

MySQL Migration Toolkit

MySQL Migration Toolkit

Abstract

This is the MySQL Migration Toolkit Manual.

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Chapter 1. Introduction to the MySQL Migration Toolkit

The MySQL Migration Toolkit is a graphical tool provided by MySQL AB for migrating schema and data from various relational database systems to MySQL.

MySQL Migration Toolkit is designed to work with MySQL versions 5.0 and higher.

The MySQL Migration Toolkit is alpha software. While every effort has been made to ensure it is free of bugs, it should not be used in a production environment. Always back up your data before using the MySQL Migration Toolkit. If you find it's lacking some feature important to you, or if you discover a bug, please use our MySQL Bug System [<http://bugs.mysql.com>] to request features or report problems.

Chapter 2. Features of the MySQL Migration Toolkit

The following are some of the key features of the MySQL Migration Toolkit:

- The MySQL Migration Toolkit supports a variety of source database systems, including the following:
 - Oracle
 - Microsoft SQL Server
 - Microsoft Access
- The MySQL Migration Toolkit is fully customizable through its Java runtime interface. Advanced users can use Java to perform custom data and schema transformations.
- The MySQL Migration Toolkit supports agent-based data migrations, with the MySQL Migration Toolkit residing on a separate machine than the source and target database servers, through the use of a special migration agent. The agent-based data migration improves migration performance by allowing data to be transferred directly from the source machine to the target machine without being router through the MySQL Migration Toolkit.

Chapter 3. Installing MySQL Migration Toolkit

3.1. Introduction

The MySQL Migration Toolkit is available for all recent 32-bit Windows platforms, in source and binary forms. MySQL Migration Toolkit can be downloaded from The MySQL web site. [<http://dev.mysql.com/downloads/migration-toolkit/>]

The MySQL Migration Toolkit requires the Java Runtime Environment (JRE) to run. The JRE can be downloaded from the Sun Microsystems web site [<http://java.sun.com/j2se/1.5.0/download.jsp>] (look for the JRE 5.0 section of the download page).

3.2. Installing Under Windows

MySQL Migration Toolkit runs on recent 32-bit Windows NT based operating systems, including Windows 2000, XP, and 2003. It doesn't run on Windows NT 4 and below.

MySQL Migration Toolkit is installed through the use of a Windows Installer (.msi) installation package, which can be used on all recent Windows operating systems. The MSI package is contained within an archive named `mysql-migration-toolkit-version-alpha-win32.msi`, where *version* indicates the MySQL Migration Toolkit version.

The Windows Installer system was updated with the release of Windows XP; those using an older version of Windows can reference this Microsoft Knowledge Base article [<http://support.microsoft.com/default.aspx?scid=kb;EN-US;292539>] for information on upgrading to the latest version.

To install MySQL Migration Toolkit, right-click on the MSI file and select Install. The installation will begin automatically after the installer prompts you for your installation preferences. During installation, you can choose whether you want the installer to place a shortcut in the Start menu and an icon on the desktop.

If you are having problems running the installer, you can download a ZIP file without an installer as an alternative. That file is called `mysql-migration-toolkit-noinstall-version-alpha-win32.zip`. Using a ZIP program, unpack it to a directory of your choice. You may want to create shortcuts to `MySQLMigrationTool.exe` for your desktop or quick launch bar.

Unless you choose otherwise, MySQL Migration Toolkit is installed in `C:\%PROGRAMFILES%\MySQL\MySQL Migration Toolkit 1.0\MySQLMigrationTool.exe`, where `%PROGRAMFILES%` is the default directory for programs on your machine. For example, this directory might be `C:\Program Files` or `C:\Programme`.

Chapter 4. Starting MySQL Migration Toolkit

Start MySQL Migration Toolkit by double-clicking its desktop icon, or by selecting its entry from the Start menu (typically the MySQL Migration Toolkit entry of the MySQL section of the Start menu). Alternatively, you can open a DOS window and start the MySQL Migration Toolkit from the command line:

```
C:\%PROGRAMFILES%\MySQL\MySQL Migration Toolkit 1.0\MySQLMigrationTool.exe
```

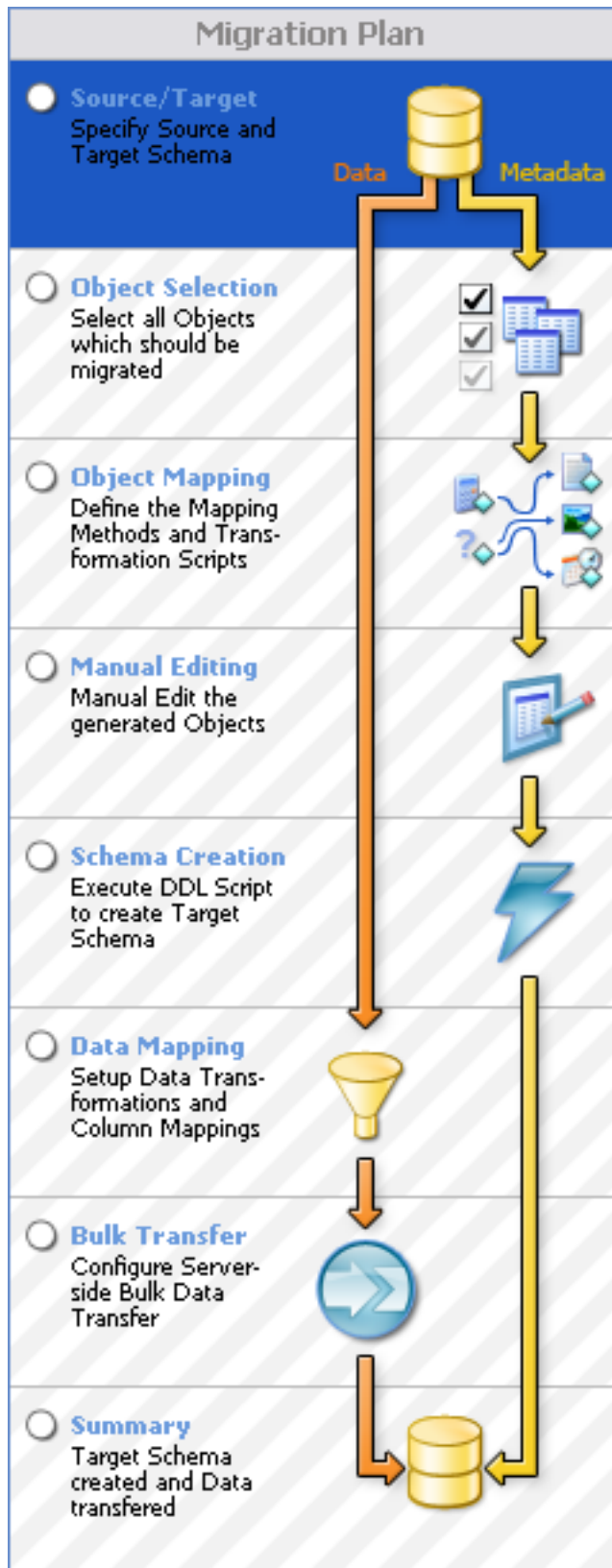
`%PROGRAMFILES%` is the default directory for programs on your machine. For example, `C:\program files` or `C:\Programme`. If your path contains spaces, you should enclose the command within double quotes. For example:

```
C:\> "C:\Program Files\MySQL\MySQL Migration Toolkit 1.0\MySQLMigrationTool.exe
```

Chapter 5. An Overview of the Migration Process

The MySQL Migration Toolkit uses an eight-step process to migrate data from an external RDBMS to MySQL:

Figure 5.1. The MySQL Migration Toolkit Migration Plan



- **Source/Target Selection:** In the first step you specify the connection parameters for the source and target database servers.
- **Object Selection:** In the second step you select the objects (tables, views, stored proced-

ures) that will be migrated.

- **Object Mapping:** In the third step you choose the method used for mapping and transforming the objects.
- **Manual Editing:** In the fourth step you can manually edit the new objects to ensure a proper transformation.
- **Schema Creation:** In the fifth step the MySQL Migration Toolkit creates the transformed object on the target MySQL server.
- **Data Mapping:** In the sixth step you specify any changes that need to be made to the data as it is migrated.
- **Bulk Transfer:** In the seventh step the MySQL Migration Toolkit transfers the data from the source server to the target server.
- **Summary:** In the eighth and final step the MySQL Migration Toolkit creates a summary report of the migration process for you to review.

Each of these sections will be covered in more detail in the coming chapters.

Chapter 6. The Migration Process In-Depth

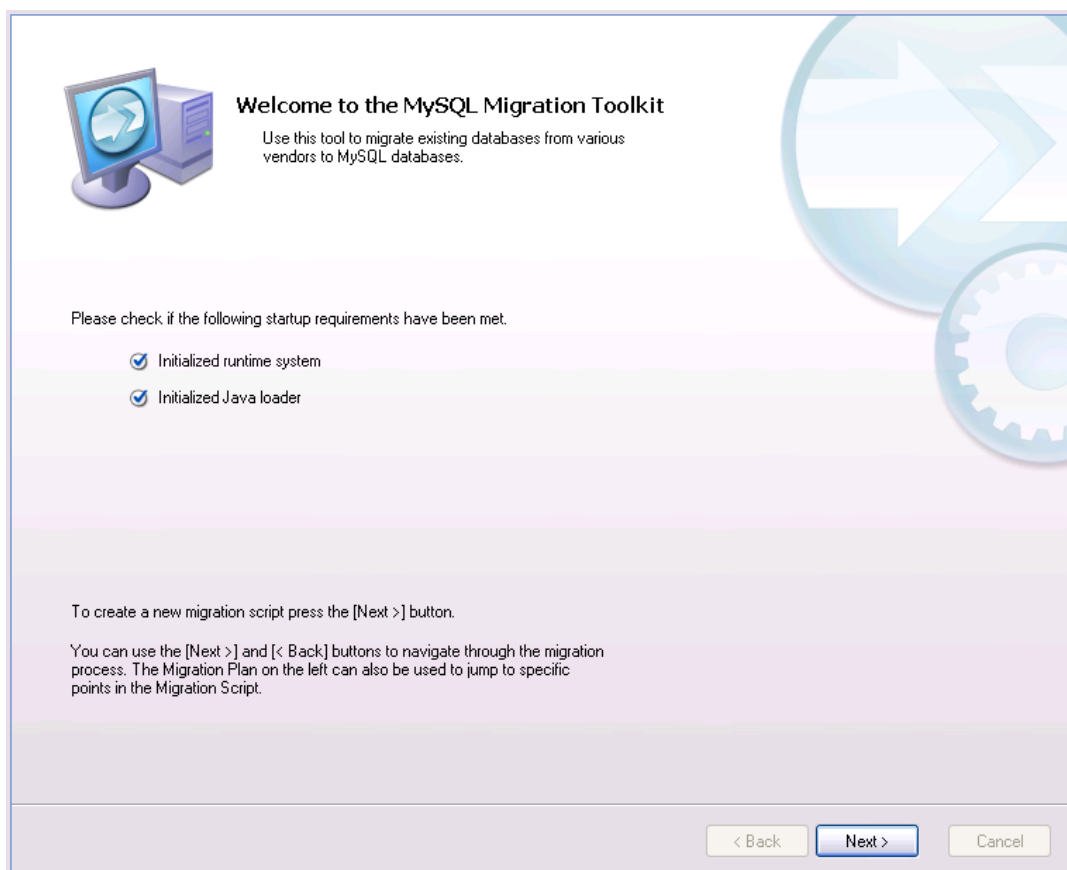
6.1. Introduction

In this chapter we will cover the different steps of the MySQL Migration Toolkit in depth. The different steps will be covered in the order that they appear in the MySQL Migration Toolkit.

