



Oracle® Change Management Pack

An Oracle Technical White Paper

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Oracle Change Management Pack

OVERVIEW

Oracle administrators must prepare for and react quickly to change to keep up with today's business needs and requirements. This often requires making changes to business applications and the databases that support them.

Change management in the Oracle environment means managing the evolution of schema objects and the database environment. For example, changes to applications can require changes in the definitions of particular objects like tables or triggers, or changes to the characteristics of a tablespace or set of users. All of these types of changes can be managed more effectively with Oracle Change Management Pack.

Oracle Change Management Pack, an optional set of applications, easily manages complex changes to the Oracle Server and database objects. Oracle Change Management Pack tracks changes by:

- Capturing the definitions of a set of database objects.
- Comparing the object definitions in one schema or database to another.
- Comparing object definitions in a schema or database to a previously captured state (baseline) of the same schema or database.
- Comparing two baselines.

Changes can also be implemented by:

- Comparing two sets of object definitions and then synchronizing database definitions with those of a baseline or another database.
- Creating one or more object definitions in multiple databases that copy the definitions in another database.
- Modifying one or more object definitions in a database by specifying the changes to make.
- Modifying object definitions in one or more databases to create the same object definitions in another database.

Oracle Change Management Pack also generates scripts used to make changes to database object definitions, enabling users to:

- View and edit a script.
- Execute a script at a destination database, which applies the changes specified by the script.
- Roll back the changes a script makes to the object definitions at a destination database.

Oracle Change Management Pack allows administrators to make all these changes in simple, direct ways. It also takes care of details, such as recreating objects and dealing with grants on the objects being modified. The database object definitions supported include tables, indexes, clusters, roles, packages, and procedures.

Tracking Applications and Change Applications

Oracle Change Management Pack contains two types of applications: *tracking applications* and *change applications*. Tracking applications report and track the evolving state of metadata in databases. Change applications describe metadata changes and execute scripts to carry out the changes. The DB Diff tool acts as both a tracking application (because its comparison function reports on the state of object definitions) and a change application (because its Synchronization Wizard is used to synchronize one set of object definitions to match the other set of definitions).

The tracking applications and their functions are:

- *DB Capture* — Captures one or more definitions from one database.
- *DB Diff* — Compares two sets of definitions.

The change applications and their functions are:

- *DB Diff's Synchronization Wizard* — Modifies a set of database definitions to match another set of database definitions.
- *DB Quick Change* — Modifies one definition in one database.
- *DB Alter* — Modifies one or more definitions in one or more databases.
- *DB Propagate* — Reproduces one or more definitions from a database within that database or in another database.

Oracle Change Management Pack also contains the Plan Manager application, a general-purpose interface that provides direct or indirect access to all Oracle Change Management Pack features. The following sections provide additional overview information on the Oracle Change Management Pack applications.

