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Chapter 1

Altova DatabaseSpy 2019
1 Altova DatabaseSpy 2019

Altova DatabaseSpy 2019 Enterprise Edition is a Windows database client application with a consistent and easy-to-use interface that simplifies querying, visualizing, managing, comparing, designing, and constructing relational databases. It allows database administrators, database developers, and other database-oriented IT professionals seamless access to all the databases in their organization and is uniquely beneficial when you need to interact with multiple databases created at different times by different developers. DatabaseSpy also integrates with Microsoft Office products, see Support Notes.

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Last updated: 28 March 2019
Chapter 2

Introduction
2 Introduction

This User Manual contains tutorials and explanations of the various DatabaseSpy features to help you get started. It also contains a comprehensive reference section that describes DatabaseSpy features in detail. The User Manual consists of the following sections:

- An Introduction, which lists system requirements and the supported databases.
- A description of the DatabaseSpy interface.
- A Tutorial section that shows you how to quickly get started with DatabaseSpy and makes you familiar with DatabaseSpy’s features.
- A description of how to use projects to organize important elements of your database projects such as Global Resources, database connections, SQL files, and database design files.
- A detailed description of the Online Browser as well as how to browse data sources and locate database objects.
- A description of the Design Editor which can be used to graphically maintain the structure and properties of your databases.
- A description of how to retrieve and edit data using the SQL Editor.
- A description of how to display retrieved data in charts.
- Descriptions of how you can work with SQL scripts in the SQL Editor.
- A description of how to compare data in database tables and merge the content of two compared tables as well as how to compare the structure of database schemas.
- A description of how to maintain XML data in DatabaseSpy.
- A description of how to import data from XML and CSV files into your databases.
- A description of how to export data from your databases to files of the formats XML, XML Structure, CSV, HTML, and Excel.
- A detailed description of the various options you can set in DatabaseSpy.
- A User Reference that contains a description of database objects and how they are created in DatabaseSpy as well as a description of all menu commands available in DatabaseSpy.
2.1 File Paths

File paths given in this documentation will not be the same for all operating systems. Note the following correspondences:

- **Documents folder**: Example files are located at `C:\Users\<username>\Documents\Altova`.
- **Application folder**: The Application folder is the folder where your Altova application is located (by default, `C:/Program Files/Altova`). When DatabaseSpy 32-bit is installed on a 64-bit operating system, the path is `C:/Program Files (x86)/Altova`. 
2.2 Support Notes

DatabaseSpy runs on the following operating systems:

- Windows 7 SP1 with Platform Update, Windows 8, Windows 10
- Windows Server 2008 R2 SP1 with Platform Update or newer

Both the 32-bit and 64-bit platforms are supported.

DatabaseSpy integrates with Microsoft Office products as follows:

- It can be used to query and design Access databases. For supported versions, see Supported Databases
- It can export data to Excel format, see Exporting Database Data.
### 2.3 Supported Databases in DatabaseSpy

The following databases are supported. While Altova endeavors to support other databases, successful connection and data processing have only been tested with the databases listed below. If your Altova application is a 64-bit version, ensure that you have access to the 64-bit database drivers needed for the specific database you are connecting to.

<table>
<thead>
<tr>
<th>Database</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firebird 2.5.4, 3.0</td>
<td></td>
</tr>
<tr>
<td>IBM DB2 8.x, 9.1, 9.5, 9.7, 10.1, 10.5</td>
<td></td>
</tr>
<tr>
<td>IBM Db2 for i 6.1, 7.1, 7.2, 7.3</td>
<td>Logical files are supported and shown as views.</td>
</tr>
<tr>
<td>IBM Informix 11.70, 12.10</td>
<td></td>
</tr>
<tr>
<td>MariaDB 10.2, 10.3</td>
<td></td>
</tr>
<tr>
<td>Microsoft Azure SQL Database</td>
<td>SQL Server 2016 codebase</td>
</tr>
<tr>
<td>MySQL 5.0, 5.1, 5.5, 5.6, 5.7, 8.0</td>
<td></td>
</tr>
<tr>
<td>Oracle 9i, 10g, 11g, 12c</td>
<td></td>
</tr>
<tr>
<td>PostgreSQL 8.0, 8.1, 8.2, 8.3, 9.0.10, 9.1.6, 9.2.1, 9.4, 9.5, 9.6, 10, 11</td>
<td>PostgreSQL connections are supported both as native connections and driver-based connections through interfaces (drivers) such as ODBC or JDBC. Native connections do not require any drivers.</td>
</tr>
<tr>
<td>Progress OpenEdge 11.6</td>
<td>With Progress OpenEdge databases, there may be cases where a table cannot be deleted using the SQL script generated by DatabaseSpy. The workaround is to drop the table by entering a DROP TABLE statement in the SQL Editor window, instead of running the generated Database Structure Change Script. The limitation originates in the fact that, in Progress OpenEdge, you cannot drop the first index created on the table, except by dropping the table. DatabaseSpy, on the other hand, attempts to remove all table constraints (which may be linked to the first index created on the table) before removing the actual table.</td>
</tr>
<tr>
<td>SQLite 3.x</td>
<td>SQLite connections are supported as native, direct connections to the SQLite database file. No separate</td>
</tr>
<tr>
<td>Database</td>
<td>Notes</td>
</tr>
<tr>
<td>---------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Sybase ASE 15, 16</td>
<td></td>
</tr>
<tr>
<td>Teradata 16</td>
<td>drivers are required.</td>
</tr>
</tbody>
</table>
Chapter 3

The DatabaseSpy Interface
3 The DatabaseSpy Interface

The main components of the DatabaseSpy graphical user interface are illustrated below.

![DatabaseSpy Interface Diagram](image)

The interface consists of the following main items:

- Several helper windows which help you connect to a database, explore objects inside it, and organize files into projects. These include the **Project window**, **Online Browser**, **Properties window**, **Overview window**, **Data Inspector window**, **Charts window**, and **Change Script window**. Some of these windows are displayed by default, while others can be triggered on demand from the **View** menu.
- The main pane is reserved for the **SQL Editor**, where you can enter, edit, generate, and run SQL statements (this requires that a data source be created first, see the **Tutorials**). The main pane can also host the Data Comparison or Schema Comparison windows, used to compare database data or schemas, respectively.
- The **Output Window** (displayed by default in the lower part of the interface) shows various messages, warnings, and errors that may occur while you work with databases.

Use the buttons displayed in the upper-right corner of each window to show, hide, pin, or dock it. To restore toolbars and windows to their default state, run the menu command **Tools** | **Restore Toolbars and Windows**.
To quickly hide (or unhide) all windows except the main window, run the commands **View | Toggle All Side Windows** and **View | Toggle Output and Change Script Windows**. The main window can be any of the following, depending on the case: SQL Editor, Data Comparison window, Schema Comparison window.
3.1 Side Windows

3.1.1 Project Window

The Project window displays files and other items that you have added to your project, which include:

- Data sources (see Adding Data Sources)
- SQL files (see Adding Files)
- SQL templates (see SQL Templates)
- Design files (see Opening, Saving, and Printing Design Files)
- Data comparison files (see Database Data Comparison Files)
- Schema comparison files (see Database Schema Comparison Files)
- Favorites (see Favorites)

The Project window provides the following commands:

<table>
<thead>
<tr>
<th>Icon</th>
<th>Command name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Create a new project icon" /></td>
<td>Create a new project</td>
<td>Closes the active project in the Project window and displays a new, empty project. If a project contains unsaved changes when you click this button, a dialog box appears and you can choose to save changes in the editor or comparison windows and project modifications. All editor and comparison windows are set offline.</td>
</tr>
<tr>
<td><img src="image" alt="Open a project icon" /></td>
<td>Open a project</td>
<td>Shows the Open Project dialog box where you can choose a *.qprj file to open in DatabaseSpy. If there is an unsaved project already open in the Project window, you are prompted to save this project.</td>
</tr>
<tr>
<td>Icon</td>
<td>Command name</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td><strong>Save project</strong></td>
<td>Saves the project under its project name. If you save a new project for the first time, the <strong>Save As</strong> dialog box is displayed where you can specify a project name and choose a location. The project name then also appears in the Project window.</td>
</tr>
<tr>
<td></td>
<td><strong>Add files to the project</strong></td>
<td>Shows the <strong>Open</strong> dialog box where you can browse for DatabaseSpy documents (SQL files, design files, data comparison files, or schema comparison files) that should be added to the project. Files are added to the corresponding folder in the Project window.</td>
</tr>
<tr>
<td></td>
<td><strong>Add the active file</strong></td>
<td>Adds the active file to the project. If the file has not been saved yet, you are prompted to enter a name and location for the file. The file is then added to the corresponding folder in the Project window.</td>
</tr>
<tr>
<td></td>
<td><strong>Find</strong></td>
<td>Finds a project item by name. Wildcards can be used in the search. For example, the search term &quot;Pr*ject&quot; will find an item called &quot;Project&quot;.</td>
</tr>
<tr>
<td></td>
<td><strong>Find next</strong></td>
<td>Finds the next occurrence of the specified text.</td>
</tr>
<tr>
<td></td>
<td><strong>Find previous</strong></td>
<td>Find the previous occurrence of the specified text.</td>
</tr>
</tbody>
</table>

Depending on where you right-click into the Project window, different options are displayed in the context menu. The same context menu command may be available in multiple places (as shown in the "Applies to" column below).

<table>
<thead>
<tr>
<th>Context menu command</th>
<th>Description</th>
<th>Applies to...</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>New Project</strong></td>
<td>Creates a new project.</td>
<td>Any Project</td>
</tr>
<tr>
<td>(Ctrl+Shift+N)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Open Project</strong></td>
<td>Opens a project.</td>
<td>Any Project</td>
</tr>
<tr>
<td>(Ctrl+Shift+O)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Save Project</strong></td>
<td>Saves the project under its current name.</td>
<td>Any Project</td>
</tr>
<tr>
<td>(Ctrl+S)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Save Project As...</strong></td>
<td>Opens the <strong>Save As</strong> dialog box where you can define a new name and/or path for the project.</td>
<td>Any Project</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Add Files to</strong></td>
<td>Opens the <strong>Open</strong> dialog box where you can select files to be added to the project.</td>
<td>Any Project</td>
</tr>
<tr>
<td>Project...**</td>
<td></td>
<td>SQL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SQL Templates</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Design</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Data Diff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Schema Diff</td>
</tr>
<tr>
<td>Context menu command</td>
<td>Description</td>
<td>Applies to...</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>![Add Active File to Project](106x663 to 121x678) Add Active File to Project</td>
<td>Includes the active file with the project and adds it to its corresponding folder in the Project window.</td>
<td>Any Project, SQL, SQL Templates, Design, Data Diff, Schema Diff</td>
</tr>
<tr>
<td>Connect to all Data Sources</td>
<td>Connects to all data sources that are included in the project.</td>
<td>Data Sources</td>
</tr>
<tr>
<td>Disconnect from all Data Sources</td>
<td>Disconnects from all active data sources in the project.</td>
<td>Data Sources</td>
</tr>
<tr>
<td>Remove all Data Sources</td>
<td>Removes all data sources from the project.</td>
<td>Data Sources</td>
</tr>
<tr>
<td>Expand</td>
<td>Siblings</td>
<td>Expand</td>
</tr>
<tr>
<td>Collapse</td>
<td>Siblings</td>
<td>Collapse</td>
</tr>
<tr>
<td>Add a new Data Source...</td>
<td>Opens the Add a Data Source dialog box where you can define a new data source connection.</td>
<td>Data Sources</td>
</tr>
<tr>
<td>Convert all to Global Resources</td>
<td>Converts all data sources in the project to global resources. Note that data source names must not contain blanks.</td>
<td>Data Sources</td>
</tr>
<tr>
<td>Connect</td>
<td>Connects to the selected data source.</td>
<td>Any Data Source</td>
</tr>
<tr>
<td>Disconnect</td>
<td>Disconnects from the selected data source.</td>
<td>Any Data Source</td>
</tr>
<tr>
<td>Remove (Del)</td>
<td>Removes the selected item from the project.</td>
<td>Any Data Source, Any Folder, Any SQL Script.sql, Any SQL Template.sql, Any Design File, Any Data Diff File, Any Schema Diff File</td>
</tr>
<tr>
<td>Rename (F2)</td>
<td>Renames the selected item. Note that you can only rename disconnected data.</td>
<td>Any Data Source, Any Folder</td>
</tr>
<tr>
<td>Context menu command</td>
<td>Description</td>
<td>Applies to...</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td></td>
<td>sources.</td>
<td></td>
</tr>
<tr>
<td>Convert to Global Resource</td>
<td>Converts the selected data source into a global resource.</td>
<td>Any Data Source</td>
</tr>
<tr>
<td>Copy Global Resource</td>
<td>Creates a copy of the global resource and adds it to the project as a normal data source.</td>
<td>Any Data Source</td>
</tr>
<tr>
<td>into Project</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Edit Global Resource</td>
<td>Opens the Global Resource dialog box where you can edit the global data source connection.</td>
<td>Any Data Source</td>
</tr>
<tr>
<td>Create Folder...</td>
<td>Creates a sub-folder for the selected item.</td>
<td></td>
</tr>
<tr>
<td>Execute All SQL Files</td>
<td>Opens all SQL files that are contained in the SQL folder in new SQL Editor windows and executes them automatically. Note that a data source must be assigned to the files.</td>
<td>SQL</td>
</tr>
<tr>
<td>Open</td>
<td>Opens the selected file in its corresponding editor or comparison window, respectively.</td>
<td>Any SQL Script.sql</td>
</tr>
<tr>
<td>Locate file...</td>
<td>Opens Windows Explorer so that you can locate the file after it has been moved on the disk.</td>
<td>Any SQL Script.sql</td>
</tr>
<tr>
<td>Execute SQL</td>
<td>Opens and executes the SQL file in an SQL Editor window. Note that a data source must be assigned to the file.</td>
<td>Any SQL Script.sql</td>
</tr>
<tr>
<td>Remove all favorites</td>
<td>Removes all items from the Favorites folder.</td>
<td>Favorites</td>
</tr>
</tbody>
</table>

### 3.1.2 Online Browser

The Online Browser displays all the database objects of the database you are connected to. The structure of folders and database objects displayed in the Online Browser may slightly vary depending on the database kind you are connected to.
The Online Browser serves as a starting point for most of the database actions in DatabaseSpy: retrieve or edit data, create SQL statements, show database items in the Design Editor, compare data or schemas, export database data, or show the row count for tables. All these actions can be started from the Online Browser with a few mouse clicks, as further described in this documentation.

**Note:** For Online Browser to be populated, an active (connected) data source must exist in your project. By default, disconnected data sources are not displayed in the Online Browser. If you want data sources to be displayed in Online Browser regardless of whether they are connected or not, first select the data source in the Project Window, and then select the **Always show in Online Browser** check box in the Properties Window.

The Online Browser window provides the following commands:
### Layout

Click this button to choose from among several layouts to display the database objects. In the default Folders layout, the database objects are presented in a hierarchical manner.

### Filter folder content (Ctrl+Alt+F)

Click this button if you want to reduce the number of displayed items by means of a filter.

### Show Favorites

You can add database objects that you use frequently to your favorites; these objects appear then in bold in the Online Browser and are available in the Favorites folder of the Project window. The Show Favorites icon allows you to switch between viewing all objects and showing only favorites.

### Object Locator (Ctrl+L)

For finding specific objects in the database you can use the Object Locator. This button toggles the Object Locator on and off.

### Refresh Data Source (F5)

Clicking this button refreshes the data source to reflect the latest changes in the database structure and updates the display of the Online Browser.

#### 3.1.3 Properties Window

The Properties window displays the properties of any selected object in the graphical user interface of DatabaseSpy. For a better overview, each element is assigned a particular color in the properties title bar. You can change these colors in the Design Editor options. If no object is selected, the properties of the editor or comparison window itself will be displayed.
You can customize the appearance of the Properties window by clicking one of the following buttons at the right edge of the header line:

- **Hide empty properties**  
  Hides all lines where no entry appears.

- **Show empty properties**  
  Restores all lines and displays also empty properties.

For performance reasons, information about child objects of an element is loaded only on demand, that is, if that particular element is expanded in the Online Browser or displayed in the Design Editor. To explicitly request information about an object, click the appropriate **Update Count** field in the object properties.

### 3.1.4 Overview Window

The Overview window serves as a navigator for large design files that occupy more space than is available in the Design Editor window. The Overview window shows the currently displayed area in the design and you can move the focus by clicking into the rectangle and moving it to the desired location in the design file.

To display the Overview window:

- On the **View** menu, click **Overview Window**.
Like other DatabaseSpy windows, the Overview window can be undocked and dragged to any position within the application, see Arranging the Information Windows.

### 3.1.5 Data Inspector Window

The Data Inspector Window is a convenient way to display the content of large data cells when you have only limited space to view the data directly in the result grid. The Data Inspector can be called via the View menu or by clicking the Show Data Inspector window while one or more data cells are selected in the Result window or in the Database Data Comparison window.

You can resize the Data Inspector window to view all the data it contains, or dock it to the application, see Arranging the Information Windows. In addition, the following commands are available in the Data Inspector:

<table>
<thead>
<tr>
<th>Icon</th>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Icon" /></td>
<td>Word wrap</td>
<td>Automatically wraps the text in the window so as to make all the text visible. This is a toggle command, that is, word wrap is turned off</td>
</tr>
<tr>
<td>Icon</td>
<td>Command</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td>again if you click the button again.</td>
<td></td>
</tr>
<tr>
<td><img src="image" alt="Pretty Print" /></td>
<td>Pretty Print</td>
<td>This button is applicable only to cells that store XML data. It indents the XML tags in a consistent and more readable way.</td>
</tr>
<tr>
<td><img src="image" alt="Save As" /></td>
<td>Save As</td>
<td>Opens the standard Windows <strong>Save As</strong> dialog box where you can specify a path and file name for the content of the data cell. The default file format is XML for XML columns and text for any other columns. You can also choose a different file format if you select &quot;All Files&quot; in the <strong>Save as type</strong> drop down list.</td>
</tr>
</tbody>
</table>
3.2 Output Window

The Output window in DatabaseSpy contains loading and error messages. Underlined parts in the Output window are hyperlinks which enable you to jump to a certain database object in the Online Browser.

Output window

The Output window provides the following commands:

<table>
<thead>
<tr>
<th>Icon</th>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Filter</td>
<td>Opens a context menu from where you can filter out messages by their severity (information messages, errors, warnings, and so on). Furthermore, you can check all or none of these options with a single mouse click by selecting either <strong>Check All</strong> or <strong>Uncheck All</strong> from the context menu.</td>
</tr>
<tr>
<td></td>
<td>Next</td>
<td>Jumps to and highlights the next message.</td>
</tr>
<tr>
<td></td>
<td>Previous</td>
<td>Jumps to and highlights the previous message.</td>
</tr>
<tr>
<td></td>
<td>Copy message</td>
<td>Copies the selected message to the clipboard.</td>
</tr>
<tr>
<td></td>
<td>Copy message with children</td>
<td>Copies the selected message including its children to the clipboard.</td>
</tr>
<tr>
<td></td>
<td>Copy all</td>
<td>Copies all messages in the message window to the clipboard.</td>
</tr>
<tr>
<td></td>
<td>Find</td>
<td>Opens the <strong>Find</strong> dialog box.</td>
</tr>
<tr>
<td></td>
<td>Find previous</td>
<td>Jumps to the previous occurrence of the string specified in the <strong>Find</strong> dialog box.</td>
</tr>
<tr>
<td></td>
<td>Find next</td>
<td>Jumps to the next occurrence of the string specified in the <strong>Find</strong> dialog box.</td>
</tr>
<tr>
<td>Icon</td>
<td>Command</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>![Icon]</td>
<td>Clear</td>
<td>Removes all messages from the Output window.</td>
</tr>
</tbody>
</table>

The Output window may show any of the following status icons accompanied by a respective message:

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Icon]</td>
<td>Denotes a success message (for example, after a database update query has been successfully run).</td>
</tr>
<tr>
<td>![Icon]</td>
<td>Denotes a message which indicates the progress of an operation.</td>
</tr>
<tr>
<td>![Icon]</td>
<td>Denotes an information message.</td>
</tr>
<tr>
<td>![Icon]</td>
<td>Denotes a warning message.</td>
</tr>
<tr>
<td>![Icon]</td>
<td>Denotes an error (for example, one returned by the database when a query fails). The actual error text may be provided by the driver which was used to connect to the database.</td>
</tr>
</tbody>
</table>
3.3 Charts Window

The Charts window serves to display selected data from the result grid in a graphical form. It contains nine tabs so that you can produce different charts from a single result grid or from different Result windows.

The Charts window provides the following commands:

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change Type</td>
<td>Opens the Chart Type dialog box where you can choose between pie, bar, line, and gauge charts and select several sub-types.</td>
</tr>
<tr>
<td>Change Appearance</td>
<td>Opens the Change Appearance dialog box which allows you to define titles, labels, axes, sizes, fonts, and 3d features (if applicable).</td>
</tr>
<tr>
<td>Select Data</td>
<td>Opens the Chart Data dialog box where you can choose the columns that should be depicted on the X- and Y-axes.</td>
</tr>
<tr>
<td>Export</td>
<td>Opens a submenu which allows you to save the chart, copy it to the clipboard or print the chart.</td>
</tr>
<tr>
<td>Reload</td>
<td>Reloads the data from the Result window. If the Auto toggle is activated, data is reloaded automatically when the source data is changed.</td>
</tr>
</tbody>
</table>

For more information, see Displaying Charts.
3.4 Database Structure Change Script Window

The Database Structure Change Script window records any changes you make to the database structure in an SQL script. This script is either generated instantly or on demand, depending on the settings in the Change Script options.

In order to provide a better overview if changes are made in large scale, the change script is structured into regions, which can be collapsed or expanded when checking the script. Please note that collapsing a region will not exclude this part of the script from execution; collapsed regions are expanded automatically when the change script is being executed.

If you have several data sources connected and you change the structure in more than one of them, a separate tab is created for each data source in the Database Structure Change Script window.

When defining primary keys or check constraints, the Database Structure Change Script window also displays comments on the validity of the definition.

The Database Structure Change Script window provides the following commands.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>🏢</td>
<td>Execute Change Script</td>
<td>Executes the change script and thus implements the recorded changes in the database. In the Change Script options, you can define the time delay during execution of the script.</td>
</tr>
</tbody>
</table>
## The DatabaseSpy Interface

### Database Structure Change Script Window

<table>
<thead>
<tr>
<th>Icon</th>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
</table>
|      | **Stop**                 | Terminates the execution of the change script, the remaining changes are not implemented in the database and the Database Structure Change Script window is cleared. This button is only visible while a change script is being executed.  
**Note**: When you click the **Stop** button, all changes that have not been executed so far will be lost. |
| ![Folder] | **Generate Change Script** | Generates or updates, respectively, a change script that reflects all the changes you have made in the database design since the change script has last been updated. This button is only active if you have defined in the Change Script options that the change script be generated on demand. |
| ![Folder] | **Edit Change Script**   | Opens the change script in a new SQL Editor window where you can edit it.  
**Note**: The script will be removed from the Database Structure Change Script window and the changes will be lost unless you execute the script in the SQL Editor. |
| ![Folder] | **Save Change Script**   | Opens the standard Windows **Save As** dialog box where you can save the script as an SQL file.                                               |
| ![Folder] | **Discard Changes**      | Discards all changes recorded in the change script. The changes you made in the design will not be implemented in the database and the Database Structure Change Script window will be cleared. |
3.5 Editors and Comparison Windows

3.5.1 SQL Editor

The SQL Editor is the area where you can display, edit, and execute SQL statements. It provides a Message window that displays success or error messages and warnings, and a Result window to display the query results, if applicable.

**Note:** A new SQL Editor window is automatically associated with the data source that is active in the Online Browser or Project Window. The active data source is displayed at all times in the Execution Target Bar. That is, all commands issued from SQL Editor will affect this particular data source only. If there are multiple data sources, the SQL Editor belongs to the one which was last clicked before you opened the SQL Editor. Any subsequent SQL Editor windows that you open will inherit the currently active data source.

The Execution Target Bar (set to be visible by default) indicates at all times the database against which all statements in the SQL Editor will be executed. See also Execution Target Bar.

The SQL Editor window provides the following commands:
<table>
<thead>
<tr>
<th>Icon</th>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Execute" /></td>
<td>Execute (F5)</td>
<td>Runs the statement (or statements) displayed in SQL Editor against the database.</td>
</tr>
<tr>
<td><img src="image" alt="Execute" /></td>
<td>Execute for data editing</td>
<td>This command is applicable only for SELECT statements. It executes the SELECT statement and switches the results into editing mode. See also Retrieving and Editing Data.</td>
</tr>
<tr>
<td><img src="image" alt="Next Statement" /></td>
<td>Next Statement (Alt+Down)</td>
<td>If the SQL Editor contains multiple statements, this command jumps to the next statement and selects it.</td>
</tr>
<tr>
<td><img src="image" alt="Previous Statement" /></td>
<td>Previous Statement (Alt+Down)</td>
<td>If the SQL Editor contains multiple statements, this command jumps to the previous statement and selects it.</td>
</tr>
<tr>
<td><img src="image" alt="Last Statement" /></td>
<td>Last Statement (Alt+End)</td>
<td>If the SQL Editor contains multiple statements, this command jumps to the last statement and selects it.</td>
</tr>
<tr>
<td><img src="image" alt="First Statement" /></td>
<td>First Statement (Alt+Up)</td>
<td>If the SQL Editor contains multiple statements, this command jumps to the first statement and selects it.</td>
</tr>
<tr>
<td><img src="image" alt="Select Entire Statement" /></td>
<td>Select Entire Statement</td>
<td>Selects the SQL statement in which the cursor is currently located.</td>
</tr>
<tr>
<td><img src="image" alt="Toggle Result Window(s)" /></td>
<td>Toggle Result Window(s)</td>
<td>Shows or hides the Result window containing the query results (if applicable). If the query returns multiple recordsets, then multiple Result tabs will be shown.</td>
</tr>
<tr>
<td><img src="image" alt="Toggle Messages Window" /></td>
<td>Toggle Messages Window</td>
<td>Shows or hides the Message window.</td>
</tr>
<tr>
<td><img src="image" alt="Show multiple results stacked" /></td>
<td>Show multiple results stacked</td>
<td>This option is applicable if the SQL Editor contains multiple statements which would retrieve multiple recordsets after execution.</td>
</tr>
<tr>
<td><img src="image" alt="Show groupings for execution" /></td>
<td>Show groupings for execution</td>
<td>If the SQL Editor contains multiple statements, this command displays statements as standalone execution blocks, if allowed by the context. See also Showing Execution Groups.</td>
</tr>
<tr>
<td><img src="image" alt="Export" /></td>
<td>Export</td>
<td>Opens the Export dialog box, see Exporting Database Data.</td>
</tr>
<tr>
<td><img src="image" alt="Re-parse the whole document" /></td>
<td>Re-parse the whole document</td>
<td>Re-parses the statements in the currently active SQL Editor window. This helps correct parsing errors that may have occurred during the initial parsing of the statement.</td>
</tr>
</tbody>
</table>
The Message window provides a statistical overview on the SQL statement that has been executed last and reports errors that might have occurred during execution.

Underlined parts in the Message window are hyperlinks which enable you to jump to a certain part of the SQL script in the SQL Editor, or to the corresponding Result window that holds the result of the respective SQL statement.

The commands and status icons available in this window are identical with those in the Output Window.

3.5.1.2 Result Window

The Result window of the SQL Editor shows the recordsets that were retrieved as a result of the database query. If an SQL Editor window contains more than one query, the results are displayed either in individual tabs or stacked in a single window, depending on configured options.
The status bar at the bottom of the window displays information on the progress of the query: whether the retrieval executed successfully, was aborted or has been stopped by the user. In addition, the number of rows and columns retrieved as well as the amount of time necessary for retrieval, and the time when the query was executed.

**Note:** In DatabaseSpy, a maximum number of 30 result tabs is allowed. If you execute a query that would produce more than 30 result tabs, only the first 30 result tabs are generated and a corresponding message is displayed in the Message window.

When you right-click anywhere in the Result window of the SQL Editor, a context menu opens which provides options for working with the results of a query. The corresponding toolbar icons are shown to the left, and keyboard shortcuts to the right of the options if they are available. Note that the available options in the context menu change dynamically, depending on the command you used for retrieving the data in the Result window. The Result window can therefore be in three different states: Execution was successful, Stopped retrieval, or Editing mode.

**Execution was successful**

The message indicates that the SELECT query has been executed successfully. This enables the following commands in the toolbar and in the context menu.

