Oracle® Application Server Personalization

User's Guide

10*g* (9.0.4)

Part No. B12102-01

September 2003

ORACLE®

Oracle Application Server Personalization User's Guide, 10*g* (9.0.4)

Part No. B12102-01

Contents

2 The OracleAS Personalization Administrative UI

3 Using the REAPI Demo

A Recommendation Algorithms

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Preface

Oracle Application Server Personalization provides real-time personalization for Web sites using an integrated real-time recommendation engine that is embedded in an Oracle database. OracleAS Personalization is based on data mining technology and modeling; it builds a predictive model of customer preferences using Web-based behavioral data collected by a Web site as well as demographic data.

This manual is designed to introduce Java programmers and DBAs to the basic components and interfaces of OracleAS Personalization.

Intended Audience

This manual is intended for users of OracleAS Personalization:

- Database administrator (DBA) who administers OracleAS Personalization
- Web applications designer
- Web applications programmer

Documentation Accessibility

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

Accessibility of Code Examples in Documentation JAWS, a Windows screen reader, may not always correctly read the code examples in this document. The conventions for writing code require that closing braces should appear on an otherwise empty line; however, JAWS may not always read a line of text that consists solely of a bracket or brace.

Structure

This manual contains the following:

- Chapter 1, "Introducing OracleAS Personalization"
- Chapter 2, "The OracleAS Personalization Administrative UI"
- Chapter 3, "Using the REAPI Demo"
- Appendix A, "Recommendation Algorithms"
- Glossary

Requirements

To follow the exercises in this manual, you will need to have OracleAS Personalization installed, including the option of installing the REAPI demo. (During installation, you are asked whether you want to install the demo data; you do.)

OracleAS Personalization needs both Oracle9*i* and Oracle Application Server installed, possibly on different systems. If they are installed on different systems,

- install the MOR, MTR, and RE schemas on the machine where Oracle9*i* is loaded
- install REAPI and the REAPI demo on the machine where Oracle Application Server is loaded
- the Administrative UI operates from the OracleJServ/HTTP server

The following software is required for the Administrative UI browser:

- Netscape 4.75 or Internet Explorer 5.5 with SP1.

Where to Find More Information

Documentation for OracleAS Personalization at the current release consists of the following documents:

- *Oracle Application Server 10G Release Notes*, 10*g* (9.0.4), which contains a chapter for each component of Oracle Application Server. The chapter for the OracleAS Personalization component contains platform-specific information, a bug report, and informatioin about any late-breaking changes.
- *Oracle Application Server Personalization User's Guide*, release 10*g (9.0.4)* (this document).
- *Oracle Application Server Personalization Administrator's Guide*, release 10*g* (9.0.4).
- *Oracle Application Server Personalization Programmer's Guide*, release 10*g* (9.0.4). A programmer's manual for programming the recommendation engines in real time and for obtaining bulk recommendations.
- The API classes and methods are also described in Javadoc (*Oracle Application Server Personalization API Reference*), updated for the current release.

Related Manuals

OracleAS Personalization documentation is a component of the Oracle Application Server 10*g* (9.0.4) Documentation Library. See especially:

- *Oracle Application Server 10G Concepts*
- *Oracle Application Server 10G Administrator's Guide*
- *Oracle Application Server 10G Installation Guide* (the appropriate version for your operating system).

Documentation Formats

Documentation for OracleAS Personalization is provided in PDF and HTML formats.

To view the PDF files, you will need

- Adobe Acrobat Reader 3.0 or later, which you can download from `www.adobe.com`.

To view the HTML files, you will need

- Netscape 4.x or later, or
- Internet Explorer 4.x or later

Online Help

The OracleAS Personalization Administrative UI includes extensive online help that can be summoned from a list of contents and from Help buttons.

Conventions

In this manual, Windows refers to the Windows 95, Windows 98, and the Windows NT operating systems.

The SQL interface to Oracle9*i* is referred to as SQL. This interface is the Oracle9*i* implementation of the SQL standard ANSI X3.135-1992, ISO 9075:1992, commonly referred to as the ANSI/ISO SQL standard or SQL92. In examples, an implied carriage return occurs at the end of each line, unless otherwise noted. You must press the Return key at the end of a line of input.

The table below shows the conventions followed in this manual and their meanings:

Convention	Meaning
boldface	Commands, menu names, menu items, names of dialogs.
`code`	Data fields and values, special characters, etc., examples of files, data, filenames, and pathnames.
italics	Argument names and placeholders in command formats.
<>	Angle brackets enclose user-supplied names.
[ ]	Brackets enclose optional clauses from which you can choose one or none.
`% **user input**` `system output`	In interactive examples, user input is shown in bold typewriter, and system output is shown in regular typewriter.

1

Introducing OracleAS Personalization

Oracle Application Server Personalization (OracleAS Personalization) enables 1:1 marketing for e-businesses by dynamically serving personalized recommendations in real time to both registered customers and anonymous visitors. OracleAS Personalization uses data mining technology to sift through the large amounts of data gathered from Web sites and other applications to find patterns within purchase, demographic, ratings, and navigational data. OracleAS Personalization answers such questions as "Which items is this person most likely to buy or like, and with what likelihood?", "People that bought this item are likely to buy which other item?", and "What should I offer this customer to retain his or her business?"

This chapter first explains what personalization is and then introduces OracleAS Personalization.

1.1 What Is Personalization?

Personalization makes recommendations automatically, implicitly, and explicitly. It should not be confused with similar processes such as customization, business rules, or collaborative filtering.

Customization requires users to explicitly state preferences such as which stocks or sports teams to track. Personalization automatically deduces the customer's interests from the customer's behavior.

Business rules, such as "people who buy digital cameras buy many batteries for the cameras," are created from the experience of human beings running a business. They are not automatic and do not necessarily apply to a particular customer.

Collaborative filtering considers a customer's purchasing history but usually is not able to distinguish gifts from regular purchases. For example, you may never buy perfume for yourself, but do sometimes buy perfume as a gift. In this case, you may

not want to get recommendations about specials on perfume. Personalization can take such things into consideration.

Personalization permits delivering recommendations with the touch and timing of someone who knows you well.

1.2 What Is OracleAS Personalization?

OracleAS Personalization is an integrated software product that provides a way for businesses to personalize recommendations they make to customers.

Recommendations are personalized for each customer. Note: A customer is often thought of as an anonymous visitor or registered customer at a Web site, but can also be a customer calling in to a call center or using an ATM machine. For OracleAS Personalization to be able to serve recommendations, the applications need only be able to make Java-API calls to or from OracleAS Personalization.

OracleAS Personalization collects the data and uses it to build predictive models that support personalized recommendations of the form "a person who has clicked links *x* and *y* and who has demographic characteristics *a* and *b* is likely to buy *z*".

OracleAS Personalization incorporates visitor activity into its recommendations in real time — during the Web visitor's session. For example, OracleAS Personalization records a visitor's navigation through the Web site, noting the links that are clicked, etc. The visitor may respond to a Web site's request to rate something, e.g., a book or a movie; the rating becomes part of the data stored for that visitor. Any purchases made become part of the data stored for that visitor. All the Web-based behavior for the visitor is saved to a database, where OracleAS Personalization uses it to build predictive models. This data can be updated with data collected in subsequent sessions, thereby increasing the accuracy of predictions.

OracleAS Personalization can work in conjunction with an existing Web application or other customer applications. The Web application asks OracleAS Personalization to record certain activities, and the data is saved by OracleAS Personalization into a schema in an Oracle9*i* database.

The application asks OracleAS Personalization to produce a list of products likely to be purchased by the visitor; a scored list of recommendations compiled from the visitor's current behavior (stored in a database table) and from data in another schema holding historical data is passed to the application.