6.2. The Welcome Screen

The first screen of the MySQL Migration Toolkit is the Welcome Screen:

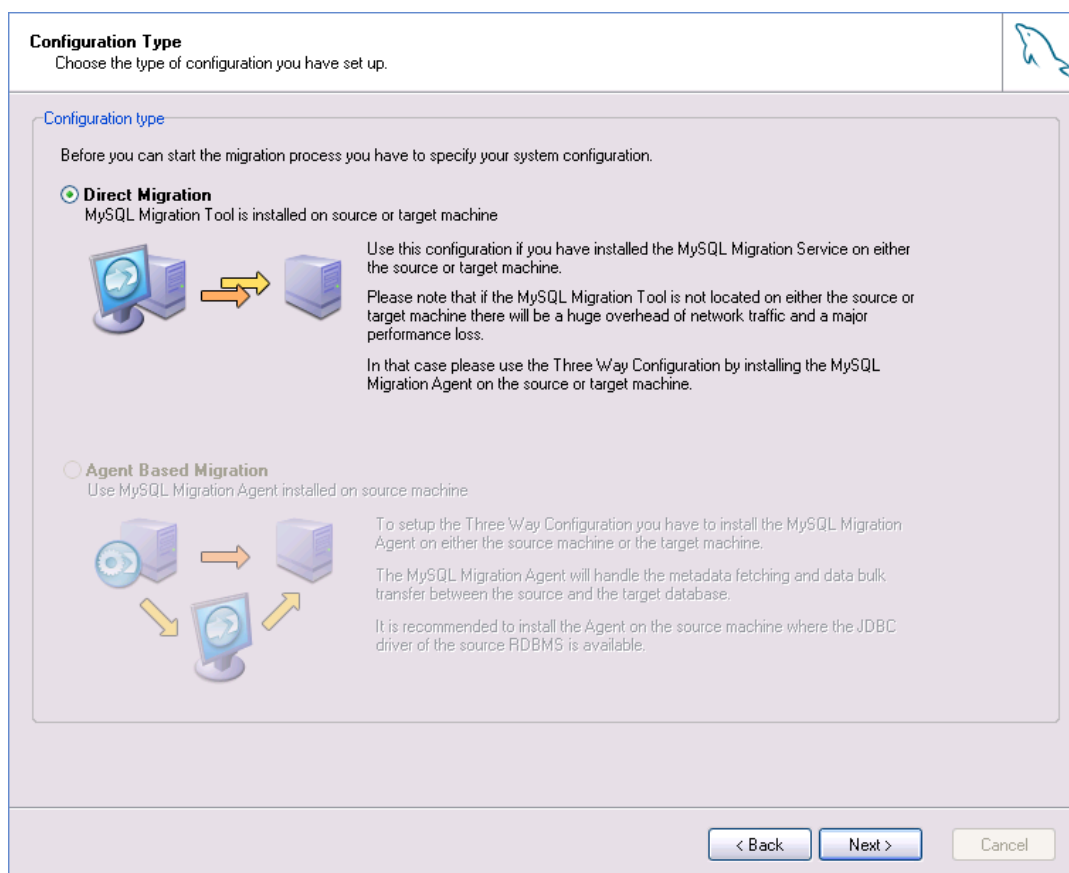
Figure 6.1. The MySQL Migration Toolkit welcome screen



The welcome screen indicates the progress of loading the various components of the MySQL Migration Toolkit. If you encounter any errors on the welcome screen you should close the MySQL Migration Toolkit and confirm that you have properly installed the Java Runtime Environment. See Section 3.1, “Introduction” for information on downloading and installing the Java Runtime Environment.

6.3. The Configuration Type Screen

The Configuration Type screen allows you to choose between a Direct Migration and a Agent-Based Migration:

Figure 6.2. The Configuration Type screen

Use the **Direct Migration** if the MySQL Migration Toolkit is installed on either the source or target machine. The Direct Migration should not be used when the MySQL Migration Toolkit is not located on either the source or target machine, as it will create a large amount of network traffic and will result in decreased performance.

Use the **Agent-Based Migration** when migrating between two server machines that do not support the use of the MySQL Migration Toolkit. The MySQL Migration agent should be installed on the source machine before using the Agent-Based Migration.

6.4. The Source Database Screen

Use the Source Database screen to select the source RDBMS used in the migration and to specify the connection parameters.

The Source Database screen's appearance will vary depending on the type of source database selected.

All Data Source screens will feature a **Details** button that can be used to expose the **Advanced Settings** panel. The **Advanced Settings** panel can be used to manually specify a JDBC driver and JDBC connection string for your migration session.

6.4.1. Microsoft Access

The Source Database screen appears as follows when you select Microsoft Access as the source database:


Figure 6.3. Source database - Microsoft Access

Source Database
Select the source database you want to migrate from.

Source Database Connection

Database System: Select the target RDBMS you want to migrate from.

Connection Parameters

 **MS Access Server**
MS Access over JDBC-ODBC bridge

Connection: + - Select a stored connection or use [+] to store or [-] to remove.

Database File: MS Access database file.

Username: Name of the user to connect with.

Password: The user's password.

Specify the path to the .mdb database file in the Database File field and specify the database username and password information if applicable.

You must make special modifications to your Access database file before it can be used with MySQL Migration Toolkit. Please see Appendix A, Preparing a Microsoft Access Database for Migration for further information.

6.4.2. Microsoft SQL Server

The Source Database screen appears as follows when you select MS SQL Server as the source database:

Figure 6.4. Source database - Microsoft SQL Server

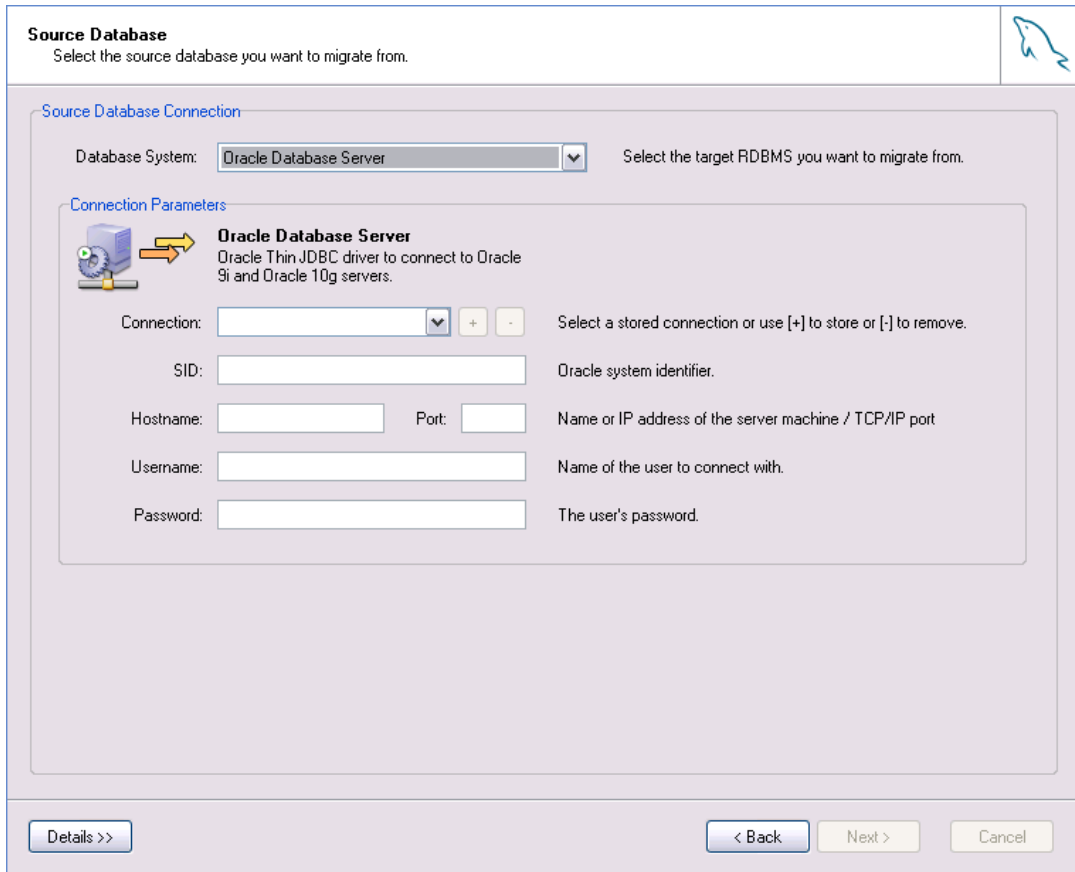
The screenshot shows a 'Source Database Connection' dialog box. At the top, 'Database System' is set to 'MS SQL Server' with a dropdown arrow. To the right, it says 'Select the target RDBMS you want to migrate from.' Below this is a 'Connection Parameters' section. It features an icon of a server and a yellow arrow pointing right. The text reads 'MS SQL Server' and 'JDBC driver to connect to MS SQL Server 2000.' There are four input fields: 'Connection:' with a dropdown and '+'/'-' buttons; 'Hostname:' with 'localhost' entered; 'Port:' with '1433' entered; and 'Password:' which is empty. To the right of these fields are instructions: 'Select a stored connection or use [+] to store or [-] to remove.', 'Name or IP address of the server machine / TCP/IP port', 'Name of the user to connect with.', and 'The user's password.'

