessions

Others may try to access an unattended workstation while the user is still logged into the system. Users must never leave their workstation unattended while logged into the system because it makes the system accessible to others. Organizations must set a corporate policy for handling unattended PC sessions. Users must use the password-locked screen savers feature on all PCs.

4

Compute Tier Security

This chapter contains information on security activities carried out in the Compute Tier.

User and Group Management

RPASCE allows administrators to assign users into distinct groups. A group is similar to a traditional database role in that it allows the administrator to configure authorization settings for several users at once. The main difference, however, is that user and group have a hierarchical relationship, where settings are always stored at the user level and group is a rollup of user. User groups are typically assigned based on a common business role such as Planners in order to facilitate managing the authorization settings at the group level.

The group that a user rolls up to is referred to as the primary group. A user can also be associated with other groups using the Other Groups property. The Other Groups property is not used for authorization purposes, but instead allows a user to save workbooks and formatting in a way that it is visible to users whose primary group is one of those Other Groups. This behavior is typically used by people who need to support other users rather than an end-user (for example, a team whose job is to set up the formatting for all of the other project groups).

When a user is added, a position is created for the user in the metadata dimension User. Similarly, when a group is added, that group is assigned a position in the metadata dimension Group. The frequent adding and dropping of users and groups can eventually exhaust the list of available positions in these dimensions and will require the reindexing of these dimensions.

Additionally, when a user is added, a directory is created for the user in the /users directory of the domain root. In global domains, this directory is created in the master and in all subdomains. This directory serves as a workbook repository, as well as a cache for some metadata such as MRU lists. When a user is deleted, these directories, as well as any workbooks created by that user, will be deleted with the user.

Locking User Accounts

User accounts can be marked as locked by the domain administrator. This prevents the user from logging on with the RPASCE Client. The account remains locked until the administrator re-enables the account. The domain administrator can set or clear account lockouts by using the User Management utility or the Edit User workbook.

Roles Created in IDCS or OCI IAM

A number of roles are created within IDCS or OCI IAM as part of the provisioning process that are used to support the RPASCE applications. Some of these roles are created to support user operations and must be assigned to users in the system.

However, there are also many roles created within IDCS or OCI IAM to support the integration of the RPASCE systems with other systems and components within the Cloud environment. These roles are used by the internal processes of the system, and, in general, do not need to be assigned to users of the system. Nor would such an assignment meaningfully affect the access rights of a user, as those systems are not exposed outside of the Cloud environment.

This section provides information about these roles created within IDCS or OCI IAM. It describes the roles that can be used by users and provides information about what those roles are used for. It also provides a summary description of the types of roles used internally by the system.

User Roles

For GA applications these include a set of GA user roles that correspond to the standard roles in the processes those GA applications support. The roles created vary by the application, and information about the roles created and their uses are detailed in the application-specific User Guides.

In addition, a role is created to allow access to the content of Retail Home, including access to notifications received in the RPASCE Client and Retail Home. This role is named PLATFORM_SERVICES_ADMINISTRATOR_ABSTRACT for production environments or PLATFORM_SERVICES_ADMINISTRATOR_ABSTRACT_PREPROD for stage environments. The role appropriate for an environment must be assigned to any and all users who must have access to Retail Home and notification content in that environment.

Users who need to administer translation resources through Retail Home must be provided with either the RETAIL_HOME_ADMIN or the RETAIL_HOME_ADMIN_ PREPROD role. Users who need to administer notifications through Retail Home must be provided with either the PLATFORM_SERVICES_ADMINISTRATOR or PLATFORM_SERVICES_ ADMINISTRATOR_PREPROD role. As above, the proper role varies between production and staging environments.

Finally, for instances that make use of the optional Atomic User Management functionality, two non-functional roles are defined: the application authorization role and the application administration role. These roles control access to the application in general (for the former) and to the administrative activities of the application (for the later) respectively and are detailed further in the Atomic User Management section of this document.

