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Data Services Tutorial

BusinessObjects Data Services XI 3.1 (12.1.0)



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Manual abstract:

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....216 Index 219 10 Data Services Tutorial Introduction 1 1 Introduction Audience and assumptions Welcome to the Data Services Tutorial. This tutorial introduces core features of Data Services. Data Services is a component of the Business Objects Business Intelligence suite that allows you to extract and integrate data for analytical reporting and e-business. Exercises in this tutorial introduce concepts and techniques to extract, transform and load batch data from flat-file and relational database sources for use in a data warehouse.



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Use this tutorial to gain practical experience using Data Services components including the Designer, repositories, and Job Servers. While exercises in this tutorial focus on how to use batch data flows, you can also use Data Services to develop real-time data extraction and integration.

The Business Objects Data Services platform also provides a number of Rapid Marts, which are predefined data models with built-in jobs provided by Data Services for use with business intelligence (BI) and online analytical processing (OLAP) tools. Contact your sales representative for more information about Rapid Marts. Audience and assumptions This tutorial assumes that: You are an application developer or database administrator working on data extraction, data warehousing, data integration, or data quality. You understand your source data systems, DBMS, business intelligence, and e-business messaging concepts. You understand your organization's data needs.

You are familiar with SQL (Structured Query Language). You are familiar with Microsoft Windows. Business Objects information resources A global network of Business Objects technology experts provides customer support, education, and consulting to ensure maximum business intelligence benefit to your business. 12 Data Services Tutorial Introduction Business Objects information resources 1 Useful addresses at a glance: Address Content Customer Support, Consulting, and Information about Customer Support proEducation services grams, as well as links to technical articles, downloads, and online forums. Consulting <http://service.sap.com/>

can provide you with information about how Business Objects can help maximize your business intelligence investment. Education services can provide information about training options and modules. From traditional classroom learning to targeted e-learning seminars, Business Objects can offer a training package to suit your learning needs and preferred learning style. Online Developer Community An online resource for sharing and learning about Data Services with your developer colleagues. <https://boc.sdn.sap.com/EIM> Data Services Tutorial 13 1 Introduction Tutorial objectives Address Blueprints Content Blueprints for you to download and modify to fit your needs. Each blueprint contains <https://boc.sdn.sap.com/>

the necessary Data Services project, jobs, vices/blueprints data flows, file formats, sample data, template tables, and custom functions to run the data flows in your environment with only a few modifications. Product documentation Business Objects product documentation. <http://help.sap.com/> Documentation mailbox Send us feedback or questions about your Business Objects documentation. Do you have a suggestion on how we can improve our documentation? Is there something that you particularly like or have found useful? Let us know, and we will do our best to ensure that your suggestion is considered for the next release of our documentation. Note: If your issue concerns a Business Objects product and not the documentation, please contact our Customer Support experts. documentation@businessobjects.com

Tutorial objectives The intent of this tutorial is to introduce core Data Services Designer functionality. After completing this tutorial you should be able to: . . . Describe the process for extracting, transforming, and loading data using Data Services Identify Data Services objects Define Data Services objects to: . . . Extract flat-file, XML, and relational data from your sources Transform the data to suit your needs 14 Data Services Tutorial Introduction Tutorial prerequisites 1 . . . Load the data to your targets Use Data Services features and functions to: Recover from run-time errors Capture changed data Verify and improve the quality of your source data Run a real-time job View and print metadata reports Examine data throughout a job using the debugger Set up a multiuser development environment Tutorial prerequisites This section provides a high-level description of the steps you need to complete before you begin the tutorial exercises. Preparation for this tutorial Read the sections on logging in to the Designer and the Designer user interface in the Data Services Designer Guide to get an overview of the Designer user interface including terms and concepts relevant to this tutorial. This tutorial also provides a high-level summary in the next section, Data Services Product Overview. Environment required To use this tutorial, you must have Data Services running on a supported version of Windows XP or Windows Server 2003 and a supported RDBMS (such as Oracle, IBM DB2, Microsoft SQL Server, or Sybase ASE).

You can install Data Services product components (Designer, Administrator, Job Server, Access Server) on a single computer or distribute them across multiple computers. In the simplest case, all components in the following diagram can reside on the same computer. Data Services Tutorial 15 1 Introduction Tutorial prerequisites Tutorial setup Ensure you have access to a RDBMS; contact your system administrator for assistance. To set up your computer for this tutorial you must do the following tasks: . . . Create repository, source, and target databases on an existing RDBMS on page 16 Install Data Services on your computer on page 18 Run the provided SQL scripts to create sample source and target tables on page 21 The following sections describe each of these tasks. Create repository, source, and target databases on an existing RDBMS To create the databases 1.

Log in to your RDBMS. 2. (Oracle only). Optionally create a service name alias, for example, using the Oracle Net8 Easy Config utility. Set the protocol to TCP/IP and enter a service name; for example, training.bobj. This can act as your connection name. 16 Data Services Tutorial Introduction Tutorial prerequisites 1 3. Create three databases--for your repository, source operational data store (ODS), and target. For each, you must create a user account and password.