Specify the hostname, username, and password to connect to the source Microsoft SQL Server to connect and click Next.

6.4.3. Oracle

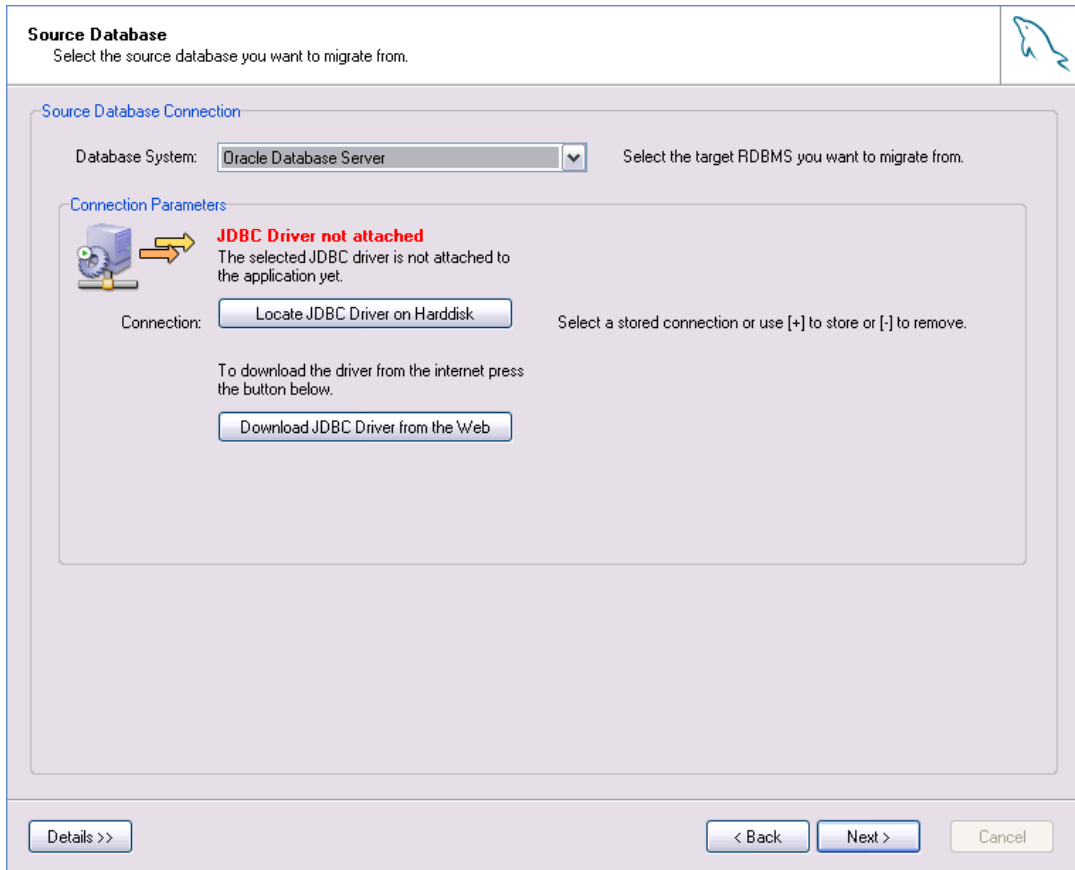
The Source Database screen appears as follows when you select Oracle as the source database:

Figure 6.5. Source database - Oracle



If you encounter the following database selection screen, it means that you do not have the appropriate JDBC driver for Oracle installed:

Figure 6.6. Oracle JDBC driver not attached



If the Oracle JDBC driver is present on your system, click the Locate JDBC Driver on Harddisk button to attach the driver.

If the Oracle JDBC driver is not present on your system, click the Download JDBC Driver from the Web button to download it. Download the `ojdbc14.jar` file and then attach it by clicking on the Locate JDBC Driver on Harddisk button.

After attaching the Oracle JDBC driver you need to restart the MySQL Migration Toolkit.

6.4.4. MySQL

The Source Database screen appears as follows when you select MySQL as the source database:

Figure 6.7. Source database - MySQL

Source Database
Select the source database you want to migrate from.

Source Database Connection

Database System: Select the target RDBMS you want to migrate from.

Connection Parameters

MySQL Server
MySQL JDBC driver to connect to MySQL 4.0, 4.1 and 5.0 servers.

Connection: + - Select a stored connection or use [+] to store or [-] to remove.

Hostname: Port: Name or IP address of the server machine / TCP/IP port

Username: Name of the user to connect with.

Password: The user's password.

Details >> < Back Next > Cancel

6.4.5. Saving Connection Information

After entering the connection information for the source database, click the + button to save the connection information.

When prompted, enter a name for the connection information and click the Ok button to save the connection information for later re-use.

You can discard saved connection information by selecting the saved connection from the Connection drop-down list and clicking the - button.

6.5. The Target Database Screen

Use the Target Database screen to select the target RDBMS used in the migration and to specify the connection parameters.

The target Database screen uses an interface that is identical to that of the Source Database screen:

Figure 6.8. Target Database - MySQL

Target Database
Select the destination database.

Target Database Connection

Database System: Select the target RDBMS you want to migrate to.

Connection Parameters

MySQL Server
MySQL JDBC driver to connect to MySQL 4.0, 4.1 and 5.0 servers.

Connection: + - Select a stored connection or use [+] to store or [-] to remove.

Hostname: Port: Name or IP address of the server machine / TCP/IP port

Username: Name of the user to connect with.

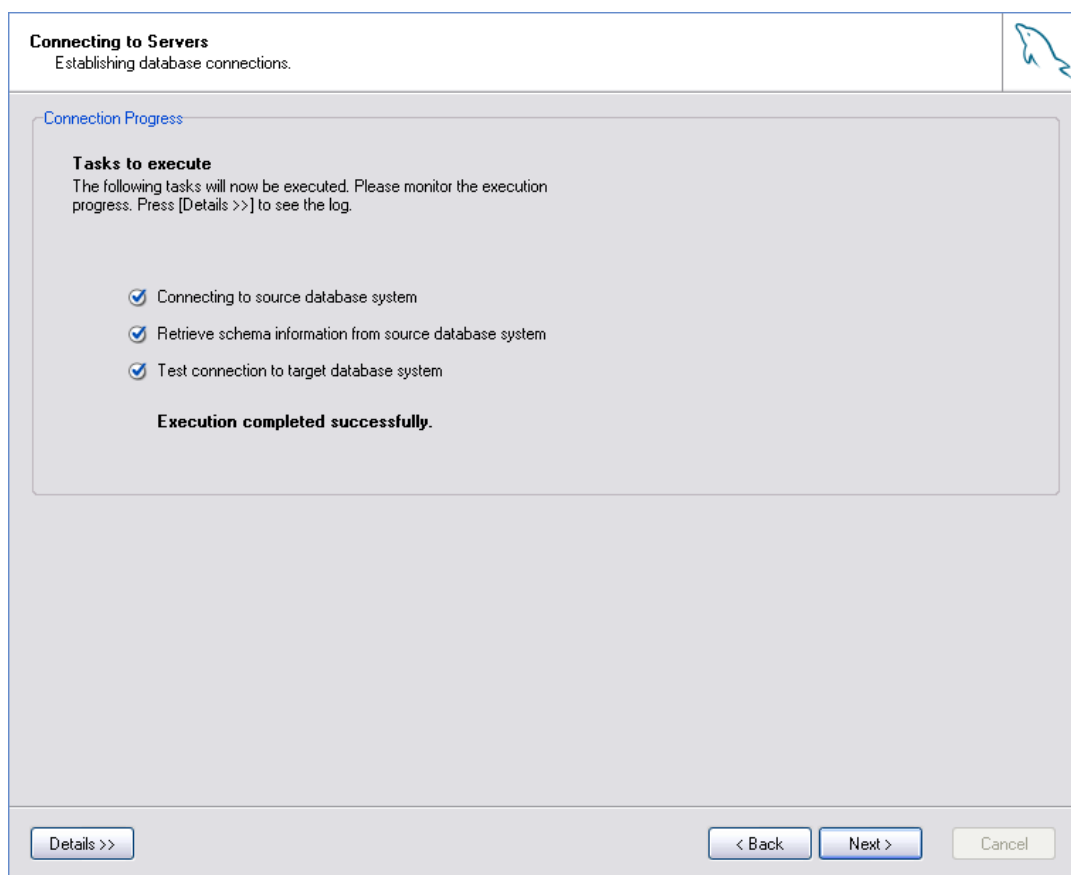
Password: The user's password.

Target database support for the MySQL Migration Toolkit is currently limited to MySQL 4.1 and MySQL 5.0.