A third schema maintains administrative schedules and activities.Although recommendations to Web site visitors is one important use of OracleAS Personalization, OracleAS Personalization can provide recommendations in other

situations. Any application that collects customer data and needs to provide recommendations can use OracleAS Personalization. OracleAS Personalization also has a batch interface that can be used to generate recommendations that would be useful in marketing campaigns.

1.3 What Kind of Data Does OracleAS Personalization Collect?

OracleAS Personalization collects four kinds of data:

- navigational behavior
- ratings
- purchases
- demographic data

Of these, navigational behavior allows the most flexibility. It can represent anything the Web application wants to consider a hit (e.g., viewing a page, clicking a link/item, etc.).

Visitors to the Web site are of two types: registered visitors (customers) and unregistered visitors (visitors). For customers, OracleAS Personalization has both data from a current session and historical data collected over time for that customer, as well as demographic data. For visitors, there is no historical data, so recommendations are based on current session behavior and any demographic data that may be available.

1.4 How Does OracleAS Personalization Collect the Data?

OracleAS Personalization collects the data using Java calls provided by the REAPI (Recommendation Engine Application Programming Interface). These calls add information to the recommendation engine (RE) cache for the specific session, identified by a session ID. The RE finds the correct session ID by looking up one of the following arguments passed in the REAPI calls:

appSessionID -- used by *sessionful* Web applications (that is, an application that stores an identifier for each session)

customerID -- used by *sessionless* Web applications (that is, an application that does not store an identifier for each session)

In more detail: The data collected are temporarily stored in a dual buffer cache. Periodically the buffer is flushed and the data are sent to the appropriate RE schema. The session data are then used, combined with historical data, to generate recommendations. Finally, the RE instance periodically flushes the data to the

Mining Table Repository (MTR) for sessions that have concluded or timed out. The OracleAS Personalization administrator can set configuration parameters to indicate what data (by data source type) is saved to the MTR. The data in the MTR is then used to build predictive models for future deployment.

1.4.1 Sessionful and Sessionless Web Applications

Some Web applications are *sessionful*, i.e., they create a session for each visit to the Web site. Others are *sessionless* (stateless), i.e., they do not create sessions.

Regardless of whether the calling Web application is sessionful or sessionless, OracleAS Personalization is always sessionful; OracleAS Personalization always creates a session internally and maps that session to the Web site's session if there is one.

During the OracleAS Personalization session, the Web application can collect data and/or request recommendations.

1.5 What Does OracleAS Personalization Do with the Data?

OracleAS Personalization uses the data to build data mining models. The models predict what the Web site visitor will probably like or buy. The predictions are based on the data collected for that Web site visitor in previous sessions, in the current session, and all available demographic, ratings, purchase, and navigational data stored in the MTR.

A model is no better than the data that it is based on. As time passes, more data is collected. When there is more data available, a model should be rebuilt.

The OracleAS Personalization Administrator defines a *package* that controls model building and deployment. A package specifies the build settings and other attributes that control the way a models is to be built, as well as the RE Farm (collection of recommendation engines) to which the model is to be deployed. After the build is complete, the package consists of the rules tables that are deployed to the recommendation engines in the specified RE Farm.

The OracleAS Personalization Administrator creates and manages schedules for building the packages, and for deploying the packages to the recommendation engines (REs) that will produce the recommendations. Recommendation engines with the same package are grouped together in recommendation engine farms (RE Farms). These and related terms are defined more fully in the next section.

1.5.1 Models Built by OracleAS Personalization

OracleAS Personalization uses data mining models to make predictions. A model is actually part of an OracleAS Personalization package.

OracleAS Personalization uses one of two algorithms, depending on the type of recommendation requested by the Web application. Both algorithms are based on a theorem of Bayes concerning conditional probability. See Appendix A for a description of the algorithms.

Data for Model Building

Model building requires data. OracleAS Personalization must have the data required to build a model before you try to build and deploy a package.

If you have data collected and saved to an Oracle database, that data can be used to populate the MTR tables. As an alternative, the MTR schema can be mapped to the existing data via views.

However, if you have no previously collected data, you must use the REAPI methods `addItem` and `addItems` to collect data. Data collection occurs in the Recommendation Engine (RE). For an RE to be up and running, there must be a package deployed in that RE. However, in order to build and deploy a package, you must have data in the MTR. To put it simply, you can't collect data unless you have enough data to build a package. You resolve this problem by populating the MTR with seed data and then using the seed data to build and deploy an initial package. See the administrator's guide for information on how to use the seed data.

1.6 OracleAS Personalization Components

The user of the OracleAS Personalization Administrative UI is anyone who needs to build and deploy packages. The *Oracle Application Server Personalization User's Guide* is designed to introduce anyone who needs to build and deploy packages to the basic components and interfaces of OracleAS Personalization. This guide may also be useful to people who design and implement REAPI programs.

> **Note:** OracleAS Personalization requires both an Oracle9*i* database and the Oracle Application Server. The database and the application server can either be installed on the same system or on different systems. If they are installed on different systems, some OracleAS Personalization components are installed on the system where the database is installed; others are installed on the system where the application server is installed.

The OracleAS Personalization components and interfaces consist of:

- **Administrative UI:** A browser-based user interface that permits the OracleAS Personalization Administrator to schedule package builds, deployments, and reports, manage RE Farms and REs, and otherwise manage OracleAS Personalization. Chapter 2 describes the Administrative UI in detail. The Administrative UI is installed on the system where Oracle Application Server is installed.
- **Recommendation Engine (RE):** An RE consists of programs and tables (RE schema) and programs required for collecting data and making recommendations. The RE supports a Web application written in Java for collecting and preprocessing customer and visitor data, and for providing recommendations to those customers and visitors. Access to the RE is provided via the REAPI (Recommendation Engine Application Programming Interface). A given RE may support one or more Java server processes in a Web application. An RE resides in the customer database on the system where Oracle9*i* is installed.
- **Recommendation Engine Farm (RE Farm):** A logical grouping of one or more REs that are populated with the same deployable package (data mining model(s)). An RE Farm is generally treated as a single unit for management from the Administrative UI.
- **Package:** An object created using the Administrative UI. A package contains the information from historical data necessary to make recommendations. A package defines the build settings and other attributes necessary for building data mining models and for scheduling model builds. A package also contains the model that is built from this definition.
- **Mining Object Repository (MOR):** The schema that maintains mining metadata and mining model results. The MOR contains data required for logging in to the data mining system, logging off, and scheduling OracleAS

Personalization events. The Administrative UI provides a way to interact with the MOR. The MOR is installed on the system where the database is installed

- **Mining Table Repository (MTR):** The MTR contains the schema and data to be used for data mining. The MTR has a fixed schema designed to support the building of models that produce recommendations. The MTR resides in the customer database on the system where Oracle9*i* is installed.
- **Recommendation Engine API (REAPI):** A collection of Java classes that enable a Web application to collect and preprocess data used to build OracleAS Personalization models and to obtain recommendations in real time from OracleAS Personalization (that is, to score items for particular customers). REAPI is installed on the system where Oracle Application Server is installed.
- **Batch Recommendation Engine API**: A collection of Java classes that permits users to obtain bulk recommendations in batch, i.e., offline. The Batch API is installed on the system where Oracle Application Server is installed.

It is an option during OracleAS Personalization installation to populate the MTR with a small amount of sample data. If this option is chosen, an RE demo can be accessed and some recommendations and administrative actions can be tested.

1.6.1 Location of OracleAS Personalization Components

OracleAS Personalization requires both Oracle9*i* and the Oracle Application Server. Oracle9*i* and Oracle Application Server may be installed on different systems.