The recommended values used in the tutorial SQL scripts are: Repository repo Source ods Target target User name Password repo ods target 4. Grant access privileges for the user account. For example for Oracle, grant CONNECT and RESOURCE roles. 5. Make a note of the connection names, database versions, user names and passwords in the following table. You will be asked to refer to this information throughout the tutorial. Value Repository Source Target Database connection name (Oracle) OR Database server name AND Database name (MS-SQL Server) Database version Data Services Tutorial 17 1 Introduction Tutorial prerequisites Value Repository Source Target User name Password Install Data Services on your computer See the Data Services Installation Guide for detailed information about system requirements, configuration, and installing on Windows or UNIX.



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Be prepared to enter the following information when installing Data Services: Your Windows domain and user name Your Windows password Your Windows computer name and host ID Data Services product keycode Connection information for the local repository and Job Server To create a local repository 1. In the Repository Manager window, enter the database connection information for the local repository. 2. Type repo for both User and Password. 3. For click Local. 4. Click Create.

The installation process takes you into the Data Services Server Manager to define a Job Server. Then, you can optionally create an Access Server if you want to use web-based batch job administration. To define a job server and associate your repository to it 1. In the Data Services Server Manager window, click Edit Job Server Config. 18 Data Services Tutorial Introduction Tutorial prerequisites 1 2.

In the Job Server Configuration Editor window, click Add to add a Job Server. 3. In the Job Server Properties window: a. Enter a unique name in Job Server name. b. For Job Server port, enter a port number that is not used by another process on the computer. If you are unsure of which port number to use, increment the default port number. c. You do not need to complete the other job server properties to run the exercises in this Tutorial. 4.

Under Associated Repositories, enter the local repository to associate with this Job Server. Every Job Server must be associated with at least one local repository. a. Click Add to associate a new local or profiler repository with this Job Server. b. Under enter the required connection information for your database type. c. Type repo for both User and Password. d. Select the Default repository check box if this is the default repository for this Job Server. You must specify exactly one default repository. e. Click Apply to save your entries. You should see repo_repo in the list of Associated Repositories. 5. 6. 7. 8. Click OK to close the Job Server Properties dialog. Click OK to close the Job Server Configuration Editor.

Click Restart on the Data Services Server Manager dialog box. Click OK to confirm that you want to restart the Data Services Service. The default installation creates the following entries in the Start > Programs > BusinessObjects XI 3.1 > BusinessObjects Data Services menu: Command Function Data Services Documentation Submenu includes documentation such as Technical Manuals, Release Summary, Release Notes, the Tutorial, and Migration Considerations. Data Services Tutorial 19 1 Introduction Tutorial prerequisites Command Function BusinessObjects License Manager Displays license information. Allows you to specify the language, territory, and code page to use for the repository connection for Designer and to process job data Opens Data Services Designer. Data Services Locale Selector Data Services Designer Opens a launch page for the Data Services Web applications including Data Services Management Console the Administrator and metadata and data quality reporting tools. Opens a dialog box to configure the Metadata services that collects metadata from the BusinessObjects Enterprise Repository and stores it in the Data Services repository. Data Services Metadata Integrator Data Services Repository Manager Opens a dialog box that you can use to update repository connection information. Opens a dialog box that you can use to configure Job Servers and Access Servers.

Data Services Server Manager When you installed Data Services, it sets up a Windows service for the Job Server. To verify that the service is enabled, open the Services Control Panel and ensure that any Data Services services are configured for a Status of Started and Startup Type Automatic. 20 Data Services Tutorial Introduction Tutorial prerequisites 1 Run the provided SQL scripts to create sample source and target tables Data Services installation includes a batch file (CreateTables_databasetype.bat) for each supported RDBMS (indicated by the suffix databasetype). The batch files run SQL scripts that create and populate tables on your source database and create the target schema on the target database. To run the scripts 1. Using Windows Explorer, locate the CreateTables batch file for your RDBMS in your Data Services installation directory in \Tutorial Files\Scripts. 2. Open the appropriate script file and edit the pertinent connection information (and user names and passwords if you are not using ods/ods and target/target). The Oracle batch file contains commands of the form: sqlplus username/password@connection @scriptfile.

sql > out outfile.out The Microsoft SQL Server batch file contains commands of the form: isql /e /n /U username /S servername /d databasename /P password /i scriptfile.sql /o outfile.out (The output files provide logs that you can examine for success or error messages.) 3.

Double-click on the batch file to run the SQL scripts. 4. Use an RDBMS query tool to check your source ODS database. The following tables should exist on your source database after you run the script. These tables should include a few rows of sample data.

Descriptive Name Table Name in Database Customer ods_customer Data Services Tutorial 21 1 Introduction Tutorial prerequisites Descriptive Name Table Name in Database Material Sales Order Header Sales Order Line Item Sales Delivery Employee Region ods_material ods_salesorder ods_salesitem ods_delivery ods_employee ods_region 5. Use an RDBMS query tool to check your target data warehouse. The following tables should exist on your target database after you run the script. Descriptive Name Table Name in Database Sales Org Dimension Customer Dimension Material Dimension Time Dimension salesorg_dim cust_dim mtrl_dim time_dim 22 Data Services Tutorial Introduction Data Services tutorial structure 1 Descriptive Name Table Name in Database Employee Dimension Sales Fact Recovery Status CDC Status employee_dim sales_fact status_table CDC_time Data Services tutorial structure The goal of the tutorial exercises is to demonstrate Data Services features using a simplified data model. The model is a sales data warehouse with a star schema that contains one fact table and some dimension tables. Sections build on jobs you create and skills learned in previous sections. You must complete each exercise to begin the next. Data Services Tutorial 23 1 Introduction Data Services tutorial structure Note: The screens in this guide are for illustrative purposes. On some screens, the available options depend on the database type and version in the environment. This tutorial is organized as follows.