System Roles

In addition to the user roles described above, a large number of roles are created to support the processes and actions of the system.These roles need not be assigned to users of the application. They are instead used for communication between the RPASCE application and other components of the Cloud environment.

In many cases, system accounts are created within IDCS or OCI IAM that make use of these roles. In general, these roles tend to be prefixed by the component of the overall system that uses the role. For example, BdiEdgeRpasJobAdminGroup, is used by RPASCE to accomplish integration with external systems through the BDI interface.

Information on the roles created to support integration with other components in the Cloud environment can be found in the documentation for those components:

Oracle Retail Bulk Data Integration Cloud Service Integration Guide

https://docs.oracle.com/cd/B31315_01/191000/BDI%20Implementation%20Guide/bdics-191000-impg.pdf

Oracle Retail Process Orchestration and Monitoring Implementation Guide

https://docs.oracle.com/en/industries/retail/retail-process-orchestration-monitoring/19.1/index.html

Authorization

This section deals with authorizing access.

Workbook Security

Currently, workbook access is either granted or denied. If users have been granted access to a workbook, they can open, modify, and commit the workbook. No distinction is made between read-write-commit, read-write, and read-only access. Workbook access is automatically granted to the user who builds a workbook, and it can be shared by that user with other users in the system who are authorized to view that workbook and the data contained within it. The user who receives access to a workbook has access to all data and operations within the workbook without limit.

For guidance on assigning permissions to workbooks by role and group, see the Implementation Considerations chapter, section "Security," of each RPASCE Application's Implementation Guide. All recommendations in the guides are for the GA solution. If a customer chooses to customize permissions, keep in mind that the Principle of Least Privilege: only provides users with sufficient permissions to do their job and nothing more.

Note: A user must have access to the workbook template in order to access the workbook, even if the workbook has world or group access rights.

Users with administrator status automatically have access to all workbook templates. By default, administrators have access to all workbooks that are saved with world access. If a workbook is saved with group access, administrators can only access the workbook if they are members of the default user group of the user who saved the workbook.

Another aspect of workbook security is the ability to set limits for the number of workbooks that a user can have saved at any given time. Limits can be set for a user per template, for a user group per template, or for a template for all users. The limits are evaluated in the above order, which means that a limit defined at user-template overrides any values defined at group-template or template. If the above limits are not defined, the default value is one billion.

The limits are checked when the workbook build process is initiated. When the limit is reached, an error message displays informing the user that the workbook build process cannot complete because the limit has been reached. The message also lets the user know what that limit is. The wizard process then terminates.

Administrative users have full access to all workbook templates, regardless of the access rights that other administrative users may assign to them in the Security workbook. The administrative user can build the Security workbook to change the access right back, so the nominal assignment does not matter for administrative users.

Non-administrative users do not have access to the Security template and User Administration template groups even if the administrator inadvertently assigns them access rights.

Measure Level Security

Measures have access rights; these are read-write, read-only, or denied. Measures that are read-write or read-only may be selected in the extra measures and insert measure dialogs. RPASCE ensures that read-only measures are not editable by the user and the presence of read-only measures does not affect the ability to commit a workbook.

Measure security can be specified and changed through the Security Administration workbook. The Measure Rights view allows Read Only, Deny, or Read/Write access to a measure to be specified for each user.

A workbook template can override the security of a measure, but it can only narrow the security of that measure. For example, a measure can have read-write access for a user and a template can specify that all users have read-only access to the measure when a workbook is built. However, if the measure security is read-only, the template cannot expand the security of that measure to read-write. Measures that are explicitly made read-only by a workbook template are not expanded to read-write access by RPASCE.

Position Level Security

Position Level Security allows access control for dimensions on a position-by-position basis. This capability is completely optional. If position level security is not explicitly defined and configured, all users in a domain have access to all positions in all hierarchies. After the position level security is defined, access to a position can be granted or denied for individual users, users in a group, or for all users.