6.6. The Connect to Server Screen

After you specify your source and target database servers, the MySQL Migration Toolkit will connect to each server and retrieve the schema information from the source server:

Figure 6.9. The Connect to Servers screen



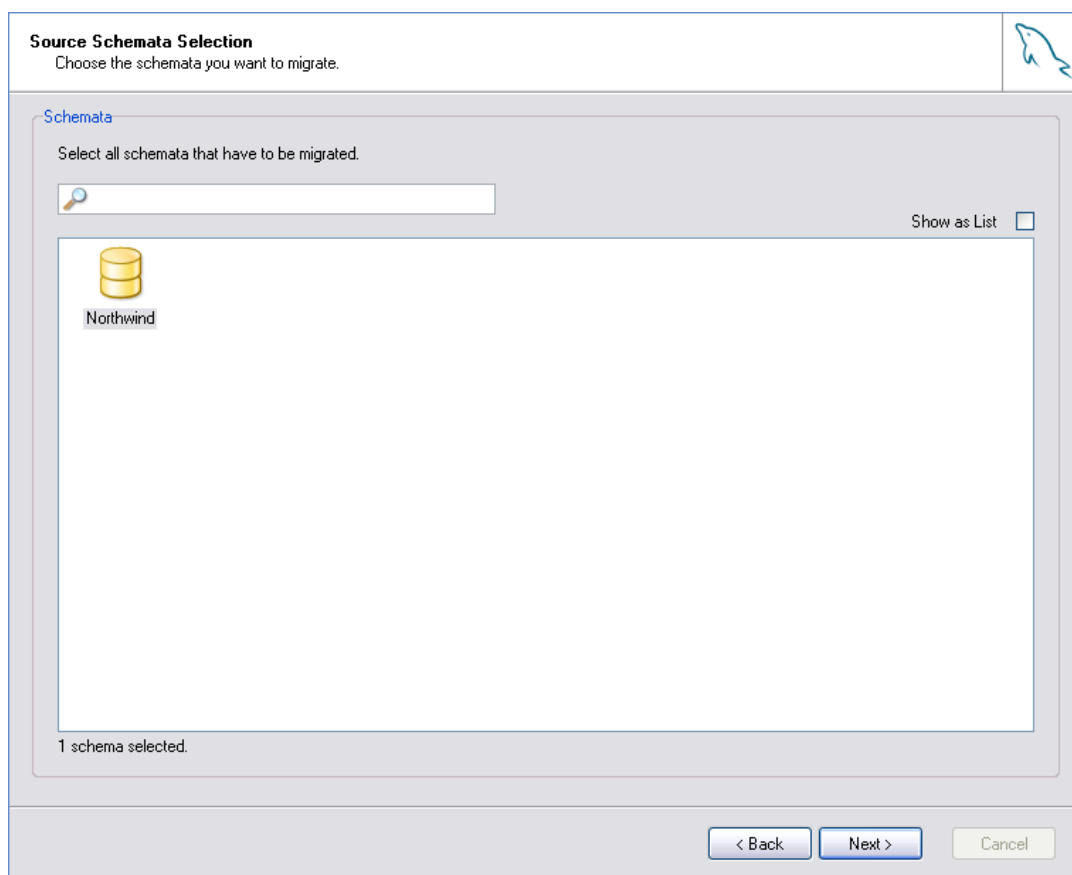
Click the Details button to see a more detailed log of the connection process.

6.7. The Source Schema Selection Screen

Use the Source Schema Selection screen to choose which databases from the source server you would like to migrate.

If there are a large number of databases to choose from, you can search for a specific database by entering the database name in the

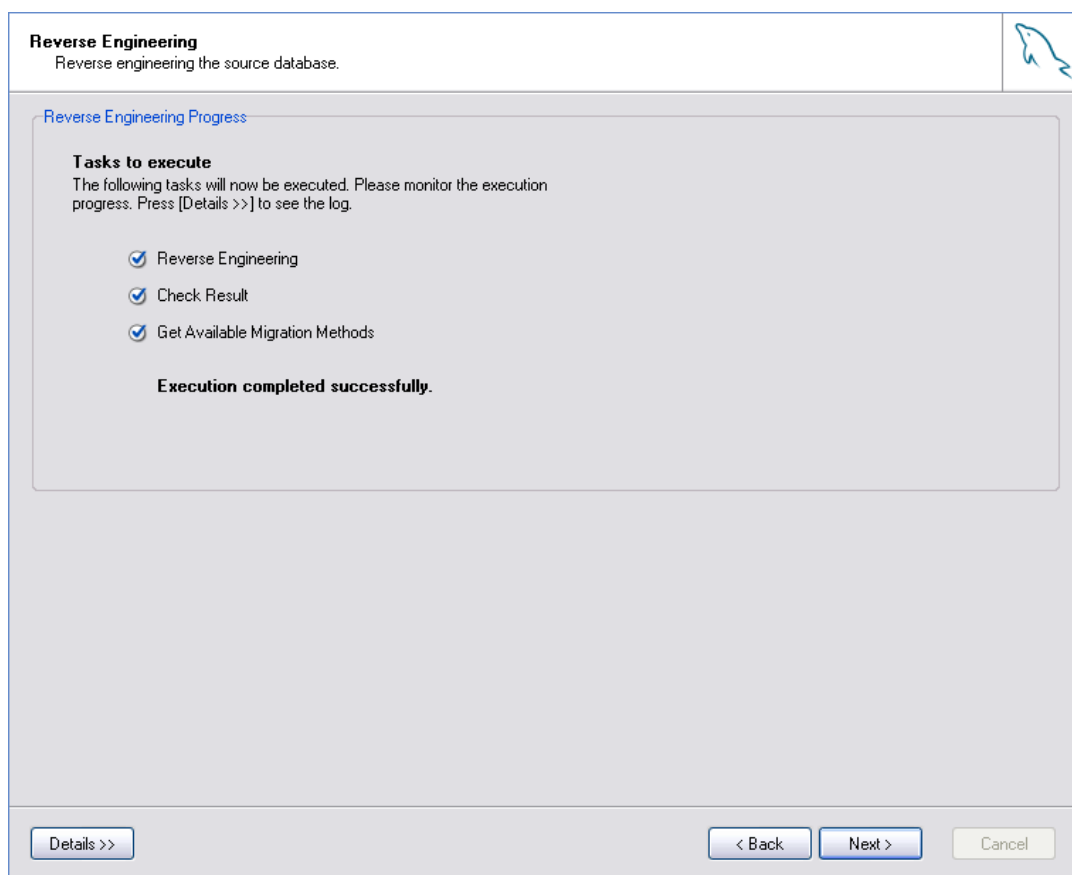
Figure 6.10. The Source Schema Selection screen



6.8. The Reverse Engineering Screen

Once you select the databases you wish to migrate, the MySQL Migration Toolkit begins the process of reverse engineering the source database:

Figure 6.11. The Reverse Engineering screen



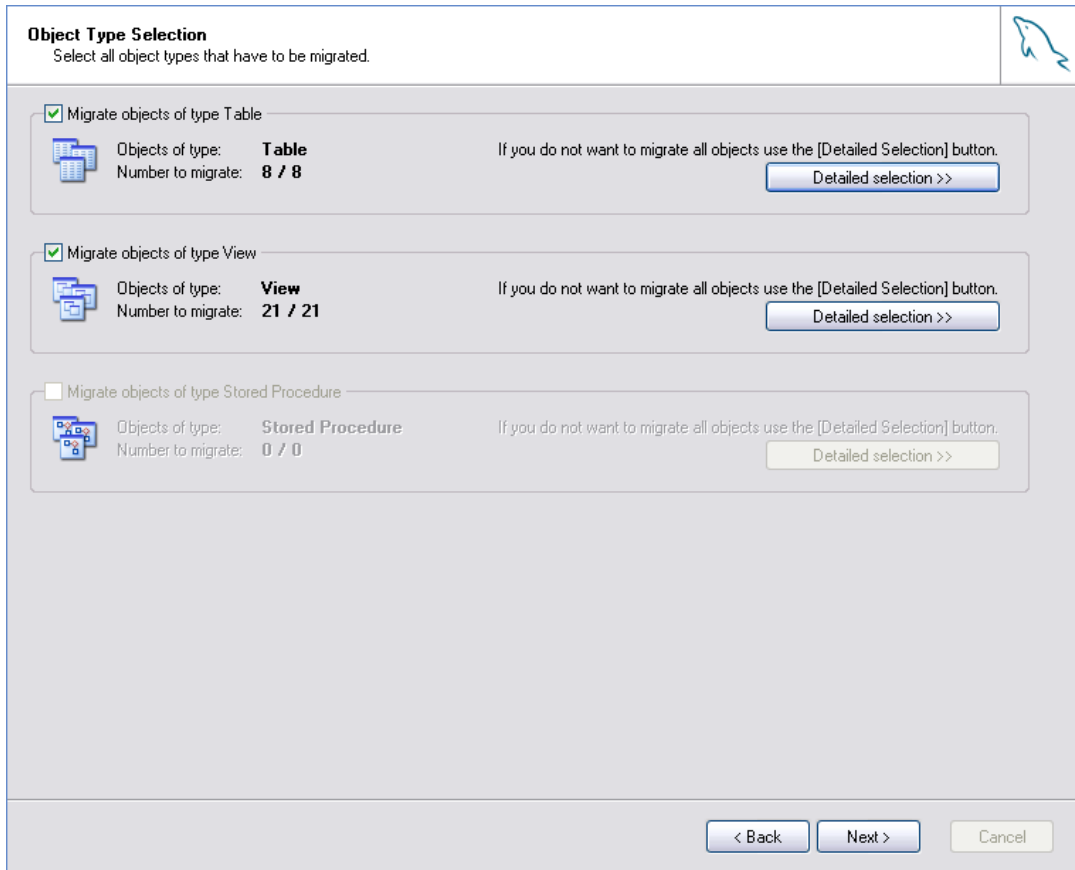
The MySQL Migration Toolkit collects column and index information for each table in the source database, along with information on stored procedures and views.

Click the Details button to see a detailed log of the reverse engineering process.

6.9. The Object Type Selection Screen

Use the Object Type Selection screen to choose which objects you wish to migrate:

Figure 6.12. The Object Type Selection screen

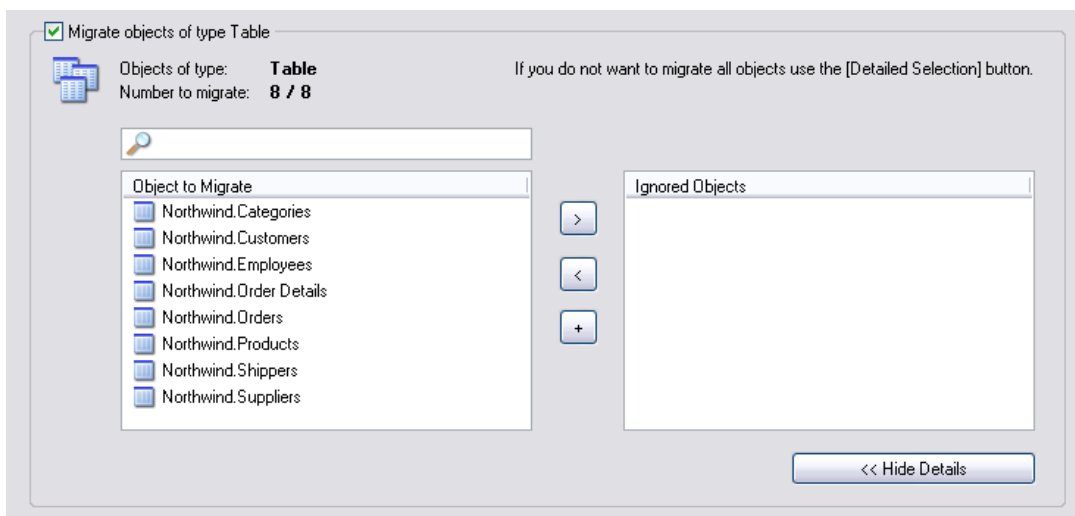


Check the box next to the objects types (Tables, Views, Stored Procedures) that you wish to migrate.