If the database and Oracle Application Server are installed on different systems, the following OracleAS Personalization components are installed on the system where Oracle Application Server is installed:

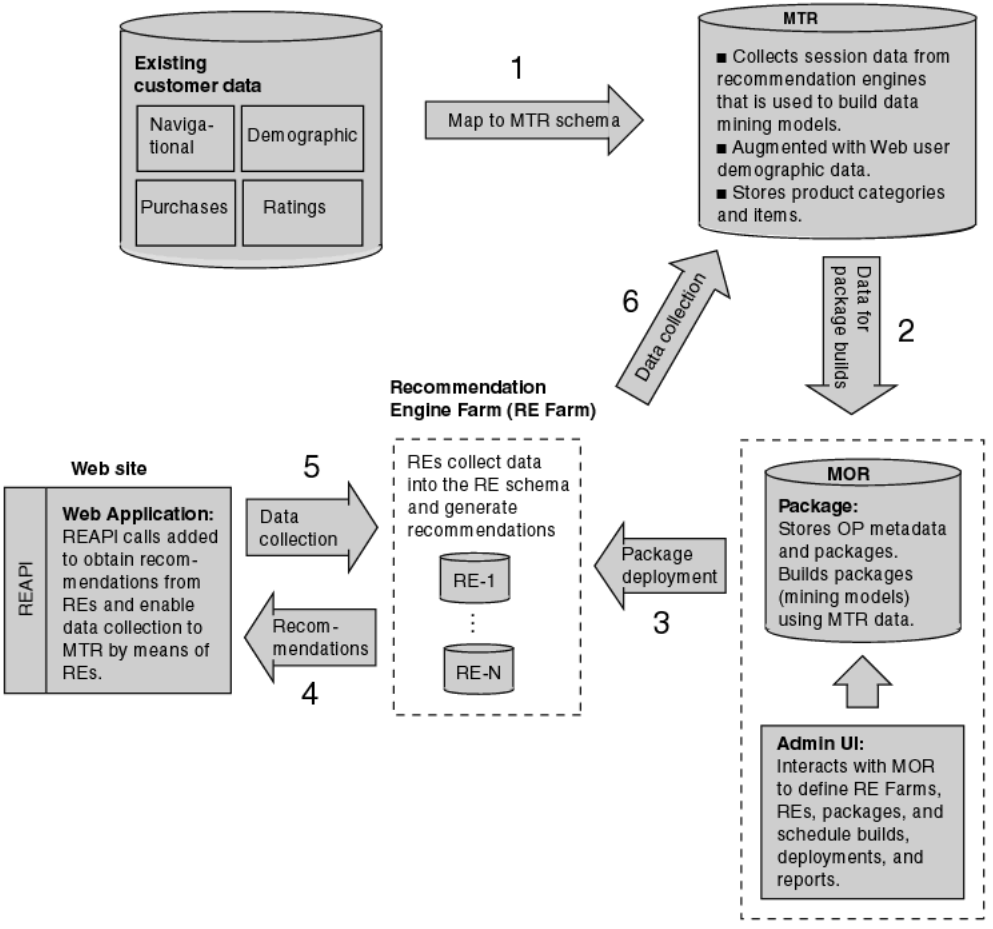
- REAPI
- RE Batch API
- REAPI Demo
- The Administrative UI

All other components are installed on the system where the database is installed.

1.7 How It All Works

OracleAS Personalization's components and process are diagrammed in Figure 1–1. The diagram is a flow chart of the entire Oracle Personalization process.

Figure 1–1 Oracle Personalization Process



Keep in mind the following main points about the different OracleAS Personalization components: the MTR (Mining Table Repository) is where all the data is stored — data that is used to create the model that produces the rules that generate the recommendations.

The MOR (Mining Object Repository) provides the administrative environment within OracleAS Personalization; it holds all the tables that are responsible for OracleAS Personalization's administrative functions. Your access to the MOR is provided by the Administrative UI. It is through the Admin UI that you control the MOR functions such as creating recommendation engine farms, building packages, scheduling packages for builds and deployments — all these functions are accomplished through the Admin UI.

The RE (Recommendation Engine) is the part of OracleAS Personalization that generates the recommendations that are displayed within a Web application. The RE is also the part of OracleAS Personalization that collects data into the RE schema.

The process, in a nutshell, is as follows: The data (step 1) resides in the MTR, and is transferred to the MOR (step 2), where a package (a data mining model) is developed. Once that package is built, it is deployed to the recommendation engine (step 3), where it is used to score data and records and develop the recommendations that are then passed to the Web application (step 4). The Web application provides data via the REAPI data collection methods, which are passed back to the REs (step 5) and are eventually synchronized back to the MTR (step 6).

Where does the data come from? Wherever it comes from, it has to end up in the MTR. There are two ways of getting the data into the MTR. The most direct way is to map existing customer data (session data — ratings, purchasing, or navigational — or demographic data) onto the MTR schema. This method lets you generate recommendations very quickly. If you have no customer data, you can use the seed data that is optionally installed with OracleAS Personalization. The point is simply that you have to have data of some kind to get started; you cannot build a model without data. It can be real data, mapped to the MTR schema, or artificial data, which you use to get started and can then adjust as real customer data comes in.

The second way to get data into the MTR is through the REAPI data collection methods, which are implemented within the Web Site. As a visitor to the Web site goes through the Web application, the APIs are collecting data at different points and sending it back to the RE, which then passes the data back to the MTR, where it is used in subsequent model builds.

Note that to collect data using REAPI calls, there must be a deployed package in the RE. Of course, you cannot deploy a package until you build it, and you cannot build a package without data. If you have no real data, you can use the seed data to kick-start the process. The seed data is artificial data — it is the minimum amount of data required to build and deploy a package. Once you have built and deployed a package, you can collect real data, and you can then build a package that can be used to generate recommendations relevant to your target.

2

The OracleAS Personalization Administrative UI

The Oracle Application Server Personalization (OracleAS Personalization) Administrative UI is a browser-based user interface that permits the OracleAS Personalization administrator to manage RE Farms and REs, schedule and deploy packages, produce reports, and otherwise manage OracleAS Personalization.

This chapter provides an overview of the Administrative UI and then illustrates how to use the UI to obtain recommendations.

2.1 Administrative UI Overview

Bring up the OracleAS Personalization Administrative UI by typing the following in the URL field of your browser:

```
http://<hostname>/OP/Admin/
```

where `<hostname>` is the name of the system on which Oracle Application Server is installed. Note that the URL is case-sensitive.

The first page that appears is the login page, which welcomes you to OracleAS Personalization.

2.1.1 Login Page

Enter a user name and password for the MOR schema (a valid user name and password were established during OracleAS Personalization installation; if you don't know what they are, ask the person who installed OracleAS Personalization).

- After entering a valid user name and password, click Log in, which brings up the OracleAS Personalization Administrative home page.

2.1.2 Home Page

The **Home** page welcomes you and briefly describes the product. At the left are links to common tasks, such as create new farm, create package, schedule a build, etc. They are listed in the order you would follow in executing the tasks. To the right is a brief status of recent events (builds, deployments, and reports).

Browse the pages to get familiar with their structure and content. Click the tabs to see the various pages. The tabs are **Home**, **Farms**, **Packages**, **Schedules**, **Reports**, and **Log**. The tab pages organize OracleAS Personalization administrative tasks.

2.1.3 Farms Page

The **Farms** page lists the current recommendation engine farms. Use the **Farms** page to create, delete, and in general manage recommendation engine farms.

The **Farms** page gives access to recommendation engines, which you add to a farm. Adding a recommendation engine to a farm means specifying the RE's database connection details. These details were established during the installation of the database.