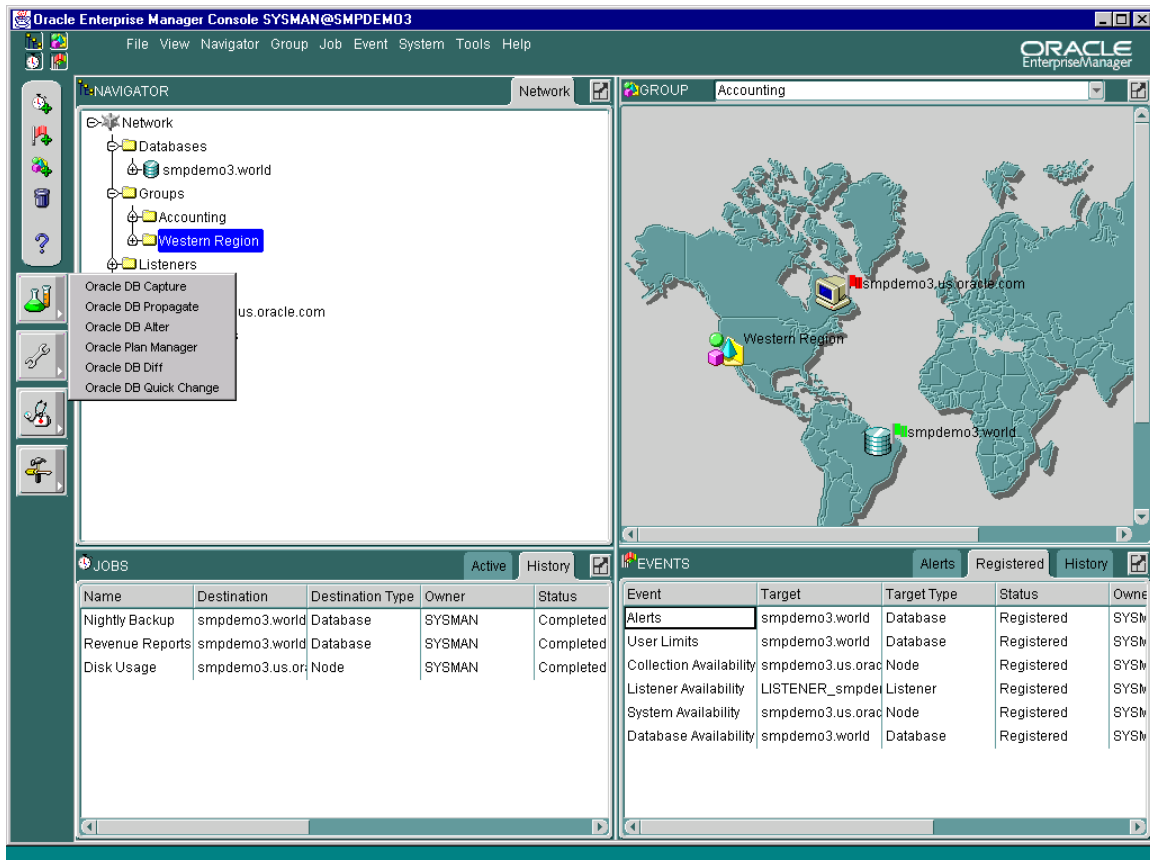


Figure 1: All Oracle Change Management Pack Applications Are Launched from the Tools Menu of the Oracle® Enterprise Manager Console

DB Capture

The DB Capture application guides administrators through the process of capturing the definitions of a database (or a subset of a database) in a form useful to Oracle Change Management Pack applications and other applications. DB Capture produces a snapshot of the set of a database's object definitions that users select in one or both of the following forms:

- *Baselines* — The baseline stores definitions in a form that other Oracle Change Management Pack applications can use.
- *SQL Data Definition Language (DDL)* — These SQL DDL statements can be used to create the definitions in a new database or input definitions to CASE tools that accept SQL DDL input.

DB Diff

The DB Diff application guides administrators through the steps of selecting and comparing two sets of object definitions. Object definitions can be selected from current databases or from a baseline created earlier with DB Capture. If differences are found between the two sets of object definitions when compared, DB Diff allows users to view the differences between the corresponding object definitions.

DB Diff can also generate a graphical HTML report detailing the comparison made and the differences found. This report can be viewed directly in a browser and printed, if desired.