Data Services Product Overview introduces the basic architecture and the user interface for Data Services. Defining Source and Target Metadata introduces working with the Designer. Use the Designer to define a datastore and a file format, then import metadata to the object library.



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After completing this section, you will have completed the preliminary work required to define data movement specifications for flat-file data. Populating the SalesOrg Dimension from a Flat File introduces basic data flows, query transforms, and source and target tables. The exercise populates the sales organization dimension table from flat-file data. Populating the Time Dimension Using a Transform introduces Data Services functions. This exercise creates a data flow for populating the time dimension table. Populating the Customer Dimension from a Relational Table introduces data extraction from relational tables. This exercise defines a job that populates the customer dimension table.

Populating the Material Dimension from an XML File introduces data extraction from nested sources. This exercise defines a job that populates the material dimension table. Populating the Sales Fact Table from Multiple Relational Tables continues data extraction from relational tables and introduces joins and the lookup function. The exercise populates the sales fact table. Changed-Data Capture introduces a basic approach to changed-data capture.

The exercise uses variables, parameters, functions, and scripts. Data Assessment introduces features to ensure and improve the validity of your source data. The exercise uses profile statistics, the validation transform, and the audit data flow feature. Recovery Mechanisms presents techniques for recovering from incomplete data loads. 24 Data Services Tutorial Introduction Exiting the tutorial 1 Multiuser Development presents the use of a central repository for setting up a multiuser development environment.

Extracting SAP ERP and R/3 Data provides optional exercises on extracting data from SAP ERP and R/3 sources. Running a Real-time Job in Test Mode provides optional exercises on running a real-time job in test mode. Exiting the tutorial You can exit the tutorial at any point after creating a sample project (see Adding a new project on page 59). To exit the tutorial 1. From the Project menu, click Exit. If any work has not been saved, you are prompted to save your work. 2. Click Yes or No. To resume the tutorial 1. Open Data Services and log in to the repository in which you saved your work.

The Designer window opens. 2. From the Project menu, click Open. 3. Click the name of the project you want to work with, then click Open. The Designer window opens with the project and the objects within it displayed in the project area. Data Services Tutorial 25 1 Introduction Exiting the tutorial 26 Data Services Tutorial Data Services Product Overview 2 2 Data Services Product Overview What does Data Services do? This section provides an overview of Data Services. It introduces the product architecture and the Data Services Designer. What does Data Services do? Data Services combines industry-leading data quality and integration into one platform. With Data Services, your organization can transform and improve data anywhere.

You can have a single environment for development, runtime, management, security and data connectivity. One of the fundamental capabilities of Data Services is extracting, transforming, and loading (ETL) data from heterogeneous sources into a target database or data warehouse. You create applications (jobs) that specify data mappings and transformations by using the Data Services Designer. Use any type of data, including structured or unstructured data from databases or flat files to process and cleanse and remove duplicate entries. You can create and deliver projects more quickly with a single user interface and performance improvement with parallelization and grid computing.

Data Services RealTime interfaces provide additional support for real-time data movement and access. Data Services RealTime reacts immediately to messages as they are sent, performing predefined operations with message content. Data Services RealTime components provide services to web applications and other client applications. Data Services features Instant traceability with impact analysis and data lineage capabilities that include the data quality process Data validation with dashboards and process auditing Workflow design with exception handling (Try/Catch) and Recovery features Multi-user support (check-in/check-out) and versioning via a central repository Administration tool with scheduling capabilities and monitoring/dashboards Transform management for defining best practices Comprehensive administration and reporting tools Scalable scripting language with a rich set of built-in functions Interoperability and flexibility with Web services-based applications High performance parallel transformations and grid computing 28 Data Services Tutorial Data Services Product Overview Data Services components 2 . . Debugging and built-in profiling and viewing data Broad source and target support . applications (for example, SAP) . databases with bulk loading and CDC changes data capture . files: comma delimited, fixed width, COBOL, XML,

Excel For details about all the features in Data Services, see the BusinessObjects Data Services XI 3.1 Reference Guide.

Data Services components The Data Services product consists of several components including: . Data Services Designer The Designer allows you to create, test, and execute jobs that populate a data warehouse. It is a development tool with a unique graphical user interface. It enables developers to create objects, then drag, drop, and configure them by selecting icons in a source-to-target flow diagram. It allows you to define data mappings, transformations, and control logic. Use the Designer to create applications specifying work flows (job execution definitions) and data flows (data transformation definitions) .

Data Services Job Server The Job Server is an application that launches the Data Services processing engine and serves as an interface to the engine and other components in the Data Services suite. . Data Services engine The Data Services engine executes individual jobs defined in the application you create using the Designer. When you start your application, the Data Services Job Server launches enough engines to effectively accomplish the defined tasks. . Data

Services Repository The repository is a database that stores Designer predefined system objects and user-defined objects including source and target metadata and transformation rules. In addition to the local repository used by the Designer and Job Server, you can optionally establish a central repository for object sharing and version control.