Position level security can be defined at levels (dimensions) at or above base (such as class in the product hierarchy) in any hierarchy other than calendar. As positions are added at a level/dimension lower in the hierarchy than where the position level security is maintained, access to those positions is automatically granted if a user has access to the parent position. In other words, if security is maintained at the subclass level, users are automatically granted access to all the SKUs in a given subclass if they have access to that subclass. This includes those that were added after security was established.

Exactly one dimension in each hierarchy can be defined as the security dimension for the hierarchy. If a security dimension is defined for the hierarchy, all dimensions in the hierarchy have position level security enabled, but position security is set at or above the designated dimension. For instance, if the class dimension is designated as the security dimension, an administrator can maintain access to positions in the class dimension or at any level above class.

The enabling of position level security as well as the specification of the dimension at which position level security will be maintained are managed within the configuration used to define the domain. The RPASCE Configuration Tools provide the ability to do this configuration within the Hierarchy Definition Tool.

Additionally, position level security can be enabled on a domain by using the hierarchyMgr utility. This utility allows the specification of the security dimension without requiring modifications to the domain's configuration and the application of a domain content patch through the rpasInstall process. For more information on the use of the hierarchyMgr utility, consult the RPASCE Online Administration Guide.

After a security dimension is defined for a hierarchy, all users in the domain default to having access to all positions in any dimension in the hierarchy. Additionally, users automatically have access to newly added positions to a domain.

The Security Administration workbook is used to control position access for individual users, user groups, or all users (referred to as world or default access). Three views are provided in this workbook for each hierarchy with a defined security dimension. The default view controls access to positions for all users (for instance, Prod Security Default); one view controls access to positions by user group (for instance, Prod Security Group); and the last view controls access to positions by individual users (for instance, Prod Security User).

Access must be granted at all levels for a user to have access to a position. This means a position must have a value of true at the levels default/world, group, and user. Table 4–1 demonstrates how access is granted or denied based on all combinations of settings. In the

table, Denied = false and Granted = true. Based on the combination of settings, a user is either granted or denied access.

Table 4–1 Granting Access

User	User Group	World	Resulting Access
Denied	Denied	Denied	Denied
Denied	Denied	Granted	Denied
Denied	Granted	Denied	Denied
Granted	Denied	Denied	Denied
Denied	Granted	Granted	Denied
Granted	Denied	Granted	Denied
Granted	Granted	Denied	Denied
Granted	Granted	Granted	Granted

Position-level security is used when a user selects positions in the wizard process before building a workbook. Only positions to which a user has access are available for selection in the 2-tree, which are then included in the build of the workbook.

Note that position-level security, when used for a global domain environment on the same dimension on which it is partitioned, is used to guide a user to the domain or domains that the user has access to. If a user only has access to positions within a single local domain, that user will be guided there on New Workbook. If a user has access to more than one, that user will be asked and can choose based on partition-level positions.

Similarly, Open by default only lists workbooks from those domains, and a user is only shown alert counts from those domains.

Atomic User Management

Atomic User Management (AUM)provides an alternative method for managing users, user groups, and user permissions. The goal of atomic user management is to streamline the process of setting up and managing user rights by moving to a role-based security model in which permissions are defined at the user group level and users are allowed or denied access as a result of the user groups to which they belong. This is done to simplify user rights management but does not alter the set of permissions or how they are enforced within the application.

Under the AUM model, RPASCE administrative users create RPASCE user groups that are named identically to the user roles defined in IDCS or OCI IAM that correspond to roles within the RPASCE application. They then set the access rights for the workbook template and the measures that will apply to all members of that group. RPASCE users can then be assigned the IDCS or OCI IAM role and, when accessing the application, be granted the rights defined for their groups automatically without the need to create those users and set their rights explicitly through the RPASCE administrative templates.

Note that AUM does not affect the process of position security. Position security is, in most cases, orthogonal to role-based security in that all users in a given role will have the same set of accessible templates and actions but each will have access to a different set of positions. Therefore, neither the mechanisms used to set up and maintain position level security nor the ways in which position level security are enforced change under the atomic user management model.