An RE must have a connection to the MTR. If there is no pre-existing MTR connection, you create one and give it a name. This also requires information established during installation and configuration of the database.

2.1.4 Packages Page

The **Packages** page lists current packages. Use this page to create, delete, and manage packages.

An OracleAS Personalization package contains all the information needed for building predictive models, which includes the general settings for the package, information about its connection to the MTR, and settings specified for the package's build (which includes settings for building the model).

To create a package, click **Create Package**. This brings up the first of three pages that guide you through creating a package:

- The first page, **Create Package**, prompts you for a name and description of the package and asks you to specify the MTR connection by name. If there is no MTR connection, you are propted to create one.

- The second page, **Specify Build Settings**, prompts you for the build settings, which include
  - Recommendation performance: This is a trade-off between accuracy and speed — that is, between higher recommendations accuracy and faster recommendations.
  - New products: Specify whether you want OracleAS Personalization to use a proxy for new products. There must be proxy information in the MTR to use this option.
  - Choose what time-stamped session data to use: Use data from any dates, including data with no dates; a rolling window of the past x number of days, or between specified dates.
- The third page, **Confirm Settings**, summarizes and confirms the settings you have specified. The **Confirm Settings** page also gives you the option of going directly to scheduling a build for the package.

2.1.5 Schedules Page

Click the **Schedules** tab and note the three kinds of events that are scheduled: Builds, deployments, and reports. The **Schedules** tab opens by default to the **Build Schedule** page (see the next section).

Build Schedule

Use this page to create, edit, delete, and in general manage the building schedule of a package, that is, the creation of predictive models and other information needed to make recommendations.

To create a new build schedule, click **Create Build Schedule**. The **Create Build Schedule** page gives you the following options:

- Build the package as soon as possible.
- Build the package at a future time that you specify, and with the frequency you specify. When a package is built, it is stored in the MOR, ready for deployment.

This page also gives you the option of going directly to scheduling deployment of the package (see the next section).

Deployment Schedule

Use this page to create, edit, delete, and in general manage deployment schedules.

Deploying a package means copying it to every RE on a given RE Farm. Multiple REs with the same package can share the load.

To create a new deployment schedule, click **Create Deployment Schedule**. The **Create Deployment Schedule** page gives you the following options:

- Deploy the package every time it is built.
- Deploy the package as soon as possible.
- Deploy the package at a future time that you specify, and with the frequency you specify.

Report Schedule

Use this page to create and manage report schedules.

To schedule a report, click **Create report schedule**.

The **Create Report Schedule** page gives you the following options:

- General settings: Specify the RE Farm, the report type, the email address of the person who should receive notification, and any notes you may wish to make.
- Data selection: Use data from any dates; a rolling window of the past x number of days, or between specified dates.
- Schedule: Run the report as soon as possible or schedule the run for a specified date with specified frequency.

The **Create Report Schedule** page also lets you do the following:

- To update or look at the details of a report schedule, click its Edit icon.
- To delete a scheduled report, select it and click **Delete**.
- To stop a scheduled report that is running, select it and click **Stop**.

Note: You cannot edit or delete a scheduled report while it is running or canceling; it must be idle.

2.1.6 Reports Page

Use this page to view reports. There are three types of reports:

- **Purchasing session report:** Reports, for a user-specified period of time, the total number of sessions, the number of sessions that had at least one purchase, and the percentage of purchasing sessions to total sessions.

  The total number of sessions includes both visitor and customer sessions. Sessions that had purchases include only customer sessions.

- **Recommendation effectiveness report:** Reports, for a user-specified time period, the number of recommendation requests served by the system, the number of recommended items clicked per recommendation request, and the number of recommended items purchased per recommendation request.

  This report includes *all* clicked and purchased items in its "Clicked" and "Purchased" columns, even those items that are not part of the recommendations.

- **Itemized recommendation effectiveness report:** Reports, for a specified time period, how many times the items have been recommended, how many times they have been clicked, and how many times they have been purchased.

  Entries in the "Product ID" column have the following format:

  <Product type> **:** <Product id>

Note: The MTR tables MTR_SESSION and MTR_RECOMMENDATION_DETAIL must be populated before a report can be generated.

2.1.7 Log Page

The event log allows you to monitor results of scheduled builds, deployments, and reports.

To view details of an item, click its Details icon. To delete one or more items, select the item(s) and click **Delete**.

2.2 Obtaining OracleAS Personalization Recommendations

You must deploy a package before you can execute a Java program that requests recommendations or collects data.

Therefore, before you can obtain recommendations you must:

1. Create a Recommendation Engine Farm.

2. Add at least one RE to the Farm.
3. Populate at least the minimum data required in the MTR tables. You can do this with the demo data that is loaded at the time of installataion.
4. Schedule a build and deployment.

This chapter illustrates performing these steps.

Note that you cannot build a package unless there is data available; see "Data for Model Building" in Chapter 1 for more information.

2.2.1 Create an RE Farm with an RE

The first step is to create an RE Farm. There are two ways to start:

- On the **Home** page, click the **Create new farm** link to bring up the **Create Recommendation Engine Farm** page.
- Click the **Farms** tab to go to the **Farms** page. On the **Farms** page, click **Create Farm** (lower right), which brings up the **Create Recommendation Engine Farm** page.

On the **Create Recommendation Engine Farm** page,

5. Enter a name for the farm.
6. Click **Add Recommendation Engine**.
7. On the **Add Recommendation Engine** page, enter a name for the recommendation engine.

   For the database connection details, you will need information that was provided during installation.

   - For **Host ID**, **Port**, **SID**, and **Database alias**, you will need the database information you provided when you installed the database.
   - For **DB schema name**, **User name**, and **Password**, you will need the information provided when you installed and configured the RE schema.
8. After filling in all the fields, click **Test Connection** to determine whether the database connection is successful, that is, to verify that the information provided can be used to make a successful connection to the desired schema.
9. Assuming the database connection is successful, click **OK** (lower right), which takes you back to the **Create Recommendation Engine Farm** page, where you will see listed the recommendation engine you defined.

Note: If you click **Cancel** instead of **OK**, the information you have entered is lost.

2.2.2 Create a Package

Next, create a package.

To create a package, you must have a connection to the MTR. If you do not have an MTR connection,

1. Click **Options** (upper right) and go to the **MTR database connections** section. The information needed for an MTR connection comes from entries provided when you installed and configured the MTR schema.
2. To check the database connection, click **Test Connection**.
3. Assuming the connection is successful, click **OK**, which returns you to the **Create Farm** page.

Now you can create a package:

1. Click the **Packages** tab, which brings up the **Packages** page.
2. On the **Packages** page, click **Create Package** (lower right), which brings up the first of three pages of the Create Package wizard.
3. Give the package a name (required), a description (optional), confirm the name of the MTR connection, and click **Next**.
4. Specify the settings to be used to build and tune the new package, and click **Next**.
5. Review the settings you have specified, leave the **Schedule a build** box checked, and click **Finish**. This takes you to the **Create Build Schedule** page.

2.2.3 Schedule a Build

On the **Create Build Schedule** page, select

1. **Build as soon as possible**.
2. Leave the **Schedule deployment** box checked.
3. Click **OK**. This takes you to the **Create Deployment Schedule** page.

2.2.4 Schedule a Deployment

On the Create Deployment Schedule page,

1. Select **Deploy every time the package is built**.
2. Leave the default for **Frequency**, Once.
3. Click **OK**. This returns you to the **Packages** page.

2.2.5 Summary

You have created an RE Farm with one RE, and you have created a package and scheduled its build and deployment.

Check the **Packages** page after a few minutes to see whether the package has yet built and deployed. The **Packages** page dispays the status; refresh the page by clicking **Go**.

