SQL Power DQguru User Guide

Version 0.9.6

SQL Power Group Inc.
[http://www.sqlpower.ca/software/]

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Chapter 1. Introduction

About DQguru

You need your data to be clean, complete, and reliable. DQguru will cleanse your data, validate and correct addresses, identify and remove duplicates, and build cross-references between source and target tables, providing you with complete and accurate data and a consolidated view of your customers, products, business units, and other essential information.

DQguru is an easy-to-use, highly intuitive tool created by data warehouse designers. DQguru contains many features geared for anyone dealing with information systems, including:

- Intuitive transformation interface allows you to easily manipulate data conversion workflows
- Accepts user-defined data matching criteria
- Innovative interface for verification of duplicates
- Merges duplicate records and their related data
- Allows for backup of affected records prior to merging of data
- Validates and corrects address information
- Runs against the entire database to perform initial data cleanup or can be incorporated into the data load process
- Builds cross-reference tables to link source system identifiers (primary keys) to target database identifiers

Whether you're building a data warehouse, data mart or a CRM system, DQguru helps you ensure the integrity of your data.

About This Guide

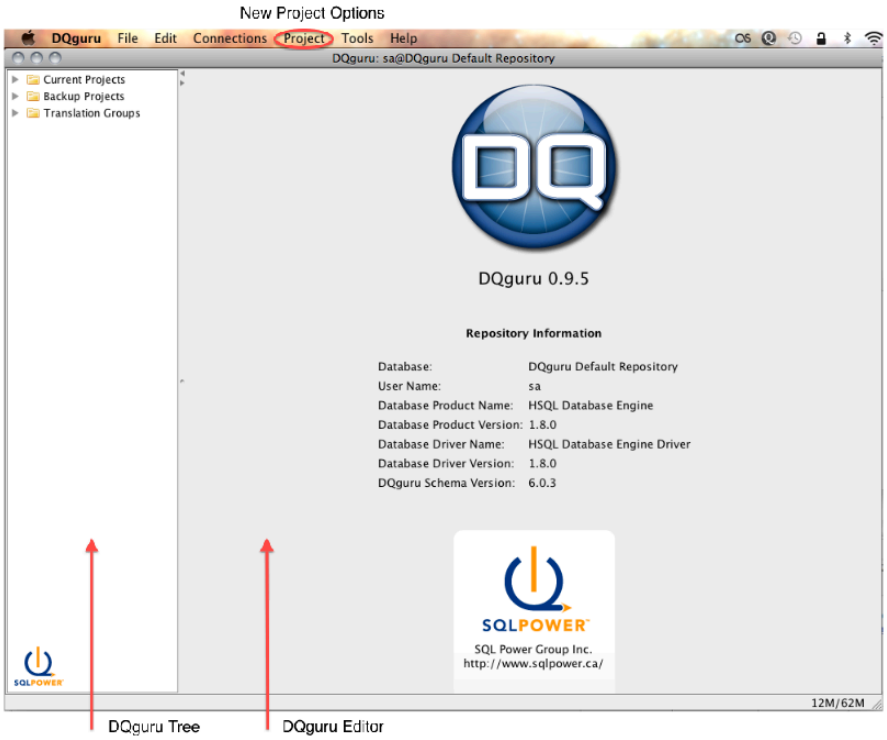
This user guide provides instructions for using DQguru. The guide assumes you are familiar with basic database operations and terminology (please refer to Chapter 7, *Glossary* for a list of some common database terms).

DQguru Licensing and Distribution

Chapter 2. Getting Started

Understanding the DQguru User Interface

DQguru contains two main areas: the Tree and Editor.



About the DQguru Editor

The DQguru Editor is your main work area. When you first start DQguru, information about the repository you're currently logged into is shown in the Editor. When you select an item in the DQguru Tree, details about the item are shown in the Editor.

About the DQguru Tree

The DQguru Tree contains the projects and translation groups within the current repository. You will use the Tree extensively when working on a project. You can click on items in the Tree in order to modify them (e.g., modify a transformation) or perform actions (e.g., run an engine).

The Tree includes three main folders:

- Current Projects - Active projects, organized in subfolders. For each project, the applicable processes, rules, engines, and other options are listed.
- Backup Projects - Backup copies of projects.
- Translation Groups - The translation groups and words you've created in the repository.

Using DQguru on Different Operating Systems

DQguru supports multiple operating systems, such as Windows, Macintosh and Linux. DQguru works the same on all operating systems, with a few minor exceptions:

- On Windows and Linux, CTRL is used as the accelerator key. On Macintosh, CMD is the accelerator key.
- On Windows and Linux, the DQguru menu bar is shown below the DQguru title bar. On Macintosh, the menu bar is shown at the top of the DQguru window.

Understanding DQguru Basic Concepts

About DQguru Projects

There are three types of DQguru projects that you can use to work with your data.

- De-duping project - Use to identify and merge duplicate records found within the same table.
- Cleansing Project - Use to reformat data to create a more uniform and professional appearance.
- X-refining Project - Use to create a cross-referencing table that links two different tables together. The cross-referencing table relates the primary key from one table to the primary key of the other table to show the relationship between the two records. Cross-reference projects will be implemented in a future release.

For more information, see the section called “Overview of Creating a Project” .

Transformations

Transformations are used to transform and manipulate your data. When you run a DQguru engine, DQguru will run each record from the source table through the transformations you've defined for the project.

Within a project, you can create one or more transformations A transformation must have at least one input step (usually the source table) and output step (either a results table or the source table), plus one or more intermediary steps that are used to transform data. You can use the following types of transformers:

- Address Correction - Splits address data into smaller chunks. Also provides validation.
- Boolean, Date, Number, String Constant - Returns a constant of the specified type, or a null value.
- Boolean, Date, Number to String - Returns a string from a boolean, formatted date, or number.
- Concatenation - Joins the contents of multiple inputs. The output is the result of the join.
- CSV Writer - Concatenates and writes the input values to a .csv file, separating the values using the given separator.
- Date to String - Formats a date as specified.
- Double Metaphone, Metaphone, Refined Soundex, Soundex - Codes the data phonetically according to the step's algorithms.
- Google Address Lookup - Looks up the given address string using a Google Maps API.

- Lowercase, Uppercase - Converts the data to the appropriate case.
- MD5 Checksum - Returns the calculated MD5 checksum of a string.
- Retain Characters - Retains only the specified characters and removes all other characters.
- Sort Words - Sorts a delimited list of words, outputting them using a specified output delimiter.
- String Substitution - Replaces all occurrences of a specified word with another word.
- String to Boolean - Compares a string against regular expressions or lists to determine a boolean return value.
- String to Date - Converts a string formatted as a date into a date type.
- Substring - Returns a part of the data.
- Substring by Word - Returns a subset of each word from the data.
- Translate Word - Replaces all occurrences of specified words with other words, as defined by the translation words you have set up. For more information, see the section called “Creating Translation Words and Groups” .
- Trim Spaces - Returns the string, with leading and trailing spaces removed.
- Word Count - Counts the number of words.

For more information, see the section called “Defining Transformations” .

Translation

You can use translation to search for one or more words and replace them with a different word (or words). For example, a common use is to replace abbreviations with the full term. You can define translation words and groups that you can use in any of your projects.

- Translation Word - Contains the instructions regarding the words to find and the replacement words.
- Translation Group - Collection of individual translation words. Typically contains related translation words.

For more information, see the section called “Creating Translation Words and Groups” .

Merge

Merge rules are used to combine duplicate records into single records. You can create column merge rules (which apply to a specific column) and table merge rules (a collection of column merge rules that apply to a table).

- Column Merge Rules - Rules that contain the merging instructions for a specific column in the database. Possible merging actions are: Use the master value, Augment nulls, Concatenate the values, Use the maximum value, Use the minimum value, and Set the sum as the value.
- Source Table Merge Rules - Essential rules that deal with the merging on the source table in the database.
- Related Table Merge Rules - Additional rules that deal with the merging on children, grandchildren or other related tables of the source table in the database.

For more information, see the section called “Creating Merge Rules” .

DQguru Engines

The DQguru engines transform data based on the processes and rules you've defined.

- Match Engine - Finds duplicate records. To do this, the engine processes data in a source table according to the transformations you've defined. The engine then determines which rows are exact duplicates and stores the results in a results table. The Match engine does not modify the data in the source table.
- Merge Engine - Combines or removes duplicate records. To do this, the engine modifies the data in a source table according to the merge rules you've defined.
- Cleansing Engine - Replaces records with reformatted data. To do this, the engine modifies the data in a source table according to the transformations you've defined.

For more information, see the section called “Running a DQguru Engine” .

Chapter 3. Working with DQguru

Overview of Creating a Project

General Guidelines

You would typically follow these steps to create a project.

1. Login to the repository where you want to store the project. For more information, see the section called “Logging into a Repository” .

   Note: You can use the DQguru default repository or create your own repository. For more information, see Chapter 5, *Working with Repositories* .

2. Create a new project and set the project parameters. For more information, see the section called “Creating a New Project” . Or to work with an existing project, simply login to the repository where the project is stored.

   Note: You can also import a project from another repository. For more information, see the section called “Importing and Exporting Projects” .

3. Define the transformations you want to run on your data. These can include translation rules. For more information, see the section called “Defining Transformations” and the section called “Creating Translation Words and Groups” .

4. Define the merge rules you want to run on your data. For more information, see the section called “Creating Merge Rules” .

5. Run the appropriate engine to apply the processes and rules you've defined. For example, in a De-duping project, you would run the Match engine to process the transformations you've defined. After validating the results, you would run the Merge engine to process the merge rules you've defined. For more information, see the section called “Running a DQguru Engine” .

General Steps for a De-duping Project

In a De-duping project, you would typically do the following:

1. Define the transformations that will be used to identify duplicate data.

2. Run the Match engine to find duplicate records in the source table, based on your transformations. DQguru stores the results in a new results table.

3. Validate the matches in the results table.

4. Define the merge rules that will be used to handle the duplicate data.

5. Run the Merge engine to combine or remove the duplicate data in the source table, based on your merge rules.

Note: To view a demo of creating a Find Duplicates project, go to www.sqlpower.ca/page/DQguru [http://www.sqlpower.ca/page/DQguru] .