<table>
<thead>
<tr>
<th>Go to statement</th>
<th>Jumps to the SQL Editor window and highlights the group of SQL statements that produced the respective result.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Auto Size Columns</strong></td>
<td>Adjusts the column width of all columns to provide an optimized view of text contained in the columns. Please note that the maximum column width for auto-sizing in the Result window is 250 pixels. In data cells containing a large amount of text, only the first part of the text is displayed followed by an ellipsis (...). You can, however, always drag the column border to show more text.</td>
</tr>
<tr>
<td><strong>Selection</strong></td>
<td>Allows you to select the row or column in</td>
</tr>
<tr>
<td><strong>Sorting</strong></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Opens a sub-menu to sort the table either ascending or descending and uses the column where the cursor is currently positioned as a sort key. To restore the default sort order, choose the corresponding option from the sub-menu.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Copy selected cells</strong></th>
<th><strong>Ctrl+C</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Copies the selected cells to the clipboard. You can select several individual cells by holding down the Ctrl button and clicking the desired cells or select a consecutive number of neighboring cells by clicking a cell and pressing the Shift key while clicking a second cell. The content of the cells can be pasted as tabbed text into a text editor or spreadsheet calculator, or can replace existing cells in the result grid. This menu option is only available if data editing in the Result window is enabled.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Copy selected cells with header</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Copies the selected cells as well as the corresponding headers (i.e., the column names) to the clipboard.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Show in Data Inspector Window</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Opens the Data Inspector window where you can conveniently view the content of large data cells.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Show result toolbar</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Shows or hides the toolbar in the Result window of the SQL Editor window.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Auto Hide</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>currently not available</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Hide</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hides the Results window. In order to show it again, click the <strong>Toggle Result Window(s)</strong> button in the toolbar of the SQL Editor window or choose the menu option SQL Editor</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Result view.</td>
</tr>
</tbody>
</table>

**Stopped Retrieval**

The **Stopped Retrieval** message indicates that the SELECT query has finished retrieving the first *n* rows. The query has been started by right-clicking tables, columns or views in the Online Browser and selecting **Retrieve data | First n rows** from the context menu. In this mode, the following additional options are available in the Result window:

<table>
<thead>
<tr>
<th><strong>Retrieve next n rows</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Retrieves the next <em>n</em> rows from the query in the active SQL Editor window.</td>
<td></td>
</tr>
</tbody>
</table>
The **Retrieve outstanding rows** button retrieves all the remaining rows from the query in the active SQL Editor window.

### Editing Mode

The ![Edit Mode](image) message indicates that data in the Result window can be edited. The query has been started by executing a SELECT statement with the **Execute for Data Editing** command, or by right-clicking tables, columns or views in the Online Browser and selecting **Edit data** from the context menu. When the SQL Editor is in the Editing mode, the following additional options are available in the Result window:

<table>
<thead>
<tr>
<th>Option</th>
<th>Shortcut</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paste</td>
<td>Ctrl+V</td>
<td>Pastes the content of the clipboard into the cell—and, if applicable, its neighboring cells—where the cursor is currently positioned. Note that if you use the <strong>Edit cell</strong> command before pasting, the entire content of the clipboard will be pasted into the selected cell as tabbed text.</td>
</tr>
<tr>
<td>Paste as new rows</td>
<td>Ctrl+Shift+V</td>
<td>Adds new rows to the result grid and pastes the content of the clipboard into the new rows. Note that only content that has been copied using the <strong>Copy selected cells</strong> command can be pasted as new rows.</td>
</tr>
<tr>
<td>Edit cell</td>
<td></td>
<td>Enables the data cell for editing and selects the content of the cell. This menu option is only available if no limitations with regard to editing records apply.</td>
</tr>
<tr>
<td>Set Null</td>
<td></td>
<td>Resets the cell to the NULL value.</td>
</tr>
<tr>
<td>Set Default</td>
<td></td>
<td>Resets the cell to the default value. This menu option is only available if a default value has been defined for the cell.</td>
</tr>
<tr>
<td>Undo Changes for this Cell</td>
<td></td>
<td>Rejects the changes that have been made to a data cell but not yet committed to the database.</td>
</tr>
<tr>
<td>Append a new row</td>
<td>Alt+Ins</td>
<td>Adds a new line to the result grid, where you can <strong>add records</strong> to the database table. The data must be committed to the database by clicking the <strong>Commit</strong> button. This menu option is only available if no limitations with regard to adding records apply.</td>
</tr>
<tr>
<td>Delete row</td>
<td></td>
<td>Deletes the row in which the cursor is currently positioned. This menu option is only available if no limitations with regard to deleting records apply.</td>
</tr>
</tbody>
</table>
Other commands
In addition, the toolbar provides the following commands:

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Find</td>
<td>Opens a Find dialog box allowing you to search a particular string in the Result window.</td>
</tr>
<tr>
<td>Maximize result view</td>
<td>Enlarges the size of the Result window to a maximum.</td>
</tr>
<tr>
<td>Undo all changes</td>
<td>Rejects all changes that have been made in the result grid since the data has been selected from the database or since updated data has last been committed to the database, respectively. This toolbar option is only available if the Result window is in the Editing mode.</td>
</tr>
<tr>
<td>Pin down</td>
<td>Pins the Result window so that it remains visible even if other queries are executed in the same window.</td>
</tr>
<tr>
<td>Show Data in Chart Window</td>
<td>Opens the Select columns dialog box in which you can choose the columns that are to be used as source for the chart.</td>
</tr>
</tbody>
</table>

When the Result window is in editing mode and XML columns are present in the current grid, the following menu opens if you click the button:

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load XML Document from File...</td>
<td>Opens the standard Windows Open dialog box from where you can choose an XML file to load into the selected cell in the result grid.</td>
</tr>
<tr>
<td>Save XML Document to File...</td>
<td>Opens the standard Windows Save As dialog box where you can choose a location to save the content of the selected cell as XML file.</td>
</tr>
<tr>
<td>Assign XML Schema...</td>
<td>Opens the Choose XML Schema dialog box where you can [assign an XML schema](assign an XML schema) for validation of the XML file stored in the database field.</td>
</tr>
</tbody>
</table>

3.5.2 Design Editor

The Design Editor is a graphical user interface where you can view your database objects and their relations as graphical objects. A table including its columns, indexes, keys, and constraints is displayed in a so-called table design (see Viewing Table Structure). You can add new tables or edit existing ones or just drag a table into a Design Editor window to see what its structure looks like.
When you add new objects (e.g., tables or columns) to Design Editor or change the structure of existing ones, these changes are not immediately effective in the database. Any changes in the database design are recorded in the Database Structure Change Script and can then either be executed or rejected.

When you right-click in an unoccupied area of the Design Editor, several general options are available in the context menu which are listed below. The corresponding Toolbar icons are shown to the left, and keyboard shortcuts to the right of the options if they are available.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Command</th>
<th>Shortcut</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Create new Table" /></td>
<td>Create new Table</td>
<td>Ctrl+T</td>
<td>Creates a new table in the currently active Design Editor window and automatically assigns it to the active data source, that is, the data source which is selected in the Online Browser. See also Creating Tables.</td>
</tr>
<tr>
<td><img src="image" alt="Add Sticky Note" /></td>
<td>Add Sticky Note</td>
<td>Alt+N</td>
<td>Adds a Sticky Note to the Design Editor window.</td>
</tr>
<tr>
<td><img src="image" alt="Select User Tables" /></td>
<td>Select</td>
<td>Alt+T</td>
<td>Selects all user tables that are contained in the active Design Editor window.</td>
</tr>
<tr>
<td><img src="image" alt="Select System Tables" /></td>
<td>Select</td>
<td>Alt+S</td>
<td>Selects all system tables that are contained in the active Design Editor window.</td>
</tr>
<tr>
<td><img src="image" alt="Auto Layout whole" /></td>
<td>Auto Layout whole</td>
<td></td>
<td>Shows the design in a hierarchical layout where</td>
</tr>
<tr>
<td>Icon</td>
<td>Command</td>
<td>Shortcut</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-----------------------</td>
<td>----------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Diagram</td>
<td></td>
<td>all relations between the tables are considered and the tables are laid out properly.</td>
</tr>
<tr>
<td></td>
<td>Save Diagram as Image</td>
<td></td>
<td>Saves the currently active design as Portable Network Graphic (<em>.png) or Enhanced Windows Metafile (</em>.EMF).</td>
</tr>
</tbody>
</table>

In addition, the toolbar provides the following icons:

<table>
<thead>
<tr>
<th>Icon</th>
<th>Command</th>
<th>Shortcut</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Changes the <strong>zoom factor</strong> of the Design Editor window; enter a value or select a zoom factor from the drop-down list.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Zoom in</td>
<td>Ctrl+Num +</td>
<td>Increases the zoom factor of the Design Editor window by 10 percent. You can also zoom in by scrolling (with the scroll-wheel of the mouse) while keeping the <strong>Ctrl</strong> key pressed.</td>
</tr>
<tr>
<td></td>
<td>Zoom Out</td>
<td>Ctrl+Num -</td>
<td>Decreases the zoom factor of the Design Editor window by 10 percent. You can also zoom out by scrolling (with the scroll-wheel of the mouse) while keeping the <strong>Ctrl</strong> key pressed.</td>
</tr>
<tr>
<td></td>
<td>Zoom to Fit</td>
<td></td>
<td>Sizes the working area to include all tables in the current Design Editor window.</td>
</tr>
<tr>
<td></td>
<td>Insert Referenced Tables</td>
<td></td>
<td>Inserts all related tables that are referenced by a constraint of the selected table.</td>
</tr>
<tr>
<td></td>
<td>Insert Referencing Tables</td>
<td></td>
<td>Inserts all related tables that include a constraint referencing the selected table.</td>
</tr>
<tr>
<td></td>
<td>Insert All Related Tables</td>
<td></td>
<td>Inserts both referenced and referencing tables.</td>
</tr>
<tr>
<td></td>
<td>Expand selected Tables</td>
<td></td>
<td>Expands all tables that are selected in the current Design Editor window.</td>
</tr>
<tr>
<td></td>
<td>Collapse selected Tables</td>
<td></td>
<td>Collapses all tables that are selected in the current Design Editor window.</td>
</tr>
<tr>
<td></td>
<td>Snap to Grid</td>
<td>Ctrl+G</td>
<td>Shows/hides the grid and toggles the snap-to-grid function on and off.</td>
</tr>
<tr>
<td></td>
<td>Export</td>
<td></td>
<td>Lets you export data from tables, see <a href="#">Exporting Database Data</a>. This command becomes enabled after you select one or more tables in Design Editor.</td>
</tr>
</tbody>
</table>
Editors and Comparison Windows

<table>
<thead>
<tr>
<th>Icon</th>
<th>Command</th>
<th>Shortcut</th>
<th>Description</th>
</tr>
</thead>
</table>
| ![Icon](image1) | Update Change Script |          | Starts the generation of a change script or updates it after changes occurred to the database structure.

By default, the database structure change script is configured to be generated or updated automatically, so this button is disabled. To enable on demand generation of the database change script, select the **On demand** check box in Change Script options.

| ![Icon](image2) | Show Options          |          | Opens the Design Editor options dialog box where you can customize the settings for the Design Editor. |

For more information about exploring or designing the database structure in Design Editor, see Exploring and Changing the Database Structure.

### 3.5.3 Data Comparison Window

The Data Comparison window allows users to select and display tables from two data sources (that may or may not be different) for the purposes of comparing the data in these tables. Mappings are defined either automatically by DatabaseSpy or manually by the user in this view. Mapping of tables can be fine-tuned to include a subset of the table's columns. Note that you need an **active connection** to a data source to be able to display a Data Comparison window.
Data Comparison window

When you right-click in an unoccupied area of the Data Comparison window, several options are available in the context menu which are listed below. The corresponding Toolbar icons are shown to the left of the options if they are available.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Icon]</td>
<td>Compare tables</td>
<td>Starts a data comparison of the tables that are currently mapped in the Data Comparison window.</td>
</tr>
<tr>
<td>![Icon]</td>
<td>Merge Left to Right</td>
<td>Merges the mapped tables so that the table on the right side is updated with the data of the table on the left side of the comparison. If you start this command from the toolbar and one or more tables are selected, only the selected tables will be merged.</td>
</tr>
<tr>
<td>![Icon]</td>
<td>Merge Right to Left</td>
<td>Merges the mapped tables so that the table on the left side is updated with the data of the table on the right side of the comparison. If you start this command from</td>
</tr>
<tr>
<td>Icon</td>
<td>Command</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>![Icon]</td>
<td>Show results</td>
<td>Shows the result of the data comparison in a new tab of the Comparison Result View (if the data has not been compared yet) or displays the corresponding result tab (if the data has already been compared before).</td>
</tr>
<tr>
<td>![Icon]</td>
<td>Open in new Schema Comparison</td>
<td>Opens all tables that are included in the data comparison in a new Schema Comparison window.</td>
</tr>
<tr>
<td>![Icon]</td>
<td>SQL and Data</td>
<td>Show merge script: Left to Right</td>
</tr>
<tr>
<td>![Icon]</td>
<td>SQL and Data</td>
<td>Show merge script: Right to Left</td>
</tr>
<tr>
<td>![Icon]</td>
<td>SQL and Data</td>
<td>Show restore script: Left</td>
</tr>
<tr>
<td>![Icon]</td>
<td>SQL and Data</td>
<td>Show restore script: Right</td>
</tr>
<tr>
<td>![Icon]</td>
<td>Sort tables</td>
<td>Ascending</td>
</tr>
<tr>
<td>![Icon]</td>
<td>Sort tables</td>
<td>Descending</td>
</tr>
<tr>
<td>![Icon]</td>
<td>Sort tables</td>
<td>Ascending mapped first</td>
</tr>
<tr>
<td>![Icon]</td>
<td>Sort tables</td>
<td>Descending mapped first</td>
</tr>
<tr>
<td>![Icon]</td>
<td>Map items</td>
<td>Maps corresponding tables in the Data Comparison window.</td>
</tr>
<tr>
<td>![Icon]</td>
<td>Unmap items</td>
<td>Removes all mappings from the Data Comparison window.</td>
</tr>
<tr>
<td>![Icon]</td>
<td>Expand tables</td>
<td>Expands all tables in the Data Comparison window and shows the table columns.</td>
</tr>
<tr>
<td>Icon</td>
<td>Command</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>--------------------------</td>
<td>-------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Collapse tables</td>
<td>Collapses all tables in the Data Comparison window.</td>
</tr>
<tr>
<td>🍃</td>
<td>Autolayout</td>
<td>Optimizes the component size and tries to display as</td>
</tr>
<tr>
<td></td>
<td></td>
<td>much of the two components as possible in the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>comparison window.</td>
</tr>
</tbody>
</table>

In addition, the toolbar provides the following icons:

<table>
<thead>
<tr>
<th>Icon</th>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stop Comparison</td>
<td>Stops the currently running comparison process. This</td>
</tr>
<tr>
<td></td>
<td></td>
<td>button is only visible while a comparison is running.</td>
</tr>
<tr>
<td></td>
<td>Toggle Message Window</td>
<td>Toggles the Message window on and off.</td>
</tr>
<tr>
<td></td>
<td>Show Options</td>
<td>Opens the Data Compare page of the Options dialog box.</td>
</tr>
</tbody>
</table>

### 3.5.3.1 Compare Result View

The result of a database data comparison is displayed in the Compare Result View which also provides context menu options and toolbar buttons for merging data to the left or right side of the comparison.

If the tables contain columns with different data types on the left and right sides which prevent data from being merged in one of the tables, the toolbar contains two additional icons which can be used to show or hide such columns. In the example below, the Show/Hide columns which don’t have any differences option has been toggled off.
The Compare Result view provides context menu options and toolbar buttons for filtering the content displayed in the Compare Result View, for navigating the differences, and for merging the differences between the two tables. The corresponding Toolbar icons are shown to the left, and keyboard shortcuts to the right of the options if they are available.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Auto Size Columns" /></td>
<td>Auto Size Columns</td>
<td>Adjusts the column width for all columns in the result grid so as to display the content properly.</td>
</tr>
<tr>
<td><img src="image" alt="Show/Hide all equal rows" /></td>
<td>Show/Hide all equal rows</td>
<td>Shows or hides rows that are equal in the left and right table.</td>
</tr>
<tr>
<td><img src="image" alt="Show/Hide all different rows" /></td>
<td>Show/Hide all different rows</td>
<td>Shows or hides rows that are different in the left and right table.</td>
</tr>
<tr>
<td><img src="image" alt="Show/Hide rows that are only on the left" /></td>
<td>Show/Hide rows that are only on the left</td>
<td>Toggles on and off the display of rows that are present in the left table only.</td>
</tr>
<tr>
<td><img src="image" alt="Show/Hide rows that are only on the right" /></td>
<td>Show/Hide rows that are only on the right</td>
<td>Toggles on and off the display of rows that are present in the right table only.</td>
</tr>
<tr>
<td><img src="image" alt="Show/Hide rows that cannot be merged from left to right" /></td>
<td>Show/Hide rows that cannot be merged from left to right</td>
<td>Shows or hides rows that are different in the left and right component and can be merged only from the right to the left side and not from the left to the right side. This button is only visible if columns with conflicting data types are compared.</td>
</tr>
<tr>
<td><img src="image" alt="Show/Hide rows that cannot be merged from right to left" /></td>
<td>Show/Hide rows that cannot be merged from right to left</td>
<td>Shows or hides rows that are different in the left and right component and can be merged only from the left to the right side and not from the right to the left side. This button is only visible if columns with conflicting data types are compared.</td>
</tr>
<tr>
<td><img src="image" alt="Next difference" /></td>
<td>Next difference</td>
<td>Selects the next difference as the current difference.</td>
</tr>
<tr>
<td><img src="image" alt="Previous difference" /></td>
<td>Previous difference</td>
<td>Selects the previous difference as the current difference.</td>
</tr>
<tr>
<td><img src="image" alt="Last difference" /></td>
<td>Last difference</td>
<td>Selects the last difference in the document as the current difference.</td>
</tr>
</tbody>
</table>
### First difference
Selects the first difference in the document as the current difference.

### Merge data from left to right
Updates the selected data cell in the right table using the data contained in the data cell of the left table. Note that the change is committed to the database immediately without a change script being generated.

### Merge data from right to left
Updates the selected data cell in the left table using the data contained in the data cell of the right table. Note that the change is committed to the database immediately without a change script being generated.

### Copy selected cells (Ctrl+C)
Copies the selected cells to the clipboard. You can select several individual cells by holding down the Ctrl button and clicking the desired cells or select a consecutive number of neighboring cells by clicking a cell and pressing the Shift key while clicking a second cell. The content of the cells can be pasted as tabbed text into a text editor or spreadsheet calculator.

### Copy selected cells with header
Copies the selected cells as well as the corresponding headers (i.e., the column names) to the clipboard.

### Hide
Hides the Compare Result view of the Data Comparison window. In order to show the Compare Result view again, select the table in one of the components and click the Show result button in the toolbar of the Data Comparison window or choose the menu option Data Comparison | Show results.

Additionally, the toolbar provides the following icons:

<table>
<thead>
<tr>
<th>Icon</th>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Icon]</td>
<td>Show/Hide columns which don't have any differences</td>
<td>Toggles on and off the display of columns that are equal in the left and right table.</td>
</tr>
<tr>
<td>![Icon]</td>
<td>Find</td>
<td>Opens the Find dialog box where you can search for data in the Compare Result View.</td>
</tr>
<tr>
<td>![Icon]</td>
<td>Show the Data Inspector window</td>
<td>Displays the content of the selected cell in the Data Inspector window.</td>
</tr>
<tr>
<td>![Icon]</td>
<td>Go to table mapping</td>
<td>Shows the mapping of the compared tables in the Data Comparison window.</td>
</tr>
<tr>
<td>![Icon]</td>
<td>Maximize the result window</td>
<td>Enlarges the size of the Compare Result View to a maximum. To display the Data Comparison window again, click the Go to table mapping button.</td>
</tr>
</tbody>
</table>
3.5.4 Schema Comparison Window

The Schema Comparison window allows users to choose two schemas from two data sources (that may or may not be different) and display their items for the purpose of comparing the structure in these schemas. Mappings are defined either automatically by DatabaseSpy or manually by the user in this view.

When you right-click in an unoccupied area of the Schema Comparison window, several options are available in the context menu which are listed below. The corresponding Toolbar icons are shown to the left of the options if they are available.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Icon]</td>
<td>Compare items</td>
<td>Starts a schema comparison of the items that are currently mapped in the Schema Comparison window.</td>
</tr>
</tbody>
</table>
### The DatabaseSpy Interface Editors and Comparison Windows

<table>
<thead>
<tr>
<th>Icon</th>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Icon]</td>
<td>Show merge script: Left to Right</td>
<td>Generates a merge script for all different items in the schema comparison and updates the structure of the items in the right component with the structure from the items in the left component. If you start this command from the toolbar and one or more items are selected, the merge script will be generated only for the selected items.</td>
</tr>
<tr>
<td>![Icon]</td>
<td>Show merge script: Right to Left</td>
<td>Generates a merge script for all different items in the schema comparison and updates the structure of the items in the left component with the structure from the items in the right component. If you start this command from the toolbar and one or more items are selected, the merge script will be generated only for the selected items.</td>
</tr>
<tr>
<td>![Icon]</td>
<td>Open in new Data Comparison</td>
<td>Opens all tables that are included in the schema comparison in a new Data Comparison window</td>
</tr>
<tr>
<td>![Icon]</td>
<td>Sort items</td>
<td>Ascending</td>
</tr>
<tr>
<td>![Icon]</td>
<td>Sort items</td>
<td>Descending</td>
</tr>
<tr>
<td>![Icon]</td>
<td>Sort items</td>
<td>Ascending mapped first</td>
</tr>
<tr>
<td>![Icon]</td>
<td>Sort items</td>
<td>Descending mapped first</td>
</tr>
<tr>
<td>![Icon]</td>
<td>Map items</td>
<td>Maps corresponding items in the Schema Comparison window.</td>
</tr>
<tr>
<td>![Icon]</td>
<td>Unmap items</td>
<td>Removes all mappings from the Schema Comparison window.</td>
</tr>
<tr>
<td>![Icon]</td>
<td>Expand items</td>
<td>Expands all items in the Schema Comparison window and shows the child objects of the items.</td>
</tr>
<tr>
<td>![Icon]</td>
<td>Collapse tables</td>
<td>Collapses all tables in the Schema Comparison window.</td>
</tr>
<tr>
<td>![Icon]</td>
<td>Autolayout</td>
<td>Optimizes the component size and tries to display as much of the two components as possible in the comparison window.</td>
</tr>
</tbody>
</table>

In addition, the toolbar provides the following icons:

<table>
<thead>
<tr>
<th>Icon</th>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Icon]</td>
<td>Stop Comparison</td>
<td>Stops the currently running comparison process. This button is only visible while a comparison is running.</td>
</tr>
<tr>
<td>Table</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td><strong>Toggle Message Window</strong></td>
<td>Toggles the Message window on and off.</td>
<td></td>
</tr>
<tr>
<td><strong>Show Options</strong></td>
<td>Opens the Data Compare page of the Options dialog box.</td>
<td></td>
</tr>
</tbody>
</table>
3.6 Execution Target Bar

The Execution Target Bar is an optional toolbar which displays the data source and root object currently assigned to the SQL Editor window or—if the data source connection is active—the Design Editor.

The Execution Target Bar is switched on for all SQL Editor windows by default. To hide the bar for individual SQL Editor windows, click the Show/Hide execution target bar button in the SQL Editor toolbar. Note that disabling the Execution Target Bar for an SQL Editor window will deactivate it in all SQL Editor and Design Editor windows that you open subsequently.

When you move your mouse cursor over the Execution Target Bar, the different elements appear as hyperlinks, enabling you to jump the Properties window where you can change the respective element.

If the data source to which an SQL Editor window is assigned is offline, the Execution Target Bar provides a Connect button for conveniently establishing a connection.

For an SQL Editor window that has no data source defined, you can use the hyperlink functionality to jump to the Properties window if you want to specify a data source. Click the "Offline" text in the Execution Target Bar to access the Data Source drop-down list where you can select a data source for the SQL Editor window.

If the root object specified for the SQL Editor window differs from the root object of the data source the window is currently connected to, the execution target bar shows a tooltip providing a more detailed description of the problem when you place the mouse cursor over its icon. By clicking the Synchronize button you can set the SQL script’s root object to the currently active root object of its data source.
3.7 **Menu Bar, Toolbars, and Status Bar**

The **menu bar** contains the various application menus. The following conventions apply:

- If commands in a menu are **not** applicable in an editor or at a particular location in the document, they are unavailable.
- Some menu commands pop up a sub-menu with a list of additional options. Menu commands with sub-menus are indicated with a right-pointing arrowhead to the right of the command name.
- Some menu commands pop up a dialog that prompts you for further information required to carry out the selected command. Such commands are indicated with an ellipsis (...) after the name of the command.
- To access a menu command, click the menu name and then the command. If a sub-menu is indicated for a menu item, the sub-menu opens when you mouseover the menu item. Click the required sub-menu item.
- A menu can be opened from the keyboard by pressing the appropriate key combination. The key combination for each menu is `Alt+KEY`, where `KEY` is the underlined letter in the menu name. For example, the key combination for the **File** menu is `Alt+F`.
- A menu command (that is, a command in a menu) can be selected by sequentially selecting (i) the menu with its key combination (see previous point), and then (ii) the key combination for the specific command (`Alt+KEY`, where `KEY` is the underlined letter in the command name). For example, to open a file (**File** | **Open**), press `Alt+F` and then `Alt+O`.
- Some menu commands can be selected **directly** by pressing a special **shortcut** key or key combination (`Ctrl+KEY`). Commands which have shortcuts associated with them are indicated with the shortcut key or key combination listed to the right of the command. For example, you can use the shortcut key combination `Ctrl+N` to open a new SQL Editor; the shortcut key `F2` to rename a database object.

**Toolbars**

The toolbars contain buttons that are shortcuts for commands found in the menus. The name of the command appears when you place your mouse pointer over the button. To execute the command, click the button.

Toolbar buttons are arranged in groups. In the **Tools** | **Customize** | **Toolbars** dialog, or when right-clicking into the toolbar and selecting **Customize**, you can specify which toolbar groups are to be displayed. In the GUI, you can also drag toolbar groups by their handles (or title bars) to alternative locations on the screen. Double-clicking the handle causes the toolbar to undock and to float; double-clicking its title bar causes the toolbar to dock at its previous location.

**Status Bar**

The **Status Bar** is located at the bottom of the application window and displays (i) status information about the connection to data sources, the loading of database content, and the loading of files, and (ii) information about menu commands and command shortcuts in the toolbars when the mouse cursor is placed over these. If you are using the 64-bit version of **DatabaseSpy**, this is indicated in the status bar with the suffix (x64) after the application name. There is no suffix for the 32-bit version.
3.8 Arranging the Information Windows

All information windows can be docked/undocked by double-clicking the title bar. When docked, the auto-hide feature can be activated by clicking the drawing-pin icon in the title bar. When auto-hidden, the window is minimized as a tab at an edge of the application window. An auto-hidden window can be re-docked by rolling it out from the edge (by mousing over its tab) and clicking the drawing-pin icon in the title bar. When you click the little arrow that is located to the right of a data source connection or favorite item and shows the respective object in the Online Browser, DatabaseSpy will automatically hide the Project window and roll out the Online Browser to display the object.

Context Menu

The context menu can be accessed by right-clicking a window tab or title bar.

- Floating
- Docking
- Auto Hide
- Hide

Click the required option to cause that window to float, be docked, or be auto-hidden or hidden.

Drag-and-drop

You can drag a window by its tab or title bar and place it at a desired location. Additionally, you can dock the window in another window or in the interface using placement controls that appear when you drag a window:

- When you drag a window over another window, a placement control appears. This control is divided into five placement sectors. Releasing the mouse key on any of these sectors docks the dragged window into the respective sector of the target window. The four arrow sectors dock the dragged window into the respective sides of the target window. The center button docks the dragged window as a tab of the target window. You can also dock a window as a tab in another window by dragging it to the tab bar and dropping it there.

- When you drag a window, a placement control consisting of four arrows appears. Each arrow corresponds to one side of the Editor or Comparison window, respectively. Releasing a dragged window over one of these arrows docks the dragged window into one side of the Editor or Comparison window, respectively.
You can also double-click the title bar of a window to toggle it between its docked and floating positions.
4 Tutorials

This section contains the following tutorials:

- **"Nanonull" Database**: This tutorial runs you through the main features of DatabaseSpy. You do not need a running database server to follow the tutorial because it uses a file-based database (SQLite). You will learn how to create a file-based database from scratch, as well as how to perform basic data manipulation tasks from DatabaseSpy.

- **"ZooDB" Database**: This tutorial provides more in-depth information about DatabaseSpy features. To follow this tutorial, you need access to a running SQL Server database where you have rights to create a demo schema and populate it with data.

All the required SQL scripts and other accompanying files for both tutorials are available in the `\Altova\DatabaseSpy2019\DatabaseSpyExamples\Tutorial` folder, relative to your personal `Documents` folder. The SQL grammar of the accompanying scripts is specific to SQLite and SQL Server, respectively. Nevertheless, the features highlighted in the tutorials are identical or similar across various database kinds supported by DatabaseSpy.
4.1 "Nanonull" Database

This tutorial shows you the basics of how to interact with a database using the DatabaseSpy graphical user interface. To follow this tutorial, no previous experience with databases is required, although basic knowledge of SQL (Structured Query Language) will be advantageous. The tutorial uses a file-based database (SQLite), for portability reasons. Most of the described procedures are either very similar or identical in other database kinds, so you can follow the tutorial even if you have little or no experience with SQLite.

The tutorial is organized into the following parts. It is recommended that you follow them sequentially.

- Create a New Database - In this part, you will learn how to create a SQLite database and how DatabaseSpy projects can be useful.
- Design Database Tables - This section shows you how to design database tables visually, using the Design Editor available in DatabaseSpy.
- Run SQL Scripts - This section shows you how to run various SQL scripts against the database, generate SQL statements from existing tables, save scripts to files, and organize them inside the project for ease of access.
- Explore a Database - This section shows you how to view the structure of objects inside a database. It also illustrates how to retrieve data from the database and edit it.
- Generate Queries From Templates - This section illustrates how you can run database queries conditionally, and also how to generate SQL statements from SQL templates.

4.1.1 Create a New Database

This tutorial part shows you how to create a new SQLite database using DatabaseSpy. The steps are very similar for a Microsoft Access database, since it is also file-based. For databases which are hosted on a server, creating the database requires a different approach, see the "ZooDB" Database tutorial.

