

Oracle Data Integrator 11g: Advanced Integration and Development

Student Guide

D78191GC10

Edition 1.0

Febraury 2013

D80589

ORACLE®

Author

Viktor Tchomodanov

**Technical Contributors
and Reviewers**

Denis Gray

Alex Kotopoulos

Julien Testut

Christophe Dupupet

Rebecca Sly

Gerry Jurrens

Sophia Chen

Vishal Parashar

Richard Green

Editors

Raj Kumar

Malavika Jinka

Aju Kumar

Graphic Designers

Seema Bopaiah

Maheshwari Krishnamurthy

Publishers

Michael Sebastian

Srividya Rameshkumar

Copyright © 2013, Oracle and/or its affiliates. All rights reserved.

Disclaimer

This document contains proprietary information and is protected by copyright and other intellectual property laws. You may copy and print this document solely for your own use in an Oracle training course. The document may not be modified or altered in any way. Except where your use constitutes "fair use" under copyright law, you may not use, share, download, upload, copy, print, display, perform, reproduce, publish, license, post, transmit, or distribute this document in whole or in part without the express authorization of Oracle.

The information contained in this document is subject to change without notice. If you find any problems in the document, please report them in writing to: Oracle University, 500 Oracle Parkway, Redwood Shores, California 94065 USA. This document is not warranted to be error-free.

Restricted Rights Notice

If this documentation is delivered to the United States Government or anyone using the documentation on behalf of the United States Government, the following notice is applicable:

U.S. GOVERNMENT RIGHTS

The U.S. Government's rights to use, modify, reproduce, release, perform, display, or disclose these training materials are restricted by the terms of the applicable Oracle license agreement and/or the applicable U.S. Government contract.

Trademark Notice

Oracle and Java are registered trademarks of Oracle and/or its affiliates. Other names may be trademarks of their respective owners.

Contents

1 Introduction

- Lesson Objectives 1-2
- Course Objectives 1-3
- Target Audience 1-4
- Class Introductions 1-5
- Agenda of Lessons 1-6
- Course Environment 1-7
- Course Materials 1-8
- Course Practices 1-9
- How can I Learn More? 1-10
- Related Training 1-11
- Overview of Oracle Data Integrator 1-12
- Features of Oracle Data Integrator 1-13
- Conventional Integration Process: ETL 1-15
- EL-T 1-16
- ODI Architecture 1-18
- Summary 1-19
- Practice 1-1: Exploring Your Environment 1-20

2 Overview of ODI Knowledge Modules

- Objectives 2-2
- ODI Knowledge Modules: Overview 2-3
- Knowledge Modules: Overview 2-4
- Global Knowledge Modules 2-5
- Knowledge Modules in Action 2-6
- Code Generation 2-7
- Types of Knowledge Modules: Overview 2-8
- Working with Knowledge Modules 2-9
- How to Select Knowledge Modules? 2-10
- Creating New Knowledge Modules 2-11
- Developing Knowledge Modules 2-12
- Editing KMs 2-13
- Description of KM Steps 2-15
- Details of the Steps are Generic 2-16
- Setting KM Options 2-17

Replacing Existing KMs	2-18
Developing Knowledge Modules	2-20
Developing Your Own KM: General Guidelines	2-21
Understanding the Substitution API	2-22
Using Substitution Methods	2-23
Understanding Various ODI Substitution Methods	2-24
Substitution Methods: Basic Examples	2-25
Using Substitution Methods in Actions	2-26
Working with Object Names	2-28
Working with Lists of Tables, Columns, and Expressions	2-30
Example: Using getTargetColList to Create a Table	2-33
Example: Using getColList in an Insert Values Statement	2-34
Example: Using getSrcTableList	2-35
Generating the Source Select Statement	2-36
Generating the Source Select Statement: Example	2-37
Working with Data Sets	2-38
Obtaining Other Information with the API	2-39
Quiz	2-40
Summary	2-41
Practice 2-1 Overview: Developing and Enhancing an Integration Knowledge Module	2-42