General Steps for a Cleansing Project

In a Cleansing project, you would typically do the following:

1. Define the transformations that will be used to cleanse the data.

2. Run the Cleanse engine to process the data in the source table, based on your transformations.

General Steps for an Address Correction Project

In an Address Correction project you would typically do the following:

1. Define the location of the Address Correction Database in the user preferences. An Address Correction Database can be obtained from www.sqlpower.ca/page/dqguru_address_data [http://www.sqlpower.ca/page/dqguru_address_data] and is required for address correction. The Address Correction Database contains all known valid mailing addresses in Canada.

2. Define the transformations that will be used to identify addresses.

3. Run the Address Correction engine to find address records in the source table, based on your transformations. DQguru stores the results in a new results table.

4. Validate the addresses in the results table.

5. Run the Commit Validated Addresses engine to correct the address data in the source table, based on your merge rules.

Logging into a Repository

Before creating a project, you must login to the repository where you want to store the project. When you start DQguru, you are automatically logged into your default repository. For more information on changing your repository login preferences, see the section called “Changing Your Repository Startup Preferences” . For information on creating a new repository, see Chapter 5, *Working with Repositories* .

Note: You can have multiple repositories open at the same time, with each repository in a separate DQguru window.

1. Click Database » Connect to Remote Repository.

2. Select the repository and enter the user ID and password.

3. Click Login. The projects stored in the repository are listed in the DQguru Tree.

Creating a New Project

All of the active projects within a repository are stored in subfolders within the Current Projects folder in the DQguru Tree.

1. Login to the repository where you want to store the project. Or to work with an existing project, simply login to the repository where the project is stored. For more information, see the section called “Logging into a Repository” .

2. Select a folder in the Current Projects folder or create a new folder. To create a new folder, right-click the Current Projects folder, then click New Folder. Enter the folder name and description, then click Save.

3. Make sure the folder is selected, then click a "new project" button in the top toolbar (New De-duping Project, New Cleansing Project, or New X-refing Project). You can also right-click the folder, click New Project, then click the type of project.

4. Enter the project parameters, then click Save.

Importing and Exporting Projects

You can use DQguru's import and export features to backup and restore projects, migrate projects from one repository to another, or share projects with colleagues. Projects are exported in XML format.

To export a project:

1. Click a project in the DQguru Tree, then select Project » Export. You can also right-click a project, then click Export.
2. In the Export Project dialog box, select a location and enter a filename, then click Save.

To import a project:

1. To import an active project, select a subfolder in the Current Projects folder in the DQguru Tree.
2. Select Project » Import.
3. In the Import Project dialog box, select the project to import, then click Open.

Creating Translation Words and Groups

You can create a translation group (containing one or more translation words) to use in your transformation.

1. Select Tools » Translate Words Manager.
2. Click New Translate Group.

   Note: To modify an existing group, click the group in the Translation Groups folder in the DQguru Tree. By expanding the you can view the translation words in the group.
3. Enter a name for the group.
4. You can now add translation words to the group. In the From field, enter the word(s) you want to find. In the To field, enter the word(s) you want to use as a replacement.
5. Click Create Translation. The From and To words are added to the group.
6. You can continue adding translation words to the group. You can reorder the words using the arrows on the right side of the window, and you can delete words by selecting the words and clicking Delete Selected Translations.
7. When you're done, click Save Group. The translation group is added to the Translation Groups folder in the DQguru Tree.
8. You can obtain a standard translation group of words from Google if you click on Get Online List.

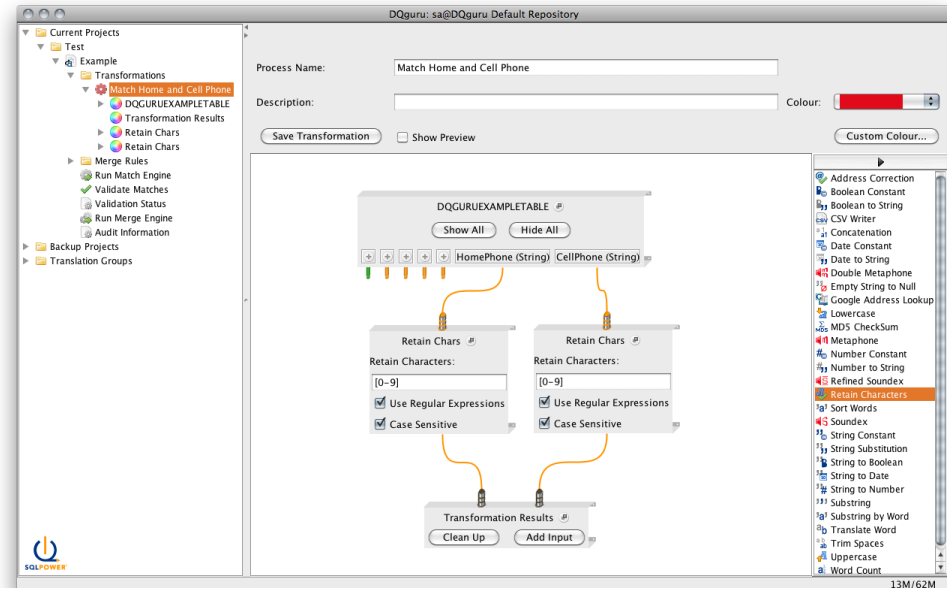
Defining Transformations

Within a project, you can create the transformations you want to use to transform your data. You can create as many transformations for a project as required.

1. In the DQguru Tree, expand the folder containing your project.
2. Right-click the Transformations folder, then click New Transformation. Or to modify an existing transformation, click the process in the Transformations folder.
3. Enter a name and description.

4. Select a colour. When you view the project results for a De-duping project, the results from each transformation will be identified by colour.

5. Use the large white area in the centre, called the Play Pen, to define the transformer to include in the transformation.



   - By default, the first step in the process (the input step) and the last step in the process (the output step) are already added to the Play Pen. The input step is typically one or more source tables. The output step may be a results table or a source table.

   - To view the columns in a source table, click Show All on the table.

   - To view the options in a results table, click the expand button on the table.

   - The transformers you can use to transform the data are shown on the right side of the Pen.

6. To add a transformer to the process, drag and drop a step into the Play Pen. You can also right-click in the Play Pen, click Add Transformer, then select the step.

   Note: You can combine a Translate Word step with another transformer. For example, you may want to concatenate first and last names using a Concatenation step, then strip out any "Mr." and "Mrs." salutations using a Translate Word step. You must set up translation words before you can add them to a transformation. For more information, see the section called “Creating Translation Words and Groups” .

7. To set the options for a step, click the expand button on the step and enter the options.

8. Connect the steps to the source and result tables by dragging the connectors from the top and bottom of the step to the appropriate tables.

9. Continue adding transformers as required.

10. Click Save Transformation.

11. The checkbox Show Preview gives the user an idea on the effect each transformer will have on the data going through it. With the checkbox selected, clicking on any one of the transformers will show a small preview on how that particular transformation will affect the first 5 rows of the column(s) attached to it.

Creating a PDF Copy of a Transformation

You can export a copy of a transformation diagram to a PDF file.

1. In the DQguru Tree, expand the folder containing your project.
2. Expand the Transformations folder, then click the process you want to export.
3. Select File » Export Play Pen to PDF.
4. Enter a filename and select a location, then click Save.

Creating Merge Rules

Within a De-duping project, you can create the merge rules you want to use to transform your data. Merge rules define how you want to deal with duplicate data and with the "child data" that references the duplicate data.

1. In the DQguru Tree, the source table for your project is shown in the Merge Rules folder. You can define merge rules for each column in the table.

   Note: To add another table to the Merge Rules folder, right-click the folder, then click New Merge Rule. Select the schema, table, index and catalog (if applicable), then click OK.
2. In the Merge Rules folder, click a table. The table columns are shown on the right side of the window.
3. Beside each column, select the action you want to perform on the column.
4. Click Save at the bottom of the window.

Running a DQguru Engine

After you've set up your project and defined transformers and/or merge rules, you can run a DQguru engine to apply the processes or rules you've defined. For more information on the engines, see the section called “DQguru Engines” .

1. Click a "run engine" button in the top toolbar (Run Match, Run Merge, or Run Cleanse). You can also click the appropriate "run engine" option in the DQguru Tree.
2. Enter the required parameters, then click the Run Engine button.

Example - Creating a De-duping Project

This section walks you through a step-by-step example to create a small De-duping project. For more information on creating projects, see the section called “Overview of Creating a Project” .

Note: To view a demo of creating a De-duping project, go to www.sqlpower.ca/page/DQguru [http://www.sqlpower.ca/page/DQguru] .

Step 1: Login to a Repository

Typically, you would first login to the repository where you want to store your project. For this example, you will use the DQguru Default Repository. You are logged into this repository by default.

Note: For more information on creating your own repository, see Chapter 5, *Working with Repositories* .

Step 2: Create a Sample Table

Next, you will create a sample table which you will use to practice finding and removing duplicate data. DQguru includes a feature you can use to quickly create this table.

1. Select Help » Build Example Table.
2. In the Data Source field, select the repository where you want to build the sample table. Leave this set to the DQguru Default Repository.
3. In the Schema field, select the schema to use for the table, such as Public.
4. In the Table field, enter the table name. You can leave this set to the default name, DQguruExampleTable.
5. Click Create.
6. In the Create Example Table dialog box, click Execute.

Step 3: Create a New Project

Next, you will create a new De-duping project.

1. First, create the folder where the project will be stored. In the DQguru Tree, right-click the Current Projects folder, then click New Folder. Enter the folder name and description, then click Save.
2. Next, create a new project within the folder. Right-click the folder, click New Project, then click New De-duping Project.
3. Enter a name and description for the project.
4. In the Source Table section, select the table you want to check for duplicate data. Select the catalog, schema and table for the DQguruExampleTable table you just created. (If you can't find the table you created, restart DQguru and try creating the project again.) You can leave the Unique Index field set to the DQguruExampleTable_pk, which is the primary key for the sample table.

   Note: The unique index option lets you choose which fields are needed to uniquely identify the records. The primary key is selected by default. If there is no primary key or the primary key is inappropriate, you can modify the unique index by clicking the Pick Columns button after you have saved the project.
5. In the Output Table section, select the table where the results of the data matching will be stored. You can leave the table name set to the default DQGURUEXAMPLETABLE_RESULT table and select a schema.