Non-Business Roles

Two special roles are associated with an RPASCE application using AUM: the first is the authentication role and the second is the application administration role. These roles are do not relate to the business processes of the application, but are instead used to manage access to the application and determine which users have administrative privileges within the application.

The names for these roles are not fixed and will vary between RPASCE applications and between the different environments (production, stage, and so on) making up a customer instance. For new customers, the role names will be provided during the provisioning and deployment process. For existing customers migrating to AUM, they are created as a part of the migration process.

Application Authorization Role

In order for users authenticated by IDCS or OCI IAM to be allowed access to the RPASCE application, they must belong to the application authorization role. Users who do not possess the authentication role will not be allowed access to the application, even if they possess one or more of the roles defined and granted rights in the application. In this way, a single set of business-related roles can be managed across multiple RPASCE application instances but access can still be limited for an application instance to a subset of all users. It can be useful, for example, to share user roles between a stage and a production environment but grant access to the stage environment to a subset of users.

Application Administrative Role

Under the AUM model, users are no longer granted administrative privileges through the setting of the admin flag within the user management templates. Instead, users possessing the administrative role for a given application instance will be granted admin rights for that application instance. These rights can then be managed by assigning a user the administrative role or revoking that role, with the changes taking effect automatically when the user next accesses the RPASCE application.

User Lifecycle in Atomic User Management

As users enter the IDCS or OCI IAM system, they can be granted both the application authorization role and one or more of the business roles. Once granted appropriate roles, users will be able to access the RPASCE application with the corresponding access rights. However, some additional administrative setup is required for a user accessing the system for the first time.

Position security is not role-based and is not managed through IDCS or OCI IAM. It is therefore necessary for an administrative user to set the position access rights for a new user in order for that user to be able to interact with data in the application. Additionally, new users will not have access to the Dashboard in the RPASCE client until a dashboard workbook has been prepared for them. When a new user first logs in, that user will receive a message from the application to contact their administrator to complete these setup processes.

During the lifetime of a user within the system, any changes to that user's responsibilities can be accommodated by updating the set of roles assigned to the user in IDCS or OCI IAM. If the set of roles possessed by a user change, those changes will automatically result in a change to that user's access rights when that user next logs in that reflect the access rights of the new set of roles they possess.

When a user should no longer be granted access to the application, the application authorization role can be revoked in IDCS or OCI IAM or, if appropriate, the user can be dropped from IDCS or OCI IAM entirely. No subsequent login attempts by that user will succeed, and they will no longer have access to the application and its data.

When a user is removed from the system, the system may continue to hold resources created by and for that user in the form of workbooks, saved formatting, and so on. To allow these resources to be reclaimed, a pair of administrative utilities can be run. First, the Sync Users from IDCS or OCI IAM utility will query IDCS or OCI IAM for the set of users authorized for the application. Any users who no are longer authorized for the application because of role changes or as a result of being removed from IDCS or OCI IAM will be flagged within the application as expired.

A second utility, Manage Users, can then be executed. This utility will drop all workbooks and reclaim all other resources associated with the expired users and will purge them from the system. The purpose of this two-step process is to safeguard against the loss of user information as a result of accident. Purging a user from the system and deleting all that user's work may result in a significant loss of time and effort. As such, it is recommended that the two utilities be scheduled to run separately in order to provide a chance for error remediation prior to the irrevocable deletion of user data.

Setting Proper Resource Limits

This section specifies how to set resource limits.

WorkbookTemplate Limits Views

The Workbook Template Limit views are used to limit the number of workbooks that the user can have saved. Limits can be set for a user per template, for a user group per template, or for a template for all users. The limits are evaluated in the above order, which means a limit defined in a user-template overrides any values defined at group-template or template. If the above limits are not defined, the default value is one billion, but it is not displayed in the workbook.