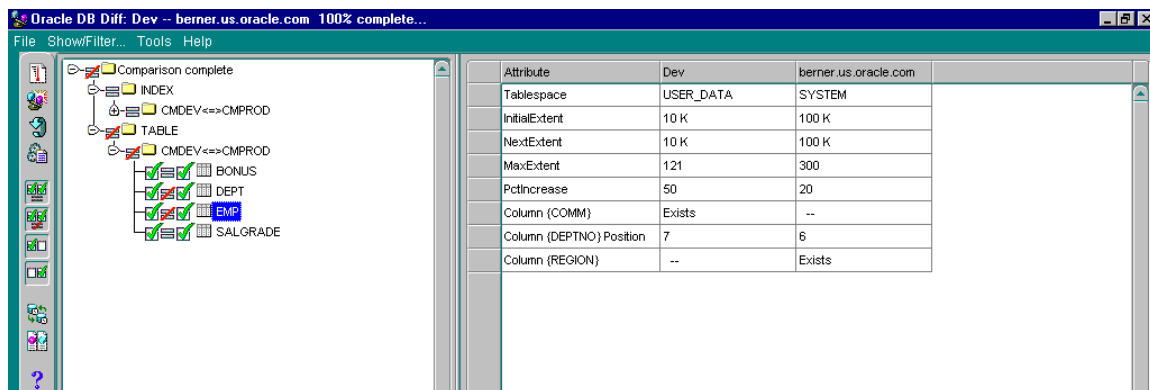


Figure 2: DB Diff Shows the Differences in the EMP Table Between Two Databases

After comparing the two sets of object definitions, administrators can use DB Diff's Synchronization Wizard to modify one set of definitions (with the exception of baselines, which are read-only and cannot be modified) to match the other set of definitions. For each selected object definition in the source, if an object definition of the same name and type already exists at the destination database, the destination object will be modified to match the source definition. If a selected object definition in the source does not exist at the destination database, it will be created. The Synchronization Wizard does all the work of determining and ordering the individual steps to perform the requested synchronization, taking object definition dependencies into account.

DB Quick Change

The DB Quick Change application guides administrators through the process of making one or more changes to a single database object definition. Users indicate changes to object definitions by directly manipulating their representation on property sheets similar to those in Oracle Enterprise Manager's Schema Manager, Security Manager, and Storage Manager applications. The DB Quick Change versions of these property sheets allow users to make some changes that cannot be made using these other applications (for example, dropping a column in a table). DB Quick Change automatically determines and orders the individual steps that must be carried out to perform the requested operations, taking object definition dependencies into account.