To create a new SQLite database:

1. Run DatabaseSpy. The Add a Data Source dialog box opens. (You can open this dialog box at any time using the menu command File | Create a Database Connection.)
2. Select SQLite and click Next.
3. Select **Create a new SQLite database**.
4. Click **Browse** and select a destination path and name.
Note: There is no restriction as to what the extension of the SQLite database file should be. To recognize it easily, you might want to call the file `Demo.sqlite`, but you can also use other extensions, such as `.db` (note this documentation and the accompanying sample files use the `.sqlite` suffix by convention). For the scope of this tutorial, it is also recommended to enter a dedicated full path instead of just the database file name.

5. Click **Connect**. You are now prompted to name the data source, for example:

6. Leave the default value as is, and click **OK**.
A data source is now available in the Project window in the top left area of the DatabaseSpy graphical interface. Notice that the data source icon is green, which indicates that the connection to the database is currently active. To quickly connect to the database or disconnect from it, right-click the connection and select Connect (or Disconnect, respectively) from the context menu. When a data source is disconnected, its icon changes to.

Also notice that, when a data source is selected in the Project window, its connection details are shown in the Properties window. This applies not only to data sources, but virtually to any object that you select from the user interface, including tables, columns, SQL scripts, and so on.

**DatabaseSpy projects**

Projects are a convenient way to organize database connections and database-related files such as SQL scripts. Saving data as a DatabaseSpy project will make it easier for you to connect to the same database in future, since you won't have to go through the database connection wizard steps again.

To save the DatabaseSpy project created so far, do one of the following:

- On the File menu, click Save Project As.
- Click the Save Project button in the Project Window.

You can also conveniently add multiple database connections to the same project. To do this, right-click the "Data Source" folder in the Project Window, and select Add a New Data Source from the context menu.

### 4.1.2 Design Database Tables

So far in this tutorial, you have created an empty SQLite database. With DatabaseSpy, you can design the tables either visually in the Design Editor, or by running table creation scripts in the SQL Editor. This part of the tutorial shows you how to design a table visually. The new table will
supposedly store some reports, so it should consist of the following columns:

- The identifier (id) of the report (of type INTEGER)
- The report name (of type TEXT).

To create the new table:

1. Make sure that the data source is connected (green) in the Project window. Otherwise, right-click the data source, and select Connect.
2. On the File menu, click New | Design Editor (alternatively, press Ctrl+D or click the Design Editor toolbar button). The Design Editor is now displayed in the main pane of DatabaseSpy.
3. Right-click anywhere in the Design Editor, and select Create New Table (Ctrl+T) from the context menu. An information dialog box appears, notifying you that a database change script has been created. Click OK to dismiss the message. Remember that the change script is visible at all times in the Database Structure Change Script window, and it is being updated on the fly as you make changes in the Design Editor window.
4. In the Design Editor, double-click inside the table header, and enter a descriptive name for the table, for example "reports".

The first column of the table, id, is generated automatically by DatabaseSpy, so all you need to is change the data type, as follows:

- Click the id column, and type INTEGER under "Type".

Note: By default, DatabaseSpy creates automatically the primary key for new tables. To disable this option, select the menu command Tools | Options | Design Editor, and then clear the option Automatically create primary key for new tables.
To create the second column:

1. Right-click the table in Design Editor, and select Insert New Column from the context menu.
2. Type the name of the column (reportname), and type TEXT under “Type”.
3. Optionally, clear the Nullable check box (assuming you don’t want the report name to be optional). This can be done either directly in the table design or in the Properties window.

So far, you have created the table design; however, it has not been committed to the database yet. To commit the changes to the database:

1. Make the Database Structure Change Script window active (you can find it under the main pane).
2. Click Execute the Generated SQL Change Script.

DatabaseSpy now runs the script against the database, and informs you about the result. The new table is now visible in the Online Browser.
4.1.3 Run SQL Scripts

In the previous part of this tutorial, you have created a table visually, using the Design Editor. An alternative way to interact with your database is by means of SQL (Structured Query Language) scripts. SQL scripts can be used to create the structure of the database, perform various operations against the database (for example, populate it with data), and also change or delete the database structure. Below, you will learn how to run some sample SQL scripts against the demo database you created so far.

Let's first create the structure of all the tables in the database, as follows:

1. Connect to your demo SQLite database created so far.
2. On the **File** menu, click **Open** | **Open File**, and browse for the **NanonullCreateTables.sql** file from the `\Altova\DatabaseSpy2019\DatabaseSpyExamples\Tutorial` folder.

The scripts now open inside the SQL Editor in the main pane.

```
/* This script creates tables for a demo SQLite database. 
Before running this script, make sure that your database does not already contain tables with the same name. */

CREATE TABLE
users (id INTEGER NOT NULL PRIMARY KEY, 
    first_name TEXT NOT NULL, 
    last_name TEXT NOT NULL, 
    email TEXT UNIQUE NOT NULL, 
    created_at TEXT NOT NULL DEFAULT CURRENT_TIMESTAMP, 
    updated_at TEXT DEFAULT CURRENT_TIMESTAMP) ;

CREATE TABLE
products (id INTEGER NOT NULL PRIMARY KEY, 
    name TEXT NOT NULL, 
    quantity INTEGER NOT NULL, 
    description TEXT, 
    created_at TEXT NOT NULL DEFAULT CURRENT_TIMESTAMP, 
    updated_at TEXT DEFAULT CURRENT_TIMESTAMP) ;
```

**SQL Editor**

The SQL Editor is the area where you can view, edit, and execute SQL statements. The demo script illustrated above will create a few tables in the database.

**Note:** A new SQL Editor window is automatically associated with the data source that is active
in the Online Browser or Project Window. The active data source is displayed at all times in the Execution Target Bar. That is, all commands issued from SQL Editor will affect this particular data source only. If there are multiple data sources, the SQL Editor belongs to the one which was last clicked before you opened the SQL Editor. Any subsequent SQL Editor windows that you open will inherit the currently active data source.

To run the SQL script against the database, do one of the following:

- Click Execute in the toolbar at the top of SQL Editor.
- On the SQL Editor menu, click Execute.
- Press F5.

DatabaseSpy runs the script and informs you about the execution result in the Message window, for example:

```
Message

✓ 0 rows affected
Elapsed time: 0.047 sec
✓ 0 rows affected
Elapsed time: 0.015 sec
✓ 0 rows affected
Elapsed time: 0.016 sec
✓ 0 rows affected
Elapsed time: 0.031 sec
✓ 0 rows affected
Elapsed time: 0.016 sec

NanongnullCreateTables.sql
```

Now click the Online Browser tab in the Project window, and then click Refresh. You will notice that several tables have been added to the database.
So far, you have created the database structure; however, the tables are empty. To quickly view the number of rows in each table, click the "count" link which appears when you move the mouse over any table in the Online Browser.

You can populate tables with some data as follows:

1. On the File menu, click Open | Open File, and browse for the NanonullPopulateTables.sql file from the \Altova\DatabaseSpy2019\DatabaseSpyExamples\Tutorial folder.
2. Click Execute.

If you go back to Online Browser now and check the count of rows in each table, you will notice that the count of rows has changed.

Let’s now automatically generate a new script which retrieves some data from the database:

- In the Online Browser, locate a table, right-click it, and select Show in new SQL Editor | SELECT from the context menu.

An SQL statement is automatically generated based on the structure of the selected table, and displayed in the SQL Editor window. Click Execute to run the generated script and view the table data in a read-only grid. Click Execute for data editing if you intend to modify data after retrieving it.

You can also create a SQL script manually, and add it to the current DatabaseSpy project, for example:

1. Open a new SQL Editor window. This can be done in one of the following ways:
   - On the File menu, click New | SQL Editor.
   - Click the SQL Editor toolbar button.
   - Press Ctrl+ N.
2. Type your script contents, for example: SELECT * FROM users;
3. Click inside the SQL Editor to make the current script active.
4. In the Project window, right-click the "SQL" folder and select Add Active File to Project from the context menu. When prompted to save the file, choose a suitable location for it (for example, the same folder as the DatabaseSpy project file).

Existing SQL scripts created outside DatabaseSpy can also be added to the project, as follows:

1. Make the Project window active.
2. Right-click on a folder inside the Project window, select Add Files to Project, and browse for the existing SQL scripts.

The "SQL" folder from the Project window is meant to help you easily group and access all SQL scripts pertaining to the project. However, there is no restriction that any SQL script must be specifically stored inside this folder. You can create additional folders or subfolders and relocate the scripts as necessary. To achieve this, use the commands available in the Project Window.

Note: Should you need to delete all the tables from the demo database, a third script called NanonullDropTables.sql is available in the the \Altova\DatabaseSpy2019\DatabaseSpyExamples\Tutorial folder for this purpose.
4.1.4 Opening the Tutorial Project

The remainder of this tutorial uses a sample DatabaseSpy project to illustrate various database tasks. The sample project is available at the following path relative to the Documents folder: \Altova\DatabaseSpy2019\DatabaseSpyExamples\Tutorial\NanonullEnterprise.qprj. To open the sample project in DatabaseSpy, do one of the following:

- On the File menu, click Open | Open Project.
- Click the Open Project button in the Project window.
- Double-click the project file in Windows Explorer, and close the database connection dialog box which appears.

The sample project contains a connection to a SQLite database which is by default inactive. To connect to the data source, right-click it in the Project window, and select Connect from the context menu.

Once you connect to the data source, the contents of the project can be viewed from the Project Window illustrated above, while the structure of the database can be viewed from the Online Browser. The Online Browser is by default available as a tab of the Project window, but it can also be undocked and pinned to another location if necessary, see also Arranging the Information Windows.
Note: For Online Browser to be populated, an active (connected) data source must exist in your project. By default, disconnected data sources are not displayed in the Online Browser. If you want data sources to be displayed in Online Browser regardless of whether they are connected or not, first select the data source in the Project Window, and then select the Always show in Online Browser check box in the Properties Window.

4.1.5 Explore a Database

This tutorial part shows you how to explore the contents of an existing database, and modify some data. To this end, let’s open the demo DatabaseSpy project which already includes a ready SQLite database populated with some data, see Opening the Tutorial Project.

Since the demo database is a SQLite database, the Online Browser displays a fixed database root object called “main”. Note that the root object name and appearance will vary in other database kinds; also, with certain databases it is possible to switch to different schemas directly from the Online Browser.
You can explore the database by expanding folders of interest in the Online Browser. The actual folder structure depends on the database kind. For the scope of this tutorial, you can expand each table in order to view its columns, as well as other objects, such as primary keys, constraints, indices, and so on. Keep in mind that the Properties window displays at all times detailed information about the currently selected object.

To view the structure of one or more tables as a diagram, open a new Design Editor (Ctrl+D) and drag the tables from the Online Browser into the editor area.

To view the actual data inside a table (remember this will display data as read-only):

1. Right-click the table in the Online Browser.
2. Select Retrieve Data | All rows or Retrieve Data | First 200 rows from the context menu. As a side note, the number of rows for the option Retrieve Data | First N rows can be configured from Tools | Options | SQL Editor.

If you want to open data for editing as opposed to just viewing it, right-click the table in Online Browser and select Edit Data. Alternatively, select Retrieve Data | N rows, and then run the command Execute for data editing. Selecting or updating data stored in the database is also possible if you run SQL queries in the SQL Editor window, see Run SQL Scripts.

Regardless of the approach you choose to retrieve data, the content retrieved from the database is displayed in a Result view, as a grid.
To be able edit data, make sure that you retrieved it using the Edit Data command (or the Execute for data editing command). In this case, you can use the commands available at the top of the Results grid to add new rows or delete existing ones. To modify a cell value, double-click it and enter the new value.

Note: To protect the integrity of the database, various data editing restrictions may apply, depending on the constraints defined for the table. For example, it is not possible to edit a column defined as a primary key, or enter text inside a numeric column. DatabaseSpy performs some basic data integrity validation checks as you modify data. If the integrity check fails, the cell background color changes to brick red. A second level of data integrity checks is provided by the database, when you actually commit the changes. If the changes are rejected by the database for any reason, an error is displayed in the Messages window, and data is not committed to the database.

Any changes made to the grid are not immediately reflected in the database. To update the database, click the Commit button, which deploys all changes to the database. In case you change your mind and would like to revert all the changes to the grid before committing them to the database, click the Undo all button.

Various options applicable to the Result view, including display and data editing options, can be configured from Tools | Options SQL Editor | Result View.

You have now learned the basics of retrieving and editing database data. For more information about working in the Result grid, see Retrieving and Editing Data.
4.1.6 Generating SQL Statements

With DatabaseSpy Enterprise Edition, in addition to standard SQL statements, you can also run a special kind of SQL statements that are referred to as "SQL templates".

If you haven't done that already, first open the demo NanonullEnterprise.qprj project, see Opening the Tutorial Project. You will find a demo SQL template called SQLTemplate1.sql in the SQL Templates folder inside the Project Window.

To run the demo SQL template:

1. Double-click the SQLTemplate1.sql file to open it in the SQL Editor.

```
SELECT "id",
    "user_id",
    "is_shipping",
    "is_billing",
    "type",
    "city",
    "street",
    "number"
FROM "main"."addresses"
WHERE "type" = :addresstype
```

2. Click Execute. A dialog box is now displayed, which prompts you to enter a parameter value.
3. Double-click the row under :addresstype, type "home" as parameter value, and click OK.
Notice that only addresses of type "home" (fifth column) are retrieved from the addresses table.

4. Click **Execute** and this time enter "work" as parameter value. You will notice that only addresses of type "work" are now retrieved.
The steps above essentially illustrate how a typical SQL template works: it provides the option to make certain parts of the SQL query conditional. The conditional parts are called "parameters" and are marked with a colon character (see the :addresstype parameter inside the SQL statement). When you attempt to run such a query, DatabaseSpy will prompt you to fill in the parameter value (or multiple values, if applicable) as required.

Apart from executing SQL statements conditionally, you can also use SQL templates to generate multiple SQL statements with a click of a button. Let's try the following example:

1. Right-click the addresses table in the Online Browser, and select Retrieve Data | All Rows from the context menu.
2. In the Result grid, click the header of the type column to select all data in it.
3. Right-click the selection and choose Execute template with values | SQLTemplate1.sql.

This command calls the template described previously as many times as there are rows inside the column, and supplies the value of each row as a parameter to the SQL template. As a result, multiple SQL SELECT statements are generated and displayed in the SQL Editor.
DatabaseSpy also executes all generated statements, and the result of each is visible in a separate Result grid.

The SQL Template run in this example is only meant for demo purposes. In a real life scenario, you might want to apply the same technique in order to generate more useful statements, for example, ones that insert data into tables. For more details about SQL templates, including an example of how to generate *INSERT* statements, see [SQL Templates](#).
4.2 "ZooDB" Database

In this tutorial, you will use DatabaseSpy to create a SQL Server database that models a zoo. SQL scripts and other files are provided to help you complete this task. You will create the database from scratch, and then use scripts and text files (*.TXT) to populate it with data.

In this tutorial, you will learn how to:

- Use **project files** to manage the connections and SQL files relevant to your database project
- Use DatabaseSpy to connect to a Microsoft SQL Server database
- Create and add tables to a database using SQL as well as DatabaseSpy's Design Editor
- Create relationships between those tables
- Add constraints to the tables
- Add data to the database using **SQL scripts** as well as DatabaseSpy's import and editing functionality
- Browse the database using the Online Browser
- Generate SQL statements using features of the SQL Editor such as generating statements based on existing objects, and autocompletion
- Export data to XML files
- Compare two schemas of a database
- Compare your database data with a backup database

**Installation and configuration**

This tutorial assumes that you have successfully installed DatabaseSpy on your computer and received a free evaluation key-code, or are a registered user of the product. The evaluation version of DatabaseSpy is fully functional but limited to a 30-day period. You can request a regular license from our secure web server or through any one of our resellers.

**Tutorial example files**

The following files are available in the \Altova\DatabaseSpy2019(DatabaseSpyExamples\Tutorial sub-folder of the Documents folder and are used in the Tutorial:

- create_ZooDB_tables.sql
- create_ZooDB_relationships.sql
- tblAnimalTypes_data.sql
- animalType_queries.sql
- tblZookeepers.txt
- dbo.tblFeedSuppliers.xml
- ZooDB.mdb
- CreateTestSchema.sql

Several other files are available if you want to optionally populate the tutorial Zoo database with data, see **Populating the Zoo Database with Data (Optional)**.
4.2.1 Setting Up a Database Project

Project files organize everything you need in order to work on your database projects. You can store the following items in a project file:

- Database connections
- SQL scripts
- SQL templates
- Design files
- Database Data Comparison files
- Database Schema Comparison files
- Favorite database objects

Objective

In this section of the tutorial, you will learn how to create a project in DatabaseSpy and connect to a database. Specifically, you will learn how to do the following:

- Create a new project and add a data source connection
- Add SQL files
- Change the project name
- Define the project startup options

Commands used in this section

<table>
<thead>
<tr>
<th>Icon</th>
<th>Command name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Create a Database Connection</td>
<td>This command is located in the Standard toolbar and in the File menu. Click this command to open the Add a Data Source dialog box that allows you to connect to any database supported by DatabaseSpy.</td>
</tr>
<tr>
<td></td>
<td>Add files to the project</td>
<td>This command is located in the toolbar of the Project window. Click this command to open the Open dialog box where you can choose the files to be added to and stored with your database project.</td>
</tr>
<tr>
<td></td>
<td>Save Project</td>
<td>This command is located in the toolbar of the Project window; alternatively, you can also choose the menu option File</td>
</tr>
<tr>
<td></td>
<td>Options</td>
<td>This command is located in the Tools menu. Click this command to open the Options dialog box where you can define the project startup options.</td>
</tr>
</tbody>
</table>
4.2.1.1 Creating the Tutorial Database

Before you can start with this tutorial, a new sandbox database must be created in Microsoft SQL Server (in this tutorial, the database name is "ZooDB"). You can accomplish this task either with Microsoft SQL Server Management Studio, or from Visual Studio. To do this, connect to Microsoft SQL Server, and follow the instructions specific to your SQL Server database administration tool to create the database. For example, the following image illustrates creating a new database on a network SQL Server from Visual Studio 2015:

![Creating a new database on a network SQL Server from Visual Studio 2015](image)

Notes:

- You will need administrator rights to create a database, please contact your database administrator if you do not have the respective rights.
- The new "ZooDB" database must be empty. All tables, relationships, and data will be added to this database in the subsequent steps of this tutorial.

4.2.1.2 Connecting to the Database

Once the database for this tutorial has been created (see Creating the Tutorial Database), you can connect to it using the Connection Wizard. The Connection Wizard allows you to establish a connection to existing databases of the most commonly used database types, such as Microsoft Access, Microsoft SQL Server, Oracle, MySQL, IBM DB2, Sybase, and PostgreSQL.

To connect to the tutorial database:

1. Select the menu option File | Create a Database Connection... or press Ctrl+Q. The "Add a Data Source" dialog box appears.
2. Click the Connection Wizard button at the top left of the dialog if it is not already selected, and select Microsoft SQL Server (ADO).
3. Click Next. The configuration page of the Connection Wizard appears.
4. Select the database provider **Microsoft OLE DB Provider for SQL Server** from the combo box.
5. Click **Next**. The **Connection** tab of the Data Link Properties dialog box appears.

6. Select or enter the name of the server you want to connect to, e.g., TS-SQL.
7. Choose the **Use a specific user name and password** radio button.
8. Enter the user name and password.
9. Activate the **Allow saving password** check box.
10. Select the database you want to connect to from the drop-down list, e.g., ZooDB, and click **OK**.
11. In the **Set A Data Source Name** dialog box, set the connection name to "ZooDBConnect" and click **OK**.
4.2.1.3 Adding SQL Files

A database project in DatabaseSpy allows you to store SQL files together with the database connection in one project file so that you have all the files and connections you need at hand when you open a project in DatabaseSpy.

In this step, you will add the SQL scripts to the project that you will later use to create the tables for the zoo database and to query the zoo database.

To add the SQL files to the project file:

1. In the Project window, right-click the SQL folder and select Add Files to Project... from the context menu. The Open dialog appears.
2. Select the files to be added to the SQL folder from the tutorial directory:
   - animalType_queries.sql
   - create_ZooDB_relationships.sql
3. Click the **Open** button. The SQL files appear in the SQL folder of the Project window.

4.2.1.4 **Renaming and Saving the Project**

If a project has not been saved yet, the text "New Project" is displayed as a project title in the Project window. You can change the project title by saving the project under a descriptive name. DatabaseSpy uses the name of the project file and displays it as project title in the Project window.

In this step of the tutorial, we will change the title of the project to "ZooDBProject" and save the project.
To save the project:

1. Select the menu option **File | Save Project As**...
2. In the Save As dialog box, choose a path for the project and enter "ZooDBProject" as a file name.
3. Click **Save**. The project is saved as **ZooDBProject.qprj** and the Project window displays **ZooDBProject** as project name.

### 4.2.1.5 Defining the Project Startup Options

In the **General** options, you can define that the last project be opened by default when DatabaseSpy is started. In this case, the Add a Data Source dialog box is suppressed and the project that was open when you last closed DatabaseSpy is opened automatically.

To activate the "Open last project on startup" setting:

1. Select the menu option **Tools | Options** and click **General**.
2. Activate the **Open last project on startup** check box, and click **OK** to confirm.
4.2.2 Adding Tables to the Database

In the previous section, you have created a database project and added a connection to a database to it. However, this database does not contain any tables yet. In DatabaseSpy, you can add tables with only a few mouse clicks.

Objective

In this section of the tutorial, you will learn how to use SQL scripts and the Design Editor to create the tables that make up the zoo database. Specifically, you will learn how to do the following:

- Open and execute an SQL file that is supplied in the tutorial folder
- Add a table using the Design Editor
- Generate and modify a CREATE statement
- Create relationships between the tables

Commands used in this section

<table>
<thead>
<tr>
<th>Icon</th>
<th>Command name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open</td>
<td>Open</td>
<td>This command is located in the context menu that opens when you right-click an SQL file in the SQL folder of the Project window. Alternatively, you can also double-click the SQL file to open the SQL script in an SQL Editor window.</td>
</tr>
<tr>
<td>![Save Project]</td>
<td>Save Project</td>
<td>This command is located in the toolbar of the Project window; alternatively, you can also choose the menu option File</td>
</tr>
<tr>
<td>![Execute]</td>
<td>Execute</td>
<td>This command is located in the toolbar of an SQL Editor window and in the SQL Editor menu. Click this command to execute the SQL in the SQL Editor window.</td>
</tr>
<tr>
<td>![Refresh]</td>
<td>Refresh</td>
<td>This command is available in the Online Browser as a button, or as an option in the context menu that opens when you right-click a database. Use this command to refresh the database and display new or changed database objects in the Online Browser.</td>
</tr>
<tr>
<td>![Show in new SQL Editor]</td>
<td>Show in new SQL Editor</td>
<td>This command is located in the context menu that opens when you right-click a table in the Online Browser. Click this command to generate a CREATE statement based on the selected table in a new SQL Editor window.</td>
</tr>
<tr>
<td>![Design Editor]</td>
<td>Design Editor</td>
<td>This command is located in the Standard toolbar; alternatively, you can also choose the menu option File</td>
</tr>
</tbody>
</table>
### Command Table

<table>
<thead>
<tr>
<th>Icon</th>
<th>Command name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>New Table</td>
<td>This command is located in the Design Editor toolbar; alternatively, you can also choose the menu option **Design Editor</td>
</tr>
<tr>
<td></td>
<td>Make Primary Key</td>
<td>This command is located in the context menu that appears when you right-click a table in a table design. Click this command to define the primary key for the table.</td>
</tr>
<tr>
<td></td>
<td>Make Foreign Key</td>
<td>This command is located in the context menu that appears when you right-click a table in a table design. Click this command to define a new foreign key for the table.</td>
</tr>
<tr>
<td></td>
<td>Execute Change Script</td>
<td>This command is located in the toolbar of the Database Structure Change Script window. Click this command to execute the recorded change script and to commit the changes to the database.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Icon</th>
<th>Command name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>command to open a new Design Editor window which is assigned to the active data source connection.</td>
</tr>
</tbody>
</table>

### 4.2.2.1 Opening and Executing an SQL File

In the previous section of the tutorial, you added the `create_ZooDB_tables.sql` script to your database project. This script can now be used to add tables to the zoo database. Note that any SQL script must be assigned to a data source connection before it can be executed in DatabaseSpy (see the instructions below).

**To add tables to a database by executing an SQL script:**

1. Make sure that the **ZooDBConnect** connection is active.

   **Note:** A new SQL Editor window is automatically associated with the data source that is active in the **Online Browser** or **Project Window**. The active data source is displayed at all times in the **Execution Target Bar**. That is, all commands issued from SQL Editor will affect this particular data source only. If there are multiple data sources, the SQL Editor belongs to the one which was last clicked before you opened the SQL Editor. Any subsequent SQL Editor windows that you open will inherit the currently active data source.

2. In the Project window, double-click the `create_ZooDB_tables.sql` entry in the SQL folder. The script file opens in an SQL Editor window.
3. If necessary, assign a data source to the current script. When the script has no data source assigned, the "Unknown - Offline" status appears at the top of the SQL Editor window.
To assign a data source to the script, click the Offline hyperlink and, in the Properties window, select "ZooDBConnect" from the Data Source list.

The SQL script is now connected to the ZooDBConnect data source, and the execution buttons in the SQL Editor are active. Click the **Save Project** button in the Project window or press **Ctrl+S** to save this data source assignment in the project properties.

4. In the SQL Editor, click the **Execute** button or press **F5**. The tables are added to the ZooDB database.

**To see the newly added tables in the Online Browser:**

1. Click the **Online Browser** tab.
2. Right-click on the name of the database, **ZooDB**, and select **Refresh** from the context menu or click the **Refresh** button in the toolbar of the Online Browser.
The newly inserted tables are displayed in the User Tables folder. If the script executed successfully, the following tables will have been added to the database:

4.2.2.2  Adding Tables Using Design Editor

The Design Editor can also be used to add tables to databases using a graphical user interface. Use of the Design Editor requires no knowledge of SQL syntax. To illustrate this, we will now add to the database a new table that stores zoo visitor statistics. We will call this table `tblVisitorStatistics`. The table will consist of the following columns:

- **StatisticID**: int; not null; primary key
- **StatisticDate**: datetime; not null;
- **VisitorCount**: int; not null

To add the table to the database using the Design Editor:

1. Click the **Design Editor** button in the Standard toolbar. A new Design window, called Design1, is opened with the connection name and database name visible in the Status bar.
2. Click the **New Table** button. A new table appears in the Design Editor window. A change script message appears at this point, and the SQL statements appear in the Database Structure Change Script window. After you complete the table definition, you will need to execute the change script to actually create the table in the database.
3. Double-click the table name, "table (dbo)" and enter "tblVisitorStatistics". Press Enter.

4. In the table design, double-click the text under "Column". Change the column name to "StatisticID" and press Enter.
5. Likewise, double-click the text under "Type", replace "varchar(255)" with "int", and press Enter. At this stage, the table has one column, and we want to add two more.

6. Click the plus icon next to column StatisticID. A column is added and selected for editing. Type "StatisticDate", press Tab, enter type as "date", and press Enter.

7. Right-click into the table design and choose Insert new | Column from the context menu. Change the column name to "VisitorCount" and press Enter. Using the same technique as for previous columns, change the data type of the "VisitorCount" column to "int".

8. Right-click the title bar of the Columns section and activate the Identity option in the context menu. The select the Identity check box for the StatisticID column.

At this stage, the table design should look as follows:

Notice that a primary key having the name <generated> has been generated automatically for the first column in the table. The indicates that the new column will have a primary key with a name automatically assigned by the database, when you run the database update script. Optionally, if you want to change the name of the primary key, replace the text <generated> with a descriptive primary key name. In this case, however, you will need to ensure that the name is not already used in the database.

You are now ready to execute the database script which will actually add the table to the database. In the Database Structure Change Script window, click the Execute Change Script button to commit the new table to the database.
4.2.2.3 Generating and Editing a CREATE Statement

The Online Browser allows you to generate SQL statements based on an existing table or column. In this step, we will generate a CREATE statement from the table `tblZookeepers`, edit the statement, and use it to create a new table `tblEmployees`.

To add a table by editing a CREATE statement generated from an existing table:

1. In the Online Browser, right-click the `tblZookeepers` table.
2. Select the menu option `Show in new SQL Editor | Create` from the context menu.
   An SQL Editor window appears, displaying the following SQL statement:

3. Edit the statement as shown below to create `tblEmployees`. The parts of the statement that need to be changed are marked using underlined, italic text:
CREATE TABLE [ZooDB].[dbo].[tblEmployees] (  
  [EmployeeID] int IDENTITY (1, 1) NOT NULL,  
  [FirstName] varchar (50) COLLATE SQL_Latin1_General_CP1_CI_AS NOT NULL,  
  [LastName] varchar (50) COLLATE SQL_Latin1_General_CP1_CI_AS NOT NULL,  
  [Address] varchar (50) COLLATE SQL_Latin1_General_CP1_CI_AS NOT NULL,  
  [City] varchar (50) COLLATE SQL_Latin1_General_CP1_CI_AS NOT NULL,  
  [State] varchar (50) COLLATE SQL_Latin1_General_CP1_CI_AS NOT NULL,  
  [Telephone] varchar (50) COLLATE SQL_Latin1_General_CP1_CI_AS NOT NULL,  
  [DOB] datetime NOT NULL,  
  CONSTRAINT [PK_Employee] PRIMARY KEY ([EmployeeID]) ) ;

4. Click the Execute button or press F5. In the Online Browser, right-click the ZooDB database and select Refresh from the context menu, or click the Refresh button. The newly inserted table, tblEmployees, is displayed along with the tables that you created earlier.

4.2.2.4 Creating Relationships Between the Tables

Now that you have added the tables to the zoo database, you will add the foreign key relationships to the database using both the Design Editor and an SQL script. A foreign key is a relation between two tables that ensures that data can only be inserted into certain columns in one table if it exists in the second table.