The limits are checked when the user begins the workbook build process. If the limit has been reached, an error message appears that informs the user that the workbook build process cannot complete because the limit has been reached. The wizard process then terminates.

Max Domain Session Limit View

The Max Domain Session Limit view is used to limit the number of user sessions that can be attached to a single domain by all users of that domain. The limit is set at the domain level. In a global domain environment, the same limit is applied individually to each local domain and the master domain.

This limit is checked during user login. If the limit has been reached, an error message appears to inform the user that the login has failed because this limit has been reached.

Max User Session Limit View

The Max User Session Limit view is used to limit the number of concurrent user sessions that can be attached to a single domain by the same user at the same time. The limit is set per user so that the administrator can control the maximum number of concurrent sessions that are allowed for an individual user. In a global domain environment, the same limit is applied individually to each local domain and the master domain.

This limit is checked during user login. If the limit has been reached, an error message appears to inform the user that the login has failed because this limit has been reached.

Information on how to set these limits can be found in RPASCE Online Administration Guide.

Dimension Modification Rights View

The Dimension Modification Rights view allows the administrator to determine which user defined dimensions, if any, a user can modify by using the Hierarchy Maintenance Workbook. The view contains a check box for each available user and dimension combination. A check mark in the cell indicates that the user is permitted to modify the specified user defined dimension. A check mark on the regular dimension has no affect. After changes are made to a user's dimension modification rights, they must be committed before they take effect.

Managing Sensitive Data

While RPASCE can be configured to store any type of data, it is designed to be used with sales history, inventory, and other business-related information with low security requirements. It is not intended to be used with any sensitive data, such as personally identifiable information or credit card information. It does not have any mechanisms to protect this data, such as encryption, and therefore must not be used in this manner.

Online Administration Tools

In order to be able to run and schedule administrative tasks in a cloud environment where the administrator has no access to the back-end servers, RPASCE Online Administration Tools provide an interface that allows authorized users to launch back-end processes from the RPASCE UI. It also provides a dashboard-like interface for the administrator to monitor the status of the tasks whose requests have been submitted.

Since the Administrator can launch processes in the back-end, albeit in a limited fashion, proper RPASCE server configuration is required to mitigate any security risks.

Authorization

By default, any RPAS administrative users have access to all RPASCE Administration Tools templates. In order to limit access to those sensitive templates, template security for RPASCE administrative users can be enabled in the domain

Auditing

All administrative tasks have a dedicated directory under the tasks folder of the domain. This directory contains the configuration, scheduling, and logging information of the task and can be used for auditing purpose. After a task is completed, its audit log is available through the Online Administration Dashboard. The number of successful or failed tasks whose logs are available through the dashboard is controlled by two domain properties:

- task_failed_limit: the number of failed tasks to be retained.
- task_success_limit: the number of successful tasks to be retained

5

Domain Security

This chapter of the security guide covers domain creation and maintenance.

Configuration Management

The process of RPASCE application configuration can be performed by an RPASCE administrator, an application expert, a consultant or a third-party implementation team. In all cases, the process of creating or modifying the configuration of an RPASCE application is performed using a stand-alone Java application known as the RPASCE Configuration Tools.

The RPASCE Configuration Tools work with an XML representation of the content of a domain known as the domain configuration. Using the Configuration Tools, a domain configuration can be inspected and modified. The configuration is then used as an input to the rpasInstall process, which creates and modifies RPASCE domains.

Because the RPASCE Configuration Tools are supported only on the Windows platform, there is a need to manage the transfer of that configuration between the system being used for the configuration and the system on which the RPASCE domain will be built and maintained.

Although the configuration itself does not contain any sensitive information, it does contain information about the meta-data of the domain and the processes used to maintain and modify that domain data. As such, it is prudent to secure the representation of the domain contained within the configuration.

To that end, there are three areas in which the security of a configuration can be discussed. These areas are:

- Upon the system on which the configuration process is performed.
- Upon the system on which the RPASCE domain is deployed.
- Upon the transfer of the configuration between the above two systems.