6.9.1. Migrating a Sub-Set of an Object Type

If you only wish to a sub-set of the available object types, click the Detailed Selection button next to the object type:

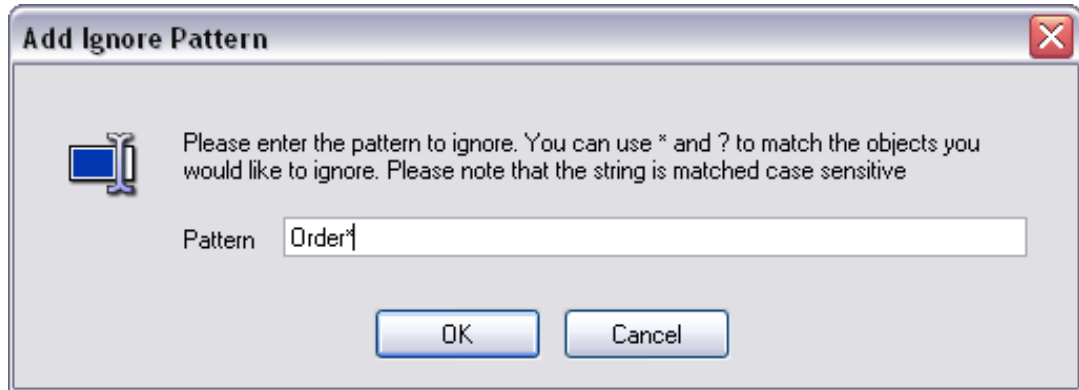
Figure 6.13. The detail view of the Object Type Selection screen



The objects in the left window will be migrated. To ignore an object, select it and click the > button. To move an object out of the ignore list, select it and click the < button.

To exclude objects based on pattern matching, click the + button:

Figure 6.14. The Add Ignore Pattern dialog



Patterns can include the * and ? characters, with * representing multiple characters (including no characters at all) and ? representing a single character.

6.10. The Object Mapping Screen

Use the Object Mapping screen to configure the methods used to migrate the database objects to MySQL. The MySQL Migration Toolkit comes with multiple migration methods that can be used to convert the database objects of an external RDBMS to MySQL.

In most cases the default settings will be adequate.

There are four areas of migration to be addressed: GRT Object, Table, View, and Stored Procedures:

Figure 6.15. The Object Mapping screen

Object Mapping
Please define how to map the database objects.

Migration of type GRT Object
Migration method: **Generic** Generic method to migrate a schema to MySQL. [Set Parameter >>](#)

Migration of type Table
Migration method: **Generic** Generic method to migrate a table to MySQL. [Set Parameter >>](#)

Migration of type View
Migration method: **Access Standard** Standard method to migrate an Access view to MySQL. [Set Parameter >>](#)

Migration of type Stored Procedure
Migration method: No migration method available for this source type.

[Details >>](#) [< Back](#) [Next >](#) [Cancel](#)

6.10.1. GRT Object

The GRT Object section of the Object Mapping screen dictates the properties of the database itself. By default a generic profile is used, with a Latin1 character set.

To modify the character set used on the database level, click the Set Parameter button. Choose from Latin1, Multilanguage, or User defined.

6.10.2. Table Objects

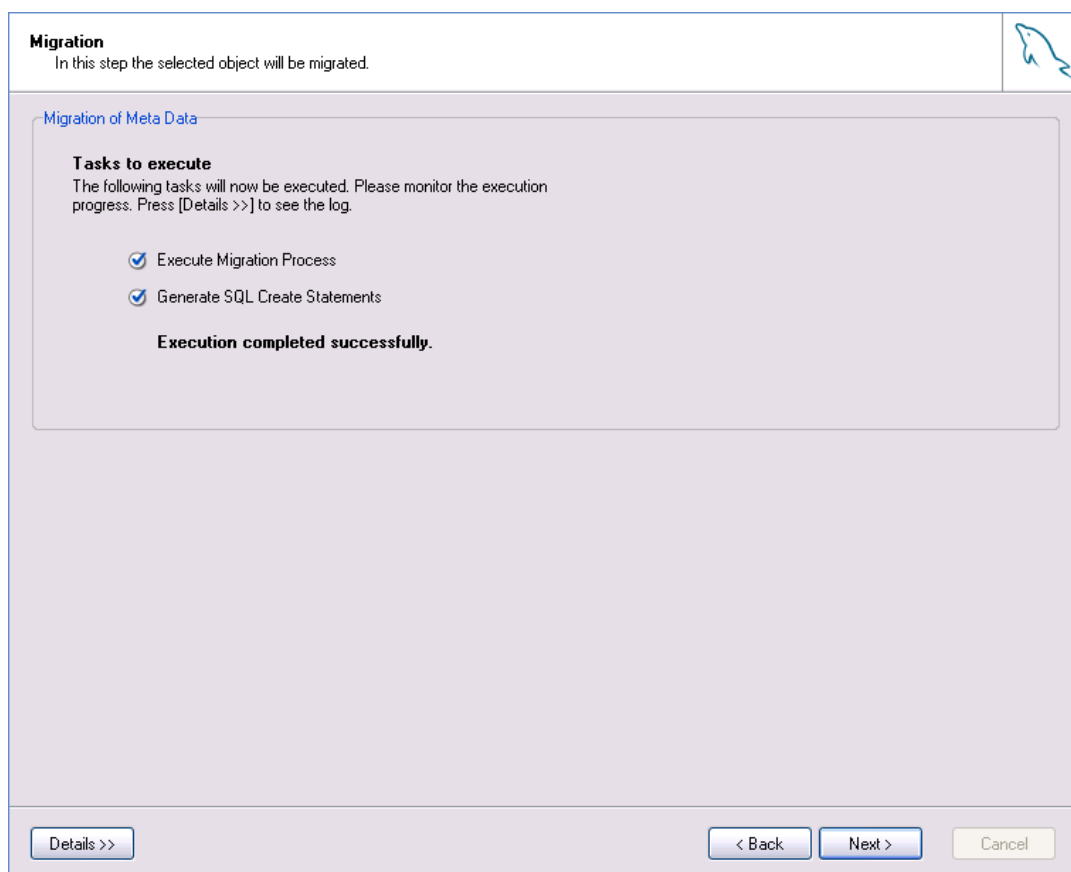
The Table section of the Object Mapping screen dictates the properties of the individual tables. By default a generic profile is used, with an InnoDB storage engine.

To modify the storage engine used with the migrated tables, click the Set Parameter button. Choose the `Data consistency` option to use the InnoDB storage engine for transactional and foreign key support. Choose the `Statistical data` option to use the MyISAM storage engine with increased performance but no transaction safety. Choose the `Data consistency / multilanguage` option to use the InnoDB storage engine with UTF8 as the default charset. If none of the provided options meet your needs, choose the `User defined` option and provide your own settings.

6.11. The Meta Migration Screen

After you configure data object mapping, the MySQL Migration Toolkit performs the conversion of the database objects and generates SQL CREATE statements.

Figure 6.16. The Meta Migration screen



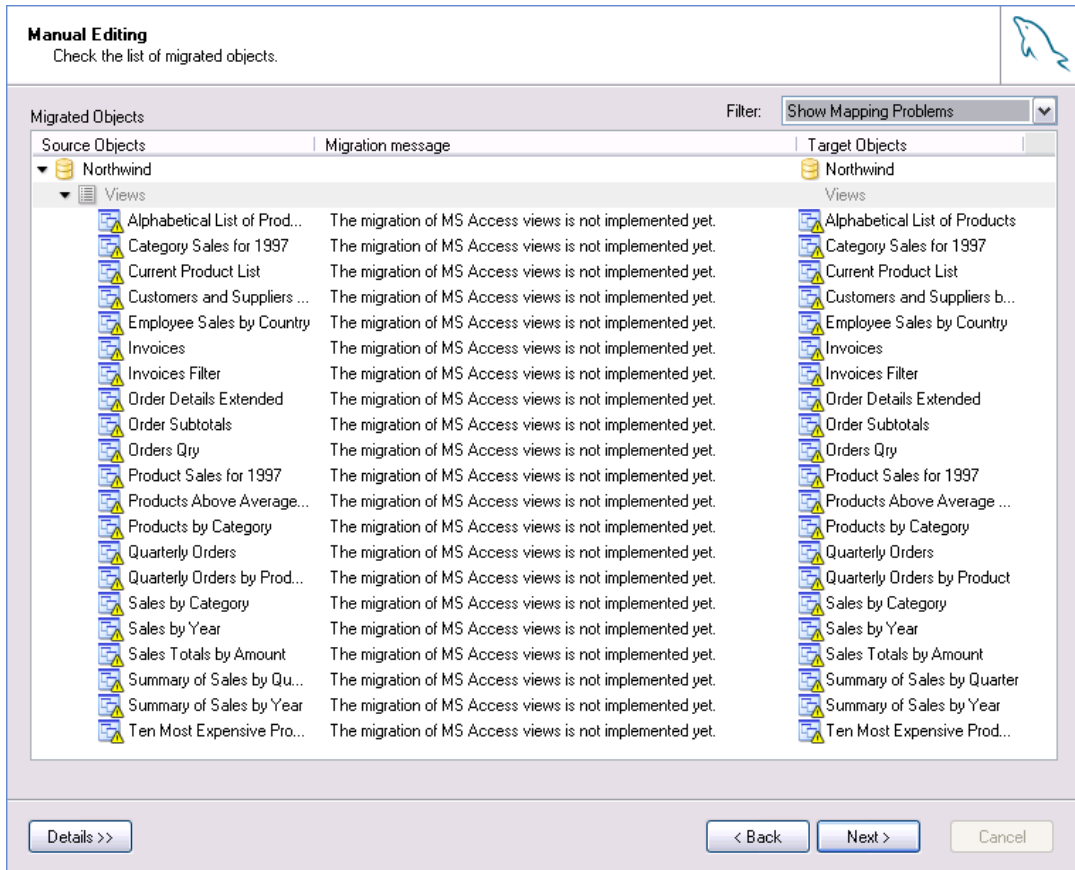
The SQL CREATE statements are not executed on the target server at this stage of the migration, but will be executed later.

Click the Details button to view a detailed log of this stage of the migration process.