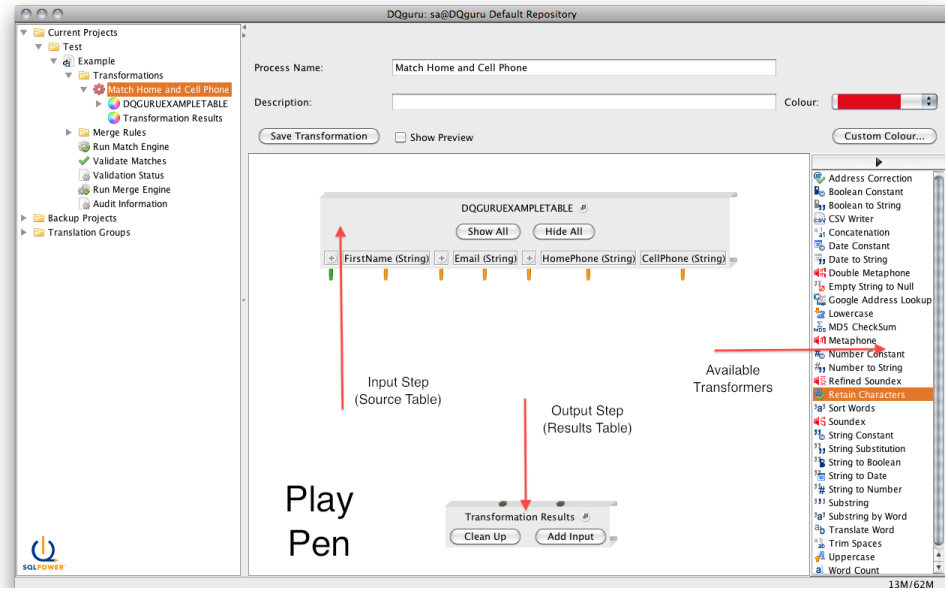
   Note: If you enter a table that does not exist, DQguru will create the table. If the table exists but is not correctly formatted, you will be given the option to drop the table and create a new one.
6. Click Save.

Step 4: Define Transformations

Next, you will create the transformations that DQguru will use to find duplicate records in the sample table.

1. In the DQguru Tree, expand the folder containing your project. Right-click the Transformations folder, then click New Transformation.

   You will use the large white area in the centre, called the Playpen, to define the transformers to include in the transformation.



   - The two default steps for a Find Duplicates project are already added to the Playpen. The first step (the input step) is the source table and is labelled with the table name. This step contains all of the initial data from your source table. The last step (the output step) is the results table and is labeled Transformation Results. This is where the transformed data will be stored so that it can be compared while matching.

   - The transformers you can use to transform the data are shown on the right side of the Playpen.

2. On the DQguruExampleTable source table, click Show All. All of the columns in the table are shown.

3. As a simple start, drag the connector under the HomePhone column to the top of the results table. This will match all records in the table that have an identical home phone number. This is a good start but not all that useful, as there are many ways to enter a phone number and this will only find a match between two phone numbers if they were entered in the exact same way.

4. Remove the connection between HomePhone and the results table by right-clicking the connection line, then clicking Delete. You can also drag the connector out of the results table and drop it in an empty space in the Playpen.

5. A more reliable way to find a match is by using a transformer. Drag the Retain Characters transformer into the Playpen. This transformer allow you to take in a string and remove all but the given characters.

6. Next, you must configure the Retain Characters step. Click the expand button beside the step name to view the step options. Because this a phone number, you will want to strip all of the characters except the numbers. In the Retain Characters field, enter 0123456789. Alternatively, you can use a regular expression. To do so, enter [0-9] and select the Use Regular Expressions check box.

7. Next, you must create a connection from the source table to the Retain Characters step and from the Retain Characters step to the results table. Drag the HomePhone connector in the source table to the connector on the top of the Retain Characters step. Drag the connector from the bottom of the Retain

Characters step to the results table. The transformation will now match all records with the same digits in the home phone number, regardless of how the phone numbers were entered. For example, the following numbers will be considered possible matches: (416) 555-1234, 416-555-1234 and 4165551234.

8. You will now add a second set of data to use in the comparison. Click the expand button on the results table. The step options appear. Click Add Input. An additional plug is added to the top of the results table. You can use this plug to connect an additional transformer to the results table.

9. Create an identical Retain Characters step in the Playpen. Connect this step to the CellPhone column in the source table and to the results table. Now any two records that have both a home phone number and a cell phone number with the same digits will be considered possible matches.

10. Enter a descriptive name for the transformation. Use a name that will allow you to easily identify this process later.

11. You can ignore the Description and Colour options for this example.

12. Click Save Transformation.

Step 5: Check for Possible Matches

Next, you will check for duplicates by running the Match engine. The Match engine will use the transformation you created to find duplicate records and will store the results in the results table. The Match engine will not modify your source data in any way.

1. In the DQguru Tree, within your project folder, click Run Match Engine.

2. You can leave all of the options set to the default settings. The following options are available:

   - Log File - Enter a filename and location for the log file. Information will be logged here when the Match engine is run.

   - Records to Process - Select the number of records to check.

   - Debug Mode - Select this option if you want to run the Match engine in debug mode.

   - Clear Match Pool - Select this option if you want to remove all matches found previously.

   - Message Level - Select the amount of information to be displayed in the results. If you set the message level to DEBUG, you should limit the number of records to process, since processing all records at the DEBUG message level can be very time-consuming.

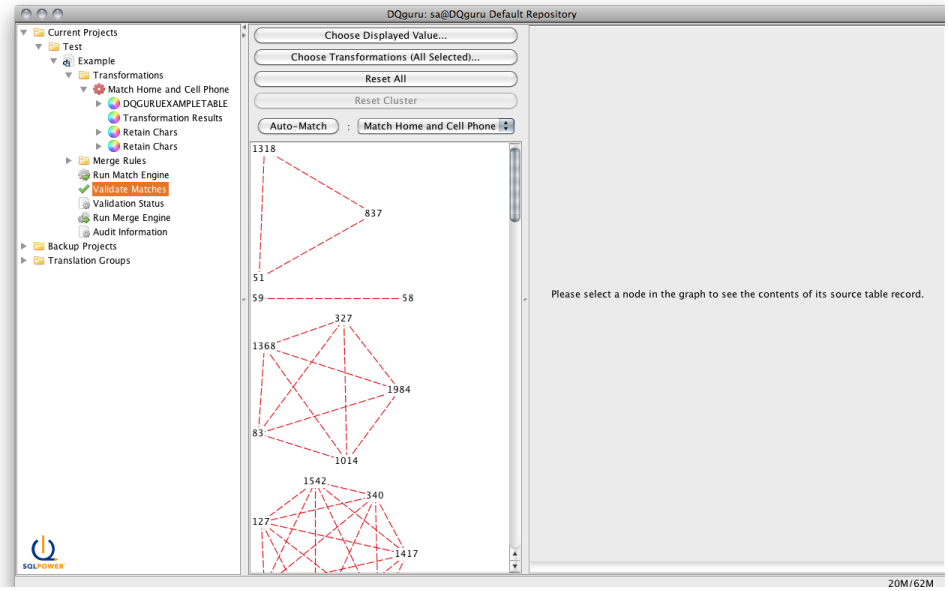
3. Click Run Match Engine. The engine runs and finds all records that share both an identical cell number and home phone number.

Step 6: Validate Matches

Next, you will review the matches to ensure they are valid duplicates.

1. In the DQguru Tree, within your project folder, click Validate Matches.

   The match groups are shown on the left side of the window. Each group contains records that have the same home and cell numbers. The records within the group are linked by dashed lines, showing the relationship between the records. The colour of the line represents the transformation responsible for the match. In this example, all of the lines will be the same colour since we used only one transformation.



2. By default, the records in the group are labelled by their unique index. You can choose to label the records using other values. For this example, you will use full name as a label. Click Choose Displayed Values, select the FirstName and LastName columns, then click OK.

3. Next, you will manually look at the matches and verify if they're really duplicates. Click on a record in the first group. On the right side of the window, the field values for the record are shown in the first column. The remaining columns contain the field values for the matching records. Fields that are different than the record in the first column are shown with a dark background and identical fields are shown with a light background.

4. The buttons above each column can be used to connect the records. The following buttons are shown above the first column: Master of All, No Match to Any, and Unmatch All. These buttons affect all of the records in the group. The following buttons are shown above the remaining columns: Master, Duplicate, and No Match. These buttons only affect the record in that column.

   Experiment with these buttons until you are satisfied with the matches in the first match group. As you experiment, the lines on the match group will change.

   - Dashed Line - The relationship is undecided.
   - Dotted Line - The records are not a match.
   - Solid Line (with a circle on one end) - The records are a match. The record with the circle is the master record and will be kept after the records are merged.

   Note that there is an Auto-Match button at the top of the window. Clicking this button will declare all undecided relationships as matches and a master record will be chosen at random. Using this option is not recommended in most cases, since serious data loss could occur if the matches are not manually checked.

Step 7: Merge Duplicate Records

Next, you will create merge rules and merge the records you've marked as matched. When you merge the records, the data in your source table will be modified.

A few notes about merge rules:

- You can define child and grandchild tables that will also be merged when the matched records are merged, to prevent orphaning records. There are no child tables in this example.
- When you click the Merge Rules folder, several buttons are shown at the bottom of the window. You can use the Derive Related Tables button to find other tables in the database that may be related to your source table (based on the primary key) and create merge rules for these tables. You can use the New Merge Rule button to manually find other tables and create rules. You do not need to use these buttons in this example.

1. In the DQguru Tree, within your project folder, expand the Merge Rules folder.
2. Click the DQguruExampleTable table in the Merge Rules folder. The table columns are shown on the right side of the window.
3. You will now define the action to be taken when merging two records for each column. For this example, you will leave the action for all columns as Augment nulls. This action will not modify the columns in the master record unless the column contains a null. If so, DQguru will attempt to fill in the missing data based on the duplicate records.
4. Next, you will merge the data. In the DQguru Tree, within your project folder, click Run Merge Engine. For this example, you can leave the Merge engine options set to the defaults.
5. Click Run Merge Engine. The engine runs and merges the matched records.
6. You can now view the status of the records. In the DQguru Tree, within your project folder, click Validation Status. The records that were matched are shown as merged. The records marked as no match or unmatched have not been modified.

Example - Creating an Address Correction Project

This section walks you through a step-by-step example to create a small Address Correction project.

If you want to walk through this example in the DQguru while reading along you will need a table with addresses in it. You will also need a copy of the Address Database and define it's location in the user Preferences. An Address Correction Database can be obtained from www.sqlpower.ca/page/dqguru_address_data [http://www.sqlpower.ca/page/dqguru_address_data] and is required for address correction.

For more information on creating projects, see the section called “Overview of Creating a Project” .