In each of these areas, precautions can be taken to maintain the integrity and confidentiality of the information represented within the configuration.

Securing the Configuration System

As the RPASCE Configuration Tools do not interact directly with an RPASCE domain, they cannot be used to inspect or modify domain information. However, because the configuration describes information about the information in the domain and the processes used to maintain and modify that information, it should be viewed as proprietary information. As such it should be subjected to the appropriate considerations employed to protect other proprietary information present on user systems.

The considerations include safeguarding the physical security of systems that store proprietary information, encryption of storage devices for these systems and limiting risk of exposure through controlling access to the information contained within the configuration.

Securing the Deployment System

.Once uploaded to the OCI environment, the configuration is protected by the same safeguards present to secure all domain resources residing within the host environment. No additional protections are required.

Securing the Transfer of Configurations

Configuration is performed on one or more users' individual systems. In order to build or update an RPASCE domain with that configuration, it is necessary to transfer the configuration to the system upon which the domain will be deployed. This transport is accomplished through use of the SFTP upload process that is documented for data file upload and is described therein.

Dynamic Position Maintenance

The creation of positions within the dimensions of an RPASCE domain is a process that is performed as part of an off-line process managed through the loadHier utility. However, the business processes performed by some RPAS applications make deferring position creation and management to an off-line process unacceptable.

Dynamic Position Maintenance (DPM) allows user to create and manage certain positions in an online process while working within a workbook. Users can create additional positions within constraints based on domain security settings and the workbook configuration and enforced by the RPASCE Server instance.

Users can also modify and or delete existing positions created through DPM operations within constraints based on domain security settings and the workbook configuration and enforced by the RPASCE Server instance.

Users are not allowed to modify or delete positions which the domain's security settings do not grant them access to; they may also not modify positions not allowed by the configuration of the workbook in which they are working. Finally, changes to formal positions managed through the loadhier process cannot by modified in any circumstances through DPM operations.

Enabling DPM functionality within a workbook involves the following process:

1. Configurator must enable DPM on particular dimensions on the domain.
2. Configurator must enable DPM on the specific workbook template.
3. Configurator or system administrator must ensure there is enough space to accommodate the volume of DPM position given by the bitsize of the dimension.
4. Administrator must give WRITE permission on that workbook template to the user.

When a user creates DPM positions, they are treated as temporary positions; loadHier does not update these positions. A command line utility informalPositionMgr is available for the purpose of:

1. When a user has finalized its information and wants to convert them to normal positions.
2. Application involves creating a very large number of DPM positions.

Like all RPASCE server utilities, this command line utility should only have execution rights granted to system administrators.

RPASCE Maintenance

Domain maintenance is a periodic operation that needs to be performed by the administrator. Its frequency depends on the degree to which the domain is subjected to hierarchy changes across time. Many of these operations can improve overall performance of data access operations - this can result in fewer contention issues which improves accessibility.

In addition, many of these operations involve removing data from the domain when that data is no longer needed by the operations being performed by the domain. This periodic cleansing serves to remove data from the system and addresses the need to retire data as a part of the data management life cycle. Some of the domain maintenance tasks that can be performed periodically are:

Purging Unused and Inactive Hierarchy Positions

All measure data within a domain is stored in either scalar or dimensional measures. As positions are introduced to the hierarchies of a domain, these positions become available for the storage of measure data. When a position is no longer needed by the domain, it can be purged. This purging, along with the use of the reindex domain, or optimize domain processes will result in the measure data associated with the retired positions being cleaned from the domain.

The purging process is performed by use of the loadHier utility purge operation. loadHier can be used to purge formal, informal, and user-defined positions from the listed hierarchies.

Clean-up of the Input and Processed Directories

RPASCE makes use of the loadhier and loadmeasure utilities to load information into the domain. These utilities read data in the form of text files that are staged to the input directory of the domain. Once the data in an input file is loaded, that file is moved to the processed sub-directory of the domain, where it is suffixed with a timestamp indicating the date and time of load.