Data Services Tutorial 29 2 Data Services Product Overview Data Services components The Designer handles all repository transactions. Direct manipulation of the repository is unnecessary except for: . Setup before installing Data Services You must create space for a repository within your RDBMS before installing Data Services.



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· Security administration Data Services uses your security at the network and RDBMS levels. · Backup and recovery You can export your repository to a file. Additionally, you should regularly back up the database where the repository is stored. · Data Services Access Server The Access Server passes messages between web applications and the Data Services Job Server and engines. It provides a reliable and scalable interface for request-response processing. · Data Services Administrator The Web Administrator provides browser-based administration of Data Services resources, including: · · · · · Scheduling, monitoring, and executing batch jobs Configuring, starting, and stopping real-time services Configuring Job Server, Access Server, and repository usage Configuring and managing adapters Managing users Publishing batch jobs and real-time services via Web services The following diagram illustrates Data Services product components and relationships. 30 Data Services Tutorial Data Services Product Overview How do you use Data Services? 2 How do you use Data Services? You use Data Services to design, produce, and run data movement applications. Using the Designer, you can build work flows and data flows that cleanse your data and specify data extraction, transformation, and loading processes.

In Data Services RealTime, you have the added capability to build real-time data flows that support e-business transactions. You create jobs to contain, organize, and run your flows. You create projects to organize the jobs. Refine and build on your design until you have created a well-tested, production-quality application. In Data Services, you can set applications to run in test mode or on a specific schedule.

Using Data Services RealTime, you can run applications in real time so they immediately respond to web-based client requests. Data Services Tutorial 31 2 Data Services Product Overview Data Services system configurations Data Services system configurations You can configure Data Services in various ways. The following diagram illustrates one possible system configuration. When integrating Data Services into your existing environment, consider: · · The servers shown in the diagram can be separate physical computers, or they can be installed on a single computer. For peak performance, install and create the Data Services local repository on either the same computer as the Data Services Job Server or on the same computer as the target data warehouse.

In either of the previous configurations, the computer should be on the same LAN segment as the rest of the Data Services components. As shown in the diagram, most Data Services components--the Designer, Job Server, and Access Server--can run on the same Windows system, or you can install the Job Server on a UNIX system running Hewlett Packard HP-UX, Sun Solaris, or IBM AIX. 32 Data Services Tutorial Data Services Product Overview The Data Services Designer window 2 Windows implementation You can configure a Windows system as either a server or a workstation. A large-memory, multiprocessor system is ideal because the multithreading, pipelining, and parallel work flow execution features in Data Services take full advantage of such a system. You can create your target data warehouse on a database server that may or may not be a separate physical computer. You can use a shared disk or FTP to transfer data between your source system and the Data Services Job Server. UNIX implementation You can install the Data Services Job Server on a UNIX system. You can also configure the Job Server to start automatically when you restart the computer. The Data Services Designer window The following illustration shows the key areas of the Data Services Designer window. Data Services Tutorial 33 2 Data Services Product Overview The Data Services Designer window The key areas of the Data Services application window are: 1.

Project area -- Contains the current project (and the job(s) and other objects within it) available to you at a given time. In Data Services, all entities you create, modify, or work with are objects. 2. Workspace -- The area of the application window in which you define, display, and modify objects. 3. Local object library -- Provides access to local repository objects including built-in system objects, such as transforms and transform configurations, and the objects you build and save, such as jobs and data flows. 4. Tool palette -- Buttons on the tool palette enable you to add new objects to the workspace. 34 Data Services Tutorial Data Services Product Overview Data Services objects 2 Data Services objects In Data Services, all entities you add, define, modify, or work with are objects. Objects have: · Options that control the object.

For example, to set up a connection to a database, defining the database name would be an option for the connection. Properties that describe the object. For example, the name and creation date. Attributes are properties used to locate and organize objects. Classes that determine how you create and retrieve the object.

You can copy reusable objects from the object library. You cannot copy single-use objects. · · The following diagram shows transform objects in the Data Services object library. When you widen the object library, the name of each object is visible next to its icon. To resize the object library area, click and drag its border until you see the text you want, then release.

Data Services Tutorial 35 2 Data Services Product Overview Data Services objects Object hierarchy The following illustration shows the hierarchical relationships for the key object types within Data Services. 36 Data Services Tutorial Data Services Product Overview Data Services objects 2 In the repository, the designer groups objects hierarchically from a project, to jobs, to optional work flows, to data flows. In jobs: · Work flows define a sequence of processing steps. Work flows and conditionals are optional. A conditional contains work flows, and you can embed a work flow within another work flow. Data Services Tutorial 37 2 Data Services Product Overview Data Services objects · Data flows transform data from source(s) to target(s). You can embed a data flow within a work flow or within another data flow. Projects and jobs A project is the highest-level object in the Data Services Designer window. Projects provide you with a way to organize the other objects you create in Data Services. Only one project is open at a time (where "open" means "visible in the project area").

A "job" is the smallest unit of work that you can schedule independently for execution. Work flows and data flows Jobs are composed of work flows and/or data flows: · · A "work flow" is the incorporation of several data flows into a coherent flow of work for an entire job.