When the package has built and deployed successfully, you can use it to collect data and make recommendations using the Recommendation Engine API.

2.2.6 MTR Sample

Next, browse the contents of the Mining Table Repository (MTR) database used to build the model. This is the prepopulated MTR that is installed when OracleAS Personalization is installed if you select that option. This prepopulated MTR provides the data needed to perform the exercises described in this manual.

Use SQL*Plus commands to examine the contents of any of the database tables. The table below shows what part of one of the MTR database tables looks like. It contains movie ratings by customers, demographic data on those customers, an ID for each movie that was rated, the rating given the movie by the customer, and the data source type.

Table 2–1 Sample MTR Database Table

CUSTOMER_ID	ITEM_ID	ITEM_TYPE	ATTRIBUTE_ID	BIN_VALUE	DATA_ SOURCE_TYPE
2	264	MOVIE	1	1	2
2	389	MOVIE	2	1	3
2	153	MOVIE	2	2	3
2	354	MOVIE	2	2	3

Table 2–1 (Cont.) Sample MTR Database Table

CUSTOMER_ID	ITEM_ID	ITEM_TYPE	ATTRIBUTE_ID	BIN_VALUE	DATA_ SOURCE_TYPE
2	264	MOVIE	2	3	3
2	153	MOVIE	3	1	4
2	264	MOVIE	3	1	4
2	354	MOVIE	3	1	4
2	389	MOVIE	3	1	4
2	0	NONE	4	3	1
2	0	NONE	5	1	1
2	0	NONE	6	2	1

This sample comes from a large database table that contains movie ratings by customers, demographic data on those customers, an ID for each movie that was rated, and the rating given the movie by the customer. Table columns are as follows:

- CUSTOMER_ID: The data is all from customer with CUSTOMER_ID = 2.
- ITEM_ID: The ID numbers identify particular movies. Demographic information for a customer always has an ITEM_ID of 0.
- ITEM_TYPE: Refers to kind of item being rated; here the type is movie. Demographic informtion for a customer always has an ITEM_TYPE of NONE.
- ATTRIBUTE_ID: Values 1, 2, and 3 are attributes from purchasing, rating, and navigational data; values 4, 5, and 6 are from demographic data (the last three rows), where 4 = age, 5 = gender, and 6 = marital status.
- BIN_VALUE: Ratings were binned in 3 bins; the values here correspond to those bins.
- DATA_SOURCE_TYPE: (what kind of data) 1 = demographic, 2 = purchases, 3 = ratings, 4 = navigational.

For more information about the OracleAS Personalization schemas, see the *Oracle Application Server Personalization Administrator's Guide*.

3

Using the REAPI Demo

This chapter presents several exercises using the REAPI Demo.

Running the REAPI Demo accomplishes the following:

- You can verify that OracleAS Personalization was installed correctly by using the REAPI to get recommendations. To run REAPI Demo, OracleAS Personalization must be installed properly and the REAPI Demo must be configured to access RE. The demo data must also be loaded into the MTR.
- To follow the exercises in this chapter, you need to have installed a populated MTR (installed if you selected "Install demo data" when you installed OracleAS Personalization).
- You can experiment with the configuration so that you can learn how best to configure RE to suit your Web site.
- You can familiarize yourself with OracleAS Personalization's Java operations and see how the calls work and how they interact.
- You can view the source code to see how the program uses the REAPI calls.

> **Note:** When you are finished using the REAPI demo, you should remove the accounts associated with it. Leaving the accounts can result in security problems.

For detailed information about the REAPI, see the *Oracle Application Server Personalization Programmer's Guide*.

For details about installing REAPI, see the *Oracle Application Server 10g Administrator's Guide*.

In a production environment, the REAPI calls are used to "instrument" a Web site so that you can collect the data needed to create good models and generate recommendations.

The REAPI and the REAPI Demo are installed on the system where Oracle Application Server is installed.

3.1 Before Running REAPI Demo

Before running the REAPI Demo, you need to have created and deployed a package to the recommendation engine so that there is data available for making recommendations.

When you install OracleAS Personalization, choose the option to install the demo data into the MTR.

Next, use the OracleAS Personalization Administrative UI (described in Chapter 2) to perform the following steps:

1. Create a movies MTR connection, using the sample movies MTR database supplied with OracleAS Personalization.
2. Create a package using the movies MTR connection created in step 1.
3. Create a recommendation engine farm (RE Farm) with one recommendation engine (RE).
4. Build a package.
5. Deploy the movies package to the farm created in step 3.

After the movies package is successfully deployed to the RE Farm, you can begin experimenting with the REAPI demo to see how the REAPI calls work.

3.2 Start REAPI Demo

When you are ready to begin working with the REAPI Demo, point your browser to the following URL:

```
http://<hostname>/OP/redemo/
```

where `<hostname>` is the name of the system on which Oracle Application Server is installed. This will bring up the REAPI Demo user interface. The first page that appears is the **Welcome to OP REAPI Demo** page.

3.2.1 Proxies

REAPI calls execute in the context of a proxy, which specifies the environment in which the calls execute. One of the important elements of the environment is the default RE schema. You must create a proxy before you execute any calls, as shown in the steps outlined below.

3.2.2 View Source Code

While you are running the REAPI Demo, you can view the source code for the demo by clicking the **View Source Code** link.

REAPI Demo is implemented as a Java servlet consisting of the following classes:

- **REDemoServlet.java**
- **REUtil.java**
- **REDemoException.java**
- **REDemoConstants.java**

You can view the source code for each of these classes; you can also download the classes to your desktop.

3.3 Exercises

This section provides exercises that you can work through to get a feel for how the REAPI Demo works. The exercises cover the following tasks:

- Creating a proxy
- Collecting data
- Making recommendations
- A sessionful exercise
- A sessionless exercise
- Changing a visitor to a customer

3.3.1 Values and Results

To get meaningful results from these examples, you must enter valid values (that is, values for which there *are* recommendations) to REAPI Demo. All the values in this

demo produce useful results. You can determine other values by examining the populated MTR provided with OracleAS Personalization.

The results returned when you execute the calls will be similar to but *not* identical to the results displayed in this document.

3.3.2 Exercise 1: Creating a Proxy

You must create a proxy before you execute any calls. Here's how: In the frame on the left of the REAPI Demo screen, click **createProxy**, and enter these values:

- **RE Name:** The name of the recommendation engine schema that you will use.
- **JDBC URL:** `jdbc:oracle:thin:<host>:<port>:<sid>` Enter the values that were specified during OracleAS Personalization installation for host, port, and SID.
- **User name:** The user name for the database. Enter the RE user name that was specified during OracleAS Personalization installation.
- **Password:** The password for the RE user. Enter the password that was specified during OracleAS Personalization installation.
- **Cache Size:** 3242 KB (default).
- **Archive Interval:** 10,000 milliseconds (default).

Click **Create RE Proxy**.

REAPI Demo displays a message indicating success or failure. (REAPI Demo does this for every action.)

3.3.3 Exercise 2: A Sessionful Web Application

Follow these steps to experiment with any of the methods listed under the heading "Sessionful." (These are the methods that are valid with a sessionful Web application.)

A sessionful Web application starts a session for each customer when the customer logs in to the site.

1. To create a session, specify a customer ID and a session ID. At the left, under **Sessionful**, click **createSession** to bring up the **Create RE Session** page, and enter these values:
   - **User Type**: Customer

- **User ID:** 1
- **App Session ID:** 1011 (You must enter a unique number; this number cannot be used more than once.)

Click **Create Session**.