6.12. The Manual Editing Screen

Use the Manual Editing screen to review the SQL CREATE statements generated by the MySQL Migration Toolkit:

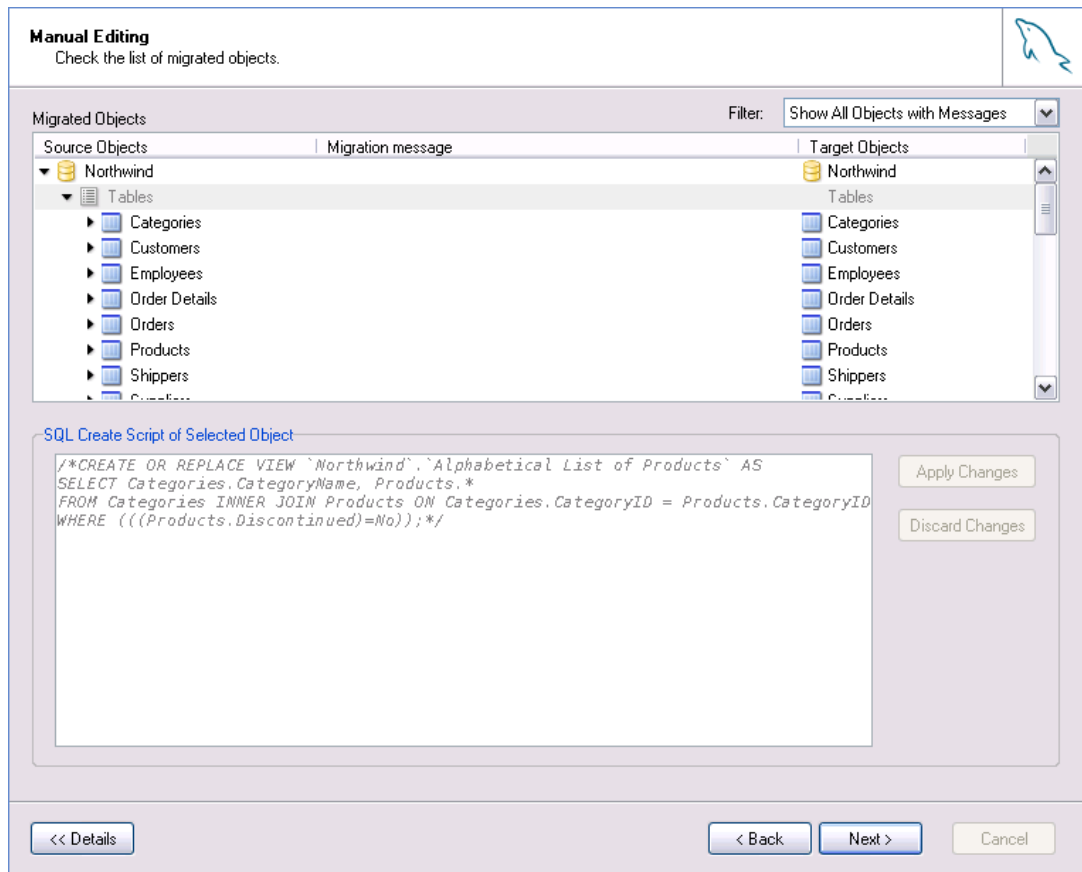
Figure 6.17. The Manual Editing screen



By default only objects that were not successfully converted are displayed in the Manual Editing screen. To view all objects select the Show All Objects entry of the Filter drop-down list. Choose the Show All Objects with Messages entry of the Filter drop-down list to view all object with status messages.

To edit the SQL CREATE statements created by the MySQL Migration Toolkit, select the object and click the Details button:

Figure 6.18. The Manual Editing screen - detailed view

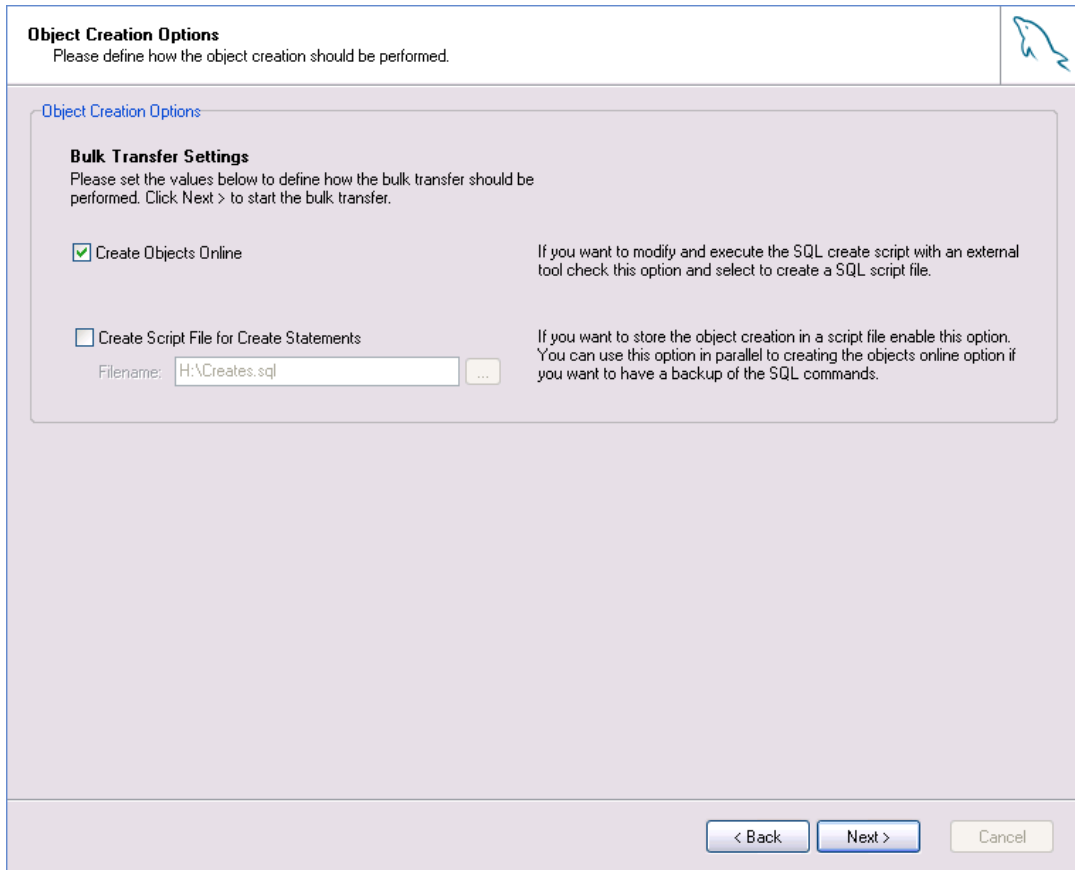


Make changes to the CREATE statement and click the Apply Changes button. If you make a mistake while editing, click the Discard Changes button to revert the CREATE statement.

6.13. The Object Creation Options Screen

After performing manual object editing the MySQL Migration Toolkit is ready to create the database objects on the target server. You have the option of either creating the database objects directly on the target server or to create a script file of the CREATE statements for later execution:

Figure 6.19. The Object Creation Options screen

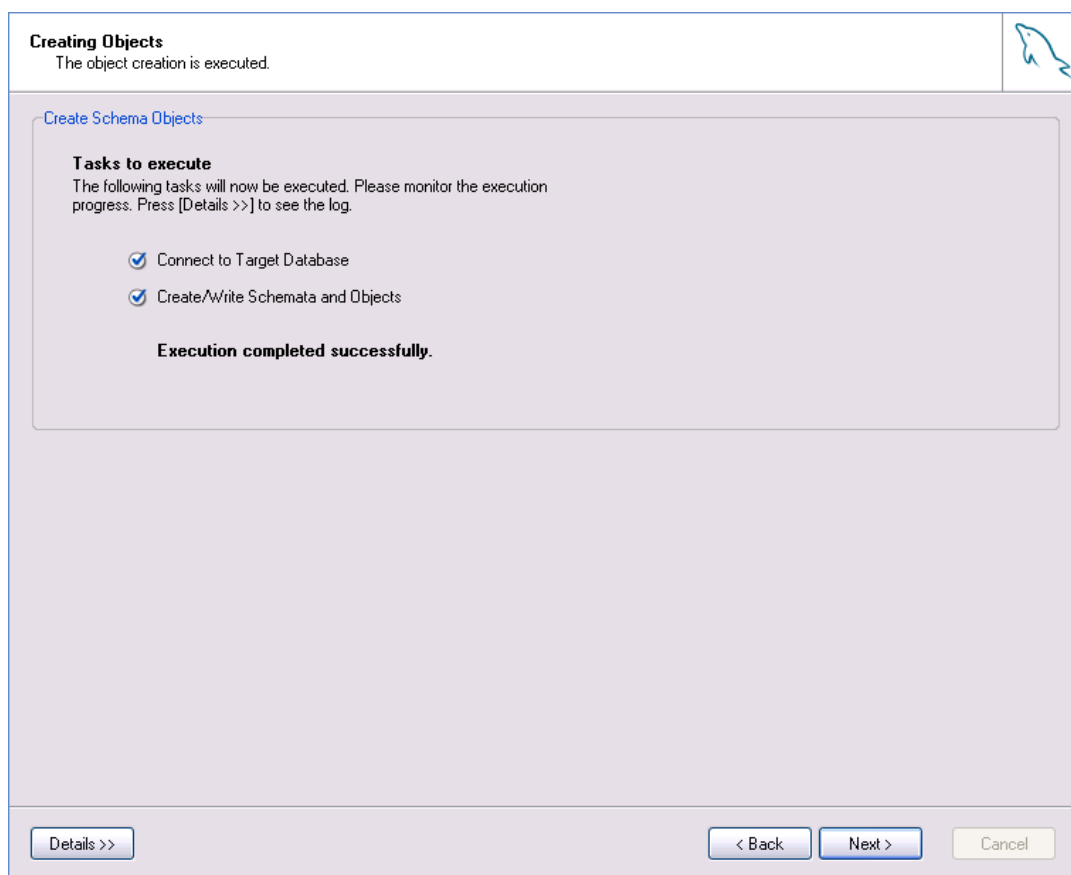


Select both options to create the target database objects and preserve a backup copy of the CREATE statements for later use.