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A "data flow" is the process by which source data is transformed into target data. A work flow orders data flows and operations that support them; a work flow also defines the interdependencies between data flows. For example, if one target table depends on values from other tables, use the work flow to specify the order in which you want Data Services to populate the tables. Also use work flows to define strategies for handling errors that occur during project execution. You can also use work flows to define conditions for running sections of a project. The following diagram illustrates a typical work flow. 38 Data Services Tutorial Data Services Product Overview Data Services objects 2 A data flow defines the basic task that Data Services accomplishes, which involves moving data from one or more sources to one or more target tables or files. You define data flows by identifying the sources from which to extract data, the transformations that the data should undergo, and targets.

Blueprints We have identified a number of common scenarios that you are likely to handle with Data Services. Instead of creating your own job from scratch, look through the blueprints. If you find one that is closely related to your particular business problem, you can simply use the blueprint and tweak the settings in the transforms for your specific needs. For each scenario, we have included a blueprint that is already set up to solve the business problem in that scenario. Each blueprint contains the necessary Data Services project, jobs, data flows, file formats, sample data, template tables, and custom functions to run the data flows in your environment with only a few modifications.

You can download all of the blueprints or only the blueprints and other content that you find useful from the Business Objects Diamond Developer website. On the Diamond website, we periodically post new and updated blueprints, custom functions, best practices, white papers, and other Data Services content. You can refer to this site frequently for updated content and use the forums to provide us with any questions or requests you may have. We have also provided the ability for you to upload and share any content that you have developed with the rest of the Data Services development community. Instructions for downloading and installing the content objects are also located on the Diamond website at <https://bo.com/dsdn.sap.com/dataservices/blueprints>.

Data Services Tutorial 39 2 Data Services Product Overview New terms Object-naming conventions Data Services recommends that you follow a consistent naming convention to facilitate object identification. Here are some examples: Prefix Suffix Object Example JOB WF DF DS Job Work flow Data flow Datastore JOB_SalesOrg WF_SalesOrg DF_Currency ODS_DS New terms Term Description Attribute Property that can be used as a constraint for locating objects. Contains steps to define how source data becomes target data. Called by a work flow or job. Logical channel that connects Data Services to source and target databases. Data flow Datastore 40 Data Services Tutorial Data Services Product Overview New terms 2 Term Description Job The smallest unit of work that you can schedule independently for execution. A job is a special work flow that cannot be called by another work flow or job.

Data that describes the objects maintained by Data Services. Any project, job, work flow, data flow, datastore, file format, message, custom function, transform, or transform configurations created, modified, or used in Data Services. Part of the Designer interface that represents a "window" into the local repository and provides access to reusable objects. A choice in a dialog box that controls how an object functions. Logical grouping of related jobs. The Designer can open only one project at a time. Characteristic used to define the state, appearance, or value of an object; for example, the name of the object or the date it was created. Metadata Object Object library Option Project Property Data Services Tutorial 41 2 Data Services Product Overview Section summary and what to do next Term Description Repository A database that stores Designer predefined system objects and userdefined objects including source and target metadata and transformation rules. Can be local or central (shared). Table, file, or legacy system from which Data Services reads data. Table or file to which Data Services loads data. Contains steps to define the order of job execution. Calls a data flow to manipulate data. Source Target Work flow Section summary and what to do next This section has given you a short overview of the Data Services product and terminology. For more information about these topics, see the Data Services Getting Started Guide and the Data Services Designer Guide.

42 Data Services Tutorial Defining Source and Target Metadata 3 3 Defining Source and Target Metadata Logging in to the repository In this section you will set up logical connections between Data Services, a flat-file source, and a target data warehouse. You will also create and import objects into the local repository. Storing connection metadata in the repository enables you to work within Data Services to manage tables that are stored in various environments. Logging in to the repository When you use Data Services, you save your work in the local repository. So, when you open Data Services, a login window for the local repository opens.

To log in to Data Services 1. From the Start menu, click Programs > BusinessObjects XI 3.1 > BusinessObjects Data Services > Data Services Designer. As Data Services starts, a repository login screen appears. A sample login window (for the Microsoft SQL Server environment) appears as follows. 44 Data Services Tutorial Defining Source and Target Metadata Defining a datastore 3 2. Supply the appropriate login information for your repository, then click OK. See Create repository, source, and target databases on an existing RDBMS on page 16 for login information. Data Services connects to the specified repository, then opens the Designer. In the next section you will define datastores (connections) for your source and target.

Defining a datastore Datastores: . . . Provide a logical channel (connection) to a database Must be specified for each source and target database Are used to import metadata for source and target databases into the repository. Data Services Tutorial 45 3 Defining Source and Target Metadata Defining a datastore . . . Are used by Data Services to read data from source tables and load data to target tables The databases to which Data Services datastores can connect include: Oracle IBM DB2 Microsoft SQL Server Sybase ASE Sybase IQ ODBC Metadata consists of: . Database tables Table name Column names Column data types Primary key columns Table attributes RDBMS functions Application-specific data structures Connection metadata is defined in the object library as datastores (for tables) and file formats (for flat files).