2. You can now execute any of the methods listed under **Sessionful**, for example, to obtain recommendations. To do this, click **recommendTopN** to bring up the **Recommend Top Items** page, and enter these values:
   - **Number of recommendations to display:** 10
   - **Tuning Settings**
     - **Data Source Type:** PURCHASING
     - **Interest Dimension:** PURCHASING
     - **Personalization Index Type:** LOW
     - **Profile Data Balance:** CURRENT
     - **Profile Usage:** INCLUDE
   - **Filtering Settings**
     - **Filtering Type:** All Items
     - **Taxonomy ID:** 1
     - **Select Categories:** For Include items, you can highlight any individual items, or, if you set Filtering Type to All Items, you do not need to highlight any items or categories.
   - **Recommendation Content**
     - **Sorting order for Prediction:** ASCEND
     - **Sorting order for Type:** NONE
     - **Sorting order for ID:** NONE

     Click **Recommend Top N**.

OracleAS Personalization then returns 10 or fewer recommendations for the user of this session. It will look something like Table 3–1, below, which displays information for four movies. It displays the item type (MOVIE, for each), the item

ID (a unique number for each item), and the ranking of the four movies, ranked on the likelihood of being purchased):

Table 3–1 Recommended Top N Items for User ID = 1

Type	Item ID	Rating
MOVIE	345	1.000
MOVIE	383	2.000
MOVIE	147	3.000
MOVIE	223	4.000

3. You can collect data while a session is running. To add data, click **addItems** to bring up the **Add Items** page, and enter these values
   - **Data source Type:** RATING
   - **Item Type:** MOVIE
   - **Item ID:** 122
   - **Value:** 5 (Rating on a scale from 1 to 5.)

   Click **Add>>** to move this item to the list; click **Add Items** to add it to the RE. This updates the information in the RE tables for this user.
4. Next, try Hot Picks. Hot picks are used by some Web sites; for example, daily specials might be in a Hot Picks Group. Click **recommendHotPicks** to bring up the **Recommend from Hot Picks** page, and enter these values:
   - **# of Recommended Items:** 10
   - **Hot Pick Group:** COMEDY
   - **Tuning Settings**
     - **Data Source Type:** NAVIGATION
     - **Interest Dimension:** NAVIGATION
     - **Personalization Index Type:** LOW
     - **Profile Data Balance:** HISTORY
     - **Profile Usage:** INCLUDE
   - **Filtering Settings**
     - **Filtering Type:** Exclude Items

  - **Taxonomy ID:** 1
  - **Select Categories:** For Exclude items, you do not need to select here.
- **Recommendation Content**
  - **Sorting order for Prediction:** ASCEND
  - **Sorting order for Type:** NONE
  - **Sorting order for ID:** NONE

  Click **Recommend Hot Picks**.

OracleAS Personalization then returns 10 or fewer recommendations for the user of this session. In this case, it returns something like what is shown in Table 3–2, below. Again, it displays the item type (MOVIE), the item ID (a number identifying each movie), and the rating.

Table 3–2 Recommended Hotpick Items for User ID = 1

Type	Item ID	Rating
MOVIE	360	1.000
MOVIE	370	2.000
MOVIE	116	3.000
MOVIE	83	4.000
MOVIE	18	5.000
MOVIE	20	6.000

5. You can also rate items with respect to the current user, that is, determine how the current user will rate items. Click **rateItems** to bring up the **Rate Items** page, and enter these values:
   - **Taxonomy ID:** 1
   - **Tuning Settings**
     - **Data Source Type:** RATING
     - **Interest Dimension:** RATING
     - **Personalization Index Type:** MEDIUM
     - **Profile Data Balance:** HISTORY
     - **Profile Usage:** INCLUDE

- **Recommendation Content**
  - **Sorting order for Prediction:** ASCEND
  - **Sorting order for Type:** NONE
  - **Sorting order for ID:** NONE
- **Items**
  - **Item Type:** MOVIE
  - **Item ID:** 72

    Click **Add>>** to add this item to the list. You can add other items to the list, if you wish.
  - Similarly, add "Movie, 122" and "Movie, 287".
  - When you are finished adding items, click **Rate Items**.

REAPI Demo returns the following:

Table 3–3 Rate Items for User ID = 1

Type	Item ID	Rating
MOVIE	72	4.3071
MOVIE	287	4.3453
MOVIE	122	4.3569

6. When you have finished experimenting, close the session. (REAPI sessions that are not explicitly closed eventually time out; it is a good practice, however, to close them explicitly.) Close the session by clicking **closeSession**, which brings up the **Close the Current Session** page. Click the **Close Session** button.

3.3.4 Exercise 3: A Sessionless Web Application

If your Web site does not start a session for each visitor or customer, you use the calls listed under **Sessionless**. For each of these calls, you provide the identification data for user and session. Otherwise, the calls are identical to sessionful ones. This example illustrates several sessionless calls.

1. If a customer buys an item, you may want to offer the customer a similar or related item, that is, a cross-sell item. To create cross-sell recommendations for an item from the HORROR hot picks group, click **Cross-SellFromHotpicks** in

the left frame under **Sessionless**. The **Cross-Sell for Items from Hot Picks** page is displayed.

- **Number of recommendations to display:** 10
  - **Hot Pick Group:** HORROR
- **User Details**
  - **User Type:** Customer
  - **User ID:** 1
- **Tuning Settings**
  - **Data Source Type:** NAVIGATION
  - **Interest Dimension:** NAVIGATION
  - **Personalization Index Type:** MEDIUM
  - **Profile Data Balance:** CURRENT
  - **Profile Usage:** INCLUDE
- **Filtering Settings**
  - **Filtering Type:** Exclude Items
  - **Taxonomy ID:** 1
  - **Select Categories:** Select items you want to exclude or select none.
- **Recommendation Content**
  - **Sorting order for Prediction:** ASCEND
  - **Sorting order for Type:** NONE
  - **Sorting order for ID:** NONE
- **Items**
  - **Item Type:** MOVIE
  - **Item ID:** 199

    Click **Add>>** to add this item to the list. Similarly, add MOVIE 354 and MOVIE 122 to the list.

When you have finished adding items, click **Cross-Sell for Items from Hot Picks**.

OracleAS Personalization then returns 10 or fewer recommendations for the user of this session. In this case, it returns the following:

Table 3–4 Cross-Sell for Items for Hot Picks for User ID = 1

Type	Item ID	Rating
MOVIE	72	1.2785

3.3.5 Exercise 4: Change Visitor to Customer

If a visitor registers as a user during a session, you need to change the visitor to a customer. You can only change a visitor to a customer during a session that the user entered as a visitor.

1. To create a session using the default proxy, you specify a visitor ID and a session ID. At the left, under **Sessionful**, click **createSession** to bring up the **Create RE Session** page, and enter these values:
   - **User Type:** Visitor
   - **User ID:** 100
   - **App Session ID:** 1015

     Note that **App Session ID** value must refer to a session that does not already exist.
2. Now you can change the visitor to a customer. At the left, under **Sessionful**, click **setVisitorToCustomer** to bring up the **Set Visitor to Customer** page. Click **Set Visitor to Customer**.

   REAPI Demo displays a message that announces SUCCESS!

You can close the session now or continue experimenting, as you like.

3.4 Summary

This chapter has presented exercises to show you how the REAPI works.

The Demo is different from the way you would use the REAPI calls in practice. In practice, you would embed the REAPI calls in a Java program that you write, and you would execute the program as you ordinarily do.

A

Recommendation Algorithms

This appendix contains descriptions of the two algorithms used by Oracle Application Server Personalization (OracleAS Personalization) to create models. Models are used to generate personalized recommendations. The two algorithms are

- Predictive Association Rules
- Transactional Naive Bayes

OracleAS Personalization automatically picks the best algorithm to for a particular type of recommendation.