3 Developing Knowledge Modules

Objectives	3-2
Developing Knowledge Modules: Best Practices	3-3
Developing KMs: Target a Particular Stage of your Integration Process	3-4
Developing KMs: What to Avoid?	3-6
Developing KMs: Other Recommendations	3-7
Using Java in Knowledge Modules	3-8
Using Code Generation Tags:	3-10
Using Code Generation Tags: Examples	3-11
Understanding Code Generation Techniques	3-12
Using Substitution Methods: Code Examples	3-14
Using ODI Substitution Methods: getJoin()	3-15
Using ODI Substitution Methods: getFilter()	3-16
Using ODI Substitution Methods: getPK()	3-17
Using ODI Substitution Methods in Journalizing Knowledge Modules: Examples	3-18
Using ODI Substitution Methods in Reverse-Engineering KM: getModel()	3-20
Troubleshooting Knowledge Modules	3-22
Troubleshooting KMs	3-23

Quiz 3-27
Summary 3-28
Practice 3-1 Overview: Creating a New Knowledge Module for
Data Generation 3-29

4 Designing ODI Integration Interfaces

Objectives 4-2
Overview of Integration Process 4-3
Conventional Integration Process: ETL 4-4
E-LT 4-5
Integration Process: Overview 4-7
Typical Integration Process 4-9
Overview of Integration Interfaces 4-10
Integration Interfaces: Overview 4-11
Basic Integration Process: The Sequence of Operations 4-13
The Staging Area 4-14
Placing the Staging Area 4-15
Designing Integration Interfaces: Best Practices 4-16
Designing Integration Interfaces: E-LT- and ETL-Style Interfaces 4-17
Designing an ETL-Style Interface 4-18
Designing an ETL-Style Interface: Using Multiconnection IKM 4-19
Designing an ETL-Style Interface: Using an LKM and a mono-connection IKM 4-22
Designing an ETL-Style Interface: Limitations of Using an LKM and a
mono-connection IKM 4-23
Using an LKM and a Mono-Connection IKM: Steps 4-24
Maintaining Integrity of Data 4-25
Enforcing ODI Data Quality 4-26
Ways to Handle Erroneous data 4-27
Error Recycling 4-28
Building a Data Quality Framework 4-29
Quiz 4-30
Summary 4-31
Practice 4-1: Creating an ODI Interface for XML to Database Transformation with
ODI Constraint and Error Recycling 4-32

5 Designing Advanced Integration Interfaces

Objectives 5-2
ODI Interfaces: Advanced Functionality 5-3
Creating Lookups 5-4
Lookup Wizard 5-6
Using Set-Based Operators with Integration Interfaces 5-7

Example: Flow with Multiple Data Sets 5-9
Defining a Data Set 5-10
Using Set-Based Operators: Guidelines 5-11
Using Partitioning with ODI Interfaces 5-12
Partitioning: Definition in Data Store After Reverse Engineering 5-13
Using Partitioning in an Interface 5-14
Using Temporary Interfaces 5-15
Using Temporary Interfaces: Example 5-16
Derived Select for Temporary Interfaces 5-17
Derived Select for Temporary Interfaces: Limitations 5-18
Quiz 5-19
Summary 5-20
Practice 5-1: Implementing ODI Integration with Temporary Interfaces 5-21

6 Using Variables in ODI

Objectives 6-2
Using Variables: Overview 6-3
Using Variables in ODI: Overview 6-4
Variable Scope 6-5
Referring to a Variable 6-6
Referring to a Variable: Using “:” Instead of “#” 6-8
Using Variables in ODI Objects 6-9
Using Variables in Packages 6-10
Using Variables in Packages: Example 6-11
Using Variables in Interfaces 6-12
Using Variables in Interfaces: Examples 6-14
Using Variables in Object Properties 6-15
Using Variables in Procedures 6-16
Using Variables Within Variables 6-18
Using Variables in the Resource Name of a Data Store 6-19
Using a Variable as a Startup Parameter: Example 6-21
Using ODI Variables in Topology 6-24
Using ODI Variables in Topology: A Server URL 6-25
Using Variables in a Server URL: Example 6-26
Tracking Variables 6-28
Tracking Variables: Notes 6-32
Quiz 6-34
Summary 6-35
Practice 6-1 Overview: Using Variables in ODI Package 6-36
Practice 6-2 Overview: Using an ODI Variable as a Startup Parameter 6-37