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The next task describes how to define datastores using the Designer. Note that while you are designating the datastores as sources or targets, datastores only function as connections. You will define the actual source and target objects when you define data flows later in the tutorial. To define a datastore for the source (ODS) database 1. From the Datastores tab of the object library, right-click in the blank area and click New. 46 Data Services Tutorial Defining Source and Target Metadata Defining a datastore 3 The Create New Datastore window opens. A example for the Oracle environment appears as follows: 2.

In the Datastore name box, type ODS_DS.

This datastore name labels the connection to the database you will use as a source. The datastore name will appear in the local repository. When you create your own projects/applications, remember to give your objects meaningful names. 3. In the Datastore type box, click Database.

4. In the Database type box, click the option that corresponds to the database software being used to store the source data. The remainder of the boxes on the Create New Datastore window depend on the Database type you selected. The following table lists the minimum options to configure for some common Database types. Enter the information you recorded in Create repository, source, and target databases on an existing RDBMS on page 16.

Data Services Tutorial 47 3 Defining Source and Target Metadata Defining a datastore Oracle DB2 MS SQL Server Sybase ASE Enable CDC Enable CDC Enable CDC Database server Database name name Database name User name Password Database version Database version Database version Data source Database server Database name name Database name User name Password User name Password User name Password 5. Click OK. Data Services saves a datastore for your source in the repository. To define a datastore for the target database Define a datastore for the target database using the same procedure as for the source (ODS) database. 1. Use Target_DS for the datastore name. 2. Use the information you recorded in Create repository, source, and target databases on an existing RDBMS on page 16. 48 Data Services Tutorial Defining Source and Target Metadata Importing metadata 3 Importing metadata With Data Services, you can import metadata for individual tables using a datastore. You can import metadata by: . . . Browsing Name Searching The following procedure describes how to import by browsing.

To import metadata for ODS source tables into Data Services 1. In the Datastores tab, right-click the ODS_DS datastore and click Open. The names of all the tables in the database defined by the datastore named ODS_DS display in a window in the workspace. 2. Move the cursor over the right edge of the Metadata column heading until it changes to a resize cursor. 3. Double-click the column separator to automatically resize the column. 4. Import the following tables by right-clicking each table name and clicking Import. Alternatively, because the tables are grouped together, click the first name, Shift-click the last, and import them together.

(Use Ctrl-click for nonconsecutive entries.) Note: In Microsoft SQL Server, the owner prefix might be dbo instead of ods. ods.ods_customer ods.ods_material ods.

ods_salesorder ods.ods_salesitem ods.ods_delivery ods.ods_employee Data Services Tutorial 49 3 Defining Source and Target Metadata Defining a file format ods.ods_region Data Services imports the metadata for each table into the local repository.

5. In the object library on the Datastores tab, under ODS_DS expand the Tables node and verify the tables have been imported into the repository. To import metadata for target tables into Data Services 1. Open the Target_DS datastore. 2. Import the following tables by right-clicking each table name and clicking Import. Alternatively, Use Ctrl-click and import them together Note: In Microsoft SQL Server, the owner prefix might be dbo instead of target. target.status_table target.cust_dim target.

employee_dim target.mtrl_dim target.sales_fact target.salesorg_dim target.time_dim target.CDC_time Data Services imports the metadata for each table into the local repository. 3. In the object library on the Datastores tab, under Target_DS expand the Tables node and verify the tables have been imported into the repository. Defining a file format If the source or target RDBMS includes data stored in flat files, you must define file formats in Data Services. File formats are a set of properties that describe the structure of a flat file.

50 Data Services Tutorial Defining Source and Target Metadata Defining a file format 3 Data Services includes a file format editor. Use it to define flat file formats. The editor supports delimited and fixed-width formats. You can specify file formats for one file or a group of files. You can define flat files from scratch or by importing and modifying an existing flat file.

Either way, Data Services saves a connection to the file or file group. Note: Data Services also includes a file format (Transport_Format) that you can use to read flat files in SAP ERP and R/3. In the next section, you will use a flat file as your source data. Therefore, you must create a file format and connection to the file now. To define a file format 1.

In the object library, click the Formats tab, right-click in a blank area of the object library, and click New > File Format. The file format editor opens. 2. Under General, leave Type as Delimited. Change the Name to Format_SalesOrg. 3. Under Data Files, click the Files folder icon and navigate in your Data Services install directory to %LINK_DIR%\Tutorial Files\sales_org.txt. Click Open. Note: The file format editor initially displays default values for the file schema.

When you select a file, a prompt asks you to verify that you want to overwrite the current schema with the schema from the file you selected. Click Yes. The file format editor displays sample data from the sales_org.txt file in the (lower right) Data Preview pane. 4. Under Default Format, change Date to ddmmyyy. The source data contains dates with a two-digit day number followed by a two-digit month number, a four-digit year (ddmmyyy), and no time value. (Note that the sample dates do not contain a delimiter between values. Using an unsupported format string such as ddmJJJJ will result in incorrect dates, and no error message will appear.) Data Services Tutorial 51 3 Defining Source and Target Metadata Defining a file format 5.

The first row contains the names of the column headings. Under Input/Output, change Skip row header to Yes. Data Services removes the first row and uses these column heading values for the field names in the upper-right Column Attributes pane. Note: A prompt asks you to verify that you want to overwrite the current schema with the schema (column headings) from the file you selected.