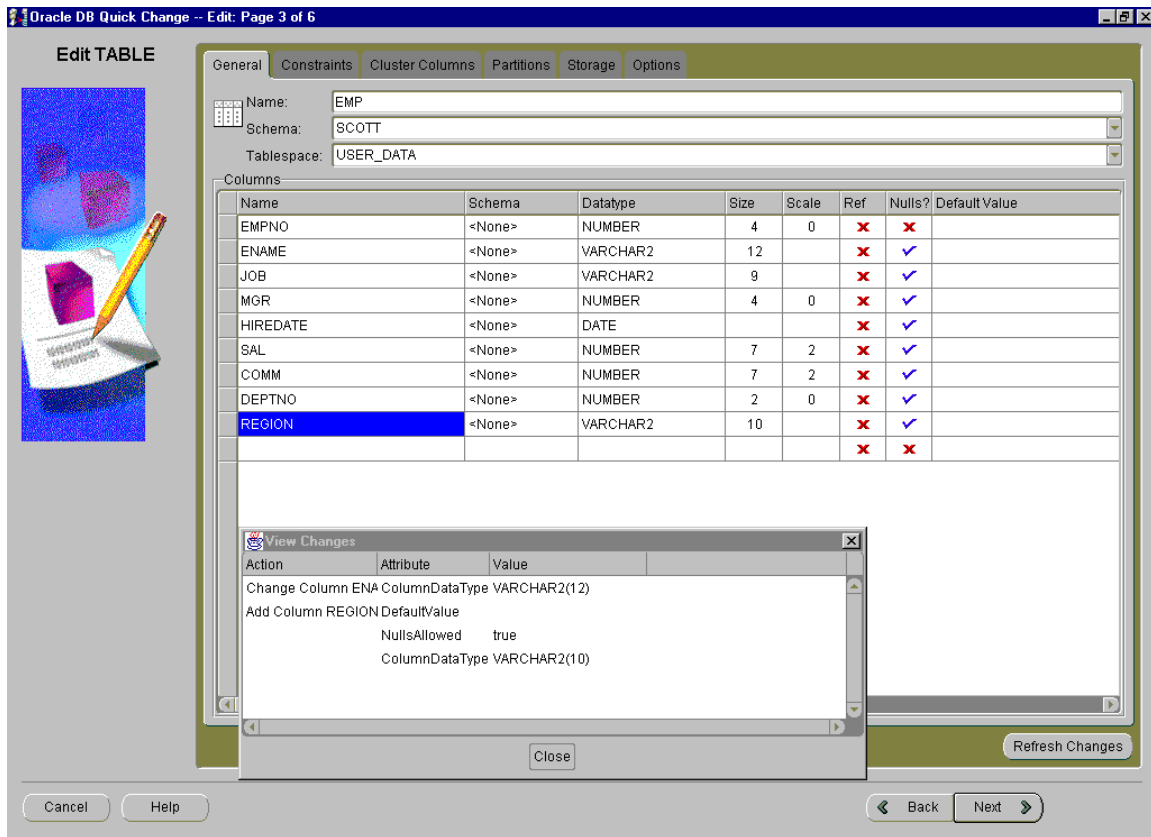


Figure 3: DB Quick Change Allows Complex Changes to Database Objects

DB Alter

The DB Alter application guides administrators through the process of making changes to one or more object definitions in one or more databases. As with DB Quick Change, users indicate changes to object definitions by directly manipulating their representation on property sheets similar to those in the Oracle Enterprise Manager Schema Manager, Security Manager, and Storage Manager applications. When users specify a group of changes to several database object definitions, DB Alter automatically determines and orders the individual steps that must be carried out to perform the requested operations, taking object definition dependencies into account. The specified changes can be applied at the source database and other databases.

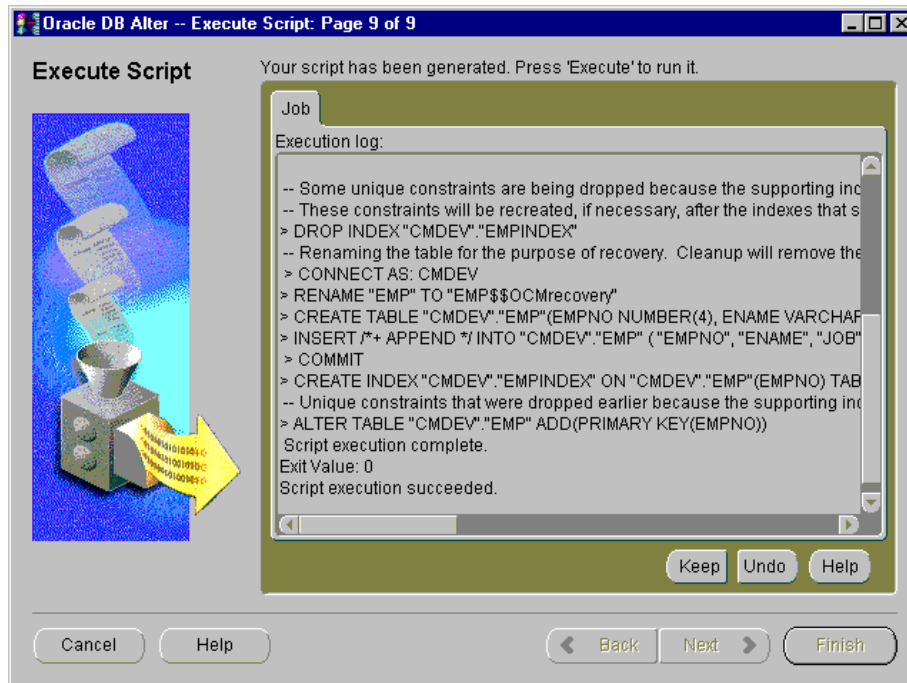


Figure 4: DB Alter Generates a Script to Implement Changes

DB Propagate

The DB Propagate application guides administrators through the steps of selecting one or more object definitions from a database, then reproducing those definitions in a destination schema within the source database or in one or more destination databases. For each selected object definition in the source database, if an object definition of the same name and type already exists at the destination database, the destination definition will be modified to match the source definition. If a selected object definition in the source database does not exist at the destination database, it will be created. DB Propagate automatically determines and orders the individual steps that must be carried out to perform the requested operations, taking object definition dependencies into account. Users can execute the specified changes immediately or schedule a time for changes to be executed. DB Propagate also gives users the option to copy table data as well, so a table's definition and its data can be cloned together.

Plan Manager

The Plan Manager application, Oracle Change Management Pack's general purpose interface, gives administrators direct or indirect access to all of the Oracle Change Management Pack features. In cases where Plan Manager cannot directly perform a task, such as capturing or comparing object definitions, Plan Manager can start the application to perform that task. The other Oracle Change Management Pack applications are dedicated to certain tasks and use components from the Plan Manager interface in a framework to guide and constrain users to that application's task. As administrators use the other Oracle Change Management Pack applications, they become familiar with the components that Plan Manager uses to accomplish different tasks.