In our example, a new animal type in table tblAnimalTypes can only be added if the Category is existing as CategoryID in table tblAnimalCategories. This way, you can only add animals that belong to an animal category that is already defined in tblAnimalCategories. You will use the Design Editor to add this relation to the database. Furthermore, this tutorial provides an SQL script that adds the remaining foreign key relations to the database.

Defining a foreign key relationship using the Design Editor

1. Make sure that the ZooDBCConnect connection is active and click the Design Editor button in the Standard toolbar or press Ctrl+D.
2. In the Online Browser, click the table tblAnimalTypes and drag it into the Design Editor window.
3. Right-click the table design and select Insert new | Key | Foreign Key from the context menu. A foreign key is created in the design, having the name <generated>, and the entry is selected for editing.
4. Optionally, change the key name from <generated> to "FK_CategoryID" and press Enter. If you leave the name as <generated>, the key name will be automatically generated by the database.
5. In the Reference column, double-click the "[select the referenced table]" entry, and select "tblAnimalCategories" from the drop-down list that appears. The first column "CategoryID"
6. In the **Columns** column, double-click the "AnimalTypeID" entry that has been inserted by default, and select "Category" from the drop-down list that appears.

7. In the **Database Structure Change Script** window, click the **Execute Change Script** button to execute the change script and to commit the new foreign key to the database.

8. Optionally, right click the "FK_CategoryID" entry in the table design and select **Add related tables | Referenced Tables** from the context menu.

### Adding foreign key relationships via SQL scripts

To speed up the creation of the remaining foreign key relationships for the zoo database, an SQL script is provided in the tutorial folder. This script has already been added to the project earlier in this tutorial.

1. Make sure that the **ZooDBConnect** connection is active.
2. In the **Project** window, double-click the file `create_ZooDB_relationshiops.sql`. The file opens in an SQL Editor window.

3. In the General section of the **Properties** window, choose "ZooDBConnect" from the **Data Source** drop-down list. The SQL script is now connected to the **ZooDBConnect** data
To get a graphical view of the relationships that were just created, right click the “User Tables” folder in the Online browser, and select **Show in new Design Editor**.

### 4.2.3 Defining Constraints

In the previous section, you have added tables and created relations between them. You may want to control which data is added to your database tables, or simplify data entry by defining default values for certain columns.

**Objective**

In this section of the tutorial, you will learn how to use the Design Editor to create columns that can contain only unique or limited data, or have a predefined standard value. Specifically, you will learn how to do the following:

- Define a **unique constraint** for a column
- Add **check constraints** on column and table level
- Provide columns with **default values**

**Commands used in this section**

<table>
<thead>
<tr>
<th>Icon</th>
<th>Command name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Show in new Design Editor</strong></td>
<td>This command is located in the context menu that opens when you right-click a database object in the Online Browser. Click this command to open a new Design Editor window and display the selected database object in it.</td>
</tr>
<tr>
<td>![Make Unique Key]</td>
<td><strong>Make Unique Key</strong></td>
<td>This command is located in the context menu that opens when you right-click a column in a table design. Click this command to define a unique key on the selected column.</td>
</tr>
<tr>
<td>![Execute Change Script]</td>
<td><strong>Execute Change Script</strong></td>
<td>This command is located in the toolbar of the Database Structure Change Script window. Click this command to execute the recorded change script and to commit the changes to the database.</td>
</tr>
<tr>
<td>![Insert new</td>
<td>Check Constraint]</td>
<td>**Insert new</td>
</tr>
<tr>
<td>![Create Default Constraint]</td>
<td><strong>Create Default Constraint</strong></td>
<td>This command is located in the context menu that opens when you right-click a column in a table design. Click this command to define a default constraint for the selected...</td>
</tr>
</tbody>
</table>
4.2.3.1  Defining a Unique Key

By defining a unique key, you can prevent the user from entering duplicate data into a column. In our zoo database, you will define a unique key on the LatinName column of table tblAnimalTypes. This way, each name can be added to the table only once.

To define a unique key on a column:

1. In the Online Browser, right-click the table tblAnimalTypes and select Design Editor | Show in new Design Editor from the context menu.
2. In the table design, right-click the column LatinName and select Make Unique key from the context menu.

A unique key is created in the design, having the name <generated>, and the entry is selected for editing.
3. Optionally, change the key name from `<generated>` to "UK_LatinName" and press Enter. If you leave the name as `<generated>`, the key name will be automatically generated by the database.

4. In the Database Structure Change Script window, click the **Execute Change Script** button to execute the change script and to commit the new unique key to the database.

4.2.3.2 **Defining a Check Constraint**

When a check constraint is defined, data will be validated according to the expression specified in the check constraint, before it is added to a table. Data that fails the validation will not be added.

In this section of the tutorial, you will create a check constraint that makes sure that different animals are entered into the Mother and Father columns of `tblAnimalBirths`. Since this constraint spans more than one column, it will be displayed in the Check Constraints section of the table design, and in the Constraints sub-folder of the Online Browser, respectively.
Defining the check constraint

1. In the Online Browser, right-click table tblAnimalBirths and select Design Editor | Show in new Design Editor from the context menu.
2. Right-click the table design and select Insert new | Check Constraint from the context menu. A check constraint is created in the design, having the name <generated>, and the entry is selected for editing.
3. Optionally, change the constraint name from <generated> to "CK_CheckParents" and press Enter. If you leave the name as <generated>, the key name will be automatically generated by the database.
4. In the Expression column, double-click the "[expression required]" entry, enter "Mother <> Father", and press Enter.
5. In the Database Structure Change Script window, click the Execute Change Script button to execute the change script and to commit the new check constraint to the database.

Testing the check constraint

After the check constraint has been committed to the database, you cannot enter the same animal ID into the "Mother" and "Father" columns anymore. If both columns contain the same value in a row, DatabaseSpy displays an error in the Message tab.

4.2.3.3 Defining a Default Constraint

For some columns it may be useful to define a standard value. By defining a default constraint and setting the Result view options accordingly, this default is inserted automatically when a new row is added to the table in the Result view.

In this section of the tutorial, you will define a default constraint on the tblAnimalBirths table which sets the number in litter automatically to "1" for new rows that are added in the Result view.
To set a default number in litter in tblAnimalBirths:

1. In the table design, right-click column "NumberInLitter" and select Create Default Constraint from the context menu. The Default Value column appears in the table design. (If the Default Value column is not visible, click into the table design and it will resize properly.)

2. Double-click the field in the NumberInLitter row, type "1", and press Enter.

3. In the Database Structure Change Script window, click the Execute Change Script button to execute the change script and to commit the new default constraint to the database.

Testing the default constraint
When testing the default constraint you have just defined, make sure that the Initialize cells with default values option is enabled in the Result View options. Please note that this option is disabled by default.

To create a new row containing a default value:

1. Select the menu option Tools | Options (Ctrl+Alt+O) and select the Result View page of the Options dialog box.
2. Activate the Initialize cells with default values check box and click OK.
3. Right-click the table heading in the Design Editor and select SQL and Data | Edit Data from the context menu. A message box appears, click OK.
4. In the Result view, click the Append a new row button. The NumberInLitter column shows "1" in the new row.

4.2.4 Inserting Data into the Database

To insert data into the database, you can enter individual INSERT statements into an SQL Editor window or save them in an SQL file and execute all the statements together. More conveniently, DatabaseSpy also allows you to import data from TXT files and add new records in the Result window after executing a SELECT statement for editing.
**Objective**

In this section of the tutorial, you will learn how to insert data into the tables you have created in the previous section. Specifically, you will learn how to do the following:

- Execute an SQL script that populates the zoo database with data
- Import data provided in a TXT file
- Import data provided in an XML file
- Create a new SQL script and save it in the project
- Add new records in the Result window of the SQL Editor

**Commands used in this section**

<table>
<thead>
<tr>
<th>Icon</th>
<th>Command name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Execute SQL" /></td>
<td>Execute SQL</td>
<td>This command is located in the context menu that opens when you right-click an SQL file in the SQL folder of the Properties window. Use this command to immediately execute the SQL statements contained in the file.</td>
</tr>
<tr>
<td>![Row Count</td>
<td>Show/ Update](image)</td>
<td>Row Count</td>
</tr>
<tr>
<td><img src="image" alt="Import" /></td>
<td>Import</td>
<td>This command is located in the Tools toolbar; alternatively, you can also choose the menu option Tools</td>
</tr>
<tr>
<td><img src="image" alt="Execute" /></td>
<td>Execute</td>
<td>This command is located in the toolbar of an SQL Editor window and in the SQL Editor menu. Click this command to execute the SQL in the SQL Editor window.</td>
</tr>
<tr>
<td>![Retrieve data</td>
<td>All rows](image)</td>
<td>Retrieve data</td>
</tr>
<tr>
<td><img src="image" alt="SQL Editor" /></td>
<td>SQL Editor</td>
<td>This command is located in the Standard toolbar; alternatively, you can also choose the menu option File</td>
</tr>
<tr>
<td><img src="image" alt="Save" /></td>
<td>Save</td>
<td>This command is located in the Standard toolbar; alternatively, you can also choose the menu option File</td>
</tr>
</tbody>
</table>
### Icon | Command name | Description
--- | --- | ---
 | Add the Active File | This command is located in the toolbar of the Project window. Clicking this command adds the active file to the project under its corresponding folder. |
 | Save Project | This command is located in the toolbar of the Project window; alternatively, you can also choose the menu option File | Save Project As... or press Ctrl+S. Click this command to save an existing project under its project name or to specify a name and path for a new project, respectively. |
 | Edit Data | This command is located in the context menu that opens when you right-click a table or column in the Online Browser; alternatively, you can also select the table and press Ctrl+Alt+E. Choose this command to generate an SQL SELECT statement that is automatically executed in the SQL Editor and switches the Result window into the Editing mode. This command works for all supported database kinds for both ADO and ODBC connections. |
 | Append a new row | This command is available as a button in the Result window toolbar. Click this button to add a new row to the result grid. Alternatively, you can also right-click anywhere in the result grid and choose Append a new row from the context menu. The Append a new row command is only available if the Result window is in the Editing mode. |
 | Commit | This command is available as a button in the Result window toolbar. Click this button to commit the changes you have made in the result grid to the database. The Commit button is only visible if the Result window is in the Editing mode. |

#### 4.2.4.1 Using a Script to Add Data to the Database

Earlier in this tutorial, you added a script to the ZooDBProject that you can now use to populate the tblAnimalTypes and tblAnimalCategories tables with data. The file tblAnimalTypes_data.sql contains all the INSERT statements that are necessary to add the data to the tblAnimalTypes and tblAnimalCategories tables.
To avoid the manual data source assignment to the individual SQL files in your project in the future, you will also define a default data source (i.e., your tutorial database) for all files that are contained in the SQL folder of the Project window.

To set a default data source for the SQL folder:

1. Click the SQL folder in the Project window.
2. In the Properties window below, select “ZooDBConnect” from the Data Source drop-down list in the General section.
3. Click the `tblAnimalTypes_data.sql` file in the SQL folder and note that “ZooDBConnect” now appears as data source in the properties.
To execute tblAnimalTypes_data.sql:

1. Make sure that the ZooDBConnect connection is active.
2. In the Project window, right-click the file tblAnimalTypes_data.sql in the SQL folder and choose Execute SQL from the context menu. The file opens in an SQL Editor window and executes automatically. The tables tblAnimalTypes and tblAnimalCategories are populated with data.

Checking the result

To do a quick check as to whether the tables have been successfully populated with data, you can display the row count for all tables in the Online Browser.

To display the row count of all tables in the Online Browser:

- Right-click the "User Tables" folder and select Row Count | Show/Update from the context menu.

4.2.4.2 Importing Data from TXT Files

DatabaseSpy provides an import function which allows you to insert data provided in text files into a database. Example text files for the zoo database are included in the tutorial folder of your DatabaseSpy installation. How to import data from XML files will be explained in the next step of this tutorial.
In this step, you will import data from the `tblZookeepers.txt` file into the database table `tblZookeepers`.

To import data from text files into the database:

1. Click the **Import** button in the **Tools** toolbar, or select the menu option **Tools | Import data to the database...**, or press **Ctrl+I**.
2. Click the **CSV** button on the left side of the dialog box.
3. In the **Selection** tab, click **...** next to the **Path**, and select the `tblZookeepers.txt` file from the `\Altova\DatabaseSpy2019\DatabaseSpyExamples\Tutorial` sub-folder of the `Documents` folder.
4. Under **Database Generation Options**, select **Update existing tables**.
5. Under **Import Mode**, select **Generate SQL in SQL Editor**.
6. In the **Preview** group box, click the **Apply Options** button. This displays table data in the Preview window. To view the table definition, choose the **Show Definition** radio button.
7. Optionally, click inside the "Target Table Name" column to change the target table name.
8. Click the **ZookID** table icon until it changes to the symbol for a column not to be imported. The column header allows you to define the fields key type, and also if it should be included during the import process. We will not import the ZookID column since this is an identity column and the primary key will be generated automatically during import.

At this stage, if you followed all the steps above, the import options must be as shown below:
9. Click the **Generate SQL** button. This creates an SQL script which can be executed to complete the import process. Click **Generate SQL** in the message box to view the script in the SQL Editor.

10. Click the **Execute** button or press F5.

You can now view the imported data as follows:

- In the Online Browser, right-click the **tblZookeepers** table and select **Retrieve data | All rows** from the context menu (alternatively, press Ctrl+Alt+R).
4.2.4.3 Importing Data from XML Files

In the previous lesson, you learned how to insert data into a database using text files. In DatabaseSpy, you can also use XML files to export data from, or import data into, a database. The tutorial folder of your DatabaseSpy installation includes also example XML files for this purpose.

In this step, you will import data from `dbo.tblFeedSuppliers.xml` into the `tblFeedSupplier` database table. This assumes you have not already populated this table by other means (for example, by importing data from `tblFeedSuppliers.txt` file into it, see Importing Data from TXT Files).

To import data from an XML file into a database table:

1. Click the Import button in the Tools toolbar, or select the menu option Tools | Import data to the database..., or press Ctrl+I. The Import data to the database dialog box opens.
2. Click the XML button on the left side of the dialog box.
3. In the Selection tab, click next to the Path field. Select `dbo.tblFeedSuppliers.xml` from the `\Altova\DatabaseSpy2019\DatabaseSpyExamples\Tutorial` sub-folder of the Documents folder.
4. Under Database Generation Options, select Update existing tables.
5. Under Import Mode, select Generate SQL in SQL Editor.
6. Click the Options tab.
7. Under Start point of import, in the "Starting from" list, select "Row". (This specifies the name of the XML element from which data will be imported).
8. Under Automatic fields, deactivate the Create primary/foreign keys check box.
9. Under Other options, select Exclude namespace name.
10. Under Preview, click the Apply Options button. This displays table data in the Preview window. Note that the Import element now is not an available choice anymore. To view the table definition, choose the Show Definition radio button.
11. Click inside the "Target Table Name" column and choose `dbo.tblFeedSuppliers.xml` from the drop-down list.
12. Click the TreatmentID table icon until it changes to the symbol for a column not to
be imported. The column header allows you to define whether it should be included during the import process. We will not import the TreatmentID column since this is an identity column and the primary key will be generated automatically during import.

At this stage, if you followed all the steps above, the import options must be as shown below (the two images below correspond to the Selection tab, and Options tab, respectively).
13. Click the **Generate SQL** button. This creates an SQL script which can be executed to complete the import process. Click **OK** in the message box to view the script in the SQL Editor.

14. Click the **Execute** button or press **F5**.

15. In the Online Browser, right-click the **ZooDB** database and select **Refresh** from the context menu.

16. Right-click the **tblMedicalTreatments** table and select **Retrieve data | All rows** from the context menu or press **Ctrl+Alt+R**.
4.2.4.4 Populating the Zoo Database with Data (Optional)

In the previous steps of this tutorial, you have imported data into the database from a text file (see Importing Data from TXT Files) as well as from an XML file (see Importing Data from XML Files).

Optionally, you can also import data from several text or XML files available in the \Altova\DatabaseSpy2019\DatabaseSpyExamples\Tutorial sub-folder of the Documents folder. In this case, make sure to import files in the order shown below, to avoid problems with foreign key relationships.

<table>
<thead>
<tr>
<th>Text files</th>
<th>XML files</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. tblZookeepers.txt</td>
<td>1. dbo.tblZookeepers.xml</td>
</tr>
<tr>
<td>2. tblFeedSuppliers.txt</td>
<td>2. dbo.tblFeedSuppliers.xml</td>
</tr>
<tr>
<td>3. tblAnimalFeed.txt</td>
<td>3. dbo.tblAnimalFeed.xml</td>
</tr>
<tr>
<td>4. tblFeedingSchedules.txt</td>
<td>4. dbo.tblFeedingSchedules.xml</td>
</tr>
<tr>
<td>5. tblAnimals.txt</td>
<td>5. dbo.tblAnimals.xml</td>
</tr>
<tr>
<td>6. tblVeterinarians.txt</td>
<td>6. dbo.tblVeterinarians.xml</td>
</tr>
<tr>
<td>7. tblAnimalBirths.txt</td>
<td>7. dbo.tblAnimalBirths.xml</td>
</tr>
<tr>
<td>8. tblMedicalTreatments.txt</td>
<td>8. dbo.tblMedicalTreatments.xml</td>
</tr>
</tbody>
</table>

Note that, for the import of all these files to succeed, the foreign key values defined in the source file (text or XML) must exist in the target database tables. If any of the import operations fails due to any reason (for example, due to data already present in the database tables), it is likely that other subsequent imports will fail. In this case, it is recommended to perform the import against a fresh copy of the database.

To set up a fresh copy of the ZooDB database:

1. Create a new database (see Creating the Tutorial Database).
2. Using the SQL Editor, run the following two scripts against it:
   - create_ZooDB_tables.sql
   - create_ZooDB_relationships.sql
4.2.4.5 Creating and Saving an INSERT Script

The context menu that opens when you right-click a table and drag it into an SQL Editor window provides the possibility to generate an INSERT statement based on an existing table.

Assuming that the zoo in our tutorial has just hired two new zookeepers, you will create a script that adds these two new employees to the table tblZookeepers, and save that script in your project.

To create a script that inserts two new zookeepers into tblZookeepers:

1. Click the SQL Editor icon in the Standard toolbar or select the menu option File | New | SQL Editor (Ctrl+N) to open a new SQL Editor window.
2. Using the right mouse button, drag and drop the tblZookeepers table from the Online Browser into the SQL Editor window. A context-sensitive menu appears.
3. Select Insert from the context menu.

The following statement appears in the SQL window:

```
INSERT INTO [ZooDB].[dbo].[tblZookeepers] ([ZookID], [FirstName], [LastName], [Address], [City], [State], [Telephone], [DOB]) VALUES (, '', '', '', '', '', '');
```

4. Repeat steps 2 and 3 to create a second INSERT statement.
5. Alter the first INSERT statement as follows:

```
INSERT INTO [ZooDB].[dbo].[tblZookeepers] ([FirstName], [LastName],
```

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[Address], [City], [State], [Telephone], [DOB] ) VALUES ('June', 'Bug', '1345 Gorilla Highway', 'Newark', 'NJ', '(515)555-7217', '1963-11-26');

**Note:** No value is being inserted for the column ZookID, because it is an identity column and its value will be automatically generated. You must therefore delete the [ZookID] entry and the first comma from the statement.

6. Alter the second INSERT statement to add the following values:

```sql
INSERT INTO [ZooDB].[dbo].[tblZookeepers] ([FirstName], [LastName], [Address], [City], [State], [Telephone], [DOB] ) VALUES ('Bruno', 'Katz', '87 Panther Place', 'Trenton', 'NJ', '(515)555-7667', '1969-09-13');
```

7. Click the **Execute** button or press **F5**.
8. To check the results, open a new SQL Editor window and enter the statement `SELECT * FROM tblZookeepers`. Execute the statement. Optionally, click the **Maximize** button to extend the size of the Result window. Notice that two new rows have been inserted into the table.

To save the SQL script and add it to the project:

1. Make the SQL Editor window that contains the INSERT statements the active window and click the **Save** button in the Standard toolbar. The Save As dialog box opens.
2. Enter a name for the script, e.g., New_keepers (.sql), select a folder and click the **Save** button. The Add to Project dialog box opens (if the dialog box does not pop up, check whether the Do not show dialog option is checked in the Newly saved files group box of the General options).
3. Click the **Add to Project** button. Alternatively, or if the Add to Project dialog box is not displayed, you can also click the **Skip Project** button and do one of the following:

- Click the **Project** tab, right-click the **SQL** folder, and select **Add Active File to Project** from the context menu.
- Click the **Add the Active File** icon in the toolbar of the Project window.

4. Right-click the name tab in the SQL Editor and select **Add to Project** from the context menu that opens.
menu, or click the Save Project icon in the toolbar of the Project window.

4.2.4.6 Adding Data in the Result Window

A more convenient way to insert data into the database is to add data directly in the Result window.

<table>
<thead>
<tr>
<th>SupplierID</th>
<th>SupplierName</th>
<th>SupplierAddress</th>
<th>SupplierCity</th>
<th>SupplierState</th>
<th>SupplierTelephone</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>The Pampered Pet</td>
<td>245 Greenaway Street</td>
<td>Chicago</td>
<td>IL</td>
<td>(515)555-0706</td>
</tr>
<tr>
<td>8</td>
<td>ZooChow Central</td>
<td>3130 Ninth Avenue</td>
<td>NY</td>
<td>NY</td>
<td>(515)555-3345</td>
</tr>
<tr>
<td>9</td>
<td>Food4Animals</td>
<td>67 Ella Drive</td>
<td>Boston</td>
<td>MA</td>
<td>(515)555-8647</td>
</tr>
</tbody>
</table>

Note that the Result window has to be enabled for data editing before you can add or delete rows or edit the data displayed in the result grid. For this purpose, the Edit Data command is available in the context menu that opens when you right-click a table or column in the Online Browser.

To add a new food supplier in the Result window:

1. In the Online Browser, right-click the tblFeedSuppliers table and select Edit Data from the context menu; alternatively, select the table and press Ctrl+Alt+E.

2. DatabaseSpy generates a SELECT statement in a new SQL Editor window, automatically executes it, and enables the Result window for editing. A popup appears, informing you that editing of data is limited for this table.

3. Click the Show Details button to learn which columns cannot be edited.
4. Optionally, if you want to suppress this popup in the future, click the **Don't show this dialog again!** check box.

5. Click **OK** to close the popup and display the data in the Result window.

6. In the Result window, click the **Append a new row** icon. Please note that the cursor automatically appears in the "SupplierName" column because the value for the "SupplierID" column will be generated automatically when the data is committed to the database.

```
<table>
<thead>
<tr>
<th>SupplierID</th>
<th>SupplierName</th>
<th>SupplierAddress</th>
<th>SupplierCity</th>
<th>SupplierState</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>ZooChow Central</td>
<td>3133 Ninth Avenue</td>
<td>NY</td>
<td>NY</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

7. Enter the following data into the newly created row:

```
Food4Animals | 67 Ella Drive | Boston | MA | (515)555-8647
```

8. Click the **Commit** button to save the changes to the database.

9. Optionally, click the "update" hyperlink next to **tblFeed Suppliers** in the Online Browser to update the row count of the table.

4.2.5 **Browsing the Database**

Now that you populated the tables of the zoo database with data in the previous section of the tutorial, you may want to browse the database and find individual database objects. DatabaseSpy allows you to customize the view of the Online Browser, use filters, and provides the Object Locator if you need to locate a specific object in the database.
Objective
In this section of the tutorial, you will learn how to use filters and how to locate objects in your database project. Specifically, you will learn how to do the following:

- Customize the Online Browser
- Show the row count of tables and views
- Filter database objects in the Online Browser
- Use the Object Locator to locate a specific database object

Commands used in this section

<table>
<thead>
<tr>
<th>Icon</th>
<th>Command name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Folders</td>
<td>This command is located in the toolbar of the Online Browser. Click the arrow to the right of the icon to open the drop-down list from where you can select a folder layout for the Online Browser. Please note that the icon changes in accordance with the selected layout.</td>
</tr>
<tr>
<td></td>
<td>Row Count</td>
<td>Show/Update</td>
</tr>
<tr>
<td></td>
<td>Row Count</td>
<td>Clear</td>
</tr>
<tr>
<td></td>
<td>Filter folder contents</td>
<td>This command is located in the toolbar of the Online Browser. Clicking this command displays additional filter icons to the right of the folders and allows you to enter filter criteria. The display changes dynamically as you enter the criteria.</td>
</tr>
<tr>
<td></td>
<td>Object Locator</td>
<td>This command is located in the toolbar of the Online Browser. Click this command to display a text box and a drop-down list below the Online Browser.</td>
</tr>
<tr>
<td></td>
<td>Search within/all</td>
<td>This command is located to the right of the drop-down list that appears if the Object Locator is switched on. Click this command to define the focus for the Object Locator. Please note that the icon changes in accordance with the selected focus.</td>
</tr>
</tbody>
</table>
4.2.5.1 Customizing the Online Browser

The Online Browser window can be configured to show different aspects of the current database. Click the Layouts icon in the icon bar of the Online Browser and select the specific layout you want to use from the drop-down list that opens. The default layout in the Online Browser is Folders. Please note that the icon changes in accordance with the selected layout.

Filters cannot be defined when either the No Folders or the Table Dependencies layout is active.

4.2.5.2 Showing the Row Count

You can get an overview on the number of rows in a table or view without the need to retrieve data first. The row count is displayed directly in the Online Browser and can be updated or cleared at any time, either for single tables or views, respectively, or for all objects in a folder at once.

The row count can be disabled in the Online Browser options; it is enabled by default.

To show the row count for a single table:

1. Make sure that the Optional display of Table and View row counts check box is activated in the Online Browser options (select the menu option Tools | Options or press Ctrl+Alt+O and select the Online Browser page to check).
2. If you hover over tables or views in the Online Browser, the string "(count)" is displayed to the right of any table or view. Select tblAnimals and click on "(count)". Notice how the...
string turns into a link when you place the mouse cursor over it.

Alternatively, you can also right-click tblAnimals and select **Row Count | Show/Update** from the context menu.

**To show the row count for all objects of a folder:**

- With the row counts option activated, right-click the User Tables folder in the Online Browser and select **Row Count | Show/Update** from the context menu.

The number of rows is retrieved for all tables that are contained in the User Tables folder.

**To hide the row count for tables, views, or folders:**

- Select the database object for which you do not want to show the row count, right-click and select **Row Count | Clear** from the context menu.

### 4.2.5.3 Filtering Objects

The application of filters allows you to reduce the number of displayed database objects and thus show only those objects that meet certain filter criteria. You can define different filters for each of the individual folders in the Online Browser.

Since the filters work on folder level, the filter function is not available in the **No Folders** and **Table Dependencies** layouts.

In this tutorial, you will use a filter to display only tables that contain the string "Animal" in the table name.
To filter for tables containing the string "Animal" in the table name:

1. Make sure you are in **Folders** layout, and expand the folders so you can see the zoo database tables.

2. In the Online Browser, click the **Filter folder contents** icon in the toolbar or press **Ctrl+Alt+F**. Filter icons appear next to the Schemas, Tables and Views folders.

3. Click the Filter icon next to the Tables folder and select **Contains** from the menu that pops up.

A text field appears to the right of the filter icon.

4. Enter "Animal" in the text field. The objects are filtered as you type.

### 4.2.5.4 Locating Database Objects

The Object Locator in DatabaseSpy serves for searching for a specific database object by name. When the Object Locator is turned on, you can enter a string in the text box below the Online
Browser window and then select a database object from the drop-down list displaying only objects that contain the text entered in the text box. Clicking an entry in the drop-down list selects the corresponding database object in the Online Browser.

**Note:** To speed up the display of database objects in the Object Locator, only items are displayed that have already been loaded into the Online Browser in the current session. Therefore, if only a few items are displayed or a certain type of database items (e.g., keys or constraints) is missing at all, load these items into the Online Browser by expanding the tree until the desired object is visible. Use the Expand | Siblings and Expand | Children commands from the context menu for this purpose.

**To display each and every item in the Online Browser:**

1. In the Online Browser, expand the schema so that all its subfolders are displayed.
2. Use Shift+Click to select all sub-items of the schema.
3. Right-click and select Expand | Children from the context menu.
4. Repeat steps 2 and 3 until all subfolders of the schema are expanded. Note that in large databases the loading of the items may take a considerable amount of time.

**To locate database objects in the Online Browser:**

1. In the Online Browser, click the Object Locator icon. A text box and a drop-down list appear at the bottom of the Online Browser.
2. Enter the string you want to look for, e.g., “type”. Clicking the drop-down arrow displays all elements that contain that string.
3. Choose an object from the drop-down list to have it selected in the Online Browser.
4. Change the Object Locator context by clicking the arrow icon next to the drop-down list and select one of the options From current Data Source, From focused item, or All.
4.2.6  Querying the Database

From time to time, you will want to query your database to see which data is stored in the individual tables. DatabaseSpy provides several possibilities for doing this.

Objective

In this section of the tutorial, you will learn how to query the database. Specifically, you will learn how to do the following:

- Query the zoo database using multiple queries in a script
- Create queries using drag and drop

Commands used in this section

<table>
<thead>
<tr>
<th>Icon</th>
<th>Command name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>🎵</td>
<td>Execute</td>
<td>This command is located in the toolbar of an SQL Editor window and in the SQL Editor menu. Click this command to execute the SQL in the SQL Editor window.</td>
</tr>
<tr>
<td>🍁</td>
<td>Define Target Name</td>
<td>This command is located in the SQL Script toolbar and in the SQL Editor menu. Clicking this command will insert a comment defining a name for the Result tab before the statement in which the cursor is currently located.</td>
</tr>
<tr>
<td>🥑</td>
<td>Current statement</td>
<td>This command is located in the toolbar of an SQL Editor window. Click this command to select the statement in which the cursor is currently located.</td>
</tr>
</tbody>
</table>

4.2.6.1  Using a Script to Query the Database

The SQL file animalType_query.sql that you have added to your database project in one of the previous sections of this tutorial contains a script that uses targets to output the two queries it is composed of to two separate Result tabs and assign a name to each tab. This way, you can execute the script with a single mouse click and have the results displayed in different Result windows. For more information, see Naming Result Tabs.
To query the database using the script animalType_queries.sql:

1. Make sure that the “ZooDBConnect” connection is active.
2. Click the **Project** tab.
3. In the SQL folder, double-click the file **animalType_queries.sql**. The file opens in an SQL Editor window.