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Click Yes.

6. In the upper-right Column Attributes pane, click DateOpen and change the data type to Date. The column types and lengths should appear as follows:
Field Name Data Type Field Size SalesOffice Region DateOpen Country Int VarChar Date VarChar 7 2 52 Data Services Tutorial Defining Source and Target Metadata New terms 3 7. Click Save & Close. New terms The terms examined in this section included: Term Meaning Datastore Connection from Data Services to tables in source or target databases.

Stored as an object in the repository. Data Services Tutorial 53 3 Defining Source and Target Metadata Summary and what to do next Term Meaning Data that describes objects maintained by Data Services. Metadata that Data Services stores in its local repository includes: · Table name Metadata · · · · Column name Column data types Primary key columns Table attributes RDBMS functions Object library The GUI part of the Designer representing the local repository. A set of properties that define the table structure for a flat file. Stored as an object in the repository. File format Summary and what to do next At this point, you have finished all the preparatory work to define data movement specifications for a flat-file data source to a target data warehouse. In this section you have: · · · Defined a datastore from Data Services to your target data warehouse Imported metadata from target tables into the local repository so that you can use Data Services Designer to work with these tables Defined file formats and a connection to flat-file source data 54 Data Services Tutorial Defining Source and Target Metadata Summary and what to do next 3 You are now ready to create a new project and define jobs that will populate the target tables with source data. You will do that for the sales organization dimension table in the next section. You can now exit Data Services or go on to the next section. The information you have created in this section has been saved in the local repository and will be automatically available to you the next time you use Data Services.

For more information about the topics in this section, see the Data Services Designer Guide. Data Services Tutorial 55 3 Defining Source and Target Metadata Summary and what to do next 56 Data Services Tutorial Populating the SalesOrg Dimension from a Flat File 4 4 Populating the SalesOrg Dimension from a Flat File Objects and their hierarchical relationships In this section, you will populate the sales organization dimension table in your target data warehouse with data from a flat file called Format_SalesOrg. The concepts and tasks in this section include: · · · · · · · · · · Objects and their hierarchical relationships on page 59 Adding a new project on page 59 Adding a job on page 60 Adding a work flow on page 60 About data flows on page 62 Saving the project on page 70 Executing the job on page 70 About deleting objects on page 72 New terms on page 73 Summary and what to do next on page 73 58 Data Services Tutorial Populating the SalesOrg Dimension from a Flat File Objects and their hierarchical relationships 4 Objects and their hierarchical relationships Everything in Data Services is an object. The key objects involved in data movement activities (like projects, jobs, work flows, and data flows) display in the Data Services Designer project area according to their relationship in the object hierarchy. The following figure shows a display of the types of objects you will be creating while you are working in this section. 1. Project 2. Job 3. Workflow 4. Dataflow Object hierarchies are displayed in the project area of the Designer.

Adding a new project Projects group and organize related objects. Projects display in the project area of the Designer and can contain any number of jobs, work flows, and data flows. To add a new project 1. In the Data Services Designer, from the Project menu click New > Project. 2. Name the project Class_Exercises. 3. Click Create. Data Services Tutorial 59 4 Populating the SalesOrg Dimension from a Flat File Adding a job The project name appears as the only object in the project area of the Designer. Next, you will define the job that will be used to extract the information from the flat-file source.

Adding a job A job is a reusable object. It is also the second level in the project hierarchy. It contains work flows (which contain the order of steps to be executed) and data flows (which contain data movement instructions). You can execute jobs manually or as scheduled. In this exercise you will define a job called JOB_SalesOrg. To add a new batch job 1. Right-click in the project area and click New Batch Job. 2. Right-click the new job and click Rename. Alternatively, left-click the job twice (slowly) to make the name editable.

3. Type JOB_SalesOrg. 4. Left-click or press Enter. The job appears in the project hierarchy under Class_Exercises and in the project tab of the object library. Adding a work flow A work flow is a reusable object. It executes only within a Job. Use work flows to: · · · · · Call data flows Call another work flow Define the order of steps to be executed in your job Pass parameters to and from data flows Define conditions for executing sections of the project 60 Data Services Tutorial Populating the SalesOrg Dimension from a Flat File Adding a work flow 4 · Specify how to handle errors that occur during execution Work flows are optional. The Data Services objects you can use to create work flows appear on the tool palette: Button Component Programming Analogy Work flow Procedure Declarative SQL select statement Subset of lines in a procedure If/then/else logic A sequence of steps that repeats as long as a condition is true Try block indicator Try block terminator and exception handler Description of a job, work flow, data flow, or a diagram in a workspace Data Flow Script Conditional While Loop Try Catch Annotation Data Services Tutorial 61 4 Populating the SalesOrg Dimension from a Flat File About data flows To add a work flow 1. With JOB_SalesOrg selected in the project area, click the work flow button on the tool palette.

2. Click the blank workspace area. A work flow icon appears in the workspace. The work flow also appears in the project area on the left under the job name (expand the job to view). Note: You can place a work flow anywhere in the workspace, but because flows are best viewed from left to right and top to bottom, place it near the top left corner.

3. Change the name of the work flow to WF_SalesOrg. 4. Click the name of the work flow. An empty view for the work flow appears in the workspace. You will use this view to define the elements of the work flow.