6.14. The Creating Objects Screen

Once you choose object creation objects, the MySQL Migration Toolkit connects to the target server and creates the database objects (assuming you chose to have the MySQL Migration Toolkit connect to the target server to create the database objects). If you chose to have a copy of the CREATE statements saved to disk this will be performed at this time.

Figure 6.20. The Creating Objects screen



Click the Details button to view a detailed log of this stage of the migration process.

6.15. The Data Mapping Options Screen

After the database objects are created on the target database server the MySQL Migration Toolkit is ready to move the server data to the target server. You have the option of either inserting the data directly on the target server or to create a script file of the `INSERT` statements for later execution:

Figure 6.21. The Data Mapping Options screen

Data Mapping Options
The selected object will now be migrated.

Standard Options

Bulk Transfer Settings
Please set the values below to define how the bulk transfer should be performed. Click Next > to start the bulk transfer.

Transfer Data Online
Keep this option selected to transfer the data now. If you want to transfer the data at a later point in time deactivate this option and enable the option to create a script file instead.

Create Script File for Insert Statements
If you want to store the data in a script file enable this option. You can use this option in parallel to the bulk transfer option if you want to have a backup of the transferred data.

Filename: ...

Details >> < Back Next > Cancel

Select both options to move the data and preserve a backup copy of the `INSERT` statements for later use.

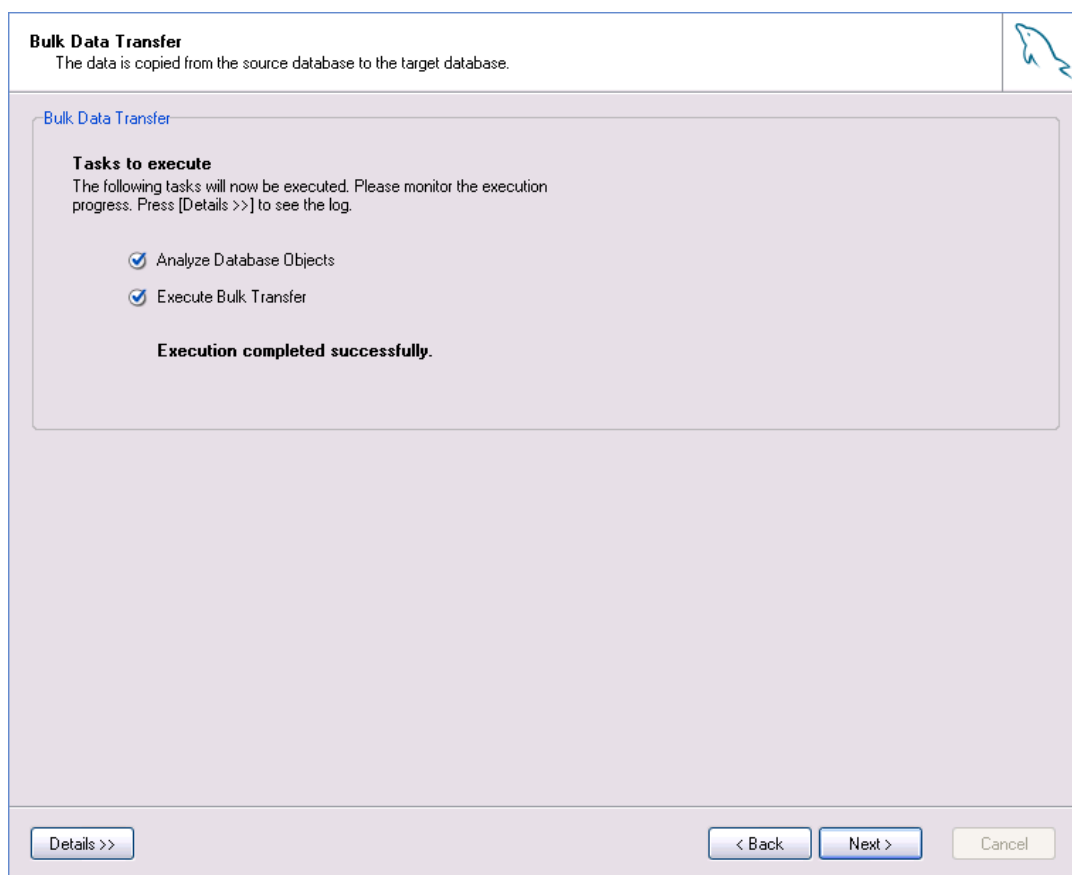
You can access additional options by clicking the Details button. If you do not wish to move BLOB data to the target server, check the box next to the Exclude BLOB values option. The BLOB data will not be moved to the target server and will not be written to the script file. If you do not wish to move BLOB data to the target server, but wish to have the BLOB data written to the script file, also check the box next to the Write BLOBs to Insert Script option.

If you wish to limit the number of rows transferred to the target server, check the box next to the Maximum Numbers of Rows to Transfer for a Table option and enter the desired number of rows. This option can be useful when generating test data.

6.16. The Bulk Data Transfer Screen

Once the data mapping options are set, the MySQL Migration Toolkit will begin the bulk data transfer process. Data will be converted to a MySQL compatible format and inserted into the target database server using bulk `INSERT` statements. Data is typically inserted in batches of 15,000 rows at a time to maximize insertion speed.

Figure 6.22. The Bulk Data Transfer screen

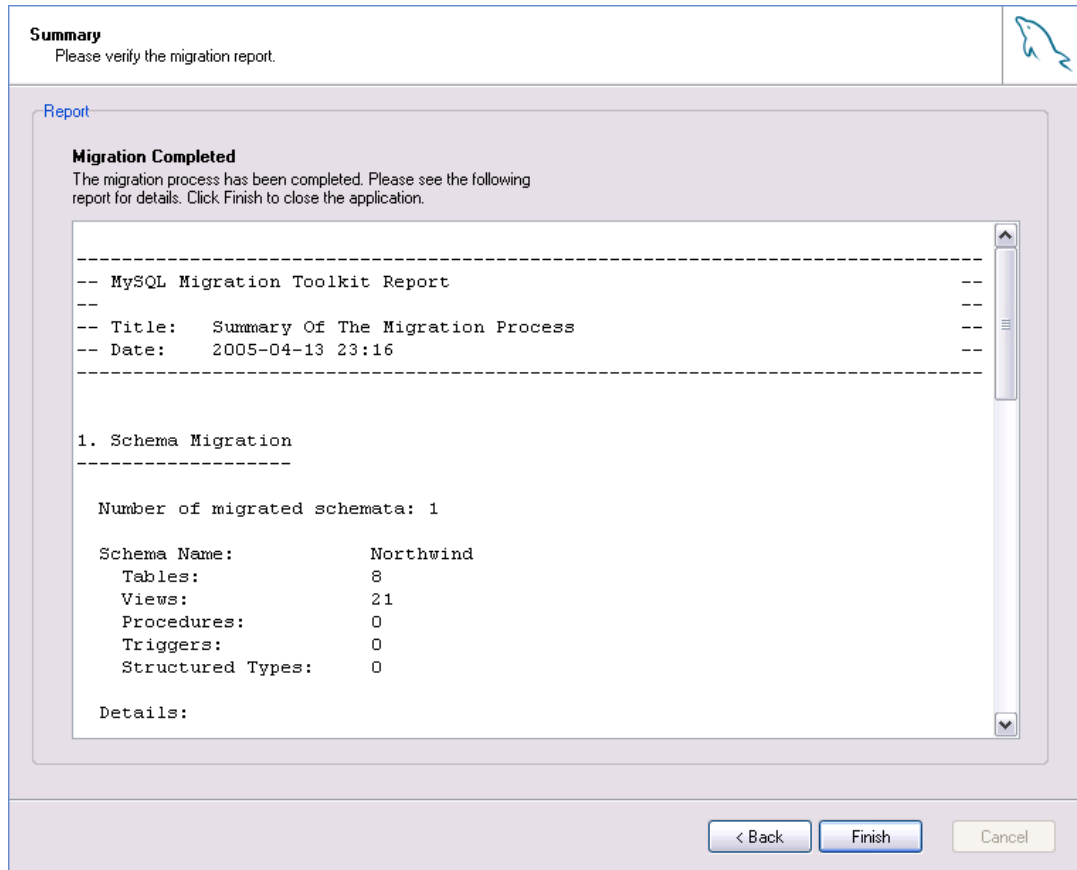


Click the Details button to view a detailed log of this stage of the migration process.

6.17. The Summary Screen

Once the bulk data transfer is complete, a summary report of the migration will be displayed:

Figure 6.23. The Summary screen



Click the Finish button to exit the MySQL Migration Toolkit.

6.18. Saving the Current Application State

If you need to close the MySQL Migration Toolkit part way through the migration process, you can save the state of the MySQL Migration Toolkit to disk and continue later.

To save the current state of the MySQL Migration Toolkit, choose the Store current application state option of the File menu.

To later retrieve the application state and resume configuring the migration, choose the Reload stored application state option of the File menu.

Chapter 7. Extending The MySQL Migration Toolkit

7.1. Introduction

One of the key features of the MySQL Migration Toolkit is that it can be easily extended and customized to support new data sources. Through the use of its Generic RunTime Environment (GRT), the MySQL Migration Toolkit can support new behaviour and data sources using code written in languages such as Java, PHP, and C.

Extending the MySQL Migration Toolkit to support a new RDBMS requires the creation of two new modules: one module that reverse engineers (ie., retrieves schema information) the source database objects and converts them into GRT objects, and one module that migrates the source GRT objects into MySQL GRT objects. The MySQL Migration Toolkit then converts the GRT MySQL objects into SQL statements that create the the target MySQL server objects.

Existing modules can be easily expanded and customized to achieve the perfect migration for individual requirements. New migration "methods" that define how the migration is performed can be added easily. The new methods are listed and can be selected by the end user in the Wizard interface or used in migration scripts.

7.2. Architecture of the MySQL Migration Toolkit

The MySQL Migration Toolkit is written on top of the Generic Runtime Environment (GRT): a thin C layer, inspired by Objective C, which allows for dynamic typing and dynamic data objects. The GRT supports the creation of new modules written in C, Java, PHP, and Lua, with support for Python and Mono forthcoming.

The MySQL Migration Toolkit is built on three primary modules: reverse engineer modules, migration modules, and transformation modules.

Reverse engineering modules retrieve the schema information from the source database and return GRT objects that describe the schema. Reverse engineering modules will have a name similar to `ReverseEngineeringAccess`.