A.1 Predictive Association Rules

The most familiar use of association rules is what we know as "market basket analysis," i.e., rules about what goes with what in a shopping cart, such as "eighty percent of people who buy beer also buy potato chips."

The association rules algorithm finds combinations of items that appear frequently in transactions and describes them as rules of the following "if-then" form: "If A, then B," where A is the antecedent and B is the consequent. (Note that the two sides of the proposition can be more than one item each; for example, "If A, B, and C, then D and E." For Predictive Association Rules, there is only one item in the consequent.)

It turns out that many such rules can be found -- the challenge is to find those that are meaningful or interesting and that also lead to actionable business decisions. An example is "eighty percent of people who buy beer and pretzels also buy chocolate." This combination is not obvious, and it can lead to a change in display layout, e.g., moving the chocolate display closer to where beer is on sale.

On the other hand, a rule like "eighty percent of people who buy paint also buy paint brushes" is not very useful, given that it's obvious and doesn't lead you to change the arrangement of these items in your store -- they're probably already displayed near each other.

Similarly, "eighty percent of people who buy toothpaste and tissues also buy tomatoes" is not obvious, and is probably not useful as it may not lead to any actionable business decision.

To identify rules that are useful or interesting, three measures are introduced: support, confidence, and lift.

Support: First, determine which rules have strong support, i.e., rules that are based on many examples in the database. Support is the percentage of records that obey the rule, i.e., baskets that contain both A and B.

Confidence: Next, determine which rules have high confidence, i.e., instances that obey the rule (contain both A and B) as a percentage of all instances of A. For example, assume you have 10 instances of A, 8 of which also have B; the other 2 do not have B. Confidence is 8 out of 10, or 80 percent.

Lift: Lift compares the chances of having B, given A, to the chances of having B in any random basket. Of the three, lift is the most useful because it improves predictability.

A.2 Transactional Naive Bayes

Naive Bayes is a type of supervised-learning module that contains examples of the input-target mapping the model tries to learn. Such models make predictions about new data based on the examination of previous data. Different types of models have different internal approaches to learning from previous data. The Naive Bayes algorithm uses the mathematics of Bayes' Theorem to make its predictions.

Bayes' Theorem is about conditional probabilities. It states that the probability of a particular predicted event, given the evidence in this instance, is computed from three other numbers: the probability of that prediction in similar situations in general, ignoring the specific evidence (this is called the *prior* probability); times the probability of seeing the evidence we have here, given that the particular prediction is correct; divided by the sum, for each possible prediction (including the present one), of a similar product for that prediction (i.e., the probability of that prediction in general, times the probability of seeing the current evidence given that possible prediction).

A simplifying assumption (the "naive" part) is that the probability of the combined pieces of evidence, given this prediction, is simply the product of the probabilities of the individual pieces of evidence, given this prediction. The assumption is true when the pieces of evidence work independently of one another, without mutual interference. In other cases, the assumption merely approximates the true value. In practice, the approximation usually does not degrade the model's predictive accuracy much, and it makes the difference between a computationally feasible algorithm and an intractable one.

Compared to other supervised-learning modules, Naive Bayes has the advantages of simplicity and speed. It also lends itself to future extensions supporting incremental learning and distributed learning.

"Transactional Naive Bayes" refers to the way the input is formatted; the algorithm is the same. The table below shows an example of traditional data format, with columns for the items (customer, apples, oranges, pears, and bananas) and rows for the customers (Joe, Jim, Jeff), and zeroes or ones in each table cell, indicating whether, for example, Joe bought an apple (no), an orange (no), a pear (no), or a banana (yes):

	apples	oranges	pears	bananas
Joe	0	0	0	1
Jim	1	0	0	1
Jeff	0	1	0	0

Traditional data layout often produces a sparse matrix because of all those zeroes; it takes up more space in the database, and therefore takes more time in calculations.

Transaction-based format has basically two columns: customer and "hits." For Joe, the table cell contains "bananas":

Joe	bananas
Jim	apples
Jim	bananas
Jeff	oranges

Transactional format looks like a "shopping basket" rather than a checklist and is better in cases where the customers buy only subsets of products. OracleAS Personalization transforms data into transactional format, if necessary, before building a package.

Glossary

This glossary explains terms used in the text and terms encountered in discussions related to personalization and data mining.

Admin UI (Administrative UI)

A graphical user interface that enables you to manage OracleAS Personalization, which includes (1) scheduling the build and deployment of packages and the generation of reports, and (2) managing the creation and use of recommendation engines (RE) and RE Farms.

Aggregated Model

This type of model is used for all the recommendation methods except cross-sell. It also allows all types of data source as inputs for predicting any of the interest dimensions. See also Cross-Sell Model.

Algorithm

See Recommendation Algorithms.

Category

A group of similar items. A category is an element in a taxonomy; an abstraction for a group of items or categories. In OracleAS Personalization, any item or category can belong to one or more other categories. See also Taxonomy.

Category Membership

Category membership specifies how items and categories are related to other categories. For example, an item can have a SUBTREELEAF relation to a category if it is a descendant of that category. Similarly, a category can have a SUBTREENODE or LEVEL relationship with another category. See also Taxonomy.

Cross-Sell Model

This type of model is used only in the cross-sell methods. It allows only either navigational or purchasing types of data source for input, and requires that the interest dimension be directly related to the type of input data source.

Data Source Types

OracleAS Personalization uses data from four types of sources: ratings, purchasing, navigational, and demographic.

Demographics .

The particular demographic attributes of interest to OracleAS Personalization are listed below. They are stored in the MTR in the CUSTOMER table/view, which consists of the following fields.

CUSTOMER_ID

NAME

GENDER

AGE

MARITAL_STATUS

PERSONAL_INCOME

HEAD_OF_HOUSEHOLD_FLAG

HOUSEHOLD_INCOME

HOUSE_HOLD SIZE

RENT_OWN_INDICATOR

ATTRIBUTE1 - ATTRIBUTE50: These are generic attributes that can be mapped to any column in the customers' database or can be null. They provide extra flexibility. The first 25 are for string (VARCHAR2) data; the last 25 (26-50) are for numeric data.

Deployment

The process of transferring the tables that define a model to one or more recommendation engines after the model has been built. A deployment also establishes the necessary connections between the recommendation engine and the MTR.

Farm

See Recommendation Engine Farm (RE Farm).

Hot Picks

On some e-commerce sites, vendors promote certain products called "hot picks"; the hot picks might, for example, be this week's specials. The hot pick items are grouped into *hot pick groups*.

I-I

The term I-I is encountered in some detailed error messages. It stands for Item-to-Item, and is an obsolete term for what is now discussed under cross-selling. See Cross-Sell Model.

Interest Dimension

Specifies the interest dimension that items should be ranked against. The interest dimensions supported in OracleAS Personalization are rating, purchasing, and navigation.

Mining Object Repository (MOR)

The MOR is the Oracle database schema that maintains mining metadata defined by the OracleAS Personalization data mining schema and provides for logging in to the data mining system, logging off, and validating users for the MOR and data mining functionality. Provides core data mining algorithm functionality.

Mining Table Repository (MTR)

The MTR is a schema containing the data used for data mining. It contains all the data necessary to define and build a package. For OracleAS Personalization, the MTR has a fixed schema designed to support the building of models that support producing customer/visitor recommendations. The MTR also stores customer data collected through the REAPI.

Model

A model is a set of tables containing all the data necessary to make recommendations. See also Recommendation Algorithms.

OP

Oracle Application Server Personalization, also OracleAS Personalization.

Package

An object created using the Admin UI that controls model building and deployment. A package specifies the build settings and other attributes that control how models are to be built, as well as the RE Farm to which the models are to be deployed. After the build is complete, it consists of the database connection information and the rules tables that are deployed to the recommendation engine.