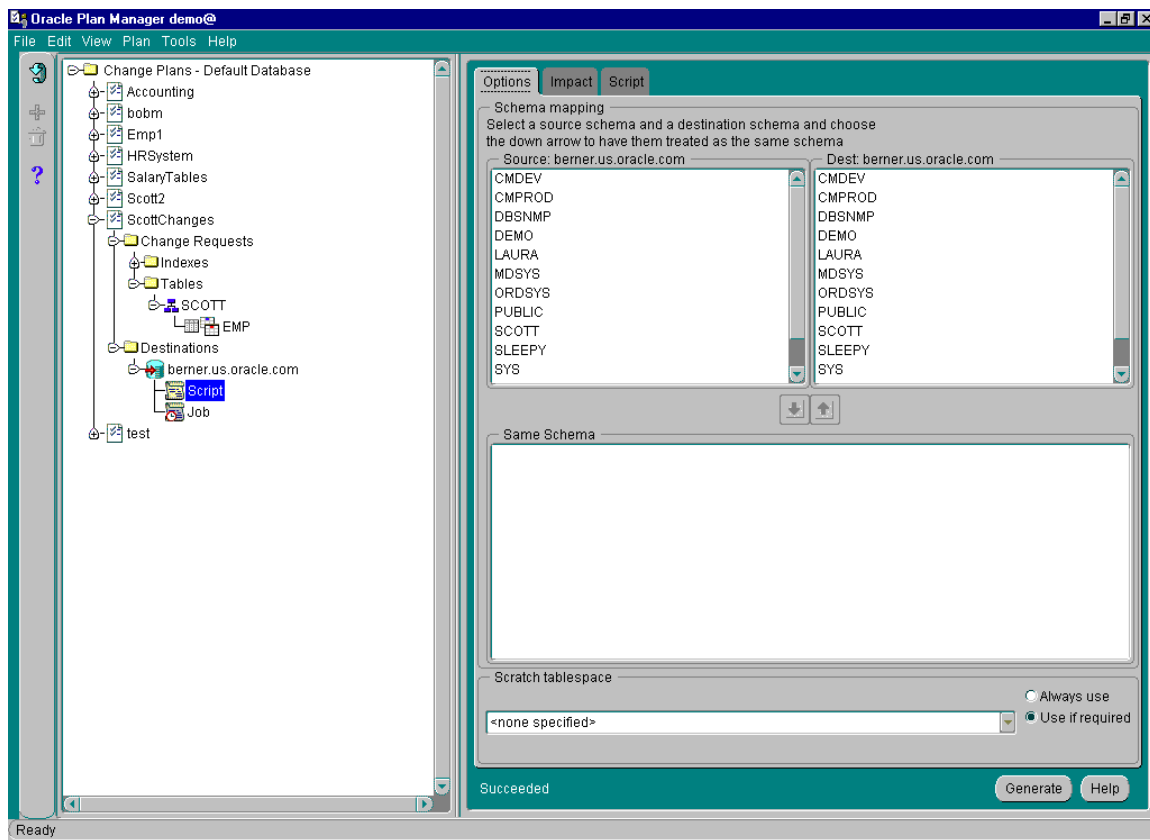


Figure 5: Plan Manager Is Oracle's General-Purpose Change Management Interface

SAMPLE USES

Some common usage scenarios for Oracle Change Management Pack applications are provided below.

- DB Capture can capture a baseline of the current state of object, schema, or database definitions, then DB Diff can later compare the baseline to the same object, schema, or database definition.
- DB Diff's Synchronization Wizard can synchronize the current schema or database with a previously captured baseline of the schema or database. This has the effect of rolling back all the changes made to the schema or database definitions since the baseline was captured.

- Use DB Quick Change to make one or more changes to a single database object, then execute those changes.
- DB Alter can specify changes to one or more object definitions in a single database, then execute those changes as a unit.
- Use DB Propagate to simplify database lifecycle activities, such as:
 - Reproducing database object definitions for developers to modify in conjunction with enhancements to an application.
 - Reproducing the enhanced object definitions at the original database after the developers are satisfied with their modifications.
 - Reproducing a set of object definitions from a development database to a test database and later to multiple production databases.
 - Reproducing selected object definitions when deploying a new application to multiple production databases.