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Notice the title bar changes to display the name of the work flow. About data flows A data flow defines the flow of data from sources to targets. It is used to: 62 Data Services Tutorial Populating the SalesOrg Dimension from a Flat File About data flows 4 . . . Identify the source data that you want to read Define the transformations that you want to perform on the data Identify the target table to which you want to load data A data flow is a reusable object. It is always called from a work flow or a job. The first data flow you need to create for this tutorial reads sales organization data from a flat file and loads the data into the sales organization dimension table in the target data warehouse. Adding a data flow The following procedure creates a data flow named DF_SalesOrg inside the work flow WF_SalesOrg. To add a data flow 1. Make sure the work flow window is open in the workspace. If it is not, click the WF_SalesOrg work flow in the project area.

2. Click the data flow button on the tool palette. 3. Click the workspace. A representation of a data flow appears in the workspace. The data flow also appears in the project area. 4. Change the name of the data flow to DF_SalesOrg. Notice the project, job, work flow, and data flow objects display in hierarchical form in both the project area and the object library. To navigate to these levels, click their names in the project area.

Data Services Tutorial 63 4 Populating the SalesOrg Dimension from a Flat File About data flows 1--Data flow in the workspace 2--Data flow in the project area 3--Data flow in the local object library 5. Click the data flow name. A definition area for the data flow appears in the workspace. This area will be used to define the data flow as described in the next section. 64 Data Services Tutorial Populating the SalesOrg Dimension from a Flat File About data flows 4 Defining the data flow Inside the data flow, you must specify the instructions to transform source data into the form you want for the target table.

In this case, you will define the data flow instructions for building the sales organization dimension table using the following objects: . . . An object representing the source file An object defining a query transform (or query). A query transform maps columns from source to target. With a query transform, you can: Select row sets Create joins Group and order by data values Create data set filters Execute functions An object representing the target table into which the data loads The next three exercises guide you through the steps necessary to define a dataflow's content: 1. Add objects to the data flow. 2. Connect them in the order that data will flow through them. 3. Define the query that maps the source columns to the target columns. To add objects to a data flow 1. Verify the DF_SalesOrg data flow is open in the workspace. In the object library, click the Formats tab. 2. The source for this data flow will be the flat file Format_SalesOrg. Click and drag the Format_SalesOrg object to the workspace. 3.

Drop the Format_SalesOrg object on the left side of the workspace to leave room for more objects on the right. 4. Click Make Source from the shortcut menu that appears when you drop the object. Data Services Tutorial 65 4 Populating the SalesOrg Dimension from a Flat File About data flows 5. Click the query button on the tool palette. 6. Click to the right of the source file in the workspace. 7. In the object library, click the Datastores tab and expand the datastore named Target_DS. 8.

The target for this data flow will be the table SALESORG_DIM. Click and drag the SALESORG_DIM object to the workspace and drop it to the right of the query. 9. Click Make Target from the shortcut menu that appears when you drop the table. Data Services creates a table with the same schema as the query output schema.

All the elements necessary to create the sales organization dimension table are now in the workspace. In the next section, you will connect the steps in the correct order. To define the order of steps in a data flow You now need to define the sequence for the data flow. The steps execute in left-to-right order. 1.

Click the square on the right edge of the source file and drag it to the triangle on the left edge of the query transform. 2. Use the same drag technique to connect the query transform to the target table. 66 Data Services Tutorial Populating the SalesOrg Dimension from a Flat File About data flows 4 The next section introduces the query transform and the query transform editor. To define a query transform that maps a source to a target 1. Click the name of the query in the project area or in the workspace. The query editor opens showing the source schema, the target schema (which has automatically been copied from the target table metadata to the output pane of the query), and options for defining the query. There are four columns in the source schema: SalesOffice, Region, DateOpen, and Country. You will specify that three of them (SalesOffice, Region, and DateOpen) be copied to the target table. 2.

Map the source columns to target columns by dragging and dropping each source column name onto the corresponding column for the target schema. From the shortcut menu that appears, click Remap Column to preserve the data type imported from the target. Notice that the column icon next to the source column changes to an arrow when dragged to the target, which indicates that the column has been mapped. Also notice that when you select a column in the target schema, the Mapping tab in the query options shows the mapping relationship for that column. You can also view the mapping relationship by scrolling the

Schema Out pane to the right to show the Mapping column. Data Services Tutorial 67 4 Populating the SalesOrg Dimension from a Flat File About data flows 1--Target schema 2--Source schema 3--Query options 4--Column mapping definition 3. Validate the query by clicking the Validate Current button on the toolbar. The Output window appears with tabs for Errors, Warnings, and Information. The Warning tab indicates that Data Services will convert the data type for the SALESOFFICE column. 4.

Close the Output window and click the Back arrow on the tool bar close the query editor and return to the data flow view. to Validating the data flow Next you will verify that the data flow has been constructed properly (which does not guarantee that the job will run or produce the correct data). The Validation menu provides design-time validation options. These options check for syntax errors, not run-time errors. Run-time validation occurs while the job executes. Related Topics · Executing the job on page 70 68 Data Services Tutorial Populating the SalesOrg Dimension from a Flat File About data flows 4 To validate a data flow 1.



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