Personalization Index

The relative degree of individualization desired in OracleAS Personalization's recommendations. A high setting produces the most individualized recommendations, those most highly related to the given user profile. A low setting generates recommendations that are the most popular or common for a given user profile. A low setting would yield "best seller" kind of recommendations, whereas a high setting will produce recommendations that may not be appropriate for many people, but the recommendations may be of higher perceived value.

P-I

The term P-I is encountered in some detailed error messages. It stands for Person-to-Item, and is an obsolete term for what is now discussed under aggregated models. See Aggregated Model.

Profile

All the data collected about a customer from that customer's sessions. Profiles are stored in the MTR or cached in the RE.

Rating scale

The rating scale for OracleAS Personalization should be in ascending order of "goodness". That is, create a scale in which a high rated item indicates that the user prefers that item over items with lower ratings.

Recommendation Algorithms

OracleAS Personalization bases its recommendations on one of two algorithms: Predictive Association Rules and Transactional Naive Bayes:

Predictive Association Rules:

- Models are based on Association Rules
- Builds models and scores datasets inside the database
- The mined rules are stored in database tables
- The rule consequents are combined and ordered using a ranking function

- Consequents with higher ranks are returned as recommendations

Transactional Naive Bayes:

- Models are based on conditional probabilities
- Builds models and scores datasets inside the database
- Probabilities are combined according to Bayes' Theorem and a score is computed
- Products with higher scores are returned as recommendations

For fuller descriptions of these algorithms, see Predictive Association Rules and Transactional Naive Bayes, in Appendix A.

Recommendation Engine (RE)

The front end of OracleAS Personalization. Via the REAPI (Recommendation Engine Application Programming Interface), RE provides the following services on a Web server associated with the calling Web application:

- Collects and pre-processes users' profile data
- Returns personalized recommendations

Recommendation Engine API (REAPI)

A collection of Java classes that enable a Web application written in Java to collect and preprocess data used to build OracleAS Personalization models and to produce recommendations from OracleAS Personalization.

Recommendation Engine Farm (RE Farm)

A group of systems with related OracleAS Personalization recommendation engines installed. When a package is deployed to an RE Farm, it is deployed to all members of the RE Farm. See also Web Farm.

Recommendations

This is how OracleAS Personalization makes its recommendations:

- Uses demographics, taxonomies, session data histories, current session data, keywords or concepts derived from the items
- Data does not have to be complete
- Performs efficient and scalable scoring
- Builds models offline

- Handles both registered customers and visitors
- Automatically selects algorithm (Transactional Naive Bayes or Predictive Association Rules) for a given recommendation task and context

RE Farm

See Recommendation Engine Farm (RE Farm).

Schedule Item

An object created using the Admin UI that controls when models specified by a package are to be built or deployed, or when a report is to be generated.

Score

With reference to applying a predictive model to new data, scoring means assigning a score that reflects the likelihood that a particular record belongs in a certain class. A score is the confidence in a prediction.

Session

Sessions are used to organize user activities. A session corresponds to a set of activities that a user does in "one sitting". Each session is uniquely associated with a user and has a start_time and end_time. All the activities performed by that particular user within the (start_time, end_time) interval are considered to be part of that session.

Sessionful and Sessionless Applications

These terms apply to the host Web application and indicate whether the application does its own session management or not. OracleAS Personalization has its own internal session management in both cases. If the application is sessionful, OracleAS Personalization maintains the mapping between its internal session and the application's session. If the application is sessionless, OracleAS Personalization's session starts at the first activity of the user and ends when the user has been inactive for a pre-specified time period. See also Web Application Session versus OracleAS Personalization Session.

SID

See System Identifier (SID).

Status (of recommendation engines)

Recommendation Engines can be in any of the following states:

- **Unloaded:** An RE is first created and no package is deployed to it

- **Loaded:** A package is being deployed to the RE
- **Online:** The RE is ready to provide recommendations
- **Offline:** The RE is not ready to provide recommendations
- **Updating:** Online, but in the process of deploying a package to the RE
- **Switching:** Offline; changing status

System Identifier (SID)

An identifier for an Oracle database instance. In OracleAS Personalization, it refers to the unique identifier assigned to each system associated with an MOR. Each system attached to an MOR must have a unique identifier specified in its configuration file.

Taxonomy

In the OracleAS Personalization context, this term refers to the structural organization of items in a company's catalog or site. Typically the catalog and/or the site has a hierarchical structure, with the most general category at the base (for example, "clothing"), and branching to increasingly specific categories (for example, from "clothing" to "shoes" to "sneakers" to "tennis shoes").

Items can belong to more than one category and to different levels of the structure. For example, "tennis shoes" can be a category in "clothiing" and also a category in "sports equipment."

The structure of the OracleAS Personalization taxonomy is a DAG (direct acyclic graph), which can contain multiple top-level nodes. The different portions of the taxonomy can be disconnected too. Any node can connect to any other node but there cannot be a path that connects a node's child back to the node itself.

OracleAS Personalization also supports multiple taxonomies (different ways of organizing the items). The taxonomy is implemented using a group of tables (they are specified by the customer at installation time):

- MTR-TAXONOMY: Lists the different taxonomies used by the site.
- MTR-TAXONOMY_CATEGORY: Specifies which categories belong to the different taxonomies. (A category can belong to multiple taxonomies; however, for a given taxonomy, there can be only one instance of any category.)
- MTR-TAXONOMY_CATEGORY_ITEM: Specifies which items are contained in a given category in a given taxonomy.
- MTR-CATEGORY: A list of all categories in all taxonomies.

User (of OracleAS Personalization)

The user of OracleAS Personalization is a DBA or system administrator or Java programmer, or perhaps all three. Do not confuse this with the user of a Web site that uses OracleAS Personalization.

User (of Web site)

Anyone who visits or logs on to the Web site. There are two kinds of users:

- Customers — registered users of the Web site (typically, the Web site stores information about these users (purchasing history, likes and dislikes, etc.)
- Visitors — users of the Web site who are *not* registered (typically the Web site stores less information about visitors than it does about customers). In many instances, the only information for visitors is the immediate Web navigation. OracleAS Personalization synchs data for visitors, but doesn't load it back for scoring.

Either type of user is assigned a user ID by the Web application.

Sometimes the Web site user is referred to as the *end user*, to distinguish this user from the user of OracleAS Personalization.

Web Application Session versus OracleAS Personalization Session

Some Web applications keep track of sessions, which provide an association between the Web server and a Web client. This association persists over multiple connections and/or requests during a given time period.

Sessions are used to maintain state and user identity across multiple page requests. The Web applications maintain session information in different ways, e.g., by using cookies, by URL rewriting, or via hidden variables like HttpSession objects. A Web application is sessionful if it keeps track of sessions, sessionless if it does not.

OracleAS Personalization has its own session management. An OracleAS Personalization session maps the OracleAS Personalization end user's activities during a certain period, i.e., from the first activity until the session is timed out or is closed by the host application. Whether the host Web application is sessionful or sessionless, OracleAS Personalization always manages its own session in order to provide better predictions. If the host application is sessionful, the OracleAS Personalization session is perfectly mapped to the host application session. If the host application is sessionless, OracleAS Personalization tracks the session on its own, which has no effect on the host application.

Web Farm

A Web farm uses two or more servers to host the same site. HTTP requests are usually routed to each server using some appropriate scheme, such as round-robin routing, to distribute load and allow the site to handle more requests in a timely manner.

During a given session, recommendation requests go to a recommendation engine, because information is temporarily stored there before being synchronized back to the MTR. If you have multiple REs, all the information from any one session has to be kept together for that RE.

Index