CHANGING DEFINITIONS: THE BASIC STEPS

In order to create and modify object definitions, administrators need to construct and deploy change plans. The following steps are involved in plan construction and plan deployment:

1. Define change requests for the plan.
2. Select a destination.
3. Generate a script for the destination.
4. Execute the script.

All of the Oracle Change Management Pack applications perform these steps, but not always in the order shown. The user interface for a specific application may also hide some steps. The following sections provide more information on each of these steps and define Oracle Change Management Pack terminology.

Constructing a Plan

Before creating and modifying definitions with Oracle Change Management Pack, administrators must construct a change plan or a container for change requests. Each change plan has a unique name. Some Oracle Change Management Pack applications, including DB Alter and DB Propagate, make it evident a change plan is being created by prompting users for the name of an existing plan or asking users to create a new plan. Other applications, including DB Diff's Synchronization Wizard and DB Quick Change, create a change plan without explicitly prompting users for change plan information.

A change plan is always associated with a single source database. All the change requests contained in a change plan are derived from object definitions in this source database. With some of the Oracle Change Management Pack applications, users specify the source database explicitly. The source database is implied in other Oracle Change Management Pack applications.

Defining Change Requests

For every plan, administrators define change requests to include in the plan. The two types of change requests are *directives* and *exemplars*.

Directives

In a directive, users specify a set of changes for an existing, named object definition. A directive can be thought of as a “Super Alter” statement. A directive for an object definition says to an Oracle Change Management Pack application, “Make these specific changes to the object definition.”

Suppose, for example, that a user defines a directive for a table named T1. Some of the changes that could be specified as directives for table T1 include:

- Adding column REGION_ID with data type of NUMBER(3)
- Renaming the column REGNAME to AREA_NAME
- Changing the tablespace for the table to tablespace TS1

Users can create directives by selecting an object definition to be modified, then specify changes to the object definition’s attributes on property sheets similar to those in Schema Manager.

Change plans created with DB Alter and DB Quick Change contain only directives.

Exemplars

An exemplar reproduces a complete object definition, either by creating a new object definition or by modifying an existing object definition of the same name and object type. An exemplar can be thought of as the example of what the user wants to reproduce. An exemplar says to an Oracle Change Management Pack application, “Reproduce this object definition. If an object definition of the same name and type already exists, make whatever changes are necessary to that object definition so that it matches this object definition. If the object definition does not exist, create an object definition that matches this object definition.” An exemplar for an object definition is the object definition plus any propagation attributes and grants that users specify for the exemplar. Change plans created with DB Propagate and DB Diff’s Synchronization Wizard contain only exemplars.

Users can specify propagation attributes for exemplars, and whether or not the grants information for an exemplar should be reproduced when the exemplar is reproduced. Propagation attributes modify an exemplar’s action when it is applied to an existing object.

DB Alter	directives
DB Diff Synchronization Wizard	exemplars
DB Propagate	exemplars
DB Quick Change	directives
Plan Manager	directives, exemplars, or both

Change Requests Created with Oracle Change Management Pack Applications

Some Oracle Change Management Pack applications, including DB Alter and DB Propagate, make it evident when a change request is being created by prompting the user to add directives or exemplars to the change plan. Other applications, including DB Diff’s Synchronization Wizard and DB Quick Change, prompt users to select object definitions to copy or modify, but do not make it evident that the selected definitions are directives or exemplars being added to the change plan.

DEPLOYING A PLAN

After creating a change plan and populating it with change requests, administrators deploy the plan by specifying a destination database, generating a script to apply the plan's change requests at the database, and executing the script.

Selecting a Destination

Before the change requests in a change plan can be executed, administrators must specify the destination database. With DB Quick Change, the database containing the object definition that is being changed is also the destination database. With DB Diff's Synchronization Wizard, the destination database is the target of the synchronization. With the other applications, users explicitly select a destination database where the change requests will be executed.