Step 1: Login to a Repository

Typically, you would first login to the repository where you want to store your project. For this example, you will use the DQguru Default Repository. You are logged into this repository by default.

Note: For more information on creating your own repository, see Chapter 5, *Working with Repositories* .

Step 2: Create a New Project

Next, you will create a new Address Correction project.

1. First, create the folder where the project will be stored. In the DQguru Tree, right-click the Current Projects folder, then click New Folder. Enter the folder name and description, then click Save.

2. Next, create a new project within the folder. Right-click the folder, click New Project, then click New Address Correction Project.

3. Enter a name and description for the project.

4. In the Source Table section, select the table you want to check for incorrect addresses. Select the catalog, schema and table for the table that contains address that need to be corrected.

   Note: The unique index option lets you choose which fields are needed to uniquely identify the records. The primary key is selected by default. If there is no primary key or the primary key is inappropriate, you can modify the unique index by clicking the Pick Columns button after you have saved the project.

5. In the Output Table section, select the table where the address validation information will be stored. This table will store the original values in the source table to user modified values. You can leave the table name set to the default and select a schema.

   Note: If you enter a table that does not exist, DQguru will create the table. If the table exists but is not correctly formatted, you will be given the option to drop the table and create a new one.

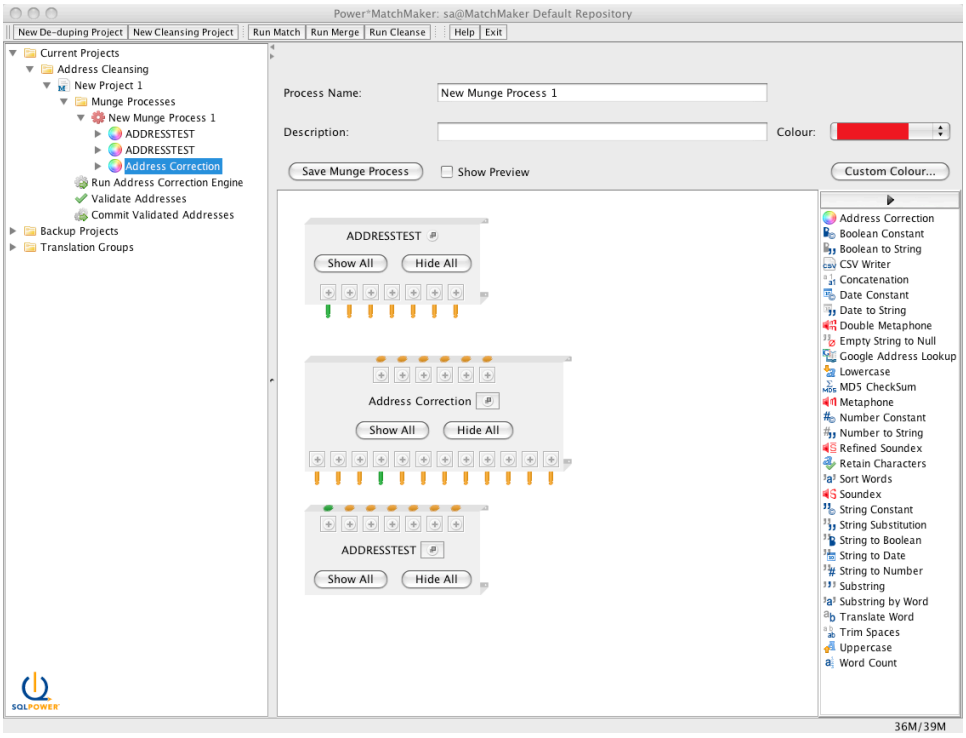
6. Click Save.

Step 3: Define Tranformations

Next, you will create the transformations that DQguru will use to find addresses in the table.

1. In the DQguru Tree, expand the folder containing your project. Right-click the Transformations folder, then click New Transformation.

   You will use the large white area in the centre, called the Playpen, to define the transformers to include in the transformation.



- The three default steps for an Address Correction project are already added to the Playpen. The first step (the input step) is the source table and is labelled with the table name. This step contains all of the initial data from your source table. The second step is the Address Correction step. This step decides if the address is valid and looks for suggestions. Depending on the engine settings this step will also write back automatically corrected addresses. The last step (the output step) is the same as the input step. This step should have values from the Address Correction step placed in it, possibly after transformations. This tells the Address Correction step how to write the addresses back to the table after modifications.

- The transformers you can use to transform the data are shown on the right side of the Playpen.

2. On the Address Correction step press the Show All button to see what each connection will give.

3. To feed data into this step some columns from the input table may need to be merged with Concatenation steps. At current the address line 1 is the connection that needs to be passed the street or route information. Address line 2 is considered additional data and is passed as is. Following address line 1 the municipality, province, country, and postal code must be given. If only Canadian addresses are being corrected and that information is not stored in the table a String constant step can be used to provide the country.

4. After plugging values into the Address Correction step, values need to be fed into the result step. Values can be placed into the result step as desired.

Step 4: Find Addresses to Correct

Next, you will find addresses by running the Addresss Correction engine. The Address Correction engine will use the transformation you created to find duplicate records and will store the results in the results table. The Address Correction engine may change the source data depending on the Validation Settings.

1. In the DQguru Tree, within your project folder, click Run Address Correction Engine.

2. The validation settings is one of the more interesting settings in the Address Correction engine. The validation settings decide what types of addresses to show for validation through the filter settings. Auto-validation can also be set from the validation settings if some addresses are to be automatically corrected.

   The Address Filter Settings have the following options:

   - Include all records - All records will be displayed in the Address Validation step even if the engine marks the address as valid.

   - Include SERP invalid or different format - Addresses that are defined as invalid based on SERP specifications will be displayed in the Address Validation step. Additionally, if a different format is found for the record by the parser than it will also be displayed in the Address Validation step.

   - Include only SERP invalid records - Addresses that are defined as invalid based on SERP specifications will be displayed in the Address Validation step.

   The Auto-validate Settings have the following options:

   - Do not auto-validate - No automatic correction of addresses will be done. The source table will not be modified and all corrections will be done in the Address Validation screen.

   - Auto-validate only SERP correctable addresses - This will write back to the source tables all addresses that are correctable based on SERP specifications.

- Auto-validate any address with only one suggestion - If an address is given only one suggestion by the Address Correction step then this setting will write that suggestion back to the source table.
- Auto-validate any address with a suggestion - If an address is given at least one suggestion by the Address Correction step then this setting will write the first suggestion back to the source table. The suggestions are ordered from most likely to least likely but it is not guaranteed that the first suggestion is not as likely as any subsequent suggestion.

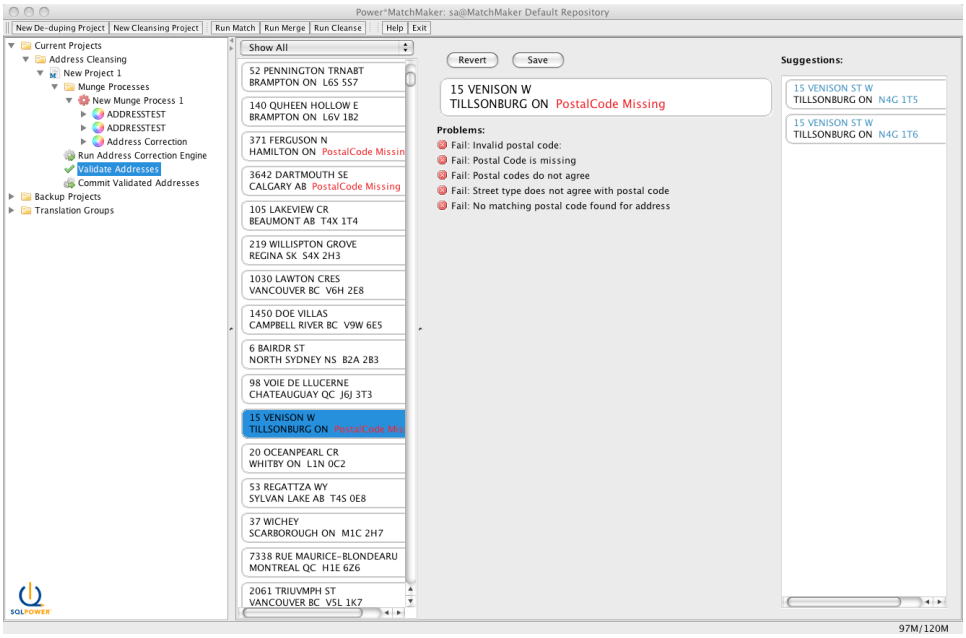
3. You can leave all of the other options set to the default settings. The following options are available:
   - Log File - Enter a filename and location for the log file. Information will be logged here when the Address Correction engine is run.
   - Records to Process - Select the number of records to check.
   - Debug Mode - Select this option if you want to run the Address Correction engine in debug mode.
   - Clear Match Pool - Select this option if you want to remove all addresses found previously.
   - Message Level - Select the amount of information to be displayed in the results. If you set the message level to DEBUG, you should limit the number of records to process, since processing all records at the DEBUG message level can be very time-consuming.
4. Click Run Engine. The engine runs and finds all addresses that needs some correction.

Step 5: Validate Addresses

Next, you will review the addresses to ensure they are valid. Additionally corrections can be done manually and suggestions can be selected.

1. In the DQguru Tree, within your project folder, click Validate Addresses.

   The addresses are shown on the left side of the window. Each address can be selected from the left list to show an editor for that address on the right of the list.



2. Selecting an address from the list shows the address editor to the right of the list. Below the address in the editor is the list of errors the address currently has. To the right of the address is a list of suggestions that are offered by the Address Correction step.

   To correct the address select an address from the suggestion list or click on parts of the address to edit it by hand. The most likely suggestions are at the top of the suggestion list while less likely suggestions appear lower. When the address is correct a green check mark will appear to the left of the address. Each change will save the address. To revert the address to what was originally in the source table press the revert button.