7 Accelerating Development in ODI with Groovy

- Objectives 7-2
- Interacting Programmatically with ODI 7-3
- Overview of ODI SDK 7-4
- SDK-Supported ODI Operations 7-5
- ODI Operations Not Supported by SDK 7-6
- Combining Different APIs 7-7
- Using ODI Groovy Editor 7-8
- Introduction to Groovy 7-9
- Introduction to the Groovy Editor 7-10
- Executing Script with Groovy Editor 7-11
- Performing SDK Tasks Using Java with Groovy Editor 7-12
- Example of Performing an SDK Task Using Java with Groovy Editor 7-13
- Performing Advanced Actions with Groovy 7-14
- Using Custom Libraries 7-15
- Defining Additional Groovy Execution Classpath 7-16
- Read Input with the `odiInputStream` Variable 7-17
- Automating Development Tasks: Example 1 7-18
- Automating Development Tasks: Example 2 7-19
- Automating Development Tasks: Example 3 7-21
- Automating Development Tasks: Example 4 7-22
- Quiz 7-23
- Summary 7-24
- Practice 7-1 Overview: Automating ODI Tasks with Groovy 7-25

8 Working with Complex Files in ODI

- Objectives 8-2
- Complex Files Concept: Overview 8-3
- Types of Files in ODI 8-4
- Complex Files Concept 8-5
- Knowledge Modules for Complex Files 8-7
- Requirements for Working with Complex Files 8-8
- Complex Files: Configuring the Topology 8-9
- Setting Up the Topology 8-10
- JDBC URL Properties 8-11
- JDBC URL: Example 8-12
- Complex File Data Server Definition: Example 8-13
- Definition of Physical and Logical Schema: Example 8-15
- Complex Files in Integration Project 8-16
- Setting Up an Integration Project and Creating a Complex File Model 8-17

Setting Up an Integration project and Creating a Complex File Model:
 Example 8-18
Designing an Interface with Complex File Model 8-19
Creating an nXSD File 8-20
Example of nXSD Schema 8-21
Using Native Format Builder Wizard 8-24
Quiz 8-27
Summary 8-28
Practice 8-1 Overview: Configuring ODI Topology and ODI Model with
 Complex Files 8-29

9 Integration of ODI in Enterprise Environment and SOA

Objectives 9-2
ODI Integration with Java EE 9-3
Understanding ODI Java EE Agent and Standalone Agent 9-4
Java EE Agent Deployment Features 9-5
Integration of ODI with Fusion Middleware Control 9-6
Using ODI Console 9-7
Using ODI Console: Example 9-8
Overview of Using Web Services with ODI 9-9
Types of Web Services 9-10
Overview of Data Services 9-11
Generation of Data Services 9-12
Overview of Public Web Services 9-13
Using Public Web Service Odilnvoke 9-14
Installing Public Web Services 9-15
Invoking Web Services 9-16
OdilnvokeWebService Tool 9-17
Integration of ODI with SOA 9-20
ODI with SOA Integration Scenarios 9-21
Integration of ODI Within SOA in Action 9-22
Example 1: Using Data Services 9-23
Example 2: Exposing ODI Process as a Web Service 9-24
Creating the BPEL process 9-25
Creating ODI Interface and ODI Package 9-26
Creating ODI Scenario and Editing the BPEL Process 9-28
Deploying the BPEL Process to the Application Server and Invoking from Enterprise
 Manager 9-29
Example 3: Calling a Web Service from Within ODI for Processing ODI Errors with
 BPEL Human Workflow 9-30
Processing ODI Errors with BPEL Human Workflow 9-31