```
1 -- target: animalTypeCountQuery
2 SELECT COUNT (ZooDB.dbo.tblAnimalTypes.EnglishName)
3 FROM ZooDB.dbo.tblAnimalTypes, ZooDB.dbo.tblAnimalCategories
4 WHERE ZooDB.dbo.tblAnimalTypes.Category=ZooDB.dbo.tblAnimalCategories.CategoryID AND
5 ZooDB.dbo.tblAnimalCategories.Category='perch-like';
```

4. In the Properties window, make sure that either “Semicolons” or “SQL Grammar” is selected in the Group statements for execution with drop-down list.

5. Click the **Execute** button or press F5. The results of the two queries appear in separate tabbed windows that use the corresponding target names as tab text.

If you do not get separate named result tabs as depicted above, switch the **Show multiple results stacked** option off in the SQL Editor toolbar.
4.2.6.2 Using Drag and Drop to Create Queries

DatabaseSpy allows you to generate SELECT statements by dragging a table and dropping it into an SQL Editor window. To this aim, you should make sure that the default statement generated for tables is a SELECT statement. Select the menu option Tools | Options, go to the Online Browser page and choose Select as SQL action for tables.

To generate a query based on the table "tblZookeepers" and specify a target for it:

1. Click the Online Browser tab.
2. Drag and drop the table tblZookeepers to the same SQL Editor window where the file animalType_queries.sql is currently open. This generates the following SELECT statement:

```sql
SELECT [ZookID], [FirstName], [LastName], [Address], [City], [State], [Telephone], [DOB] FROM [ZooDB].[dbo].[tblZookeepers];
```

3. Place the cursor anywhere in the new SELECT statement. Click the Current statement icon in the SQL Editor window. This selects the entire statement.

4. Click the Define Target name button in the SQL Script toolbar. The text -- target: Result appears above the statement.

```sql
-- target: Result
SELECT [ZookID], [FirstName], [LastName], [Address], [City], [State], [Telephone], [DOB] FROM [ZooDB].[dbo].[tblZookeepers];
```

5. Change the text "Result" to "Select zookeepers".
6. In the Properties window, make sure that either "Semicolons" or "SQL Grammar" is selected in the Group statements for execution with drop-down list.

7. Click the Execute button or press F5. The results of all three queries in the script appear in separate result windows.

```
-- target: Select zookeepers
SELECT [ZookID], [FirstName], [LastName], [Address], [City], [State], [Telephone], [DOB] FROM [ZooDB].[dbo].[tblZookeepers];
```

4.2.7 Using Auto-Completion

In DatabaseSpy, the auto-completion feature assists you when entering SQL statements in the SQL Editor. As you type, you are offered different possible SQL keywords or names of database objects to choose from.

The SQL syntax depends on the specific SQL flavor you are using. This is automatically determined by the connection string you defined using the Connection wizard, i.e., the Create a Database Connection option.

**Objective**

In this section of the tutorial you will learn how to use the auto-completion feature in DatabaseSpy. Specifically, you will add a new column to the table tblVeterinarians while using auto-completion.

**Note:** When executing only one of the select statements, make sure that the --target: text is selected in addition to the select statement below it, if you want the target window text to be generated. The Current statement button will not select the --target: line.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Command name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image.png" alt="SQL Editor" /></td>
<td>SQL Editor</td>
<td>This command is located in the Standard toolbar;</td>
</tr>
</tbody>
</table>
4.2.7.1  **Adding a New Column to a Table**

In the list of veterinarians of our tutorial zoo, currently the only contact information is the phone number, so the zoo authorities also want the e-mail address of the veterinarian. You will add a column, called “Email” of type `varchar(50)`, to the table `tblVeterinarians`.

**To create and execute an SQL ALTER statement using auto-completion:**

1. Click the **SQL Editor** toolbar button to open a new SQL Editor window.
2. Enter “alt”. The auto-completion window pops up.
3. Press **Enter**. The word “ALTER” appears in the SQL Editor.
4. Start typing “tab” and add the word “TABLE” after “ALTER”. Your SQL statement should now be “ALTER TABLE”.
5. Press **Ctrl+Space** to manually trigger auto-completion, select “tblVeterinarians” from the list and press **Space**.
6. Continue creating the SQL statement until you have typed the following text:

   ```sql
   ALTER TABLE [tblVeterinarians] ADD Email VARCHAR (50)
   ```

7. Execute the SQL statement by clicking the **Execute** button or pressing **F5**.

You have now created the new **Email** column. To view it in the Online Browser, click the **Refresh database** button.

### 4.2.8 Updating Database Data

So far, you have learned how to create tables, insert data and execute queries to retrieve data from these tables. This section of the tutorial shows you how to update data contained in the tables of the Zoo database in the Result window of DatabaseSpy.

**Objective**

In this section of the tutorial, you will learn how to edit database data in the Result window of the SQL Editor. Specifically, you will learn how to do the following:

- **Update a data cell** in the Result window
- **Delete record sets** in the Result window
- **Copy a row of records** and append it to the result grid as a new row

**Commands used in this section**

<table>
<thead>
<tr>
<th>Icon</th>
<th>Command name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>⏩</td>
<td><strong>Edit Data</strong></td>
<td>This command is located in the context menu that opens when you right-click a table or column in the Online Browser; alternatively, you can also select the table and press <strong>Ctrl+Alt+E</strong>. Choose this command to generate an SQL SELECT statement that is automatically executed in the SQL Editor and switches the Result window into the Editing mode. This command works for all supported...</td>
</tr>
</tbody>
</table>
## Editing Records in the Result Window

In the previous section of the tutorial, you have added a new column for the e-mail address of the veterinarians to thetblVeterinarians table. Now you will enter the actual e-mail information into this new column.

You can add this information directly in the Result window of the SQL Editor if you first select the tblVeterinarians table for editing.

**To edit table records in the Result window:**

1. In the Online Browser, right-click the tblVeterinarians table and select Edit Data from the context menu. Alternatively, select the table and press Ctrl+Alt+E.
2. A popup appears, informing you that editing of data is limited for this table.

[Image: DatabaseSpy]

3. Optionally, click the **Show Details** button to learn which columns cannot be edited.
4. Optionally, if you want to suppress this popup in the future, click the **Don't show this dialog again!** check box.
5. Click **OK** to close the popup and display the data in the Result window.
6. In the result grid, double-click the "Email" cell in the first row. A cursor appears in the cell.

<table>
<thead>
<tr>
<th>LastName</th>
<th>Address</th>
<th>City</th>
<th>State</th>
<th>Telephone</th>
<th>DOB</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hoofman</td>
<td>12 Elrave Boulevard</td>
<td>Concord</td>
<td>NH</td>
<td>(515)555-2759</td>
<td>[NULL]</td>
<td>[NULL]</td>
</tr>
<tr>
<td>Scales</td>
<td>49 Wheateeth Avenue</td>
<td>Hartford</td>
<td>CT</td>
<td>(515)555-2843</td>
<td>[NULL]</td>
<td>[NULL]</td>
</tr>
<tr>
<td>Wormworth</td>
<td>31 Marsupial Place</td>
<td>Newark</td>
<td>NJ</td>
<td>(515)555-9352</td>
<td>[NULL]</td>
<td>[NULL]</td>
</tr>
</tbody>
</table>

7. Double-click the cell again to have the entire content selected and enter "peggy@yahoo.com".
8. Press the **Enter** key. The color of the updated cell changes. To see the full content of the cell, place the mouse cursor over the cell which will then expand.

[Image: Email]

9. Click the **Commit** button to save your changes to the database. The updated cell changes back to its default color and the update is committed to the database.
4.2.8.2 Deleting a Table Row in the Result Window

One of the veterinarians will not be available for the zoo anymore and the zoo authorities want to have his records deleted from the database. DatabaseSpy allows you to delete a row from a table with a mouse click, provided that the Result window is in the Editing mode.

To delete a row from a database table:

1. Make sure that the Result window is still in the Editing mode.
2. Click somewhere into the sixth row of the result grid and click the Delete row button in the toolbar of the Result window.

The background color of the row as well as the text color change to indicate that this row is to be deleted from the database.

3. Click the Commit button. The row is removed from the result grid and deleted from the database.

4.2.8.3 Copying Table Rows

In the tblMedicalTreatments table, the zookeepers in our tutorial zoo keep records about the medical treatments of the zoo animals. If a disease occurs repeatedly, you can copy a previous entry in this table and append it to the result grid as a new row.
In the screenshot above, you can see that the zoo’s hill mynah (AnimalID 5004) suffered from the Newcastle Disease already twice. In this section of the tutorial, you will copy a previous treatment and add it to the medical treatments record.

To copy a row and append it to the result grid:

1. In the Online Browser, right-click the tblMedicalTreatments table and select Edit Data from the context menu.
2. In the Result window, right-click into the fifth row and select Selection | Row from the context menu.
3. Right-click again and select Copy selected cells from the context menu.
4. Right-click anywhere in the result grid and select Paste as new rows from the context menu.
5. Double-click the “TreatmentDate” cell of the new row and enter the new date of the treatment.
6. If required, change the VetID table if a different veterinarian is responsible for the treatment.
7. Click the Commit button to actually add the new row to the database.

### 4.2.9 Designating Database Objects as Favorites

DatabaseSpy’s Favorites feature allows you to put database objects into the Favorites folder so that you have quick access to them.

**Objective**

In this section of the tutorial, you will learn how to add tables that need to be updated frequently to the Favorites folder of a database project.
Commands used in this section

<table>
<thead>
<tr>
<th>Icon</th>
<th>Command name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Add to/Remove from Favorites</strong></td>
<td>This command is located in the context menu that opens when you right-click a table or column in the Online Browser. Click this command to add the selected item to the <strong>Favorites</strong> folder in the Project window.</td>
</tr>
<tr>
<td>★</td>
<td><strong>Show Favorites</strong></td>
<td>This command is located in the toolbar of the Online Browser. Clicking this command toggles the Favorites view on and off. Note that this icon is unavailable if no items have been added to the <strong>Favorites</strong> folder yet.</td>
</tr>
</tbody>
</table>

4.2.9.1  Adding Objects to the Favorites Folder

Some of the tables in the zoo database need to be queried or to have their data updated more often than others. For example, `tblAnimalFeed` needs to be updated every time the amount of a type of feed that the zoo keeps in storage changes. `tblMedicalTreatments` needs to be updated whenever a veterinarian visits. Adding these tables to the Favorites folder in the Project window provides you with quick access to these tables.

To add tables to the Favorites folder:

1. In the Online Browser, right-click table `tblAnimalFeed` and select **Add to/Remove from Favorites** from the context menu, or select the table and press Ctrl+F2.
2. Select the menu option **Tools | Options** and, on the Online Browser page, make sure that the **Enable full row selection** check box is activated. Click OK to confirm your change, if applicable.
3. In the Online Browser, move the mouse over table `tblMedicalTreatments` and click the favorites icon that appears to the right of the table name.

Tables that have been added to the **Favorites** folder are shown in bold type in the Online Browser.

4. Click the **Show Favorites** icon to switch to the favorites view.
Note that the **Show Favorites** icon is now active and that only favorite items are shown in the Online Browser.

5. Click the **Show Favorites** icon again to switch back to the normal Online Browser view.
6. Click the **Project** tab to change to the Project window. Note that the favorite items have been added to the **Favorites** folder in the Project window.

7. Click the **Show in Online Browser** icon to the right of an item in the **Favorites** folder to display the corresponding database object in the Online Browser.

### 4.2.10 Exporting Database Data

**Objective**

In this section of the tutorial, you will learn how to export data from the zoo database. Specifically, you will learn how to do the following:

- Select tables for the export to XML files
- Preview the data to be exported
- Specify the path for the export file
4.2.10.1 Exporting Tables to XML

The Export database data dialog box allows you to select individual tables for export and choose the desired export format. Furthermore, you can specify a folder where the export files are to be stored, and preview the data before actually exporting it.
To export table data to XML:

1. Click the **Export** button in the Tools toolbar. The Export database data dialog box opens.
2. Click the **XML** icon at the left side.
3. In the Source group box, click the respective check boxes of `tblAnimalCategories` and `tblAnimalTypes`. Note that Filters, Favorites, and Locators can be used to limit the amount of tables in this tree.
4. Optionally, activate the **Show checked objects only** check box to hide objects not
selected for export.
5. In the Destination group box, enter "ZooDB_" as a prefix that will be added to the exported tables.
6. Select the destination path of the XML files, C:\TEMP in this case.
7. Select one of the tables to be exported and click the Preview button in the Preview group box to preview the table before exporting it.
8. Click Export. A separate XML file for each of the selected tables is created at the specified location.
9. Double click one of the exported XML files to check its contents.

```
<?xml version="1.0" encoding="UTF-8"?>
<Import name="tblAnimalTypes" query="SELECT [AnimalTypeID],
    [AnimalName], [EnglishName], [LatinName], [AreaOfOrigin], [Category]">
<!-- MS SQL Server -->
<!-- Column name:AnimalTypeID type:int -->
<!-- Column name:EnglishName type:varchar maxlength:50 -->
<!-- Column name:LatinName type:varchar maxlength:50 -->
<!-- Column name:AreaOfOrigin type:varchar maxlength:50 -->
<!-- Column name:Category type:int -->
</Import>
</Row>
```

4.2.11 Comparing Database Schemas

The schema comparison feature in DatabaseSpy allows you to compare and merge the structure of different schemas of a database or schemas in different database types. In our zoo tutorial, you will compare the live database with a test environment that runs on the same database server.

Objective

In this section of the tutorial, you will learn how to compare the structure of two schemas of a database and merge differences between the schemas. Specifically, you will learn how to do the following:

- Add a schema to the zoo database and add tables using an SQL script
- Set up a database schema comparison and select items for comparison
- Review and correct the mapping
- Compare the structure of two schemas of the zoo database
- Show and examine the differences
- Merge the differences between the two schemas

Commands used in this section

<table>
<thead>
<tr>
<th>Icon</th>
<th>Command name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Open File...</td>
<td>This command is located in the File</td>
</tr>
<tr>
<td>Icon</td>
<td>Command name</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td><img src="image" alt="icon" /></td>
<td>Execute</td>
<td>can also use the keyboard shortcut Ctrl+O. This command is located in the toolbar of an SQL Editor window and in the SQL Editor menu. Click this command to execute the SQL in the SQL Editor window.</td>
</tr>
<tr>
<td><img src="image" alt="icon" /></td>
<td>Refresh</td>
<td>This command is available in the Online Browser as a button, or as an option in the context menu that opens when you right-click a database. Use this command to refresh the database and display new or changed database objects in the Online Browser.</td>
</tr>
<tr>
<td><img src="image" alt="icon" /></td>
<td>Schema Comparison</td>
<td>This command is located in the Standard toolbar; alternatively, you can also choose the menu option File</td>
</tr>
<tr>
<td><img src="image" alt="icon" /></td>
<td>Start Comparison</td>
<td>This command is located in the toolbar of the Schema Comparison window; alternatively, you can also choose the menu option Schema Comparison</td>
</tr>
<tr>
<td><img src="image" alt="icon" /></td>
<td>Toggle Message Window</td>
<td>This command is located in the Schema Comparison window toolbar. Use this command to switch the display of the Message window on and off.</td>
</tr>
<tr>
<td><img src="image" alt="icon" /></td>
<td>Collapse items</td>
<td>This command is available in the Schema Comparison menu, or as an option in the context menu that opens when you right-click the title bar of a comparison component. Use this command to collapse all items in both components.</td>
</tr>
<tr>
<td><img src="image" alt="icon" /></td>
<td>Show merge script: Left to Right</td>
<td>This command is available in the Schema Comparison menu, or as an option in the context menu that opens when you right-click the title bar of, or a database item in, a comparison component. Use this command to show the merge script that copies the changes in the left component into the right component. If called from the title bar of a component or when no item is selected, this command will generate the merge script for all items in the component.</td>
</tr>
<tr>
<td><img src="image" alt="icon" /></td>
<td>Show merge script: Right to Left</td>
<td>This command is available in the Schema Comparison menu, or as an option in the context menu that opens when you right-click the title bar of, or a database item in, a comparison component. Use this command to show the merge script that copies the changes in the right component into the left component.</td>
</tr>
</tbody>
</table>

4.2.11.1 Adding a Schema

The tutorial folder of your DatabaseSpy installation contains an SQL script that will create a new schema in your zoo database and add all zoo tables to it. You will open and execute this script in the SQL Editor.

To add schema "test" to the zoo database:

1. Select the menu option File | Open | Open File... or press Ctrl+O to open the Windows Open dialog box.
2. Navigate to the tutorial folder (Altova\DatabaseSpy2019\DatabaseSpyExamples\Tutorial sub-folder of the Documents folder), select CreateTestSchema.sql and click Open. The script opens in a new SQL Editor window.
3. In the Properties window, select “ZooDBConnect” from the Data Source drop-down list.
4. Click the Execute button in the SQL Editor toolbar or press F5.
5. In the Online Browser, click the Refresh button in the toolbar or right-click ZooDB and select Refresh from the context menu.

4.2.11.2 Setting Up a Database Schema Comparison

DatabaseSpy provides a Schema Comparison window which is used to select schemas and tables, and to map database items, start a comparison, and display the merge script for the compared items. Opening a Schema Comparison window and selecting the schemas and database items to be compared is usually done in a single step.

To select schemas for comparison:

1. Click the Schema Comparison button in the Standard toolbar or select the menu option File | New | Schema Comparison. A new Schema Comparison window is opened and the Select Database Objects for Comparison dialog box appears, where the first data source connection, ZooDBConnect, is preselected in the Data Source drop-
down list, and the **Left Side** button is activated by default.

2. Expand the tree structure in the selection dialog box until the schemas are displayed, expand schema dbo and activate the **User Tables** check box. This selects all tables in the User Tables folder.

3. Click the **Right Side** button, expand schema test and also activate the User Tables check box.
4. Click OK. The tables appear in two separate components of the Schema Comparison window, and matching items are mapped automatically.

5. Select the menu option **Schema Comparison | Collapse items** or select this command from the context menu that opens when you right-click the header of either component in the Schema Comparison window.

![Schema Comparison Window](image)

6. Optionally, if the sort order is different in the left and right component, select the menu option **Schema Comparison | Sort items | Ascending** or select this command from the context menu that opens when you right-click the header of either component in the Schema Comparison window.

### 4.2.11.3 Mapping Items

Normally, corresponding items are mapped automatically in DatabaseSpy, however if, for example, different naming conventions are applied on the compared databases, automatic mapping might fail. In this case, you can still map corresponding items manually, by drawing a line between the respective items.

If you check the sorted tables in your database schema comparison, you will notice that item `dbo.tblVeterinarians` is not mapped to `test.tblVets`. Obviously, the difference in the name of the two items was too big for the automatic mapping to identify these two items as a comparison pair.
We will now take a closer look on these two items to determine whether or not they can be considered corresponding. Double-click the items or click the plus sign to expand the table in the comparison components. Since the columns that are contained in the table are pretty similar in the left and right components, we can map them and hence include them in the comparison. Note that all child items of the tables that are equal on both sides will be mapped automatically when you draw the connection line between the parent.

Two column pairs, LastName/Name and Telephone/Phone, are still unmapped, if you further expand these items, you will see that data types as well as Nullable constraints are equal on both sides and that these items can also be mapped safely.
To manually map dbo.tblVeterinarians and test.tblVets:

1. In the Schema Comparison window, click the triangle next to `dbo.tblVeterinarians` and, keeping the mouse button pressed, draw a line to `test.tblVets`. Release the mouse button when the cursor changes its shape.

2. Double-click either `dbo.tblVeterinarians` or `test.tblVets` to expand the table in both components and map column "LastName" to column "Name" as described in step 1.

3. In the same way, map column "Telephone" to column "Phone".

4.2.11.4 Starting a Comparison

You can start a comparison from the Schema Comparison menu or by clicking the Start Comparison button in the toolbar of the Schema Comparison window. Alternatively, you can also right-click the title bar of either component and choose Compare items from the context.
menu. This way, you run a comparison for all mapped items in the database comparison components. DatabaseSpy displays comparison result icons that indicate whether a pair of mapped items is equal or contains differences.

Please note that there are three different kinds of differences displayed in the above screenshot:

- **tblAnimals** and **tblMedicalTreatments** show a **Different** sign on both sides of the comparison and the table names are not highlighted:

```
| dbo.tblAnimals | test.tblAnimals |
```

This indicates that the table name itself is equal, however, one or more child items are different. Expand the table to learn where the differences occur.

- **tblFeedingSchedules** and **tblZookeepers** show a **Different** sign on one side and an **Equal** sign on the other side of the comparison; the table names are not highlighted:

```
| dbo.tblFeedingSchedules | test.tblFeedingSchedules |
```

```
| dbo.tblZookeepers | test.tblZookeepers |
```
This indicates that the tables are equal but there is at least one additional item in the table that shows the Different sign. If you expand this table, these additional items are not mapped and indicated with a question mark.

- `dbo.tblVeterinarians` and `test.tblVets`, respectively, show a Different sign and their table names are highlighted:

A summary of the comparison result on table level is displayed in the Message window. Click the
To view the differences in more detail—that is, on item level—you have to **examine the comparison results in the components**. All items that contain differences are automatically expanded in the components so as to allow for easy identification of differences.

To compare all mapped items:

Do one of the following:

- Select the menu option **Schema Comparison | Compare items**.
- Click the **Start Comparison** button in the toolbar of the Schema Comparison window.
- Right-click the title bar in either comparison component and choose **Compare items** from the context menu.

4.2.11.5 **Examining the Differences**

When you start a schema comparison in DatabaseSpy, all items in the comparison components are expanded and scrollbars are displayed so that you are able to scroll through the items and check for differences. DatabaseSpy uses icons to identify tables that contain differences, and color coding to indicate the particular difference itself. So, if you are examining your comparison result for differences, we recommend a top-down approach: Start at the top and collapse any table that does not contain differences. If a table with differences appears do the same on item level, that is, collapse all the items that are equal on both sides of the comparison. Eventually, only different items in tables that contain differences are displayed.
After you have started a comparison and examined the differences between the schemas, you can merge the two schemas. Since changes to the database structure cannot be easily undone, DatabaseSpy will not directly perform a merge but display the merge script in an SQL Editor window where you can review the script and execute it if you are sure that the changes to the schema structure should be committed to the database.

You can either merge all differences at once (i.e., create one merge script that contains all the changes to the schema structure) or choose one or more particular differences to merge (i.e., create a merge script that contains selected changes). The merge itself can be performed in both directions, that is, from left to right or from right to left. You can therefore also decide to mix the schema structure by merging some changes from left to right and others from right to left.

The screenshot below shows the merge script for copying the structure of schema "dbo" to schema "test" (merge left to right).
A different merge script is generated if you decide to merge the changes from right to left:
In this section of the tutorial, you will rename `test.tblVets` to `test.tblVeterinarians` (merge left to right) and add the e-mail column to both `dbo.tblZookeepers` (merge right to left) and `test.tblVeterinarians` (merge left to right).

To merge schemas in the zoo database:

1. Select the menu option **Schema Comparison | Collapse items** or right-click the title bar of either component and choose **Collapse items** from the context menu.
2. Expand database and schema and select either `dbo.tblVeterinarians` or `test.tblVets`.
3. Select the menu option **Schema Comparison | Show merge script: Left to Right** or right-click the table in the component and choose **Show merge script: Left to Right** from the context menu. The merge script is displayed in a new SQL Editor window.

```sql
ALTER TABLE [ZooDB].[dbo].[tblAnimalBirths] DROP CONSTRAINT [FK_VetID2];

SP_RENAME '[dbo].[tblVeterinarians]','tblVets';

SP_RENAME '[dbo].[tblVets].[LastName]','Name','COLUMN';

SP_RENAME '[dbo].[tblVets].[Telephone]','Phone','COLUMN';

ALTER TABLE [ZooDB].[dbo].[tblAnimals] ALTER COLUMN [AnimalWeight] int NOT NULL;

ALTER TABLE [ZooDB].[dbo].[tblMedicalTreatments] ALTER COLUMN [Problem] varchar (300) COLLATE SQL_Latin1_General_CP1_CI_AS NULL;

ALTER TABLE [ZooDB].[dbo].[tblZookeepers] ADD [Email] varchar (50) COLLATE SQL_Latin1_General_CP1_CI_AS NULL;

ALTER TABLE [ZooDB].[dbo].[tblAnimalBirths] ADD CONSTRAINT [FK_VetID2] FOREIGN KEY ([Veterinarian]) REFERENCES [ZooDB].[dbo].[tblVets] ([VetID]) ;
```

Note that the script contains only SQL for renaming the table itself; remember that there were also two columns with different names in this table. To generate a merge script that not only renames the table but also the two columns, you have to select the columns as well before you generate the merge script. Close the SQL Editor window without executing or saving the script, and get back to the Schema Comparison window.
4. Expand `tblVeterinarians` and select the table name as well as columns "LastName", "Telephone", and "Email" (hold down the Ctrl key to select multiple items).

5. Select the menu option **Schema Comparison | Show merge script: Left to Right** and check the merge script in the SQL Editor.