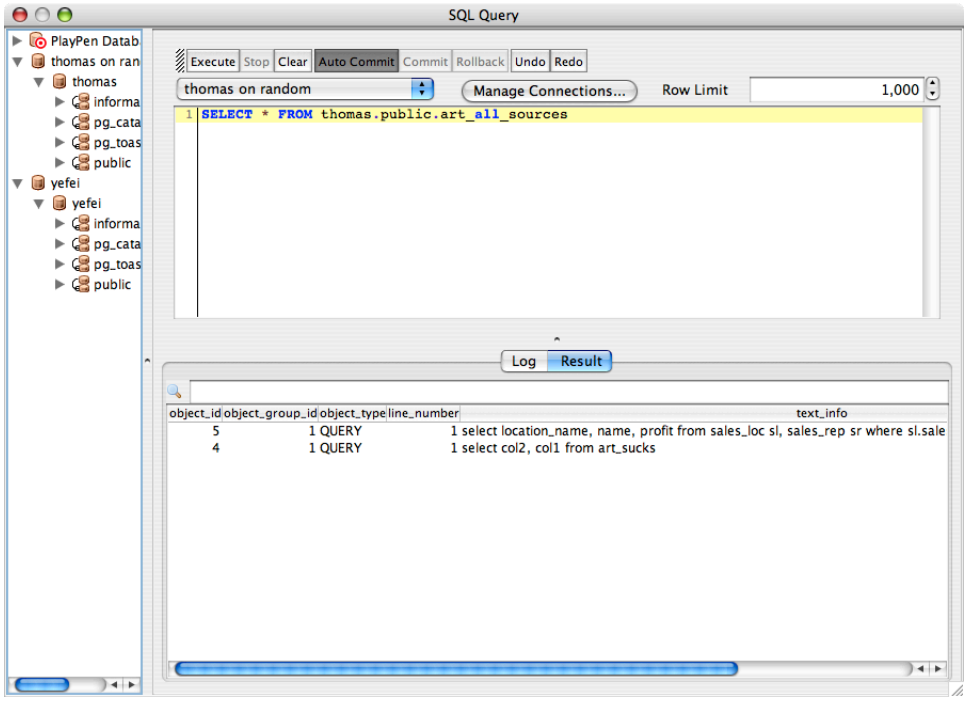
3. When an address is corrected and is valid a green check mark will appear to the left of it in the list. Once all of the addresses have been corrected the addresses can be committed to the source table. Select the Commit Validated Addresses from the project tree and press the Run Engine button to write all modified addresses to the source table.

Universal SQL Access

Universal SQL Access is a "fall-back" tool that lets you work at the raw SQL command level. This is an advanced topic and should only be used by those familiar with the intricacies of SQL commands and the details of your database.

Universal SQL Access is started from the menu entry under the Tools menu, and begins with the GUI window shown below. The first thing you should do is select which database connection you wish to use. The list of Connections is the same as the main program uses, as set up in the JDBC Connections window.

The basic steps to using Universal SQL Access are to type a command in the top (SQL Command) window and click the Execute button; the results are displayed in the bottom (SQL Results) window. To save you some typing, you can just drag the databases, tables and columns shown in the DB tree of the Universal SQL Access and drop on the top (SQL Command) window.



SQL Statements can be entered multiple at a time, can be more than one line long, but be careful! if you have multiple commands, do end the previous ones with a semicolon, which is unnecessary if there is only

one command. These statements are not interpreted by Universal SQL Access itself, so anything that the given database and driver accepts can be used. For example, with Oracle, you can use PL*SQL statements. With most drivers you should be able to use stored procedures. Each SQL statement is executed in its own transaction context if you turn the Auto Commit on, that is, changes are committed immediately (so be careful!). If you turn the Auto Commit off, you can decide to Commit or Rollback later.

Output (Results) Window

Command Output appears in the SQL Output window. A scrollbar will appear if the information cannot all be seen at once.

A visual indication of the success or failure of the command is displayed below the output: green for success, red for failure. As well, failures will be accompanied by a pop-up window containing details on the failure.

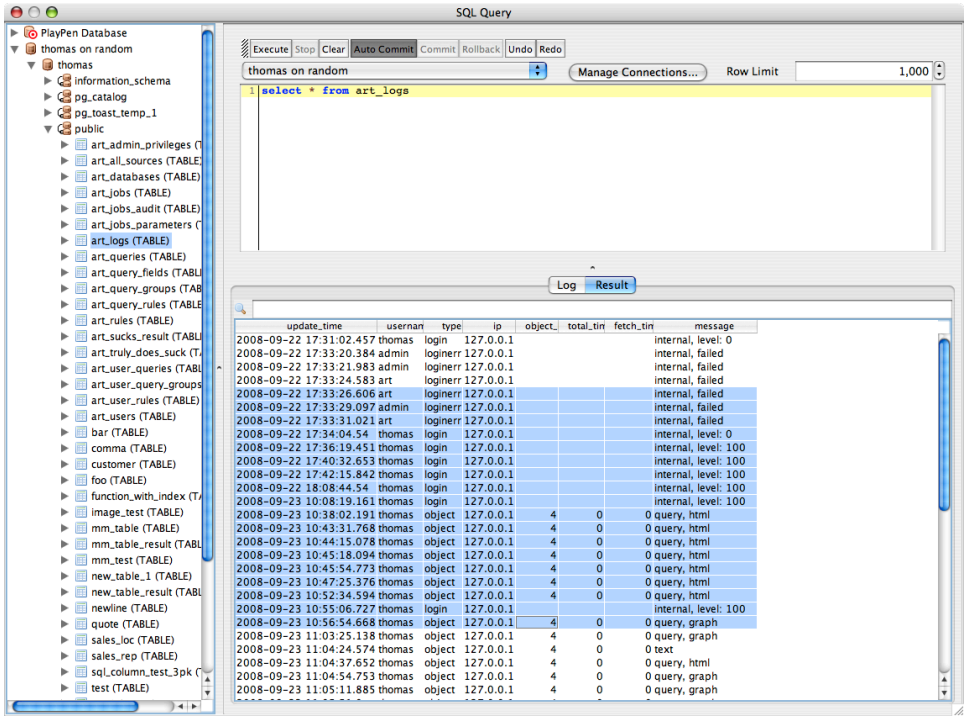
The Clear Output button clears the contents of the output window.

Output Formats

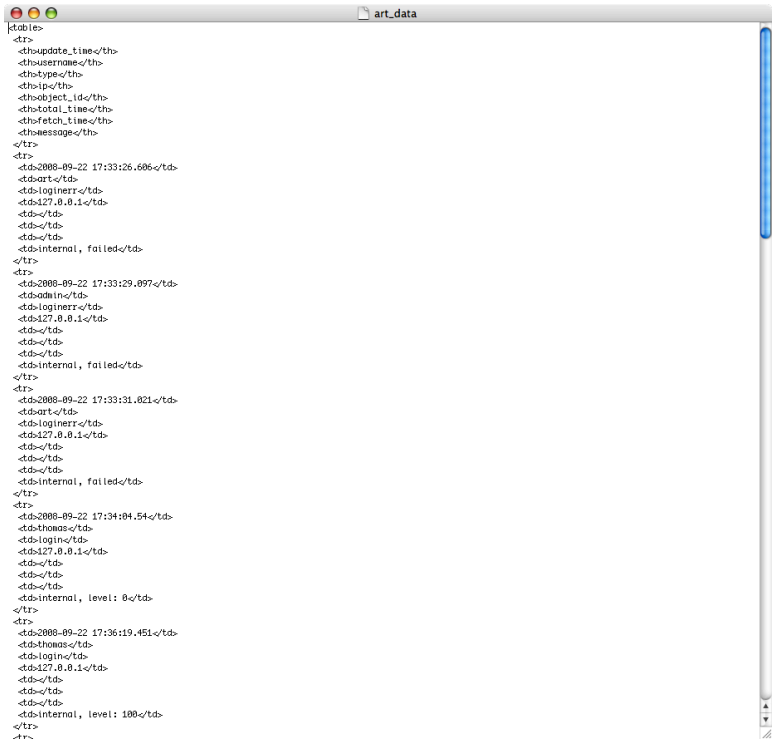
The output format in the result window is always Table mode, which provides a friendlier interface which ensures all of the columns are lined up properly. If you right-click on a table or multiple tables,you can generate a HTML file or CSV file. HTML mode generates an HTML table to display the results of a Select. CSV mode generates a CSV file, which is a specially formatted plain text file which stores spreadsheet or basic database-style information in a very format.

CSV files are often used as a simple way to transfer a large volume of spreadsheet or database information between programs, without worrying about special file types. For example, transferring a home-made address book from power*architect into a database program such as Filemaker Pro could be done by exporting the file as a CSV from Excel, then importing that CSV into Filemaker.

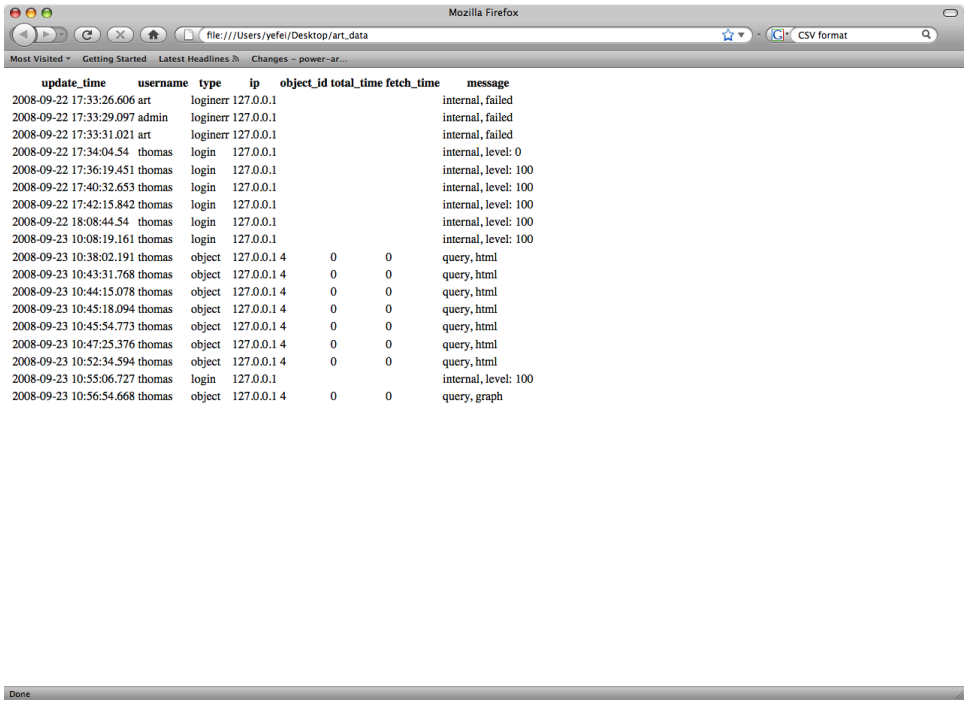
For example, a "select * from art_logs" looked like this:



You can view this same data in HTML just by right-click the selected table and choose "Exported selected to HTML..". When tried to open this file just by text editor, it looked like this:



when used a web browser to open this file, the output liked this:



update_time	username	type	ip	object_id	total_time	fetch_time	message
2008-09-22 17:33:26.606	art	loginerr	127.0.0.1				internal, failed
2008-09-22 17:33:29.097	admin	loginerr	127.0.0.1				internal, failed
2008-09-22 17:33:31.021	art	loginerr	127.0.0.1				internal, failed
2008-09-22 17:34:04.54	thomas	login	127.0.0.1				internal, level: 0
2008-09-22 17:36:19.451	thomas	login	127.0.0.1				internal, level: 100
2008-09-22 17:40:32.653	thomas	login	127.0.0.1				internal, level: 100
2008-09-22 17:42:15.842	thomas	login	127.0.0.1				internal, level: 100
2008-09-22 18:08:44.54	thomas	login	127.0.0.1				internal, level: 100
2008-09-23 10:08:19.161	thomas	login	127.0.0.1				internal, level: 100
2008-09-23 10:38:02.191	thomas	object	127.0.0.1	4	0	0	query, html
2008-09-23 10:43:31.768	thomas	object	127.0.0.1	4	0	0	query, html
2008-09-23 10:44:15.078	thomas	object	127.0.0.1	4	0	0	query, html
2008-09-23 10:45:18.094	thomas	object	127.0.0.1	4	0	0	query, html
2008-09-23 10:45:54.773	thomas	object	127.0.0.1	4	0	0	query, html
2008-09-23 10:47:25.376	thomas	object	127.0.0.1	4	0	0	query, html
2008-09-23 10:52:34.594	thomas	object	127.0.0.1	4	0	0	query, html
2008-09-23 10:55:06.727	thomas	login	127.0.0.1				internal, level: 100
2008-09-23 10:56:54.668	thomas	object	127.0.0.1	4	0	0	query, graph

With a bit of formatting, or even a CSS style sheet, this HTML page could be made quite usable.

Universal SQL Access is not perfect, but it is adequate for many purposes involving direct use of SQL (We will add more useful features to it later).

Chapter 4. Setting up Database Support

There are several reasons you will need to connect to a database when using DQguru. When creating a new project, DQguru must connect to the database containing the data you want to work with. You can also save your DQguru project in a remote repository; if you choose to do this, DQguru must connect to the repository.

In order to retrieve data from a database or save your DQguru project to a remote repository, you must first set up a connection to the database where the data or repository is located. Setting up a database connection involves the following steps:

1. Define general settings and drivers for the database platform (such as SQL Server or Oracle). For more information, see the section called “Setting up Database Types” .

2. Create a connection for a specific database. This connection uses the general settings and drivers you have configured for the database platform. For more information, see the section called “Setting up Database Connections” .

Setting up Database Types

You must define general settings for the database platforms used by your databases (such as SQL Server, MySQL, Oracle, DB2, etc.). These settings will be used by DQguru when you set up a connection to a specific database.

Note: At this point you are configuring general settings only and are not setting up a connection to a specific database. For more information on creating a database connection, see the section called “Setting up Database Connections” .

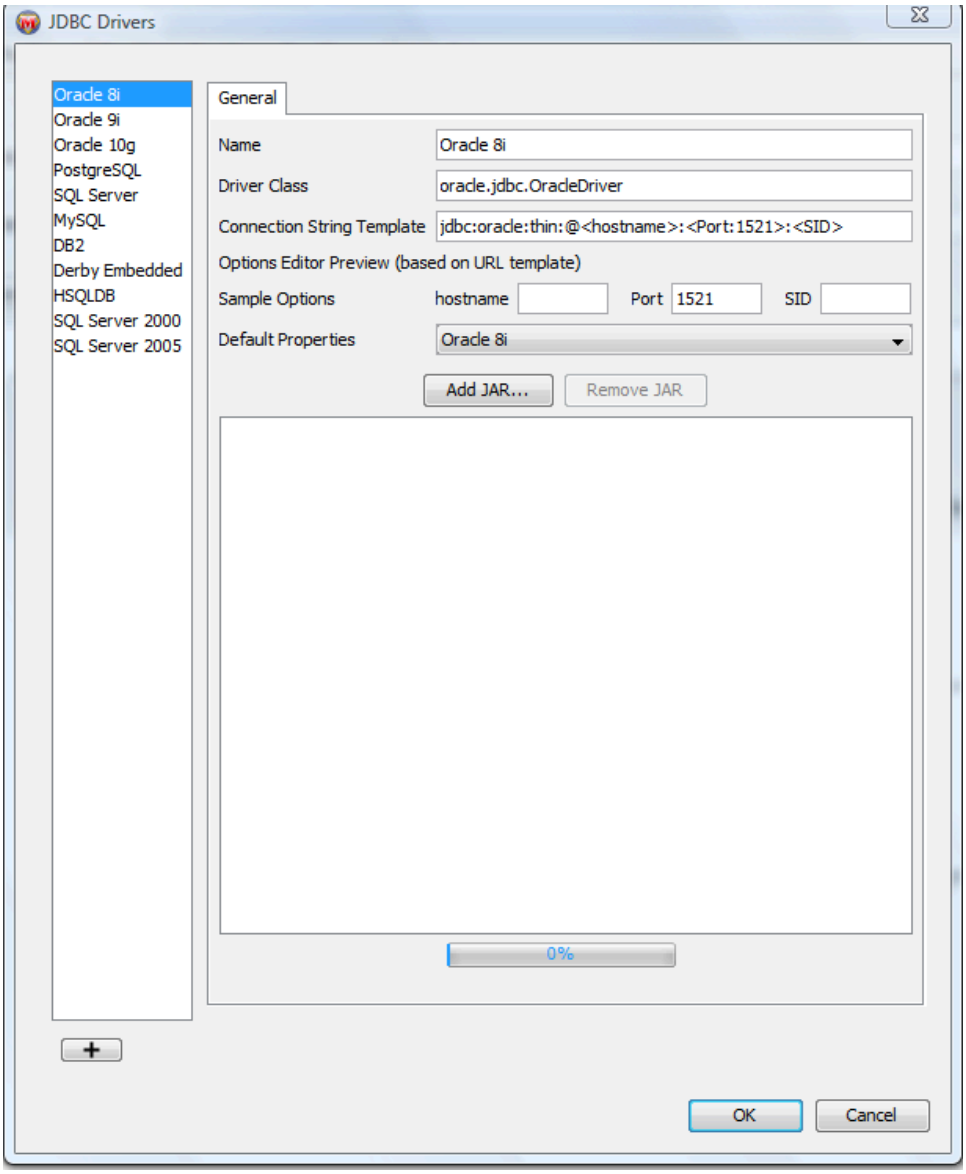
General settings for several database platforms are already pre-configured in DQguru. If you plan to work with one of these database platforms, all you need to do is define the location of the JDBC driver. For more information, see the section called “Defining the JDBC Driver” . You can also define additional database platforms in DQguru. For more information, see the section called “Adding a New Database Type” .

Adding a New Database Type

To add a new database type:

1. Select Database » Manage Database Connections. The Database Connection Manager dialog box appears.

2. Click JDBC Drivers. The JDBC Drivers dialog box appears. Existing database types, including the pre-defined database types included with DQguru, are listed on the left.



Note: You can modify an existing database type by clicking on it in the list.

3. Click + below the list of database types.
4. Enter the following information on the General Tab:

Name	Name for the database type (for example, PostgreSQL or SQL Server).
Driver Class	Java class name of the driver. This is the driver class within the JDBC driver JAR file that will be used for database connections.
Connection String Template	General format of the JDBC URL for the database platform. Important: You are not creating a connection for a specific database - you are entering a generic

In this field ...	Enter the following information ...
	connection string that applies to the database platform. Later on, when you set up a connection to a specific database, DQguru will use this template to create the URL to connect to the database. The connection string template must conform to a specific pattern that includes literals and variables. • Literals are entered like normal text but may not contain angle brackets (< or >), which are reserved for defining variables. As the name implies, literals appear in the URL in the same position and way they appear in the template. • Variables are used to for values that change often, such as the schema or database name you wish to connect to. To define a variable in the template, use the format <variable_name:default_value> (to include a default value) or <variable_name> (if you don't want to include a default value). If you use a default value, it is entered automatically when you create a database connection. You can modify the value if the database you are connecting to is configured to use a different value. Each variable you define is shown below the Connection String Template field. This provides you with a preview of the values you will be able to modify when creating a database connection. For example, the connection string template to connect to a Microsoft SQL Server database might look like this: jdbc:sqlserver://<Hostname>:<Port:1433> When you create a connection to a specific SQL Server database, DQguru will use this template to create the connection URL. In this example, the template will create the URL "jdbc:sqlserver://:1433", where 1433 is the default port value. Since SQL Server databases listen to port 1433 by default, it makes sense to include this value in the template. When you're creating the actual database connection, you can change the port value if the database you're connecting to is configured differently.

5. Click OK.

Next, you must define the location of the JDBC driver for the database type. For more information, see the section called “Defining the JDBC Driver” .

Defining the JDBC Driver

Whether you are adding a new database platform to DQguru or want to use one of the pre-configured platforms, the last step in setting up a database type is to locate the JAR file (or files) that contain the JDBC drivers for the database platform.

Note: At this point, you are just telling DQguru where the drivers are. You must set up a database connection in order to connect to a specific database (for more information, see the section called “Setting up Database Connections”).

Unlike most applications, which need a distinct driver program to communicate with each type of database, DQguru uses Java-based drivers. These drivers normally come from the database vendor in the form of JAR (Java Archive) files. JAR files are an extension to the file format used by PKZip/WinZip archives.

Most database platforms provide drivers that are fully backward compatible. This means that it is best to use the newest driver available, regardless of the software version on the specific database server you intend to connect to. One exception to this is the Oracle database. It is important to match the major version number of your JDBC driver with the major version number of the Oracle database server you connect to. For example, if you are connecting to an Oracle 10g database, use the latest Oracle 10g driver. If you are connecting to an Oracle 9i database, use the Oracle 9i driver.

To define the JDBC driver for a database type:

1. If you do not have the JDBC driver for a specific database platform, you can usually obtain one from the database vendor. If that fails, you can find a directory of databases drivers on Sun's web site [http://developers.sun.com/product/jdbc/drivers] . There is also a permanent thread in the SQL Power user support forum [http://www.sqlpower.ca/forum/posts/list/401.page] where you can share information with other users about finding and configuring drivers for a particular database platform.