The periodic clean-up of these processed files is advisable because, over a period of time, these files can occupy sizable and valuable diskspace. The RPASCE Online Administration interface provides a Clean Up task that includes an option to remove all files from the processed directory in the domain.

Reindexing Domain Arrays

Run the reindexDomain analyze option from the master domain on individual hier/dims periodically to check whether a particular hier/dim requires a bitsize increase or whether it needs to be defragged. If hierarchy operations are frequent enough and if the above check is not made, then the size of the hier/dim and the available list of physical ids may not be sufficient enough to accommodate and allocate for the incoming hierarchy load request. This can result in a loadhier failure.

ReindexDomain also reshapes arrays, and a periodical run, in conjunction with the use of hierarchy purging, will remove inactive physical IDs and can potentially reduce the size of the domain arrays and remove unneeded data from the domain.

Optimizing Domain Arrays

Run optimizeDomain periodically from the master domain to improve performance and to minimize the space required by the domain data. Optimize domain has options to selectively defrag domain data based on database fragmentation and, in conjunction with hierarchy purging, to clean up domain data that is no longer required by the system.

A detailed description of LoadHier, ReindexDomain, and OptimizeDomain can be found in the RPASCE Online Administration Guide.

6

RPASCE Integration

This chapter covers integrating information across multiple RPASCE domains.

Data and Metadata Integration

The client/server interactions of RPASCE define how users may access the system but are not effective for larger scale modification of the data of the system. To allow for these operations, RPASCE supports bulk data load and export operations. RPASCE supports only file-based integration. These files are provided to and retrieved from the system through the use of an SFTP server that is part of the provisioned environment.

Integrating User Information

The RPASCE platform supports the bulk creation of user accounts as a part of the domain build process. This bulk creation is accomplished by supplying a users.xml document with the other configuration inputs provided for the domain build.

The information contained within the supplied file is used to create a set of users and user groups within the RPASCE domain as a convenience; subsequent user maintenance is performed using the administrative user management templates. Note that user accounts created in this fashion will not have access to the system until they are provisioned within the OID. See the individual application Administrative Guides for information on creating and maintaining users in the OID.

Integrating Dimension and Measure Data

The RPASCE platform stores data within an embedded BTree database located within the domain on the file system. As such, it is necessary to manage the integration of the data within an RPASCE domain with other domains or with outside systems through a set of data import and export operations.

The primary operations used for this are the loadhier and loadmeasure utilities for importing data and the exportHier and exportmeasure utilities for exporting data. These operations can be performed either directly through scheduling a task in the Online Administration Tool interface or indirectly through the RPASCE batch framework.

The RPASCE platform supports the importing of data from and exporting of data to text files. These files provide an efficient method of moving large amounts of data into or out of an RPASCE domain. Based on configuration options for these tasks, the input and output files will be transferred via the SFTP server (for integration with non-cloud applications) or via an internal (single-tenant) file holding area for integration between multiple Oracle Cloud applications.

Details on secure access to the SFTP server, including instructions for setting up SSH keys, may be found in the Nightly Batch File Uploads section of each cloud application's Administration Guide.

RPASCE Planning Data Store

RPASCE includes an optional component known as Planning Data Store (PDS). RPASCE PDS allows a configurable subset of RPASCE data and metadata to be stored in an Oracle Database for the purposes of multi-application integration and reporting.

RPASCE PDS enforces a least privileges model of database access control. The PDS installation process will create, in its standard configuration, ten Oracle schemas. Only one of these schemas, the Data Mart schema, will own persistent data tables. The remaining schemas have defined access rights, as required by particular RPASCE Server processes. Oracle DB login details for these schemas are stored in an Oracle Wallet, created and managed internally to the RPASCE Cloud Service. Figure 6–1 shows all schemas and the corresponding role and connection alias for each.