Generating a Script for a Destination

After a destination database has been selected, a script can be generated from the change plan. The script generated from the change plan (not the plan itself) will be run against the destination database. During the initial stage of script generation, Oracle Change Management Pack examines the structure and definitions in the destination database, so it can generate a script designed exclusively for execution against the destination database.

If administrators use a single plan to generate scripts for several databases that have different structures and definitions, Oracle Change Management Pack may generate a different script for each database. This is because Oracle Change Management Pack takes each destination database's structure and definitions into account when creating the script.

For example, suppose the plan contains an exemplar for table T2, and the administrator uses an Oracle Change Management Pack application to generate two scripts, one to run against destination database DB1 and the other to run against destination database DB2. If table T2 does not exist in database DB1, the script generated for DB1 will include statements that define table T2. If a different version of table T2 already exists in database DB2, the script generated for DB2 will include statements to make the definition of table T2 in database DB2 match the exemplar for table T2.

After Oracle Change Management Pack generates a script for a destination database, users can view and edit the script. Oracle Change Management Pack also creates an impact log when it generates the script. Users can view the impact log to determine the impact of executing the script at the destination database. Both the scripts and impact reports are saved in the repository, but these reports can also be saved as files, if needed.

Executing the Script

When a script is executed at a destination database, if any data in user tables is changed or moved, Oracle Change Management Pack makes a copy of the old data for recovery purposes. The recovery data is stored in tables that look like the original tables but have different names.

This feature allows administrators to accept or undo the changes made by the script at the destination database. If users accept the changes, an accept script is run. The accept script deletes the recovery data. If users undo the changes, a revert script is run. The revert script deletes the new tables and uses the recovery data to create the original user tables with their original data.

Users also have the following two options after executing a script:

- If users want to execute the same set of change requests against another database, it is possible to select a new destination database for the plan, generate a script for the destination database, and execute the new script against that database. The DB Quick Change application allows users to run a script against only one destination database (the database that contains the object definition being changed). However, if users save a plan created by DB Quick Change, they can select that plan in Plan Manager, select another destination database, generate a script for the destination database, then execute that script against that database.
- Users can add, modify, or remove change requests in the plan.

MODIFYING AND CREATING OBJECT DEFINITIONS WITH PLAN MANAGER

All of the Oracle Change Management Pack applications except Plan Manager guide and constrain users when performing a particular task. With Plan Manager, users have direct access (through Plan Manager) or indirect access (by starting the necessary application using the Tools menu of Plan Manager) to all features provided by the Oracle Change Management Pack applications. However, because the Plan Manager application does not know which task a user is trying to perform, it does not provide much guidance (except in the form of online help) on how to perform particular tasks.

SEARCHING FOR PARTICULAR OBJECTS

The Oracle Change Management Pack allows users to search for an object based on characteristics of its name. For example, users can search for all tables whose name contains the string “TEST”. This capability can be useful when administrators must search for a particular object but do not know its exact name. This search capability is also incorporated throughout the Oracle Change Management Pack. For example, users can use the Pack to capture the definitions of all the tables whose names start with “S_”.

ORACLE ENTERPRISE MANAGER PRODUCT FAMILY

The Oracle Enterprise Manager product family also includes the Oracle® Diagnostics Pack, Oracle® Tuning Pack, Oracle® Management Pack for Oracle8i, Oracle® Management Pack for Oracle Applications and Oracle® Management Pack for SAP/R3. All of these products are fully integrated into the Oracle Enterprise Manager console and provide a unified systems management framework for end-to-end management of the Oracle environment.

Built upon open Internet standards such as Java, CORBA, and IIOP, these products provide the first management framework designed to support Internet computing—all applications can be accessed from anywhere a browser is available. A reliable and scalable multi-administrator repository leverages administrative staff by providing cooperative management. Using the Oracle Enterprise Manager product family, administrators and IT manager can insure higher-productivity, deliver better services, and reduce the overall cost of information systems.

CONCLUSION

Oracle Change Management Pack provides the Oracle administrator with an easy-to-use set of tools for managing complex changes within the Oracle Server and database objects. In the past, the process of tracking and implementing changes was a very expensive and difficult process. Oracle Change Management Pack greatly reduces the time and costs associated with managing the implications of changing business needs and requirements.



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