2. Decide on a permanent location to store your JDBC drivers. A good strategy is to create a JDBC folder under your Documents folder and collect all of you JDBC driver files there.

3. Save the JDBC driver (it will usually be one or more JAR files) in the location you've chosen.

4. If the JDBC Drivers dialog box is not already open, select Database » Manage Database Connections, then click JDBC Drivers.

5. Select a database type from the list on the left side of the dialog box.

6. Click Add JAR.

7. Locate the JAR file and click Open. If there is a valid driver class in the JAR file, a file tree will appear showing the JDBC driver classes within the JAR file.

8. Select the driver you want to use.

9. Click OK.

Setting up Database Connections

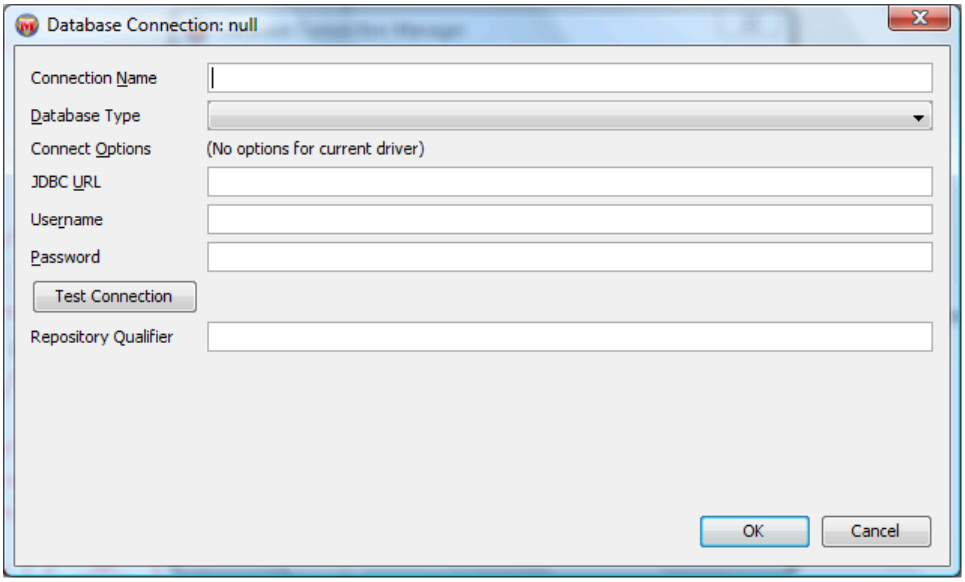
You must set up a database connection for each database DQguru will need to connect to.

Before creating a connection, you must define the general settings for the database platform. For more information, see the section called “Setting up Database Types” .

Creating a New Database Connection

To create a new database connection:

1. Select Database » Manage Database Connections, then click New. The Database Connection dialog box appears.



2. Enter the following information:

Connection Name	Enter a name for the database connection.
Database Type	Select the database platform used by the database you want to connect to. Note: This list contains the database types you defined previously. For more information, see the section called “Setting up Database Types” .
Connect Options and JDBC URL	Enter the connection options for the database driver. These options are based on the database type you select. If you are using one of the fully-supported drivers, the connection option parameters are added into the JDBC URL field in the order that the Java driver expects to see them (this string is sometimes called a "db URL" in Java terminology). In the following example: • The default port number from the database type has been entered automatically in the Connect Options. (You would not usually change a default value unless the database server you're connecting to has been configured to use a different value.)

In this field ...	Do this ...
	• The hostname and database name have been entered manually in the Connect Options. • The PostgreSQL driver is being used.
Username and Password	Enter the username and password to connect to the database.
Repository Qualifier	If the database connection is for a repository, enter the repository qualifier. This information will automatically be prefixed to the repository tables. The value is dependent on the database platform. • In Oracle, this would be the schema owner. • In DB2, this would be the schema name. • In SQL Server 2000, this would be the database name, followed by "." and then the owner. • In SQL Server 2005, this would be the database name, followed by "." and then the schema name. • In MySQL, this would be the database name. • In PostgreSQL, this would be the database name, followed by "." and then the schema name.

3. Click OK. The new connection is added to the Database Connection Manager.

Modifying or Deleting Database Connections

You can modify a database connection's properties or permanently delete it.

To modify a database connection:

1. Select Database » Manage Database Connections. Select a database connection, then click Edit. The Database Connection dialog box appears.

2. Modify the connection settings. For information on the settings, see the section called “Creating a New Database Connection” .

3. Click OK.

To permanently delete a database connection:

1. Select Database » Manage Database Connections.

2. Select a database connection, then click Remove.

Chapter 5. Working with Repositories

About Repositories

Your DQguru projects are saved in a special data store called a repository. The first time you run DQguru, a local repository is created for you automatically, called the DQguru Default Repository. The repository itself is actually a relational database schema and is stored in an embedded database, located in a directory called .mm (notice the leading dot) within your home directory. On Unix systems, you can find your home directory by issuing a cd command with no arguments. On Windows systems, your home directory is usually in C:\Documents and Settings\ *Your Name* . Be sure to backup this repository regularly. Simply make a copy of the .mm directory when DQguru is not running and save this copy in a safe location.

There are many advantages to using this local repository: you don't require a network connection, you can easily backup and restore the repository, it's fast, and it's already been set up for you. However, there are times you may want to save your work in a remote, shared repository. For instance, if you are working on a large De-duping project as part of a team, you may want to divide up the work and tackle it in parallel. Or if your cleansing process is part of a nightly maintenance routine that runs on a server, you may want to point the routine to the same repository you work in. Or perhaps there is a DBA at your organization who makes backups nightly and your project data would be safer in her system than it would be in a local database on your workstation or laptop.

If you decide to use a remote repository, you must create the repository, then connect to it using DQguru. See the following sections for details.

Creating a Remote Repository

Create a Database and User

Before creating a remote repository, you must decide where to store it. Storing a shared repository on a workstation is not recommended for several reasons. The entire team will rely on one person's workstation, and that person will be responsible for keeping their system up and running and performing regular backups of the repository database. They will also be inconvenienced when the database software needs to be upgraded. Hosting the repository on a dedicated database server is a much better choice.

Once you've chosen a location, you must choose the database software you will use to create the repository. You can create a repository using PostgreSQL, MySQL, Oracle, Microsoft SQL Server, or HSQLDB. If available, you can use a database server that already exists on your network. Otherwise, there is a wide range of free and commercial database platforms to choose from. If you have to install a new database and you're unsure which to choose, the DQguru development team recommends PostgreSQL. It's robust, flexible, performs well, is easy to set up and administer, and it's free.

Note: If you'd like to experiment with keeping the repository in a different type of database, contact the DQguru developers on the web support forum [http://www.sqlpower.ca/forum] .

Use the database software's vendor-supplied tools to create the database you will use to house your repository and to create a new database user for DQguru. This user is typically called mm but you can use any name.

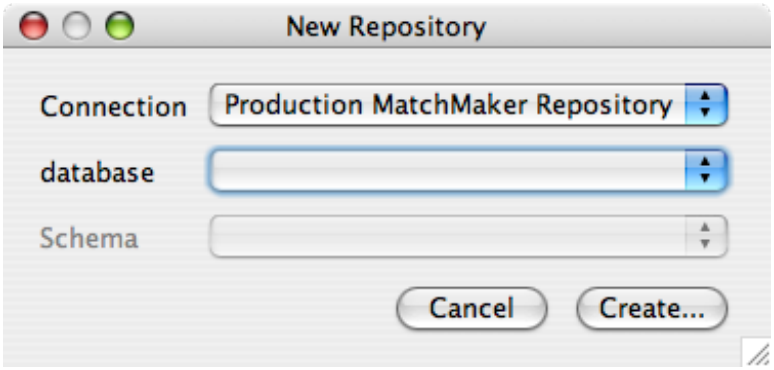
Create a New Data Source

You must create the data source that DQguru will use to connect to your new repository. For details, see ??? .

Create the Repository Tables

Once you've created your repository database and data source, you must create the tables in the repository.

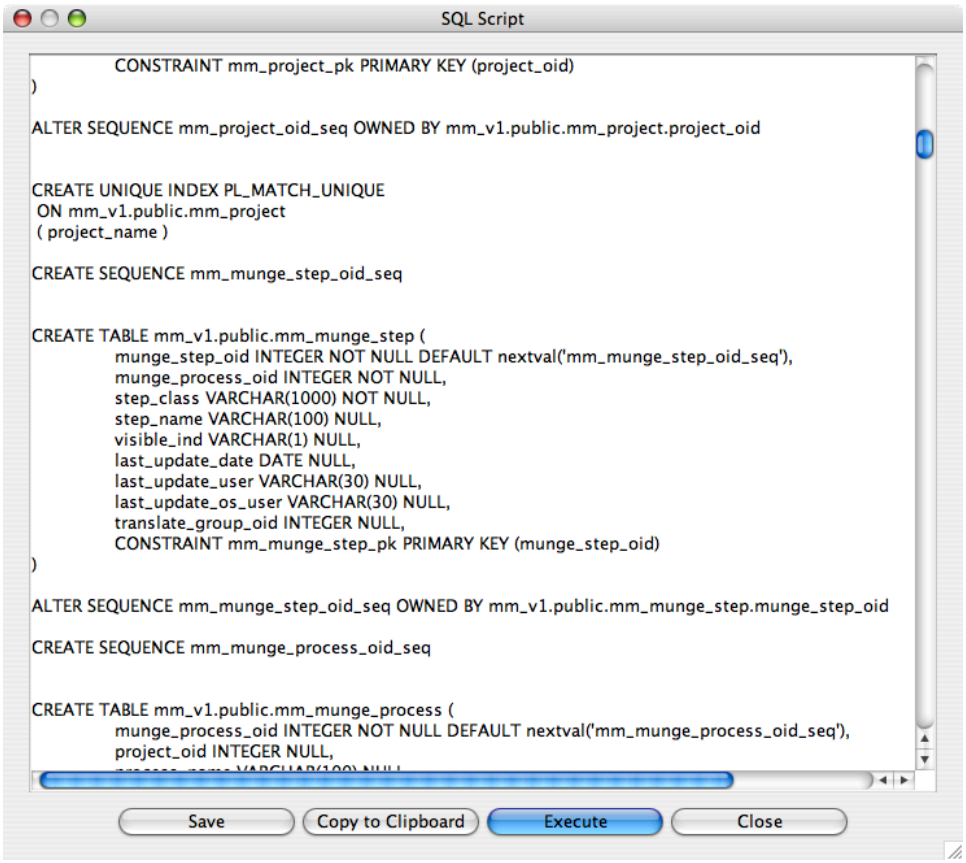
1. Select Database » Create Repository. The New Repository dialog box appears.