```
1  SP_RENAME '[test].[tblVets]', 'tblVeterinarians';
2  SP_RENAME '[test].[tblVeterinarians].[Name]', 'LastName', 'COLUMN';
3  SP_RENAME '[test].[tblVeterinarians].[Phone]', 'Telephone', 'COLUMN';
4  ALTER TABLE [ZooDB].[test].[tblVeterinarians] ADD [Email] varchar (50) COLLATE SQL_Latin1_General_CP1_CI_AS NULL;
```

Now both table and columns will be renamed and the column "Email" will be added to schema test.

6. Make sure that the SQL Editor is still connected to ZooDB and click **Execute**.

7. In the Online Browser, click the **Refresh** button in the toolbar or right-click ZooDB and select **Refresh** from the context menu. Note that `dbo.tblVeterinarians` now appears unmapped in the Schema Comparison window.
8. Double-click the title bar of the right comparison component and select the renamed table `tblVeterinarians` in the Select Database Objects for Comparison dialog box.

9. Click the **Compare** button in the comparison window toolbar. No differences now exist between `dbo.tblVeterinarians` and `test.tblVeterinarians`.

10. Expand `test.tblZookeepers`, right-click column `Email` and select **Show merge script: Right to Left** from the context menu.

11. Execute the merge script, refresh the database, and run a comparison to see the changes in the Schema Comparison window. No differences now exist between `dbo.tblZookeepers` and `test.tblZookeepers`.

### 4.2.12 Comparing Database Data

It may happen that you have to restore data from a backup database, or that you migrate your database tables to a different database provider. DatabaseSpy provides a database data comparison and merging feature that can assist you in these tasks.

#### Objective

In this section of the tutorial, you will learn how to compare database data and show the comparison results. Specifically, you will learn how to do the following:

- **Set up a data comparison** and **select tables** for comparison
- **Start** a comparison
- **Show the results** in the Comparison Result window
- **Change the automatic mapping and remove tables** from comparison components
- **Merge** database data

#### Commands used in this section

<table>
<thead>
<tr>
<th>Icon</th>
<th>Command name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="icon" alt="Add a New Data Source..." /></td>
<td><strong>Add a New Data Source...</strong></td>
<td>This command is located in the context menu that opens when you right-click the Data Sources folder in the Project window. Click this command to add an additional data source to your project.</td>
</tr>
<tr>
<td><img src="icon" alt="Save Project" /></td>
<td><strong>Save Project</strong></td>
<td>This command is located in the toolbar of the Project window; alternatively, you can also choose the menu option **File</td>
</tr>
</tbody>
</table>
### Command Table

<table>
<thead>
<tr>
<th>Icon</th>
<th>Command name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Icon" /></td>
<td>Data Comparison</td>
<td>This command is located in the Standard toolbar; alternatively, you can also choose the menu option **File</td>
</tr>
<tr>
<td><img src="image2.png" alt="Icon" /></td>
<td>Start Comparison</td>
<td>This command is located in the toolbar of the Data Comparison window; alternatively, you can also choose the menu option **Data Comparison</td>
</tr>
<tr>
<td><img src="image3.png" alt="Icon" /></td>
<td>Show selected results</td>
<td>This command is located in the context menu that opens when you right-click a table in a component of a Data Comparison window; alternatively, you can also select a table in a component and click the <strong>Show result</strong> icon in the toolbar of the Data Comparison Result window. Click this command to display the detailed comparison results for the selected table.</td>
</tr>
<tr>
<td><img src="image4.png" alt="Icon" /></td>
<td>Show/Hide all equal rows</td>
<td>This command is located in the context menu that opens when you right-click into the Data Comparison Result window; alternatively, you can also use the <strong>Show/Hide all equal rows</strong> toggle button in the toolbar of the Data Comparison window. Deactivate this option to hide all rows that are equal in both of the compared tables.</td>
</tr>
<tr>
<td><img src="image5.png" alt="Icon" /></td>
<td>Show/Hide rows that are only on the left</td>
<td>This command is located as a toggle button in the toolbar of the Data Comparison Result window; alternatively, you can also choose the this option from the context menu that opens when you right-click into the Data Comparison Result window. Deactivate this option to hide rows that exist only in the table that is on the left side of the comparison.</td>
</tr>
<tr>
<td><img src="image6.png" alt="Icon" /></td>
<td>Show/Hide columns which don't have any differences</td>
<td>This command is located as a toggle button in the toolbar of the Data Comparison Result window. Deactivate this option to hide all columns that do not contain differences.</td>
</tr>
<tr>
<td><img src="image7.png" alt="Icon" /></td>
<td>Find</td>
<td>This command is located as a toolbar button in the Data Comparison Result window. Click this command to open the Find dialog box and enter the string that you search for in the comparison result grid.</td>
</tr>
<tr>
<td><img src="image8.png" alt="Icon" /></td>
<td>Merge data from right to left</td>
<td>This command is located as a toolbar button in the Data Comparison Result window. Click this command to copy data from the table in the right comparison component to...</td>
</tr>
<tr>
<td>Icon</td>
<td>Command name</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>---------------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td>the mapped table in the left component.</td>
<td>Execute</td>
</tr>
<tr>
<td></td>
<td>This command is available in the Online Browser as a button, or as an option in the context menu that opens when you right-click a database. Use this command to refresh the database and display new or changed database objects in the Online Browser.</td>
<td>Refresh</td>
</tr>
<tr>
<td></td>
<td>This command is located in the context menu that opens when you right-click a table or column in a component of the Data Comparison window. Click this command to have all rows of data displayed in a Result tab.</td>
<td>SQL and Data</td>
</tr>
<tr>
<td></td>
<td>This command is located in the context menu that opens when you right-click a table or column in a component of the Data Comparison window. Choose this command to generate an SQL SELECT statement that is automatically executed in the SQL Editor and switches the Result window into the Editing mode. This command works for all supported database kinds for both ADO and ODBC connections.</td>
<td>SQL and Data</td>
</tr>
<tr>
<td></td>
<td>This command is available as a button in the Result window toolbar. Click this button to delete the row in which the cursor is currently located. Alternatively, you can also right-click a cell in the row to be deleted and choose Delete row from the context menu. The Delete row command is only available if the Result window is in the Editing mode.</td>
<td>Delete row</td>
</tr>
<tr>
<td></td>
<td>This command is available as a button in the Result window toolbar. Click this button to commit the changes you have made in the result grid to the database. The Commit button is only visible if the Result window is in the Editing mode.</td>
<td>Commit</td>
</tr>
</tbody>
</table>

4.2.12.1 Setting Up a Database Data Comparison

The tutorial folder of your DatabaseSpy installation contains a Microsoft Access 2003 database which serves as a backup database for the tutorial "zoo" database. In this step of the tutorial, you will add this database to your tutorial project and select the tables in both databases for comparison.

To add the ZooDB-Backup data source to your project:

1. In the Project window, right-click the Data Sources folder and select Add a New Data
2. In the Add a Data Source dialog box, choose the Microsoft Access ( ADO ) option button and click **Next**.
3. On the Connect to MS Access page, click the **Browse** button and navigate to the tutorial folder (`\Altova\DatabaseSpy2019\DatabaseSpyExamples\Tutorial sub-folder of the Documents folder`).
4. Select the **ZooDB.mdb** database and click **Next**.
5. In the Set A Data Source Name dialog box, enter "ZooDB-Backup" and click **OK**. The data source is added to the project and a connection to it is automatically established.
6. Click the **Save Project** button in the Project window toolbar or press **Ctrl+S**.

**Opening a Data Comparison window**

DatabaseSpy provides a Data Comparison window which is used to select and map tables, start a comparison, and merge data of the compared tables. Opening a Data Comparison window and selecting the tables (and columns) to be compared is usually done in a single step.

**To select tables for comparison:**

1. Click the **Data Comparison** button in the Standard toolbar or select the menu option **File | New | Data Comparison**. A new Data Comparison window is opened and the Select Database Objects for Comparison dialog box appears, where the first data source connection, ZooDBConnect, is preselected in the Data Source drop-down list, and the **Left Side** button is activated by default.
2. Expand the tree structure in the selection dialog box until the tables are displayed and activate the User Tables check box. This selects all tables in the User Tables folder.
3. Click the **Right Side** button and select "ZooDB-Backup" from the Data Source drop-down list.

4. Expand the tree structure in the selection dialog box until the tables are displayed and activate the User Tables check box. This selects all tables in the User Tables folder.
5. Click **OK**. The tables appear in two separate components of the Data Comparison window, and matching tables and columns are mapped automatically.

6. Select the menu option **Data Comparison | Collapse tables** or select this command from the context menu that opens when you right-click the header of either component in the Data Comparison window.

7. Optionally, if the sort order is different in the left and right component, select the menu option **Data Comparison | Sort tables | Ascending** or select this command from the context menu that opens when you right-click the header of either component in the Data Comparison window.

### Starting a Comparison

4.2.12.2  **Starting a Comparison**

You can start a comparison from the **Data Comparison** menu or by clicking the **Start Comparison** button in the toolbar of the Data Comparison window. This way, you run a comparison for all mapped tables in the database comparison components. DatabaseSpy displays the row count for the compared tables and shows comparison result icons that indicate whether a pair of mapped tables is equal or contains differences. Place your mouse cursor over a comparison result icon to display a brief summary of the comparison result.
To compare all mapped tables:

- Select the menu option **Data Comparison | Compare tables**.
- Click the **Start Comparison** button in the toolbar of the Data Comparison window.
- Right-click the title bar in either comparison component and choose **Compare tables** from the context menu.

To show a brief comparison result for "tblMedicalTreatments":

- Place the mouse cursor over the comparison result icon of table tblMedicalTreatments. A balloon help appears with an overview of the comparison result (see screenshot above).

Results in the Message window

The Message window below the Data Comparison window logs for which tables a comparison has been started and displays brief summaries of the individual comparison results. The message window also provides hyperlinks to the tables in the Data Comparison windows and to the detailed results of a specific comparison in the Comparison result window.
4.2.12.3 Showing the Results

In the previous step of the tutorial, you have learned how to start a comparison and display an overview of a comparison result directly in the Data Comparison window or in the Message window. Now you will have a more detailed look on the differences between the two versions of table tblAnimalBirths that you have compared earlier in this tutorial.

If you display the comparison result overview (either by placing the mouse cursor over the comparison result icon of tblAnimalBirths in the Data Comparison window, or by expanding the relevant row in the Summary section of the Message window), you learn that

- two rows are different and
- three rows are only on the left side

of your comparison of tblAnimalBirths. You can inspect this comparison result more closely in the Data Comparison Result window.
To show the detailed comparison result for "tblAnimalBirths":

Do one of the following:

- Click the comparison result icon next to tblAnimalBirths.

- Right-click tblAnimalBirths and select Show selected results from the context menu.

- In the Result window, click the Show result window hyperlink for tblAnimalBirths.

Showing all results
You can also open all comparison results in the Data Comparison Result window with a single click. At the bottom of the Message window, DatabaseSpy provides two hyperlinks, Show only results with differences and Show all results, which open the results in separate tabs of the Data Comparison Result window.

Configuring the Result view
The Data Comparison Result window provides several buttons which allow you to show or hide rows with a certain comparison result. For example, you can hide all rows that are equal on the left and right side of the comparison or show only non-equal rows but hide rows that exist only on the left side of the comparison.

To hide all equal rows in the Data Comparison Result window:

- Right-click into the Data Comparison Result window and deactivate the context menu option Show/Hide all equal rows.
Only non-equal rows are displayed in the Data Comparison Result window.

In the next step, you will also hide all rows that occur only on the left side of the comparison and display only those rows that exist in both tables and are different on the left and right side.

To hide all rows that exist only on the left side:

- In the Data Comparison Result window, deactivate the Show/Hide rows that are only on the left button in the toolbar.

Now only rows are displayed that exist in both tables and are different on the left and on the right side.

Since a lot of columns are now displayed where no differences occur, you can also hide these columns and restrict the display to exactly those columns and rows which are different in the two tables.
To hide all columns where no differences occur:

- In the Data Comparison Result window, deactivate the **Show/Hide columns which don't have any differences** button in the toolbar.

Only two rows and two columns are now displayed in the Data Comparison Result window – exactly those data sets where the differences occur.

### 4.2.12.4 Unmapping and Removing Tables

You have seen in the previous step of the tutorial that some of the tables are equal in both databases. When examining the differences, you can unmap these tables and remove them from the comparison components.

To unmapped and remove equal tables:

1. Right-click **tblAnimalCategories** and choose **Unmap selected** from the context menu.
2. Click the connection line between the two versions of tblAnimalFeed and hit the Del key.

3. Right-click the connector between the two versions of tblAnimals and choose Unmap selected from the context menu.

4. Click tblAnimalTypes in the left component and hit the Del key. This deletes the mapping and removes tblAnimalTypes from the left component.
5. Double-click the header of “ZooDB-Backup” in the right component and deselect `tblAnimalCategories`, `tblAnimalFeed`, `tblAnimalTypes`, and `tblAnimals`.

6. Select `tblAnimalCategories`, `tblAnimalFeed`, and `tblAnimals` in the left component and hit the Del key.

### 4.2.12.5 Merging Tables

Let’s pretend that one of our recently hired zookeepers, Bruno Katz, has a degree on veterinary medicine and now joins the team of veterinarians of our tutorial zoo. In this step of the tutorial, you will transfer Bruno’s record from `tblZookeepers` to `tblVeterinarians` using DatabaseSpy’s merging functionality.

**To transfer a record set to another table:**

1. Click the **Data Comparison** button in the Standard toolbar to open a new Data Comparison window.
2. In the Select Database Objects for Comparison dialog box, choose “ZooDBConnect” in the Data Source drop-down list, and activate the **tblVeterinarians** and **tblZookeepers** check boxes in the Source group box.

3. Click OK. Both tables are added to the left comparison component; the right component remains empty with no data source assigned.

4. Click **dbo.tblZookeepers** and, keeping the mouse button pressed, drag the table into the right component. Note that both components now have the same data source assigned.

5. Click the triangle next to **dbo.tblVeterinarians** in the left component and, keeping the mouse button pressed, draw a line to the triangle next to **dbo.tblZookeepers** in the right component. Release the mouse button when the shape of the cursor changes.

All columns except “VetID” and “ZookID” are also mapped automatically.

6. In the same way, map column "VetID" with column "ZookID".

7. Click the **Start Comparison** button in the toolbar of the Data Comparison window.

8. Select the menu option **Data Comparison | Show results**.

9. In Data Comparison Result window, click the **Find** button in the toolbar, enter "Katz" in the **Find what** field, and click **Find next**.

10. Close the Find dialog box and click the **Merge data from right to left** button in the toolbar. The Merge data (Right to Left) dialog box appears.
11. Click the Show Merge script button and edit the merge script as follows (delete the first column "[VetID]", and the first value "15."): 

```sql
INSERT INTO [ZooDB].[dbo].[tblVeterinarians]([FirstName],[LastName], [Address],[City],[State],[Telephone],[DOB])VALUES('Bruno','Katz','87 Panther Place','Trenton','NJ','(515)555-7667','1969-09-13 00:00:00.000');
```

12. Click the Execute button or press F5.
13. In the Online Browser, select the ZooDB database in the ZooDBConnect data source and click the Refresh button in the Online Browser toolbar.
14. In the Data Comparison window, right-click tblVeterinarians and select SQL and Data | Retrieve data | All rows from the context menu. Bruno Katz has been added to the list of veterinarians.

<table>
<thead>
<tr>
<th>VetID</th>
<th>FirstName</th>
<th>LastName</th>
<th>Address</th>
<th>City</th>
<th>State</th>
<th>Telephone</th>
<th>DOB</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Robin</td>
<td>Fowler</td>
<td>183 Lionheart Drive</td>
<td>Albuquerque</td>
<td>NM</td>
<td>(515)555-2810</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Jacob</td>
<td>Fisher</td>
<td>87 Bearpaw Circle</td>
<td>Milwaukee</td>
<td>WI</td>
<td>(515)555-7209</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Bruno</td>
<td>Katz</td>
<td>87 Panther Place</td>
<td>Trenton</td>
<td>NJ</td>
<td>(515)555-7567</td>
<td></td>
</tr>
</tbody>
</table>

15. In the Data Comparison window, right-click tblZookeepers and select SQL and Data | Edit data from the context menu.
16. Click OK in the message box that appears and select Bruno Katz in the result grid.
17. Click Delete row in the toolbar and click the Commit button to save the change to the database.
Chapter 5

Connecting to a Database
5 Connecting to a Database

In the most simple case, a database can be a local file such as a Microsoft Access or SQLite database file. In a more advanced scenario, a database may reside on a remote or network database server which does not necessarily use the same operating system as the application that connects to it and consumes data. For example, while DatabaseSpy runs on a Windows operating system, the database from which you want to access data (for example, MySQL) might run on a Linux machine.

To interact with various database types, both remote and local, DatabaseSpy relies on the data connection interfaces and database drivers that are already available on your operating system or released periodically by the major database vendors. In the constantly evolving landscape of database technologies, this approach caters for better cross-platform flexibility and interoperability.

The following diagram illustrates, in a simplified way, data connectivity options available between DatabaseSpy (illustrated as a generic client application) and a data store (which may be a database server or database file).

* Direct native connections are supported for SQLite and PostgreSQL databases. To connect to such databases, no additional drivers are required to be installed on your system.

As shown in the diagram above, DatabaseSpy can access any of the major database types through the following data access technologies:

- ADO (Microsoft® ActiveX® Data Objects), which, in its turn, uses an underlying OLE DB (Object Linking and Embedding, Database) provider
- ADO.NET (A set of libraries available in the Microsoft .NET Framework that enable interaction with data)
- JDBC (Java Database Connectivity)
- ODBC (Open Database Connectivity)

Some ADO.NET providers are not supported or have limited support. See ADO.NET Support Notes.

The data connection interface you should choose largely depends on your existing software infrastructure. You will typically choose the data access technology and the database driver which integrates tighter with the database system to which you want to connect. For example, to connect to a Microsoft Access 2013 database, you would build an ADO connection string that uses a native provider such as the Microsoft Office Access Database Engine OLE DB Provider. To connect to Oracle, on the other hand, you may want to download and install the latest JDBC, ODBC, or ADO.NET interfaces from the Oracle website.

While drivers for Windows products (such as Microsoft Access or SQL Server) may already be available on your Windows operating system, they may not be available for other database types. Major database vendors routinely release publicly available database client software and drivers which provide cross-platform access to the respective database through any combination of ADO, ADO.NET, ODBC, or JDBC. In addition to this, several third party drivers may be available for any of the above technologies. In most cases, there is more than one way to connect to the required database from your operating system, and, consequently, from DatabaseSpy. The available features, performance parameters, and the known issues will typically vary based on the data access technology or drivers used.
5.1 Starting the Database Connection Wizard

Whenever you take an action that requires a database connection, a wizard appears that guides you through the steps required to set up the connection.

Before you go through the wizard steps, be aware that for some database types it is necessary to install and configure separately several database prerequisites, such as a database driver or database client software. These are normally provided by the respective database vendors, and include documentation tailored to your specific Windows version. For a list of database drivers grouped by database type, see Database Drivers Overview.

To start the database connection wizard:

- On the File menu, click Create a Database Connection.

After you select a database type and click Next, the on-screen instructions will depend on the database kind, technology (ADO, ADO.NET, ODBC, JDBC) and driver used.
For examples applicable to each database type, see *Database Connection Examples*. For instructions applicable to each database access technology, refer to the following topics:

- Setting up an ADO Connection
- Setting up an ADO.NET Connection
- Setting up an ODBC Connection
- Setting up a JDBC Connection
5.2 Database Drivers Overview

The following table lists common database drivers you can use to connect to a particular database through a particular data access technology. Note that this list does not aim to be either exhaustive or prescriptive; you can use other native or third party alternatives in addition to the drivers shown below.

Even though a number of database drivers might be already available on your Windows operating system, you may still need to download an alternative driver. For some databases, the latest driver supplied by the database vendor is likely to perform better than the driver that shipped with the operating system.

Database vendors may provide drivers either as separate downloadable packages, or bundled with database client software. In the latter case, the database client software normally includes any required database drivers, or provides you with an option during installation to select the drivers and components you wish to install. Database client software typically consists of administration and configuration utilities used to simplify database administration and connectivity, as well as documentation on how to install and configure the database client and any of its components.

Configuring the database client correctly is crucial for establishing a successful connection to the database. Before installing and using the database client software, it is strongly recommended to read carefully the installation and configuration instructions of the database client; these may vary for each database version and for each Windows version.

To understand the capabilities and limitations of each data access technology with respect to each database type, refer to the documentation of that particular database product and also test the connection against your specific environment. To avoid common connectivity issues, note the following:

- Some ADO.NET providers are not supported or have limited support. See ADO.NET Support Notes.
- When installing a database driver, it is recommended that it has the same platform as the Altova application (32-bit or 64-bit). For example, if you are using a 32-bit Altova application on a 64-bit operating system, install the 32-bit driver, and set up your database connection using the 32-bit driver, see also Viewing the Available ODBC Drivers.
- When setting up an ODBC data source, it is recommended to create the data source name (DSN) as System DSN instead of User DSN. For more information, see Setting up an ODBC Connection.
- When setting up a JDBC data source, ensure that JRE (Java Runtime Environment) or Java Development Kit (JDK) is installed and that the CLASSPATH environment variable of the operating system is configured. For more information, see Setting up a JDBC Connection.
- For the installation instructions and support details of any drivers or database client software that you install from a database vendor, check the documentation provided with the installation package.

<table>
<thead>
<tr>
<th>Database</th>
<th>Interface</th>
<th>Drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firebird</td>
<td>ADO.NET</td>
<td>Firebird ADO.NET Data Provider (<a href="https://www.firebirdsql.org/en/additional-downloads/">https://www.firebirdsql.org/en/additional-downloads/</a>)</td>
</tr>
<tr>
<td>Database</td>
<td>Interface</td>
<td>Drivers</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>JDBC</td>
<td>Firebird JDBC driver (<a href="https://www.firebirdsql.org/en/jdbc-driver/">https://www.firebirdsql.org/en/jdbc-driver/</a>)</td>
</tr>
<tr>
<td></td>
<td>ODBC</td>
<td>Firebird ODBC driver (<a href="https://www.firebirdsql.org/en/odbc-driver/">https://www.firebirdsql.org/en/odbc-driver/</a>)</td>
</tr>
<tr>
<td>IBM DB2</td>
<td>ADO</td>
<td>IBM OLE DB Provider for DB2</td>
</tr>
<tr>
<td></td>
<td>ADO.NET</td>
<td>IBM Data Server Provider for .NET</td>
</tr>
<tr>
<td></td>
<td>JDBC</td>
<td>IBM Data Server Driver for JDBC and SQLJ</td>
</tr>
<tr>
<td></td>
<td>ODBC</td>
<td>IBM DB2 ODBC Driver</td>
</tr>
<tr>
<td>IBM DB2 for i</td>
<td>ADO</td>
<td>• IBM DB2 for i5/OS IBMDA400 OLE DB Provider</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• IBM DB2 for i5/OS IBMDARLA OLE DB Provider</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• IBM DB2 for i5/OS IBMDASQL OLE DB Provider</td>
</tr>
<tr>
<td></td>
<td>ADO.NET</td>
<td>.NET Framework Data Provider for IBM i</td>
</tr>
<tr>
<td></td>
<td>JDBC</td>
<td>IBM Toolbox for Java JDBC Driver</td>
</tr>
<tr>
<td></td>
<td>ODBC</td>
<td>iSeries Access ODBC Driver</td>
</tr>
<tr>
<td>IBM Informix</td>
<td>ADO</td>
<td>IBM Informix OLE DB Provider</td>
</tr>
<tr>
<td></td>
<td>JDBC</td>
<td>IBM Informix JDBC Driver</td>
</tr>
<tr>
<td></td>
<td>ODBC</td>
<td>IBM Informix ODBC Driver</td>
</tr>
<tr>
<td>Microsoft</td>
<td>ADO</td>
<td>• Microsoft Jet OLE DB Provider</td>
</tr>
<tr>
<td>Access</td>
<td></td>
<td>• Microsoft Access Database Engine OLE DB Provider</td>
</tr>
<tr>
<td></td>
<td>ADO.NET</td>
<td>.NET Framework Data Provider for OLE DB</td>
</tr>
<tr>
<td></td>
<td>ODBC</td>
<td>• Microsoft Access Driver</td>
</tr>
<tr>
<td>MariaDB</td>
<td>ADO.NET</td>
<td>In the absence of a dedicated .NET connector for MariaDB, use</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Connector/NET for MySQL (<a href="https://dev.mysql.com/downloads/connector/net/)">https://dev.mysql.com/downloads/connector/net/)</a></td>
</tr>
<tr>
<td></td>
<td>JDBC</td>
<td>MariaDB Connector/J (<a href="https://downloads.mariadb.org/">https://downloads.mariadb.org/</a>)</td>
</tr>
<tr>
<td></td>
<td>ODBC</td>
<td>MariaDB Connector/ODBC (<a href="https://downloads.mariadb.org/">https://downloads.mariadb.org/</a>)</td>
</tr>
<tr>
<td>Microsoft</td>
<td>ADO</td>
<td>• Microsoft OLE DB Provider for SQL Server</td>
</tr>
<tr>
<td>SQL Server</td>
<td></td>
<td>• SQL Server Native Client</td>
</tr>
<tr>
<td></td>
<td>ADO.NET</td>
<td>• .NET Framework Data Provider for SQL Server</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• .NET Framework Data Provider for OLE DB</td>
</tr>
<tr>
<td></td>
<td>JDBC</td>
<td>• Microsoft JDBC Driver for SQL Server (<a href="https://docs.microsoft.com/en-us/sql/connect/jdbc/microsoft-jdbc-driver-for-sql-server">https://docs.microsoft.com/en-us/sql/connect/jdbc/microsoft-jdbc-driver-for-sql-server</a>)</td>
</tr>
<tr>
<td></td>
<td>ODBC</td>
<td>• SQL Server Native Client</td>
</tr>
<tr>
<td>MySQL</td>
<td>ADO.NET</td>
<td>Connector/NET (<a href="https://dev.mysql.com/downloads/connector/net/">https://dev.mysql.com/downloads/connector/net/</a>)</td>
</tr>
<tr>
<td>Database</td>
<td>Interface</td>
<td>Drivers</td>
</tr>
<tr>
<td>----------</td>
<td>-----------</td>
<td>---------</td>
</tr>
<tr>
<td>JDBC</td>
<td>Connector/J (<a href="https://dev.mysql.com/downloads/connector/j/">https://dev.mysql.com/downloads/connector/j/</a>)</td>
<td></td>
</tr>
<tr>
<td>ODBC</td>
<td>Connector/ODBC (<a href="https://dev.mysql.com/downloads/connector/odbc/">https://dev.mysql.com/downloads/connector/odbc/</a>)</td>
<td></td>
</tr>
</tbody>
</table>
| Oracle   | ADO       | • Oracle Provider for OLE DB  
           |           | • Microsoft OLE DB Provider for Oracle |
|          | ADO.NET   | Oracle Data Provider for .NET (http://www.oracle.com/technetwork/topics/dotnet/index-085163.html) |
|          | JDBC      | • JDBC Thin Driver  
           |           | • JDBC Oracle Call Interface (OCI) Driver  
           |           | These drivers are typically installed during the installation of your Oracle database client. Connect through the OCI Driver (not the Thin Driver) if you are using the Oracle XML DB component. |
|          | ODBC      | • Microsoft ODBC for Oracle  
           |           | • Oracle ODBC Driver (typically installed during the installation of your Oracle database client) |
| PostgreSQL | JDBC | PostgreSQL JDBC Driver (https://jdbc.postgresql.org/download.html) |
|          | ODBC      | psqlODBC (https://odbc.postgresql.org/) |
|          | Native Connection | Available. There is no need to install any drivers if using native connection. |
| Progress OpenEdge | JDBC | JDBC Connector (https://www.progress.com/jdbc/openedge) |
| SQLite   | Native Connection | Available. There is no need to install any drivers if using native connection. |
| Sybase   | ADO       | Sybase ASE OLE DB Provider |
|          | JDBC      | jConnect™ for JDBC |
|          | ODBC      | Sybase ASE ODBC Driver |
|          | JDBC      | Teradata JDBC Driver (https://downloads.teradata.com/download/connectivity/jdbc-driver) |
|          | ODBC      | Teradata ODBC Driver for Windows (https://downloads.teradata.com/download/connectivity/odbc-driver/windows) |
5.3 Setting up an ADO Connection

Microsoft ActiveX Data Objects (ADO) is a data access technology that enables you to connect to a variety of data sources through OLE DB. OLE DB is an alternative interface to ODBC or JDBC; it provides uniform access to data in a COM (Component Object Model) environment. ADO is the typical choice for connecting to Microsoft native databases such as Microsoft Access or SQL Server, although you can also use it for other data sources.

To set up an ADO connection:

1. Start the database connection wizard.
2. Click ADO Connections.

   ADO Connections

   Generate a valid connection string by clicking on the build button. Once the connection string is generated click on the 'Connect' button to proceed.

   Build ...  

   3. Click Build.
4. Select the data provider through which you want to connect. The table below lists a few common scenarios.

<table>
<thead>
<tr>
<th>To connect to this database...</th>
<th>Use this provider...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microsoft Access</td>
<td>• Microsoft Office Access Database Engine OLE DB Provider</td>
</tr>
<tr>
<td></td>
<td>When connecting to Microsoft Access 2003, you can also use the Microsoft Jet OLE DB Provider.</td>
</tr>
</tbody>
</table>
| SQL Server                    | • SQL Server Native Client  
|                               | • Microsoft OLE DB Provider for SQL Server |
| Other database                | Select the provider applicable to your database. |
|                               | If an OLE DB provider to your database is not available, install the required driver from the database vendor (see Database Drivers Overview). Alternatively, set up an ODBC or JDBC connection. |
|                               | If the operating system has an ODBC driver to the required database, you can also use the Microsoft OLE DB Provider for ODBC Drivers. |

5. Click **Next** and complete the wizard.
The subsequent wizard steps are specific to the provider you chose. For SQL Server, you will need to provide or select the host name of the database server, as well as the database username and password. For Microsoft Access, you will be asked to browse for or provide the path to the database file.

The complete list of initialization properties (connection parameters) is available in the **All** tab of the connection dialog box—these properties vary depending on the chosen provider. The following sections provide guidance on configuring the basic initialization properties for Microsoft Access and SQL Server databases:

- **Setting up the SQL Server Data Link Properties**
- **Setting up the Microsoft Access Data Link Properties**

### 5.3.1 Connecting to an Existing Microsoft Access Database

This approach is suitable when you want to connect to a Microsoft Access database which is not password-protected. If the database is password-protected, set up the database password as shown in **Connecting to Microsoft Access (ADO)**.

**To connect to an existing Microsoft Access database:**

1. Run the database connection wizard (see **Starting the Database Connection Wizard**).
2. Select **Microsoft Access (ADO)**, and then click **Next**.
3. Select **Use an existing MS Access database**.
4. Browse for the database file, or enter the path to it (either relative or absolute).
5. Click **Connect**.

### 5.3.2 Creating a New Microsoft Access Database

As an alternative to connecting to an existing database file, you can create a new Microsoft Access database file (.accdb,.mdb) and connect to it, even if Microsoft Access is not installed on the computer. The database file created by DatabaseSpy is empty. To create the required database structure, use Microsoft Access or the Design Editor of DatabaseSpy.

**To create a new Microsoft Access database:**

1. Run the database connection wizard (see **Starting the Database Connection Wizard**).
2. Select **Microsoft Access (ADO)**, and then click **Next**.
3. Select **Create a new MS Access database**, and then enter the path (either relative or absolute) of the database file to be created (for example, `c:\users\public\products.mdb`). Alternatively, click **Browse** to select a folder, type the name of the database file in the "File name" text box (for example, **products.mdb**), and click **Save**.

   **Notes**
   - Make sure that you have write permissions to the folder where you want to create the database file.
   - The database file name must have the .mdb or .accdb extension.

4. Click **Connect**.

### 5.3.3 Setting up the SQL Server Data Link Properties

When you connect to a Microsoft SQL Server database through ADO (see Setting up an ADO Connection), ensure that the following data link properties are configured correctly in the **All** tab of the Data Link Properties dialog box.
5.3.4 Setting up the Microsoft Access Data Link Properties

When you connect to a Microsoft Access database through ADO (see Setting up an ADO Connection), ensure that the following properties are configured correctly in the All tab of the Data Link Properties dialog box.
Connecting to a Database
Setting up an ADO Connection

Data Link Properties dialog box

<table>
<thead>
<tr>
<th>Property</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Source</td>
<td>This property stores the path to the Microsoft Access database file. To avoid database connectivity issues, it is recommended to use the UNC (Universal Naming Convention) path format, for example: \anyserver\share$\filepath</td>
</tr>
<tr>
<td>Jet OLEDB:System Database</td>
<td>This property stores the path to the workgroup information file. You may need to explicitly set the value of this property before you can connect to a Microsoft Access database. If you cannot connect due to a &quot;workgroup information file&quot; error, locate the workgroup information file (System.MDW) applicable to your user profile, and set the property value to the path of the System.MDW file.</td>
</tr>
<tr>
<td>Property</td>
<td>Notes</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Jet OLEDB:Database</td>
<td>If the database is password-protected, set the value of this property to the database password.</td>
</tr>
<tr>
<td>Password</td>
<td>Notes</td>
</tr>
</tbody>
</table>
5.4 Setting up an ADO.NET Connection

ADO.NET is a set of Microsoft .NET Framework libraries designed to interact with data, including data from databases. To connect to a database from DatabaseSpy through ADO.NET, Microsoft .NET Framework 4 or later is required. As shown below, you connect to a database through ADO.NET by selecting a .NET provider and supplying a connection string.

A .NET data provider is a collection of classes that enables connecting to a particular type of data source (for example, a SQL Server, or an Oracle database), executing commands against it, and fetching data from it. In other words, with ADO.NET, an application such as DatabaseSpy interacts with a database through a data provider. Each data provider is optimized to work with the specific type of data source that it is designed for. There are two types of .NET providers:

1. Supplied by default with Microsoft .NET Framework.
2. Supplied by major database vendors, as an extension to the .NET Framework. Such ADO.NET providers must be installed separately and can typically be downloaded from the website of the respective database vendor.

Note: Certain ADO.NET providers are not supported or have limited support. See ADO.NET Support Notes.

To set up an ADO.NET connection:

1. Start the database connection wizard.
2. Click ADO.NET Connections.
3. Select a .NET data provider from the list.
4. Enter a database connection string. A connection string defines the database connection information, as semicolon-delimited key/value pairs of connection parameters. For example, a connection string such as `Data Source=DBSERV;Initial Catalog=ProductsDB;User ID=dbuser;Password=dbpass` connects to the SQL Server database `ProductsDB` on server `DBSERV`, with the user name `dbuser` and password `dbpass`. You can create a connection string by typing the key/value pairs directly into the "Connection String" dialog box. Another option is to create it with Visual Studio (see Creating a Connection String in Visual Studio).

The syntax of the connection string depends on the provider selected from the "Provider" list. For examples, see Sample ADO.NET Connection Strings.
5. Click **Connect**.

### 5.4.1 Creating a Connection String in Visual Studio

In order to connect to a data source using ADO.NET, a valid database connection string is required. The following instructions show you how to create a connection string from Visual Studio.

**To create a connection string in Visual Studio:**

1. On the **Tools** menu, click **Connect to Database**.
2. Select a data source from the list (in this example, Microsoft SQL Server). The Data Provider is filled automatically based on your choice.
3. Click **Continue**.
4. Enter the server host name and the user name and password to the database. In this example, we are connecting to the database ProductsDB on server DBSQLSERV, using SQL Server authentication.

5. Click **OK**.

If the database connection is successful, it appears in the Server Explorer window. You can display the Server Explorer window using the menu command **View** | **Server Explorer**. To obtain the database connection string, right-click the connection in the Server Explorer window, and select **Properties**. The connection string is now displayed in the Properties window of Visual Studio. Note that, before pasting the string into the “Connection String” box of DatabaseSpy, you will need to replace the asterisk ( * ) characters with the actual password.
5.4.2 Sample ADO.NET Connection Strings

To set up an ADO.NET connection, you need to select an ADO.NET provider from the database connection dialog box and enter a connection string (see also Setting up an ADO.NET Connection). Sample ADO.NET connection strings for various databases are listed below under the .NET provider where they apply.

.NET Data Provider for Teradata

This provider can be downloaded from Teradata website (https://downloads.teradata.com/download/connectivity/net-data-provider-for-teradata). A sample connection string looks as follows:

```
Data Source=ServerAddress;User Id=user;Password=password;
```

.NET Framework Data Provider for IBM i

This provider is installed as part of IBM i Access Client Solutions - Windows Application Package. A sample connection string looks as follows:

```
DataSource=ServerAddress;UserID=user;Password=password;DataCompression=True;
```

For more information, see the ".NET Provider Technical Reference" help file included in the installation package above.

.NET Framework Data Provider for MySQL

This provider can be downloaded from MySQL website (https://dev.mysql.com/downloads/connector/net/). A sample connection string looks as follows:

```
Server=127.0.0.1;Uid=root;Pwd=12345;Database=test;
```


.NET Framework Data Provider for SQL Server

A sample connection string looks as follows:

```
Data Source=DBSQLSERV;Initial Catalog=ProductsDB;UserID=dbuser;Password=dbpass
```

See also: https://msdn.microsoft.com/en-us/library/ms254500(v=vs.110).aspx

IBM DB2 Data Provider 10.1.2 for .NET Framework 4.0
Connecting to a Database

**Setting up an ADO.NET Connection**

**Database**

Database=PRODUCTS;UID=user;Password=password;Server=localhost:5000;

**Note:** This provider is typically installed with the IBM DB2 Data Server Client package. If the provider is missing from the list of ADO.NET providers after installing IBM DB2 Data Server Client package, refer to the following technical note: [https://www-01.ibm.com/support/docview.wss?uid=swg21429586](https://www-01.ibm.com/support/docview.wss?uid=swg21429586).


**Oracle Data Provider for .NET (ODP.NET)**

The installation package which includes the ODP.NET provider can be downloaded from Oracle website (see [http://www.oracle.com/technetwork/topics/dotnet/downloads/index.html](http://www.oracle.com/technetwork/topics/dotnet/downloads/index.html)). A sample connection string looks as follows:

Data Source=DSORCL;User Id=user;Password=password;

Where DSORCL is the name of the data source which points to an Oracle service name defined in the tnsnames.ora file, as described in Connecting to Oracle (ODBC).

To connect without configuring a service name in the tnsnames.ora file, use a string such as:

Data Source=(DESCRIPTION=(ADDRESS_LIST=(ADDRESS=(PROTOCOL=TCP)(HOST=host)(PORT=port)))(CONNECT_DATA=(SERVER=DEDICATED)(SERVICE_NAME=MyOracleSID)));User Id=user;Password=password;

See also: [https://docs.oracle.com/cd/B28359_01/win.111/b28375/featConnecting.htm](https://docs.oracle.com/cd/B28359_01/win.111/b28375/featConnecting.htm)

5.4.3 **ADO.NET Support Notes**

The following table lists known ADO.NET database drivers that are currently not supported or have limited support in DatabaseSpy.

<table>
<thead>
<tr>
<th>Database</th>
<th>Driver</th>
<th>Support notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>All databases</td>
<td>.Net Framework Data Provider for ODBC</td>
<td>Limited support. Known issues exist with Microsoft Access connections. It is recommended to use ODBC direct connections instead.</td>
</tr>
<tr>
<td>All databases</td>
<td>.Net Framework Data Provider for OleDb</td>
<td>Limited support. Known issues exist with Microsoft Access connections. It is recommended to use ADO direct connections instead.</td>
</tr>
<tr>
<td>Firebird</td>
<td>Firebird ADO.NET Data Provider</td>
<td>Limited support. It is recommended to use ODBC or JDBC instead.</td>
</tr>
</tbody>
</table>
### Database Connection

<table>
<thead>
<tr>
<th>Database</th>
<th>Driver</th>
<th>Support notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Informix</td>
<td>IBM Informix Data Provider for .NET Framework 4.0</td>
<td>Not supported. Use DB2 Data Server Provider instead.</td>
</tr>
<tr>
<td>Oracle</td>
<td>.Net Framework Data Provider for Oracle</td>
<td>Limited support. Although this driver is provided with the .NET Framework, its usage is discouraged by Microsoft, because it is deprecated.</td>
</tr>
<tr>
<td>PostgreSQL</td>
<td>-</td>
<td>No ADO.NET drivers for this vendor are supported. Use a native connection instead.</td>
</tr>
<tr>
<td>Sybase</td>
<td>-</td>
<td>No ADO.NET drivers for this vendor are supported.</td>
</tr>
</tbody>
</table>
5.5 Setting up an ODBC Connection

ODBC (Open Database Connectivity) is a widely used data access technology that enables you to connect to a database from DatabaseSpy. It can be used either as primary means to connect to a database, or as an alternative to OLE DB- or JDBC-driven connections.

To connect to a database through ODBC, first you need to create an ODBC data source name (DSN) on the operating system. This step is not required if the DSN has already been created, perhaps by another user of the operating system. The DSN represents a uniform way to describe the database connection to any ODBC-aware client application on the operating system, including DatabaseSpy. DSNs can be of the following types:

- System DSN
- User DSN
- File DSN

A System data source is accessible by all users with privileges on the operating system. A User data source is available to the user who created it. Finally, if you create a File DSN, the data source will be created as a file with the .dsn extension which you can share with other users, provided that they have installed the drivers used by the data source.

Any DSNs already available on your machine are listed by the database connection dialog box when you click ODBC connections on the ODBC connections dialog box.

### ODBC Connections dialog box

If a DSN to the required database is not available, the DatabaseSpy database connection wizard...
will assist you to create it; however, you can also create it directly on your Windows operating system. In either case, before you proceed, ensure that the ODBC driver applicable for your database is in the list of ODBC drivers available to the operating system (see Viewing the Available ODBC Drivers).

To connect by using a new DSN:

1. Start the database connection wizard.
2. On the database connection dialog box, click ODBC Connections.
3. Select a data source type (User DSN, System DSN, File DSN).

4. Click Add.
5. Select a driver, and then click User DSN or System DSN (depending on the type of the DSN you want to create). If the driver applicable to your database is not listed, download it from the database vendor and install it (see Database Drivers Overview).
6. On the dialog box that pops up, fill in any driver specific connection information to complete the setup.

For the connection to be successful, you will need to provide the host name (or IP address) of the database server, as well as the database username and password. There may be other optional connection parameters—these parameters vary between database providers. For detailed information about the parameters specific to each connection method, consult the documentation of the driver provider. Once created, the DSN becomes available in the list of data source names. This enables you to reuse the database connection details any time you want to connect to the database. Note that User DSNs are added to the list of User DSNs whereas System DSNs are added to the list of System DSNs.

To connect by using an existing DSN:

1. Start the database connection wizard.
2. Click ODBC Connections.
3. Choose the type of the existing data source (User DSN, System DSN, File DSN).
4. Click the existing DSN record, and then click Connect.

To build a connection string based on an existing .dsn file:

1. Start the database connection wizard.
2. Click ODBC Connections.
3. Select Build a connection string, and then click Build.
4. If you want to build the connection string using a File DSN, click the File Data Source tab. Otherwise, click the Machine Data Source tab. (System DSNs and User DSNs are known as "Machine" data sources.)
5. Select the required .dsn file, and then click OK.
To connect by using a prepared connection string:

1. Start the database connection wizard.
2. Click ODBC Connections.
3. Select Build a connection string.
4. Paste the connection string into the provided box, and then click Connect.

5.5.1 Viewing the Available ODBC Drivers

You can view the ODBC drivers available on your operating system in the ODBC Data Source Administrator. You can access the ODBC Data Source Administrator (Odbcad32.exe) from the Windows Control Panel, under Administrative Tools. On 64-bit operating systems, there are two versions of this executable:

- The 32-bit version of the Odbcad32.exe file is located in the C:\Windows\SysWoW64 directory (assuming that C:\ is your system drive).
- The 64-bit version of the Odbcad32.exe file is located in the C:\Windows\System32 directory.

Any installed 32-bit database drivers are visible in the 32-bit version of ODBC Data Source Administrator, while 64-bit drivers—in the 64-bit version. Therefore, ensure that you check the database drivers from the relevant version of ODBC Data Source Administrator.
driver, you will need to download it from the database vendor (see Database Drivers Overview). Once the ODBC driver is available on your system, you are ready to create ODBC connections with it (see Setting up an ODBC Connection).
5.6 Setting up a JDBC Connection

JDBC (Java Database Connectivity) is a database access interface which is part of the Java software platform from Oracle. JDBC connections are generally more resource-intensive than ODBC connections but may provide features not available through ODBC.

Prerequisites

- JRE (Java Runtime Environment) or Java Development Kit (JDK) must be installed. This may be either Oracle JDK or an open source build such as Oracle OpenJDK. DatabaseSpy will determine the path to the Java Virtual Machine (JVM) from the following locations, in this order: a) The custom JVM path you may have set in application Options, see Java Settings; b) The JVM path found in the Windows registry; c) The JAVA_HOME environment variable.
- Make sure that the platform of DatabaseSpy (32-bit, 64-bit) matches that of the JRE/JDK.
- The JDBC drivers from the database vendor must be installed. If you are connecting to an Oracle database, note that some Oracle drivers are specific to certain JRE versions and may require additional components and configuration. The documentation of your Oracle product (for example, the "Oracle Database JDBC Developer's Guide and Reference") includes detailed instructions about the configuration procedure for each JDBC driver.
- The CLASSPATH environment variable must include the path to the JDBC driver (one or several .jar files) on your Windows operating system. When you install some database clients, the installer may configure this variable automatically. The documentation of the JDBC driver will typically include step-by-step instructions on setting the CLASSPATH variable (see also Configuring the CLASSPATH).

Setting up a JDBC connection

1. Start the database connection wizard.
2. Click JDBC Connections.
3. Optionally, enter a semicolon-separated list of .jar file paths in the "Classpaths" text box. The .jar libraries entered here will be loaded into the environment in addition to those already defined in the CLASSPATH environment variable. When you finish editing the "Classpaths" text box, any JDBC drivers found in the source .jar libraries are automatically added to the "Driver" list (see the next step).
4. Next to "Driver", select a JDBC driver from the list, or enter a Java class name. Note that this list contains any JDBC drivers configured through the CLASSPATH environment variable (see Configuring the CLASSPATH), as well as those found in the "Classpaths" text box.

The JDBC driver paths defined in the CLASSPATH variable, as well as any .jar file paths entered directly in the database connection dialog box are all supplied to the Java Virtual Machine (JVM). The JVM then decides which drivers to use in order to establish a connection. It is recommended to keep track of Java classes loaded into the JVM so as not to create potential JDBC driver conflicts and avoid unexpected results when connecting to the database.

5. Enter the username and password to the database in the corresponding boxes.

6. In the Database URL text box, enter the JDBC connection URL (string) in the format specific to your database type. The following table describes the syntax of JDBC connection URLs (strings) for common database types.

<table>
<thead>
<tr>
<th>Database</th>
<th>JDBC Connection URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firebird</td>
<td>jdbc:firebirdsql://&lt;host&gt;[:&lt;port&gt;]/&lt;database path or alias&gt;</td>
</tr>
<tr>
<td>IBM DB2</td>
<td>jdbc:db2://hostName:port/databaseName</td>
</tr>
<tr>
<td>IBM DB2 for i</td>
<td>jdbc:as400://[host]</td>
</tr>
</tbody>
</table>
Connecting to a Database

Setting up a JDBC Connection

<table>
<thead>
<tr>
<th>Database</th>
<th>JDBC Connection URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM Informix</td>
<td>jdbc:informix-sqli://hostName:port/databaseName:INFORMIXSERVER=myserver</td>
</tr>
<tr>
<td>MariaDB</td>
<td>jdbc:mariadb://hostName:port/databaseName</td>
</tr>
<tr>
<td>Microsoft SQL Server</td>
<td>jdbc:sqlserver://hostName:port;databaseName=name</td>
</tr>
<tr>
<td>MySQL</td>
<td>jdbc:mysql://hostName:port/databaseName</td>
</tr>
<tr>
<td>Oracle</td>
<td>jdbc:oracle:thin:@//hostName:port:service</td>
</tr>
<tr>
<td>Oracle XML DB</td>
<td>jdbc:oracle:oci:@//hostName:port:service</td>
</tr>
<tr>
<td>PostgreSQL</td>
<td>jdbc:postgresql://hostName:port/databaseName</td>
</tr>
<tr>
<td>Progress OpenEdge</td>
<td>jdbc:datadirect:openedge://host:port;databaseName=db_name</td>
</tr>
<tr>
<td>Sybase</td>
<td>jdbc:sybase:Tds:hostName:port/databaseName</td>
</tr>
<tr>
<td>Teradata</td>
<td>jdbc:teradata://databaseServerName</td>
</tr>
</tbody>
</table>

Note: Syntax variations to the formats listed above are also possible (for example, the database URL may exclude the port or may include the username and password to the database). Check the documentation of the database vendor for further details.

7. Click Connect.

5.6.1 Configuring the CLASSPATH

The CLASSPATH environment variable is used by the Java Runtime Environment (JRE) or the Java Development Kit (JDK) to locate Java classes and other resource files on your operating system. When you connect to a database through JDBC, this variable must be configured to include the path to the JDBC driver on your operating system, and, in some cases, the path to additional library files specific to the database type you are using.

The following table lists sample file paths that must be typically included in the CLASSPATH variable. Importantly, you may need to adjust this information based on the location of the JDBC driver on your system, the JDBC driver name, as well as the JRE/JDK version present on your operating system. To avoid connectivity problems, check the installation instructions and any pre-installation or post-installation configuration steps applicable to the JDBC driver installed on your operating system.

<table>
<thead>
<tr>
<th>Database</th>
<th>Sample CLASSPATH entries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firebird</td>
<td>C:\Program Files\Firebird\Jaybird-2.2.8-JDK_1.8\jaybird-full-2.2.8.jar</td>
</tr>
<tr>
<td>IBM DB2</td>
<td>C:\Program Files (x86)\IBM\SQLLIB\java\db2jcc.jar;C:\Program Files (x86)\IBM\SQLLIB\java\db2jcc_license_cu.jar;</td>
</tr>
<tr>
<td>Database</td>
<td>Sample CLASSPATH entries</td>
</tr>
<tr>
<td>------------------------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>IBM DB2 for i</td>
<td>C:\jt400\jt400.jar;</td>
</tr>
<tr>
<td>IBM Informix</td>
<td>C:\Informix_JDBC_Driver\lib\ifxjdbc.jar;</td>
</tr>
<tr>
<td>Microsoft SQL Server</td>
<td>C:\Program Files\Microsoft JDBC Driver 4.0 for SQL Server\sqljdbc_4.0\enu\sqljdbc.jar</td>
</tr>
<tr>
<td>MariaDB</td>
<td>&lt;installation directory&gt;\mariadb-java-client-2.2.0.jar</td>
</tr>
<tr>
<td>MySQL</td>
<td>&lt;installation directory&gt;\mysql-connector-java-version-bin.jar</td>
</tr>
<tr>
<td>Oracle</td>
<td>ORACLE_HOME\jdbc\lib\ojdbc6.jar;</td>
</tr>
<tr>
<td>Oracle (with XML DB)</td>
<td>ORACLE_HOME\jdbc\lib\ojdbc6.jar; ORACLE_HOME\LIB\xmlparserv2.jar; ORACLE_HOME\RDBMS\jlib\xdb.jar;</td>
</tr>
<tr>
<td>PostgreSQL</td>
<td>&lt;installation directory&gt;\postgresql.jar</td>
</tr>
<tr>
<td>Progress OpenEdge</td>
<td>%DLC%\java\openedge.jar; %DLC%\java\pool.jar;</td>
</tr>
<tr>
<td>Sybase</td>
<td>C:\sybase\jConnect-7_0\classes\jconn4.jar</td>
</tr>
<tr>
<td>Teradata</td>
<td>&lt;installation directory&gt;\tdgssconfig.jar; &lt;installation directory&gt;\terajdbc4.jar</td>
</tr>
</tbody>
</table>

- Changing the CLASSPATH variable may affect the behavior of Java applications on your machine. To understand possible implications before you proceed, refer to the Java documentation.
- Environment variables can be user or system. To change system environment variables, you need administrative rights on the operating system.
- After you change the environment variable, restart any running programs for settings to take effect. Alternatively, log off or restart your operating system.

### To configure the CLASSPATH on Windows 7:

1. Open the **Start** menu and right-click **Computer**.
2. Click **Properties**.
3. Click **Advanced system settings**.
4. In the **Advanced** tab, click **Environment Variables**.
5. Locate the CLASSPATH variable under user or system environment variables, and then click **Edit**. If the CLASSPATH variable does not exist, click **New** to create it.
6. Edit the variable value to include the path on your operating system where the JDBC driver is located. To separate the JDBC driver path from other paths that may already be in the CLASSPATH variable, use the semi-colon separator ( ; ).
To configure the CLASSPATH on Windows 10:

1. Press the Windows key and start typing "environment variables".
2. Click the suggestion **Edit the system environment variables**.
3. Click **Environment Variables**.
4. Locate the CLASSPATH variable under user or system environment variables, and then click **Edit**. If the CLASSPATH variable does not exist, click **New** to create it.
5. Edit the variable value to include the path on your operating system where the JDBC driver is located. To separate the JDBC driver path from other paths that may already be in the CLASSPATH variable, use the semi-colon separator ( ; ).
5.7 Setting up a PostgreSQL Connection

Connections to PostgreSQL databases can be set up either as native connections, or connections via ODBC, JDBC, and other drivers. The advantage of setting up a native connection is that no drivers are required to be installed on your system.

If you prefer to establish a connection by means of a non-native driver, see the following topics:

- Setting up a JDBC Connection
- Connecting to PostgreSQL (ODBC)

Otherwise, if you want to set up a native connection to PostgreSQL, follow the steps below. To proceed, you need the following prerequisites: host name, port, database name, username, and password.

To set up a native PostgreSQL connection:

1. Start the database connection wizard.
2. Click PostgreSQL Connections.
3. Enter the host (localhost, if PostgreSQL runs on the same machine), port (typically 5432, this is optional), the database name, username, and password in the corresponding boxes.
4. Click **Connect**.

If the PostgreSQL database server is on a different machine, note the following:

- The PostgreSQL database server must be configured to accept connections from clients. Specifically, the **pg_hba.conf** file must be configured to allow non-local connections. Secondly, the **postgresql.conf** file must be configured to listen on specified IP address(es) and port. For more information, check the PostgreSQL documentation (https://www.postgresql.org/docs/9.5/static/client-authentication-problems.html).
- The server machine must be configured to accept connections on the designated port (typically, 5432) through the firewall. For example, on a database server running on Windows, a rule may need to be created to allow connections on port 5432 through the firewall, from **Control Panel > Windows Firewall > Advanced Settings > Inbound Rules**.
5.8 Setting up a SQLite Connection

SQLite (https://www.sqlite.org/index.html) is a file-based, self-contained database type, which makes it ideal in scenarios where portability and ease of configuration is important. Since SQLite databases are natively supported by DatabaseSpy, you do not need to install any drivers to connect to them.

5.8.1 Connecting to an Existing SQLite Database

To connect to an existing SQLite database:

1. Run the database connection wizard (see Starting the Database Connection Wizard).
2. Select SQLite, and then click Next.
3. Select Use an existing SQLite database, and then browse for the SQLite database file, or enter the path (either relative or absolute) to the database. The Connect button becomes enabled once you enter the path to a SQLite database file.
4. Optionally, select the Disable Foreign Keys check box, see Foreign Key Constraints.
5. Click Connect.

5.8.2 Creating a New SQLite Database

You can create a new SQLite database file and connect to it, as an alternative to connecting to an existing database file. The database file created by DatabaseSpy is empty; use queries or scripts to create the required database structure and populate it with data.

To create a new SQLite database:

1. Run the database connection wizard (see Starting the Database Connection Wizard).
2. Select SQLite, and then click Next.
3. Select **Create a new SQLite database**, and then enter the path (either relative or absolute) of the database file to be created (for example, `C:\Users\Public\Products.sqlite`). Alternatively, click **Browse** to select a folder, type the name of the database file in the "File name" text box (for example, `products.sqlite`), and click **Save**. Make sure that you have write permissions to the folder where you want to create the database file.

4. Optionally, select the **Disable Foreign Keys** check box, see **Foreign Key Constraints**.

5. Click **Connect**.

### 5.8.3 Foreign Key Constraints

When you connect to an existing SQLite database from DatabaseSpy, or when you create a new one, foreign key constraints are enabled by default. Foreign key constraints help preserve the integrity of data in your database. For example, when foreign keys are enabled, it is not possible to delete a record from a table if it has dependencies in another table.

In certain cases, you may want to temporarily override this behavior and disable foreign keys, perhaps, in order to update or insert multiple rows of data without getting data validation errors. To explicitly disable foreign keys before connecting to the SQLite database, select the **Disable Foreign Keys** option available on the database connection wizard.
When foreign keys are disabled, you will be able to perform operations against data that would otherwise not be possible due to validation checks. At the same time, however, there is also the risk of introducing incorrect data in the database, or creating "orphaned" rows. (An example of an "orphaned" row would be an address in the "addresses" table not linked to any person in the "person" table, because the person was deleted but its associated address was not.)
5.9 Using a Connection from Global Resources

Altova Global Resources represent a way to refer to files, folders, or databases so as to make these resources reusable, configurable and available across multiple Altova applications.

If you have already configured a database connection to be available as a global resource, you can reuse the connection at any time (even across different Altova applications).

To use a database connection from Global Resources:

1. Start the database connection wizard.
2. Click Global Resources. Any database connections previously configured as global resources are listed.

   ![Global Resources Window](image)

3. Select the database connection record, and click Connect.

   **Tip:** To get additional information about each global resource, move the mouse cursor over the global resource.
5.10 Database Connection Examples

This section includes sample procedures for connecting to a database from DatabaseSpy. Note that your Windows machine, the network environment, and the database client or server software is likely to have a configuration that is not exactly the same as the one presented in the following examples.

Note: For most database types, it is possible to connect using more than one data access technology (ADO, ADO.NET, ODBC, JDBC) or driver. The performance of the database connection, as well as its features and limitations will depend on the selected driver, database client software (if applicable), and any additional connectivity parameters that you may have configured outside DatabaseSpy.

5.10.1 Connecting to Firebird (ODBC)

This topic provides sample instructions for connecting to a Firebird 2.5.4 database running on a Linux server.

Prerequisites:

- The Firebird database server is configured to accept TCP/IP connections from clients.
- The Firebird ODBC driver must be installed on your operating system. This example uses the Firebird ODBC driver version 2.0.3.154 downloaded from the Firebird website (https://www.firebirdsql.org/).
- The Firebird client must be installed on your operating system. Note that there is no standalone installer available for the Firebird 2.5.4 client; the client is part of the Firebird server installation package. You can download the Firebird server installation package from the Firebird website (https://www.firebirdsql.org/), look for "Windows executable installer for full Superclassic/Classic or Superserver". To install only the client files, choose "Minimum client install - no server, no tools" when going through the wizard steps.

Important:

- The platform of both the Firebird ODBC driver and client (32-bit or 64-bit) must correspond to that of DatabaseSpy.
- The version of the Firebird client must correspond to the version of Firebird server to which you are connecting.

- You have the following database connection details: server host name or IP address, database path (or alias) on the server, user name, and password.

To connect to Firebird via ODBC:

1. Start the database connection wizard.
2. Click ODBC Connections.
3. Select User DSN (or System DSN, if you have administrative privileges), and then click
4. Select the Firebird driver, and then click **User DSN** (or **System DSN**, depending on what you selected in the previous step). If the Firebird driver is not available in the list, make sure that it is installed on your operating system (see also **Viewing the Available ODBC Drivers**).

5. Enter the database connection details as follows:

| Data Source Name (DSN) | Enter a descriptive name for the data source you are creating. |
6. Click OK.

5.10.2 Connecting to Firebird (JDBC)

This topic provides sample instructions for connecting to a Firebird database server through JDBC.

**Prerequisites:**

- JRE (Java Runtime Environment) or Java Development Kit (JDK) must be installed. This may be either Oracle JDK or an open source build such as Oracle OpenJDK. DatabaseSpy will determine the path to the Java Virtual Machine (JVM) from the following locations, in this order: a) The custom JVM path you may have set in application Options, see Java Settings; b) The JVM path found in the Windows registry; c) The JAVA_HOME environment variable.
- Make sure that the platform of DatabaseSpy (32-bit, 64-bit) matches that of the JRE/JDK.
- The Firebird JDBC driver must be available on your operating system (it takes the form of a .jar file which provides connectivity to the database). The driver can be downloaded from

<table>
<thead>
<tr>
<th>Database</th>
<th>Enter the server host name or IP address, followed by a colon, followed by the database alias (or path). In this example, the host name is firebirdserv, and the database alias is products, as follows:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>firebirdserv:products</td>
</tr>
<tr>
<td></td>
<td>Using a database alias assumes that, on the server side, the database administrator has configured the alias products to point to the actual Firebird (.fdb) database file on the server (see the Firebird documentation for more details).</td>
</tr>
<tr>
<td></td>
<td>You can also use the server IP address instead of the host name, and a path instead of an alias; therefore, any of the following sample connection strings are valid:</td>
</tr>
<tr>
<td></td>
<td>firebirdserver:/var/Firebird/databases/butterflies.fdb</td>
</tr>
<tr>
<td></td>
<td>127.0.0.1:D:\Misc\Lenders.fdb</td>
</tr>
<tr>
<td></td>
<td>If the database is on the local Windows machine, click Browse and select the Firebird (.fdb) database file directly.</td>
</tr>
<tr>
<td>Client</td>
<td>Enter the path to the fbclient.dll file. By default, this is the bin subdirectory of the Firebird installation directory.</td>
</tr>
<tr>
<td>Database Account</td>
<td>Enter the database user name supplied by the database administrator (in this example, PROD_ADMIN).</td>
</tr>
<tr>
<td>Password</td>
<td>Enter the database password supplied by the database administrator.</td>
</tr>
</tbody>
</table>
the Firebird website (https://www.firebirdsql.org/). This example uses Jaybird 2.2.8.

- You have the following database connection details: host, database path or alias, username, and password.

**To connect to Firebird through JDBC:**

1. **Start the database connection wizard.**
2. Click **JDBC Connections**.
3. Next to "Classpaths", enter the path to the .jar file which provides connectivity to the database. If necessary, you can also enter a semicolon-separated list of .jar file paths. In this example, the required .jar file is located at the following path: C:/jdbc/firebird/jaybird-full-2.2.8.jar. Note that you can leave the "Classpaths" text box empty if you have added the .jar file path(s) to the CLASSPATH environment variable of the operating system (see also Configuring the CLASSPATH).
4. In the “Driver” box, select org.firebirdsql.jdbc.FBDriver. Note that this entry is available if a valid .jar file path is found either in the "Classpath" text box, or in the operating system's CLASSPATH environment variable (see the previous step).

   ![Database connection wizard screenshot]

5. Enter the username and password to the database in the corresponding text boxes.
6. Enter the connection string to the database server in the Database URL text box, by replacing the highlighted values with the ones applicable to your database server.

   `jdbc:firebirdsql://<host>[:<port>]/<database path or alias>`

7. Click **Connect**.
5.10.3 Connecting to IBM DB2 (ODBC)

This topic provides sample instructions for connecting to an IBM DB2 database through ODBC.

Prerequisites:

- IBM Data Server Client must be installed and configured on your operating system (this example uses IBM Data Server Client 9.7). For installation instructions, check the documentation supplied with your IBM DB2 software. After installing the IBM Data Server Client, check if the ODBC drivers are available on your machine (see Viewing the Available ODBC Drivers).
- Create a database alias. There are several ways to do this:
  - From IBM DB2 Configuration Assistant
  - From IBM DB2 Command Line Processor
  - From the ODBC data source wizard (for this case, the instructions are shown below)
- You have the following database connection details: host, database, port, username, and password.

To connect to IBM DB2:

1. Start the database connection wizard and select IBM DB2 (ODBC/JDBC).
2. Click Next.
3. Select **ODBC**, and click **Next**. If prompted to edit the list of known drivers for the database, select the database drivers applicable to IBM DB2 (see Prerequisites), and click **Next**.
4. Select the IBM DB2 driver from the list, and then click Connect. (To edit the list of available drivers, click Edit Drivers, and then check or uncheck the IBM DB2 drivers you wish to add or remove, respectively.)
5. Enter a data source name (in this example, **DB2DSN**), and then click **Add**.

6. On the **Data Source** tab, enter the user name and password to the database.
7. On the **TCP/IP** tab, enter the database name, a name for the alias, the host name and the port number, and then click OK.
8. Enter again the username and password, and then click OK.