Quiz 9-38
Summary 9-39
Practice 9-1 Overview: Integrating ODI in the Enterprise Environment 9-40
Practice 9-2 Overview: Exposing an ODI Scenario as a Web Service 9-41
Practice 9-3 Overview: Integrating ODI with a BPEL Process Within SOA 9-42

10 Enhancing ODI Security

Objectives 10-2
Oracle Data Integrator (ODI) Security: Overview 10-3
Security Concepts: Overview 10-4
Authorizing by Object Instance 10-6
ODI Security Navigator: Overview 10-7
Using Generic and Nongeneric Profiles 10-9
Built-in Profiles 10-10
Implementing a Strongly Secured Approach 10-12
Security Policy Approach 10-13
Defining Security Policies: Using Generic Profiles 10-14
Defining Security Policies: Using Nongeneric Profiles 10-15
Using Nongeneric Profiles: Granting an Authorization by Object Instance 10-16
Unused Authorizations 10-17
Cleaning Up Unused Authorizations 10-18
ODI Security Integration: Overview 10-19
Implementing External Authentication (OPSS) 10-21
Configuring External Authentication 10-23
Using External LDAP Server 10-24
Oracle Internet Directory (OID): Architecture 10-25
Configuring ODI External Authentication 10-26
Configuring External Authentication with OID 10-27
1. Creating a New OID User with Directory Services Manager 10-28
2. Editing the jps-config.xml File to Point to OID LDAP Server 10-29
3. Running the Script (odi_credtool.cmd) to Set Up the Credentials for the Identity Store 10-30
4. Creating New ODI Master Repository Referencing a User in the External LDAP Server 10-31
5. Creating a New ODI Connection Referencing a User in the External OID LDAP Server 10-33
Switching the Master Repository Authentication Mode 10-34
Using Switch Authentication Mode Wizard 10-35
Reactivating Users After Switching to Internal Authentication 10-38
Re-enabling Users After Switching to External Authentication 10-39
External Password Storage 10-40

Setting Up External Password Storage 10-41
Implementing External Password Storage 10-42
Quiz 10-44
Summary 10-45
Practice 10-1: Implementing ODI External User Authentication 10-46

11 Choosing Integration Strategies: Best Practices

Objectives 11-2
Defining an ODI Integration Strategy 11-3
Integration Strategies 11-4
Strategies with Staging Area on the Target 11-5
Strategies with Staging Area on the Target: Append 11-7
Strategies with Staging Area on the Target: Control Append 11-8
Strategies with Staging Area on the Target: Incremental Update 11-10
Strategies with Staging Area on the Target: Incremental Update:
 Optimization 11-12
Working with Slowly Changing Dimensions 11-13
Three Types of Slowly Changing Dimensions 11-14
Working with Type 2 Slowly Changing Dimensions 11-15
Type 2 SCDs: Example 11-16
Implementing Type 2 SCDs 11-17
Implementing Type 2 SCDs: Steps 11-18
Strategies with Staging Area Different from the Target 11-20
Using ODI for Bulk Processing 11-24
Using ODI for Bulk Processing: Design Patterns 11-26
Using Cross-Reference (XREF) Table: Overview 11-28
Using the XREF Knowledge Module 11-29
Real-Time Data Integration: Using ODI with Oracle GoldenGate 11-31
Loading Data Patterns 11-32
Oracle GoldenGate: Overview 11-33
Oracle GoldenGate Solutions: Overview 11-34
Oracle GoldenGate Concepts 11-35
Using ODI with Oracle GoldenGate 11-36
Using ODI and GoldenGate Together 11-37
Initialize CDC Process and Perform Change Operations with
 Oracle GoldenGate 11-38
Working on ODI Projects: Best Practices 11-39
1. Use Context-Independent Design 11-40
2. Use Procedures Only when Needed 11-41
3. Always Enforce Data Quality 11-42
4. Handle Error Cases in Packages 11-43

- 5. Choose Right Knowledge Module 11-44
- 6. Other Best Practices 11-45
- Quiz 11-46
- Summary 11-47