2. In the Connection box, select the data source you created for the repository.

3. Select the catalog and schema for the database, if applicable.

4. Click Create. In a few moments, a SQL scripts appears. This script will be used to create the repository tables.



5. Click Execute to run the script. Alternatively, you can save or copy the script and then use third-party tool to run it.

If any of the statements in the script fail, an error message will appear showing the SQL statement that failed and the database vendor's error message. If the statement failed due to permissions problems, you could use a vendor-supplied tool to grant the necessary permissions, then try the failed statement in an external tool. Once the statement executes properly, you can come back to DQguru and resume the script. If the statement fails for other reasons which don't appear to be recoverable, you will have to abort the script and visit our support forum for assistance.

Once the script finishes executing, a message will appear showing how many statements were attempted and how many succeeded. Assuming the script executed successfully, your remote repository has now been created.

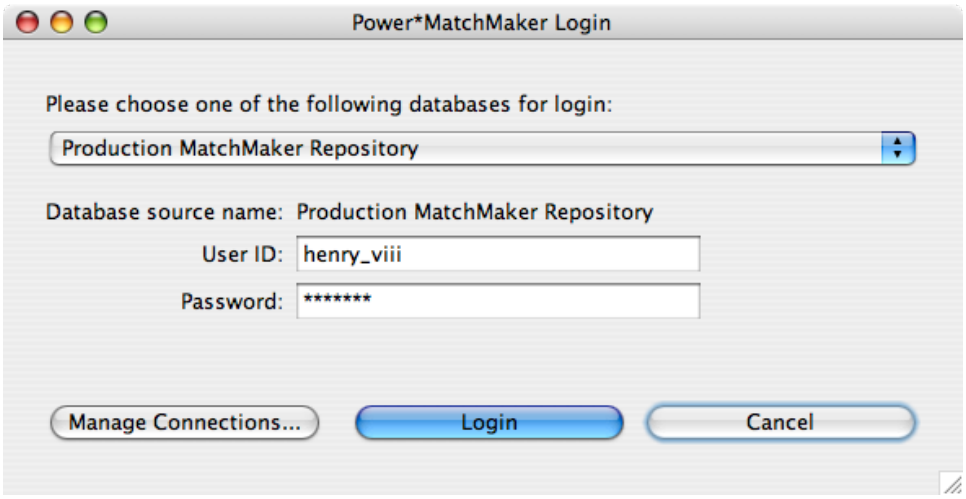
Connecting to a Remote Repository

Once you've created a remote repository, you must connect to it in DQguru. You can then start saving your projects in the repository.

DQguru allows you to connect to any number of repositories at the same time. Each active repository connection is referred to as a session. Each session is shown in a separate DQguru window and the window's title bar identifies the repository. The name of the user you're connected as, followed by an @ sign, followed by the repository's data source name, is shown in the title bar.

To start a new repository session:

1. Select Database » Connect to Remote Repository. The DQguru Login dialog box appears.



2. Select the data source for the repository you want to connect to. For more information, see ??? .

3. Enter the user ID and password for the repository.

4. Click Login. A window appears containing the new repository session.

Note: When you start a new repository session, any other active repository sessions remain open as well. To close a repository session, simply close the session's window.

Using Concurrent Sessions Within the Same Repository

One of the main advantages of using a shared repository is that multiple DQguru users can work within it at the same time. However, users must be careful not to overwrite changes made by others. To prevent this, each user should work on a different part of the project. For example, if you are working on one transformation and a co-worker is working on a different transformation within the same project, you will not interfere with each other. However, if you are both working on the same transformation, whoever saves last will "win," trampling the other person's version of the same transformation.

Real time collaboration is planned for a future version of DQguru, so users within the same repository can see all changes immediately. Until this feature is implemented, ensure that all users working on the same project are aware which part of the project each user is modifying.

Changing Your Repository Startup Preferences

By default, DQguru will login to the DQguru Default Repository at startup. You can change your preferences so that you login to a remote repository automatically when DQguru starts or so that you are prompted to choose a repository at startup. For example, if you typically work in the same remote repository all the time, you may want to login to that repository each time you start DQguru. Or, if you typically work on projects in several different repositories, you may want to be able to choose a repository each time you start DQguru.

1. Select File » User Preferences. On Macintosh systems, select the DQguru application menu, then select User Preferences (you can also use the standard keyboard shortcut Command-comma). The User Preferences dialog box appears.

2. If you want to login to a repository automatically at startup, select Automatically connect to this repository and choose a repository.

3. If you want to select a repository at startup, select Show the Login Dialog.

4. Click OK. Your changes will take effect the next time you start DQguru.

Chapter 6. Engine Runner Tool

The Engine Runner Tool is a command-line tool recently added to the DQguru for running a DQguru project's engine without having to use the GUI. It should be located in the directory where the DQguru was installed as the file named `dqguru-engine-runner.jar`. This is an executable JAR file, so you will need to use the `java` command to run it on the command-line.

IMPORTANT: You need to setup your DQguru projects through the GUI *before running this tool* . This tool will only be able to run on already pre-defined transformations in projects. It is also important that you set your engine settings exactly as you want them in the GUI before running the tool, because you cannot override them with the command-line interface at current.

Here's an example usage of the tool:

```
java -Xmx1024m -jar dqguru-engine-runner.jar --repository "DQguru Default Repository" --username "sa" --password "" --project "My Project"
```

Here's a piece-by-piece explanation of the command:

- java - The Engine Runner is a Java program, so you will need to use Java to run it.
- -Xmx1024m - You can optionally specify Java Virtual Machine arguments after the java command. For example, this sets the maximum memory the program may use. Increase the number if the Engine Runner keeps running out of memory.
- -jar dqguru-engine-runner.jar - Specifies the executable JAR file that actually contains the command-line program.
- --repository "DQguru Default Repository" - This is where you specify the name of the datasource where you have stored your DQguru repository. Note that if it has spaces in it, you need to put it in quotes (" ").
- --username "sa" - This is where you specify the username for the datasource where your repository is stored.
- --password "" - This is where you specify the password for the datasource and username that you're logging in with. If the password is nothing, you will still have to enter empty quotes ("").
- --project "My Project" - This is the project name with the engine you want to run. Note that if it has spaces in it, you need to put it in quotes (" ").

You may also run the program with a "--help" flag to get a list of all possible arguments that you can give to the program.

```
java -jar dqguru-engine-runner.jar --help
```

Chapter 7. Glossary

This section lists some database-related terms and their meanings.

Some of these terms are from FolDoc, "The Free On-line Dictionary of Computing", http://www.foldoc.org/, Editor Denis Howe.

Column	The set of all instances of a given field from all records in a table [http://foldoc.org/foldoc/foldoc.cgi?table] .
Database	One or more large structured sets of persistent data, usually associated with software to update and query [http://foldoc.org/foldoc/foldoc.cgi?query] the data. A simple database might be a single file containing many records [http://foldoc.org/foldoc/foldoc.cgi?records] , each of which contains the same set of fields [http://foldoc.org/foldoc/foldoc.cgi?fields] where each field is a certain fixed width.
Data Modeling	The product of the database design process which aims to identify and organize the required data logically and physically.
Data Warehouse	A database, often remote, containing recent snapshots of corporate data. Planners and researchers can use this database freely without worrying about slowing down day-to-day operations of the production database.
ETL	Extract, Transform and Load, the process of maintaining and transforming data into and out of a relational database.
Foreign key	A column [http://foldoc.org/foldoc/foldoc.cgi?column] in a database table [http://foldoc.org/foldoc/foldoc.cgi?table] containing values that are also found in some primary key [http://foldoc.org/foldoc/foldoc.cgi?primary+key] column (of a different table). By extension, any reference to entities of a different type. Some RDBMSs [http://foldoc.org/foldoc/foldoc.cgi?RDBMSs] allow a column to be explicitly labelled as a foreign key and only allow values to be inserted if they already exist in the relevant primary key column.
Identifying Relationship	Where the key of the parent table is a subset of the key of the child table.
JDBC	Java Database Connectivity, an unofficial acronym for the "java.sql" package of functionality used to access relational databases from programs written in the Java programming language.

Key	A value used to identify a record [http://foldoc.org/foldoc/foldoc.cgi?record] in a database, derived by applying some fixed function to the record. The key is often simply one of the fields [http://foldoc.org/foldoc/foldoc.cgi?fields] (a column [http://foldoc.org/foldoc/foldoc.cgi?column] if the database is considered as a table with records being rows - see key field [http://foldoc.org/foldoc/foldoc.cgi?key+field]). Alternatively the key may be obtained by applying some function, such as a hash function [http://foldoc.org/foldoc/foldoc.cgi?hash+function] , to one or more of the fields. The set of keys for all records forms an index [http://foldoc.org/foldoc/foldoc.cgi?index] . Multiple indices may be built for one database depending on how it is to be searched.
Primary key	The candidate key [http://foldoc.org/foldoc/foldoc.cgi?candidate+key] selected as being most important for identifying a body of information (an entity, object or record [http://foldoc.org/foldoc/foldoc.cgi?record]).
Record (row)	One or more structured sets of persistent data, usually associated with software to update and query [http://foldoc.org/foldoc/foldoc.cgi?query] the data. A simple database might be a single file containing many records [http://foldoc.org/foldoc/foldoc.cgi?records] , each of which contains the same set of fields [http://foldoc.org/foldoc/foldoc.cgi?fields] where each field is a certain fixed width.
SQL	Originally SEQUEL [http://en.wikipedia.org/wiki/SQL#History] and still pronounced that way by many practitioners, SQL is the Standard Query Language; a unified language for creating queries that is accepted (with some variations) by all modern relational databases.
Table	A collection of records [http://foldoc.org/foldoc/foldoc.cgi?records] in a relational database [http://foldoc.org/foldoc/foldoc.cgi?relational+database] .

Chapter 8. Appendices

Appendix A: GNU GPL Version 3

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Version 3, 29 June 2007

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The DQguru team is also grateful to the JFree team for their top-notch charting library, which has a nice API as well as nice-looking output.

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- jcommon-1.0.0.jar
- jfreechart-1.0.1.jar

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Version 3, 29 June 2007

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