Migration modules convert the source database GRT objects to MySQL GRT objects and then handle the bulk data transfer between the source and MySQL databases. Migration modules will have a name similar to `MigrationAccess`.

Transformation modules convert the MySQL GRT objects into the actual SQL statements used to create objects such as tables and views on the target MySQL server. Transformation modules will have a name similar to `TransformationMySQL`. Transformation modules are supplied by the MySQL GUI team and need not be created to add support for a new source database.

All modules are derived from base classes whose methods can be re-written to match the new source database.

7.3. The Modular Migration Process

From a module developer point of view, the migration process is as follows:

1. The MySQL Migration Toolkit prompts the user for a source database and connection parameters. The user selection determines which modules will be used for the source database.

2. The MySQL Migration Toolkit calls the `testConnection` method of the reverse engineering module. The `testConnection` method returns success or failure to the MySQL Migration Toolkit.
3. The MySQL Migration Toolkit calls the `getSchemata` method of the reverse engineering module. The `getSchemata` method returns a list of the schemas available on the source RDBMS for the user to choose from.
4. Once the user has selected one or more schema to migrate, the MySQL Migration Toolkit calls the `reverseEngineer` method of the reverse engineering module. The `reverseEngineer` method converts all objects in the source RDBMS (tables, views, procedures) into a collection of GRT objects.
5. After the source database has been reverse engineered, the MySQL Migration Toolkit calls the `migrationMethods` method of the migration module. The `migrationMethods` method generates a list of available methods than can be selected by the user in the Object Mapping Screen.
6. Once the user has selected the migration methods, the MySQL Migration Toolkit calls the `migrate` method of the migration module. The `migrate` method converts the source RDBMS GRT objects into MySQL GRT objects by calling the selected migration method for each source schema object. If no explicit method is assigned, the default migration method for the object type will be used.
7. After the MySQL GRT objects have been created, the MySQL Migration Toolkit calls the transformation module to convert the MySQL GRT objects into SQL statements that will create the objects on the target MySQL server. The MySQL Migration Toolkit then either executes the SQL statements on the target MySQL server or writes them to a script file.
8. In the final step, the MySQL Migration Toolkit calls the `dataBulkTransfer` method of the migration module. The `dataBulkTransfer` method loops through the selected tables in the selected schema and migrates the rows of the tables to the target MySQL database or loads them into a script file, depending on the user preference.

7.4. Tools Required to Extend the MySQL Migration Toolkit

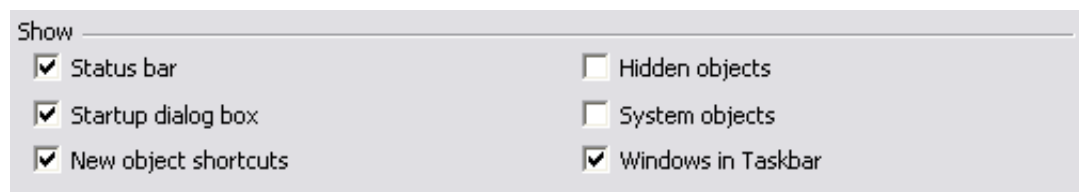
The MySQL AB GUI Team uses Eclipse for development of the MySQL Migration Toolkit modules and recommends Elcipse for use when developing modules for the MySQL Migration Toolkit. See <http://www.eclipse.org/> for more information.

Appendix A. Preparing a Microsoft Access Database for Migration

The MySQL Migration Toolkit requires access to the system tables of a Microsoft Access database for the purpose of reverse-engineering. By default, read access to the system tables of an Access database is restricted for external applications.

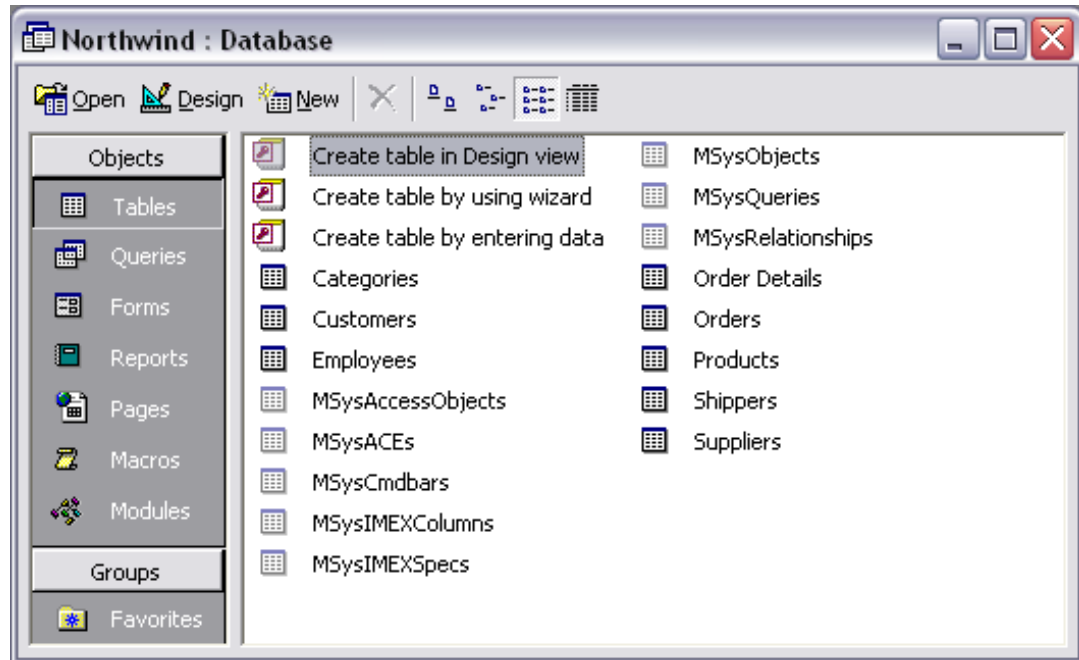
To enable access to the system tables by the MySQL Migration Toolkit, open the database in Microsoft Access and choose the Options entry of the Tools menu. Within the Options dialog, select the View tab and look for the Show section:

Figure A.1. The show section



Check the box next to the System objects option and close the options dialog. System tables for the database should now be present:

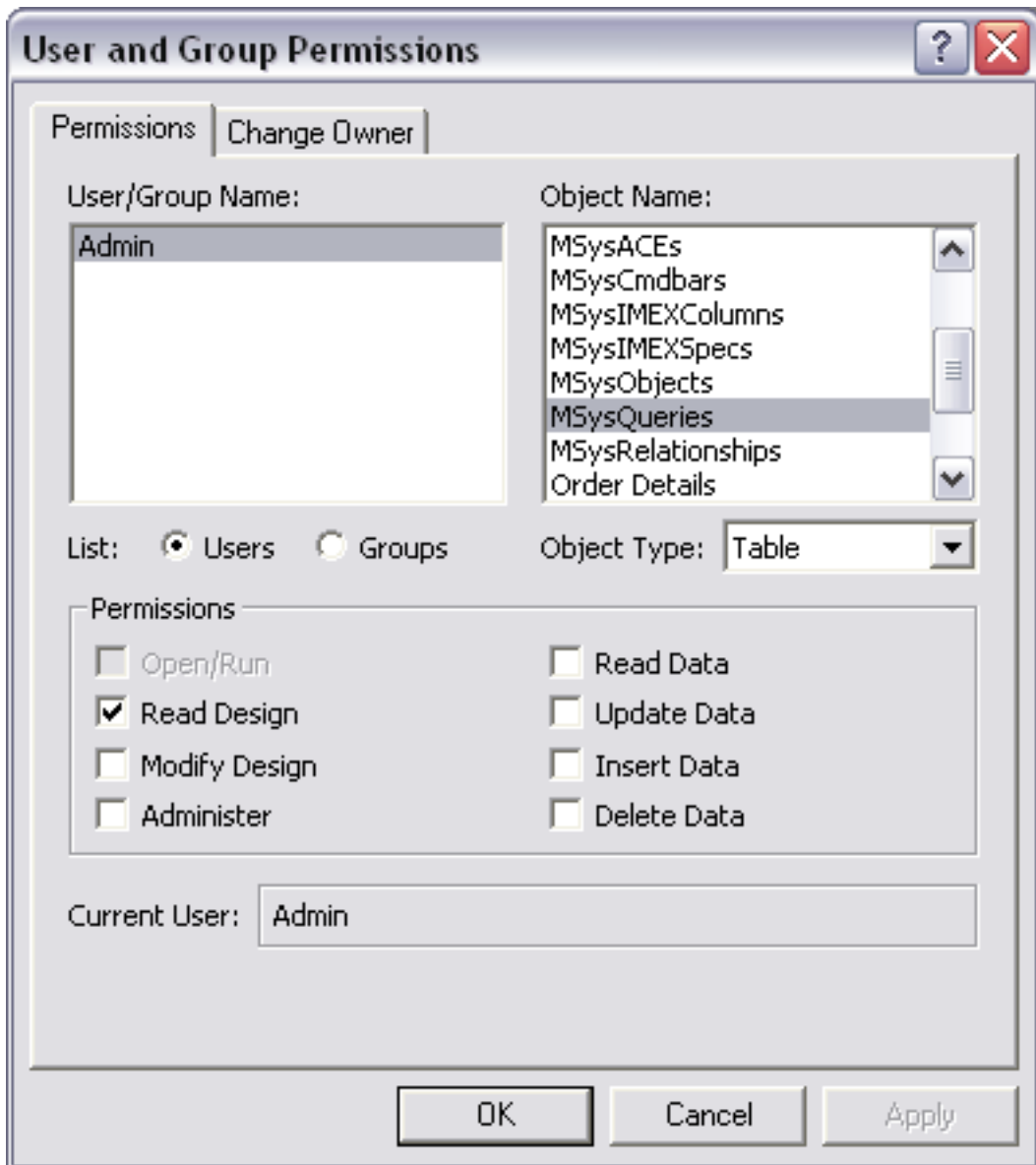
Figure A.2. The system objects



Note the presence of the various MSys tables.

After you expose the system objects to the MySQL Migration Toolkit, you must also grant permission to access the objects. Choose the User and Group Permissions entry from the Security section of the Tools menu:

Figure A.3. Granting access to the system objects



Enable the `Administer` permission for both the `MSysObjects` and `MSysQueries` tables. You will need to click the `Apply` button after enabling each table and before moving to the next table.

After completing these steps, you can reverse-engineer the schema in your Access database using the MySQL Migration Toolkit.