Table 6–1 Schemas

Schema Name	Role	DB Connection Alias
rpas_data_mart	N/A	rpas_data_mart_conn
rpas_patch_user	rpas_patch_role	rpas_patch_conn
rpas_batch_user	rpas_batch_role	rpas_batch_conn
rpas_dimload_user	rpas_dimload_role	rpas_dimload_conn
rpas_factload_user	rpas_factload_role	rpas_factload_conn
rpas_hiermgr_user	rpas_hiermgr_role	rpas_hiermgr_conn
rpas_wkbk_user	rpas_wkbk_role	rpas_wkbk_conn
rpas_etl_user	rpas_etl_role	rpas_etl_conn
rpas_bdi_user	rpas_bdi_role	rpas_bdi_conn
rpas_rdonly_user	rpas_rdonly_role	rpas_rdonly_conn

The RPASCE PDS installer creates the required schemas and set their permissions.

The RPAS PDS build process (a set of binary utilities and shell scripts) creates all schema objects and load metadata.

The rpas_bdi_user schema is open to Oracle Bulk Data Integration (BDI). The BDI installation process takes username and password of rpas_bdi_schema, and creates a separate Wallet for its own internal use.

The rpas_rdonly_user schema is created for Oracle RESTful Data Service (ORDS) web services. The web services are read-only, so the rpas_rdonly_user schema has read only access to PDS.

Use of ORDS in Conjunction with the Planning Data Store

Customers can make use of Oracle ReSTful Data Services (ORDS) to invoke web services that supply the data stored with in the Planning Data Store. Several standard web service endpoints are provided, and it is possible to create additional endpoints to supplement those provided.

The access provided to ORDS by the Planning Data Store allows only for reading data; there is no capability for modification of the data contained within the Planning Data Store. The

endpoints provided are intended for use by external systems that connect to ORDS through the use of system accounts.

In order to connect to the Planning Data Store through ORDS, the account representing the external process must exist within the IDCS or OCI IAM instance associated with the application. Additionally, that account must belong to the group RPAS_ORDS_GROUP. All unauthenticated access requests and any requests made by a user who is not a member of the RPAS_ORDS_GROUP will be denied.

Creation of Additional Service Endpoints

In order to create additional service endpoints, it is necessary for a user to gain limited administrative access to ORDS. First, the user must exist within the IDCS or OCI IAM instance and belong to the RPAS_ORDS_GROUP role. Second, a service request must be created to give that user access to the ORDS administrative UI.

Once access is granted, authorized users will be able to access parts of the ORDS administrative UI that allow the creation and registration of endpoints. However, they will not have access to other administrative functions (such as security policy management) of the ORDS instance.

7

Extending and Customizing Products

RPASCE allows the extension of the calculation capabilities of the Server component through the creation of custom calculation expressions. Calculations that modify customer data in the system are defined in an expression language; when processing customer data, a component of the Server known as the Calculation Engine performs updates according to the expressions defined within the application.

The expression language contains a predefined set of calculation primitives, such as arithmetic operations, and a set of predefined functions that perform more complex operations on the data. It is possible for a customer to extend this set of functions to provide unique methods for evaluating expressions and performing calculations through the creation of a Java Special Expression.

In order to maintain the security of the system, the execution of Java Special Expressions is tightly constrained. JVMs in which these expressions are run are created with the Java Security Manager installed with a security policy that grants no privileges to externally supplied code.

As a result, any operation attempted by externally supplied code that attempts to access any privileged resource, such as the file system, network, or even internal JVM resources such as class loaders, execution threads and executor services, or internal system properties will be vetoed by the Java Security Manager and will result in a SecurityException.

This exception will prevent the execution of the privileged action and should an exception halt the execution of externally authored code result in the halting of a Java Special Expression, a notification to the application monitoring team will be generated by the system.

Details about the security policy imposed on Java Special Expressions can be found within the *Oracle Retail Predictive Application Server RPASCE Extension Development Guide*.