```
<table>
<thead>
<tr>
<th>Database alias</th>
<th>D82DSN</th>
<th>Add</th>
</tr>
</thead>
<tbody>
<tr>
<td>User ID</td>
<td>john_doe</td>
<td></td>
</tr>
<tr>
<td>Password</td>
<td>☑️</td>
<td></td>
</tr>
<tr>
<td>Change password</td>
<td>☑️</td>
<td></td>
</tr>
<tr>
<td>New password</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verify new password</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection mode</td>
<td>Share</td>
<td>☑️</td>
</tr>
<tr>
<td></td>
<td>Exclusive</td>
<td></td>
</tr>
</tbody>
</table>
```

5.10.4 Connecting to IBM DB2 for i (ODBC)

This topic provides sample instructions for connecting to an IBM DB2 for i database through ODBC.

Prerequisites:

- **IBM System i Access for Windows** must be installed on your operating system (this example uses IBM System i Access for Windows V6R1M0). For installation instructions, check the documentation supplied with your IBM DB2 for i software. After installation, check if the ODBC driver is available on your machine (see Viewing the Available ODBC Drivers).
You have the following database connection details: the I.P. address of the database server, database user name, and password.

- Run System i Navigator and follow the wizard to create a new connection. When prompted to specify a system, enter the I.P. address of the database server. After creating the connection, it is recommended to verify it (click on the connection, and select File > Diagnostics > Verify Connection). If you get connectivity errors, contact the database server administrator.

To connect to IBM DB2 for i:

1. Start the database connection wizard.
2. Click ODBC connections.
3. Click User DSN (alternatively, click System DSN, or File DSN, in which case the subsequent instructions will be similar).
4. Click Add 🔄.
5. Select the iSeries Access ODBC Driver from the list, and click User DSN (or System DSN, if applicable).
6. Enter a data source name and select the connection from the System combo box. In this example, the data source name is **iSeriesDSN** and the System is **192.0.2.0**.

![Connection Options](image)

7. Click Connection Options, select **Use the User ID specified below** and enter the name of the database user (in this example, **DBUSER**).
8. Click OK. The new data source becomes available in the list of DSNs.
9. Click Connect.
10. Enter the user name and password to the database when prompted, and then click OK.

5.10.5 Connecting to IBM Informix (JDBC)

This topic provides sample instructions for connecting to an IBM Informix database server through JDBC.

Prerequisites:

- JRE (Java Runtime Environment) or Java Development Kit (JDK) must be installed. This may be either Oracle JDK or an open source build such as Oracle OpenJDK. DatabaseSpy will determine the path to the Java Virtual Machine (JVM) from the following locations, in this order: a) The custom JVM path you may have set in application Options, see Java Settings; b) The JVM path found in the Windows registry; c) The JAVA_HOME environment variable.
- Make sure that the platform of DatabaseSpy (32-bit, 64-bit) matches that of the JRE/JDK.
- The JDBC driver (one or several .jar files that provide connectivity to the database) must be available on your operating system. In this example, IBM Informix JDBC driver version 3.70 is used. For the driver's installation instructions, see the documentation accompanying the driver or the "IBM Informix JDBC Driver Programmer's Guide".
- You have the following database connection details: host, name of the Informix server, database, port, username, and password.
To connect to IBM Informix through JDBC:

1. Start the database connection wizard.
2. Click JDBC Connections.
3. Next to "Classpaths", enter the path to the .jar file which provides connectivity to the database. If necessary, you can also enter a semicolon-separated list of .jar file paths. In this example, the required .jar file is located at the following path: C:\Informix_JDBC_Driver\lib\ifxjdbc.jar. Note that you can leave the "Classpaths" text box empty if you have added the .jar file path(s) to the CLASSPATH environment variable of the operating system (see also Configuring the CLASSPATH).
4. In the "Driver" box, select com.informix.jdbc.IfxDriver. Note that this entry is available if a valid .jar file path is found either in the "Classpath" text box, or in the operating system's CLASSPATH environment variable (see the previous step).

5. Enter the username and password to the database in the corresponding text boxes.
6. Enter the connection string to the database server in the Database URL text box, by replacing the highlighted values with the ones applicable to your database server.

```
jdbc:informix-sqli://hostName:port/
databaseName:INFORMIXSERVER=myserver;
```
7. Click Connect.
5.10.6 Connecting to MariaDB (ODBC)

This example illustrates how to connect to a MariaDB database server through ODBC.

Prerequisites:

- The MariaDB Connector/ODBC (https://downloads.mariadb.org/connector-odbc/) must be installed.
- You have the following database connection details: host, database, port, username, and password.

To connect to MariaDB through ODBC:

1. Start the database connection wizard.
2. Select MariaDB (ODBC), and then click Next.

3. Select Create a new Data Source Name (DSN) with the driver, and choose MariaDB ODBC 3.0 Driver. If no such driver is available in the list, click Edit Drivers, and select any available MariaDB drivers (the list contains all ODBC drivers installed on your operating system).
4. Click Connect.
5. Enter name and, optionally, a description that will help you identify this ODBC data source in future.

6. Fill in the database connection credentials (TCP/IP Server, User, Password), select a database, and then click **Test DSN**. Upon successful connection, a message box appears:
7. Click **Next** and complete the wizard. Other parameters may be required, depending on the case (for example, SSL certificates if you are connecting to MariaDB through a secure connection).

**Note:** If the database server is remote, it must be configured by the server administrator to accept remote connections from your machine's IP address.

## 5.10.7 Connecting to Microsoft Access (ADO)

A simple way to connect to a Microsoft Access database is to follow the wizard and browse for the database file, as shown in [Connecting to an Existing Microsoft Access Database](#). An alternative approach is to set up an ADO connection explicitly, as shown in this topic. This approach is useful if your database is password-protected.

It is also possible to connect to Microsoft Access through an ODBC connection, but there are some limitations in this scenario, so it is best to avoid it.

To connect to a password-protected Microsoft Access database:

1. Start the database connection wizard.
2. Click **ADO Connections**.
3. Click **Build**.
4. Select the **Microsoft Office 15.0 Access Database Engine OLE DB Provider**, and then click **Next**.
5. In the Data Source box, enter the path to the Microsoft Access file. Because the file is on the local network share U:\Departments\Finance\Reports\Revenue.accdb, we will convert it to UNC format, and namely \server1\dfs\Departments\Finance\Reports\Revenue.accdb, where server1 is the name of the server and dfs is the name of the network share.

6. On the All tab, double click the Jet OLEDB:Database Password property and enter the database password as property value.

Note: If you are still unable to connect, locate the workgroup information file (System.MDW) applicable to your user profile, and set the value of the Jet OLEDB: System database property to the path of the System.MDW file.
5.10.8 Connecting to Microsoft SQL Server (ADO)

This example illustrates how to connect to a SQL Server database through ADO. These instructions are applicable when you use a native SQL Server provider such as SQL Server Native Client 11.0 and also when you use the Microsoft OLE DB Provider for SQL Server provider.

To connect to SQL Server:

1. Start the database connection wizard.
2. Select Microsoft SQL Server (ADO), and then click Next. The list of available ADO drivers is displayed. In this example, the SQL Server Native Client 11.0 is used as provider. You can also select the Microsoft OLE DB Provider for SQL Server provider.
3. Click Next. The Data Link Properties dialog box appears.
4. Select or enter the name of the database server, for example, SQLSERV01. If you are connecting to a named SQL Server instance, the server name looks like SQLSERV01 \SOMEINSTANCE. To view the list of all servers on the network, expand the drop-down list.

5. If the database server was configured to allow connections from users authenticated on the Windows domain, select **Use Windows NT integrated security**. Otherwise, select **Use a specific user name and password**, clear the **Blank password** check box, and enter the credentials in the relevant boxes.

6. Select the database to which you are connecting (in this example, Nanonull).
7. To test the connection at this time, click **Test Connection**. This is an optional, recommended step.

Even if the connection test is successful at this time, you must still persist the security info, see the next step.

8. Click the **All** tab, and change the **Persist Security Info** property to **True**.
9. Click **OK**.

### 5.10.9 Connecting to Microsoft SQL Server (ODBC)

This example illustrates how to connect to a SQL Server database through ODBC.

**To connect to SQL Server using ODBC:**

1. Start the database connection wizard.
2. Click **ODBC Connections**.
3. Select **User DSN** (or **System DSN**, if you have administrative privileges), and then click **Add**. 
4. Select **SQL Server** (or **SQL Server Native Client**, if available), and then click **User DSN** (or **System DSN** if you are creating a System DSN).

5. Enter a name and description to identify this connection, and then select from the list the SQL Server to which you are connecting (**SQLSERV01** in this example).
6. If the database server was configured to allow connections from users authenticated on the Windows domain, select **With Windows NT authentication**. Otherwise, select **With SQL Server authentication**... and type the user name and password in the relevant boxes.

7. Select the name of the database to which you are connecting (in this example,
8. Click Finish.

5.10.10 Connecting to MySQL (ODBC)

This example illustrates how to connect to a MySQL database server from a Windows machine through the ODBC driver. The MySQL ODBC driver is not available on Windows, so it must be downloaded and installed separately. This example uses MySQL Connector/ODBC 8.0.

Prerequisites:

- MySQL ODBC driver must be installed on your operating system. Check the MySQL documentation for the driver version recommended for your database server version (see https://dev.mysql.com/downloads/connector/odbc/).
- You have the following database connection details: host, database, port, username, and password.

If you installed MySQL Connector/ODBC for 64-bit platform, make sure to install DatabaseSpy for 64-bit platform as well.

To connect to MySQL via ODBC:

1. Start the database connection wizard.
2. Select MySQL (ODBC), and then click Next.

3. Select Create a new Data Source Name (DSN) with the driver, and select a MySQL driver. If no MySQL driver is available in the list, click Edit Drivers, and select any available MySQL drivers (the list contains all ODBC drivers installed on your operating system).

   If you installed DatabaseSpy 64-bit, then the 64-bit ODBC drivers are shown in the list. Otherwise, the 32-bit ODBC drivers are shown. See also Viewing the Available ODBC Drivers.

4. Click Connect.
5. In the Data Source Name box, enter a descriptive name that will help you identify this ODBC data source in future.

6. Fill in the database connection credentials (TCP/IP Server, User, Password), select a database, and then click **OK**.

**Note:** If the database server is remote, it must be configured by the server administrator to accept remote connections from your machine's IP address. Also, if you click **Details>>**, there are several additional parameters available for configuration. Check the driver's documentation before changing their default values.

### 5.10.11 Connecting to Oracle (ODBC)

This example illustrates a common scenario where you connect from DatabaseSpy to an Oracle database server on a network machine, through an Oracle database client installed on the local operating system.

The example includes instructions for setting up an ODBC data source (DSN) using the database connection wizard in DatabaseSpy. If you have already created a DSN, or if you prefer to create it directly from ODBC Data Source administrator in Windows, you can do so, and then select it when prompted by the wizard. For more information about ODBC data sources, see [Setting up an ODBC Connection](#).
**Prerequisites:**

- The Oracle database client (which includes the ODBC Oracle driver) must be installed and configured on your operating system. For instructions on how to install and configure an Oracle database client, refer to the documentation supplied with your Oracle software.
- The `tnsnames.ora` file located in Oracle home directory contains an entry that describes the database connection parameters, in a format similar to this:

```plaintext
ORCL =
  (DESCRIPTION =
   (ADDRESS_LIST =
     (ADDRESS = (PROTOCOL = TCP)(HOST = server01)(PORT = 1521))
   )
  (CONNECT_DATA =
   (SID = orcl)
   (SERVER = DEDICATED)
  )
)
```

The path to the `tnsnames.ora` file depends on the location where Oracle home directory was installed. For Oracle database client 11.2.0, the default Oracle home directory path could be as follows:

```
C:\app\username\product\11.2.0\client_1\network\admin\tnsnames.ora
```

You can add new entries to the `tnsnames.ora` file either by pasting the connection details and saving the file, or by running the Oracle *Net Configuration Assistant* wizard (if available).

**To connect to Oracle using ODBC:**

1. Start the database connection wizard.
2. Select **Oracle (ODBC / JDBC)**, and then click **Next**.
Connecting to a Database

**JDBC vs. ODBC**

- **JDBC**
  
  Java-based connection that may provide support for more modern features of your database that aren’t available via ODBC. The tradeoff for these features is a potential sacrifice of performance.

- **ODBC**
  
  An ODBC connection will generally be faster and less resource-intensive than a JDBC connection, but lacks support for more modern database features (such as native XML types).

3. Select **ODBC**.

**Connecting to Oracle**

- Select an option how you wish to connect to the database and click Connect.
  
  - Create a new Data Source Name (DSN) with the driver:
    - Microsoft ODBC for Oracle
  
  - Use an existing Data Source Name:
    - User DSN
    - System DSN

4. Click **Edit Drivers**.
5. Select the Oracle drivers you wish to use (in this example, **Oracle in OraClient11g_home1**). The list displays the Oracle drivers available on your system after installation of Oracle client.

6. Click **Back**.

7. Select **Create a new data source name (DSN) with the driver**, and then select the Oracle driver chosen in step 4.
Avoid using the Microsoft-supplied driver called **Microsoft ODBC for Oracle** driver. Microsoft recommends using the ODBC driver provided by Oracle (see [http://msdn.microsoft.com/en-us/library/ms714756%28vs.85%29.aspx](http://msdn.microsoft.com/en-us/library/ms714756%28vs.85%29.aspx)).

8. Click **Connect**.
9. In the Data Source Name text box, enter a name to identify the data source (in this example, **Oracle DSN 1**).

10. In the TNS Service Name box, enter the connection name as it is defined in the `tnsnames.ora` file (see [prerequisites](#)). In this example, the connection name is **ORCL**.

11. Click **OK**.

12. Enter the username and password to the database, and then click **OK**.

### 5.10.12 Connecting to Oracle (JDBC)

This example shows you how to connect to an Oracle database server from a client machine, using the JDBC interface. The connection is created as a pure Java connection, using the **Oracle Instant Client Package (Basic)** available from the Oracle website. The advantage of this connection type is that it requires only the Java environment and the .jar libraries supplied by the Oracle Instant Client Package, saving you the effort to install and configure a more complex database client.
Prerequisites:

- JRE (Java Runtime Environment) or Java Development Kit (JDK) must be installed. This may be either Oracle JDK or an open source build such as Oracle OpenJDK. DatabaseSpy will determine the path to the Java Virtual Machine (JVM) from the following locations, in this order: a) The custom JVM path you may have set in application Options, see Java Settings; b) The JVM path found in the Windows registry; c) The \JAVA_HOME environment variable.
- Make sure that the platform of DatabaseSpy (32-bit, 64-bit) matches that of the JRE/JDK.
- The Oracle Instant Client Package (Basic) must be available on your operating system. The package can be downloaded from the official Oracle website. This example uses Oracle Instant Client Package version 12.1.0.2.0, for Windows 32-bit.
- You have the following database connection details: host, port, service name, username, and password.

To connect to Oracle through the Instant Client Package:

1. Start the database connection wizard.
2. Click JDBC Connections.
3. Next to "Classpaths", enter the path to the .jar file which provides connectivity to the database. If necessary, you can also enter a semicolon-separated list of .jar file paths. In this example, the required .jar file is located at the following path: C:\jdbc \instantclient_12_1\odbc7.jar. Note that you can leave the "Classpaths" text box empty if you have added the .jar file path(s) to the CLASSPATH environment variable of the operating system (see also Configuring the CLASSPATH).
4. In the "Driver" box, select either oracle.jdbc.OracleDriver or oracle.jdbc.driver.OracleDriver. Note that these entries are available if a valid .jar file path is found either in the "Classpath" text box, or in the operating system's CLASSPATH environment variable (see the previous step).
5. Enter the username and password to the database in the corresponding text boxes.
6. Enter the connection string to the database server in the Database URL text box, by replacing the highlighted values with the ones applicable to your database server.

```
jdbc:oracle:thin:@//host:port:service
```

7. Click Connect.

### 5.10.13 Connecting to PostgreSQL (ODBC)

This topic provides sample instructions for connecting to a PostgreSQL database server from a Windows machine through the ODBC driver. The PostgreSQL ODBC driver is not available on Windows, so it must be downloaded and installed separately. This example uses the psqlODBC driver (version 11.0) downloaded from the official website (see also Database Drivers Overview).

**Note:** You can also connect to a PostgreSQL database server directly (without the ODBC driver), see Setting up a PostgreSQL Connection.

**Prerequisites:**

- *psqlODBC* driver must be installed on your operating system.
- You have the following database connection details: server, port, database, user name, and password.
To set up a connection to PostgreSQL using ODBC:

1. Start the database connection wizard.
2. Click ODBC Connections.
3. Select the User DSN option.
4. Click Create a new DSN and select the driver from the drop-down list. If no PostgreSQL driver is available in the list, make sure that the PostgreSQL ODBC driver is installed on your operating system, as mentioned in the prerequisites above.

5. Click User DSN.

6. Fill in the database connection credentials (these must be supplied by the database owner), and then click Save.

The connection is now available in the list of ODBC connections. To connect to the database, you can either double-click the connection or select it, and then click Connect.
5.10.14 Connecting to Progress OpenEdge (ODBC)

This topic provides sample instructions for connecting to a Progress OpenEdge database server through the Progress OpenEdge 11.6 ODBC driver.

Prerequisites:

- The ODBC Connector for Progress OpenEdge driver must be installed on your operating system. The Progress OpenEdge ODBC driver can be downloaded from the vendor’s website (see also Database Drivers Overview). Make sure to download the 32-bit driver when running the 32-bit version of DatabaseSpy, and the 64-bit driver when running the 64-bit version. After installation, check if the ODBC driver is available on your machine (see also Viewing the Available ODBC Drivers).
You have the following database connection details: host name, port number, database name, user ID, and password.

Connecting to Progress OpenEdge through ODBC

1. Start the database connection wizard.
2. Click ODBC Connections.
3. Click User DSN (alternatively, click System DSN, or File DSN, in which case the subsequent instructions will be similar).
4. Click Add.
5. Select the Progress OpenEdge Driver from the list, and click User DSN (or System DSN, if applicable).
6. Fill in the database connection credentials (Database, Server, Port, User Name,
Password), and then click **OK**. To verify connectivity before saving the entered data, click **Test Connect**.

![ODBC Progress OpenEdge Wire Protocol Driver Setup](image)

7. Click **OK**. The new data source now appears in the list of ODBC data sources.
8. Click **Connect**.

### 5.10.15 Connecting to Progress OpenEdge (JDBC)

This topic provides sample instructions for connecting to a Progress OpenEdge 11.6 database server through JDBC.

#### Prerequisites

- JRE (Java Runtime Environment) or Java Development Kit (JDK) must be installed. This may be either Oracle JDK or an open source build such as Oracle OpenJDK. DatabaseSpy will determine the path to the Java Virtual Machine (JVM) from the following locations, in this order: a) The custom JVM path you may have set in application Options, see Java Settings; b) The JVM path found in the Windows registry; c) The JAVA_HOME environment variable.
- Make sure that the platform of DatabaseSpy (32-bit, 64-bit) matches that of the JRE/JDK.
- The operating system's `PATH` environment variable must include the path to the `bin` directory of the JRE or JDK installation directory, for example `C:\Program Files (x86)\Java\jre1.8.0_51\bin`.
- The Progress OpenEdge JDBC driver must be available on your operating system. In this example, JDBC connectivity is provided by the `openedge.jar` and `pool.jar` driver component files available in `C:\Progress\OpenEdge\java` as part of the OpenEdge SDK installation.
• You have the following database connection details: host, port, database name, username, and password.

Connecting to OpenEdge through JDBC

1. Start the database connection wizard.
2. Click JDBC Connections.
3. Next to "Classpaths", enter the path to the .jar file which provides connectivity to the database. If necessary, you can also enter a semicolon-separated list of .jar file paths. In this example, the required .jar file paths are: 
   \C:\Progress\OpenEdge\java\openedge.jar;\C:\Progress\OpenEdge\java\pool.jar. Note that you can leave the "Classpaths" text box empty if you have added the .jar file path(s) to the CLASSPATH environment variable of the operating system (see also Configuring the CLASSPATH).
4. In the “Driver” box, select 
   com.ddtek.jdbc.openedge.OpenEdgeDriver. Note that this entry is available if a valid .jar file path is found either in the "Classpath" text box, or in the operating system's CLASSPATH environment variable (see the previous step).

   Classpaths: C:\Progress\OpenEdge\java\openedge.jar;C:\Progress\OpenEdge\java\pool.jar
   Driver: com.ddtek.jdbc.openedge.OpenEdgeDriver
   Username: dbuser
   Password: ********

5. Enter the username and password to the database in the corresponding text boxes.
6. Enter the connection string to the database server in the Database URL text box, by replacing the highlighted values with the ones applicable to your database server.

   jdbc:datadirect:openedge://host:port;databaseName=db_name

7. Click Connect.
5.10.16 Connecting to Sybase (JDBC)

This topic provides sample instructions for connecting to a Sybase database server through JDBC.

Prerequisites:

- JRE (Java Runtime Environment) or Java Development Kit (JDK) must be installed. This may be either Oracle JDK or an open source build such as Oracle OpenJDK. DatabaseSpy will determine the path to the Java Virtual Machine (JVM) from the following locations, in this order: a) The custom JVM path you may have set in application Options, see Java Settings; b) The JVM path found in the Windows registry; c) The JAVA_HOME environment variable.
- Make sure that the platform of DatabaseSpy (32-bit, 64-bit) matches that of the JRE/JDK.
- Sybase jConnect component must be installed on your operating system (in this example, jConnect 7.0 is used, installed as part of the Sybase Adaptive Server Enterprise PC Client installation). For the installation instructions of the database client, refer to Sybase documentation.
- You have the following database connection details: host, port, database name, username, and password.

To connect to Sybase through JDBC:

1. Start the database connection wizard.
2. Click JDBC Connections.
3. Next to "Classpaths", enter the path to the .jar file which provides connectivity to the database. If necessary, you can also enter a semicolon-separated list of .jar file paths. In this example, the required .jar file path is: C:sybase\jConnect-7_0\classes\jconn4.jar. Note that you can leave the "Classpaths" text box empty if you have added the .jar file path(s) to the CLASSPATH environment variable of the operating system (see also Configuring the CLASSPATH).
4. In the "Driver" box, select com.sybase.jdbc4.jdbc.SybDriver. Note that this entry is available if a valid .jar file path is found either in the "Classpath" text box, or in the operating system's CLASSPATH environment variable (see the previous step).
5. Enter the username and password to the database in the corresponding text boxes.

6. Enter the connection string to the database server in the Database URL text box, by replacing the highlighted values with the ones applicable to your database server.

```
jdbc:sybase:Tds:hostname:port/databaseName
```

7. Click Connect.

### 5.10.17 Connecting to Teradata (ODBC)

This example illustrates how to connect to a Teradata database server through ODBC.

**Prerequisites:**

- The Teradata ODBC driver must be installed (see https://downloads.teradata.com/download/connectivity/odbc-driver/windows). This example uses Teradata ODBC Driver for Windows version 16.20.00.
- You have the following database connection details: host, username, and password.

**To connect to Teradata through ODBC:**

1. Press the **Windows** key, start typing "ODBC", and select **Set up ODBC data sources**
(32-bit) from the list of suggestions. If you have a 64-bit ODBC driver, select **Set up ODBC data sources (64-bit)** and use 64-bit DatabaseSpy in the subsequent steps.

2. Click the **System DSN** tab, and then click **Add**.

3. Select **Teradata Database ODBC Driver** and click **Finish**.
4. Enter name and, optionally, a description that will help you identify this ODBC data source in future. Also, enter the database connection credentials (Database server, User, Password), and, optionally, select a database.

5. Click OK. The data source now appears in the list.
6. Run DatabaseSpy and start the database connection wizard.
7. Click ODBC Connections.
Connecting to a Database

5.10.18 Connecting to Teradata (JDBC)

This example illustrates how to connect to a Teradata database server through JDBC.

Prerequisites:

- JRE (Java Runtime Environment) or Java Development Kit (JDK) must be installed. This may be either Oracle JDK or an open source build such as Oracle OpenJDK. DatabaseSpy will determine the path to the Java Virtual Machine (JVM) from the following
locations, in this order: a) The custom JVM path you may have set in application Options, see Java Settings; b) The JVM path found in the Windows registry; c) The JAVA_HOME environment variable.

- Make sure that the platform of DatabaseSpy (32-bit, 64-bit) matches that of the JRE/JDK.
- The JDBC driver (one or more .jar files that provide connectivity to the database) must be available on your operating system. In this example, Teradata JDBC Driver 16.20.00.02 is used. For more information, see https://downloads.teradata.com/download/connectivity/jdbc-driver.
- You have the following database connection details: host, database, port, username, and password.

To connect to Teradata through JDBC:

1. Start the database connection wizard.
2. Click JDBC Connections.
3. Next to "Classpaths", enter the path to the .jar file which provides connectivity to the database. If necessary, you can also enter a semicolon-separated list of .jar file paths. In this example, the .jar files are located at the following path: C:\jdbc\teradata. Note that you can leave the "Classpaths" text box empty if you have added the .jar file path(s) to the CLASSPATH environment variable of the operating system (see also Configuring the CLASSPATH).
4. In the “Driver” box, select com.teradata.jdbc.TeraDriver. Note that this entry is available if a valid .jar file path is found either in the "Classpath" text box, or in the operating system's CLASSPATH environment variable (see the previous step).
5. Enter the username and password to the database in the corresponding text boxes.
6. Enter the connection string to the database server in the Database URL text box, by replacing the highlighted value with the one applicable to your database server.

```
jdbc:teradata://databaseServerName
```

7. Click **Connect**.
Chapter 6

DatabaseSpy Projects
6 DatabaseSpy Projects

A DatabaseSpy Project combines everything that you need when working with your databases in a single project file. It includes data source connections, SQL files, database design files, and comparison files for data and schemas. You can also define favorites for your most frequently used files or database objects.

The content of your project is displayed in the Project window.

Note: DatabaseSpy projects created in one version (for example Database 2019) can only be opened with the same or later versions. Also, DatabaseSpy Enterprise can open projects saved with DatabaseSpy Professional, but the opposite is not possible.

Every time you start DatabaseSpy (and provided that you have not changed the default setting of the Open last project on startup check box in the General options), an empty project is displayed in the Project window. You must at least add a data source to it and save it in your file system.

If DatabaseSpy starts with the last project, you can create a new project by proceeding as follows:

- In the Project window, click the Create a new project button or select the menu option File | New | Project.

If there is an unsaved project already open in the Project window, you are prompted to save this project. After you have decided what to do with the unsaved project, a new, empty project appears in the Project window.

If you want to open an already existing DatabaseSpy Project do one of the following:
In the Project window, click the **Open a project** button or select the menu option **File | Open | Open Project** and choose a project file from the Open dialog box.

Select the menu option **File | Open | Open File...**, select "Altova DatabaseSpy Project (*.qprj)" from the Files of type drop-down list, and choose a project file from the Open dialog box.

If there is an unsaved project already open in the Project window, you are prompted to save this project.

A project is displayed with its file name in DatabaseSpy, so if you save a project make sure that you choose a descriptive name for the *.qprj file. You can rename a project only by changing its file name.

**To save a project:**

- In the Project window, click the **Save Project** button or select the menu option **File | Save | Save Project**.

**To save the project under a new name and change its title:**

1. Select the menu option **File | Save | Save Project As**.
2. Select the folder where you want to save the project file and enter a name for the file.
3. Click **Save**.

**To close a project:**

- Open an existing project, or create a new one.

**To delete a project:**

- Delete the respective *.qprj file from your hard disk.
6.1 Adding Data Sources

Working with any kind of database in DatabaseSpy requires that you add a data source to the project. All data sources added to the project appear in the Data Sources folder in the Project window.

To add a data source to your project:

Do one of the following:

- On the File menu, click Create a Database Connection.
- Press the keyboard shortcut Ctrl+Q.
- Click the Connect to a database toolbar button.
- In the Project window, right-click the Data Sources folder and select Add a New Data Source... from the context menu.

From this point onwards, follow the connectivity instructions applicable to the database kind or to the interface you want to connect (ADO, ADO.NET, ODBC, JDBC, or native), see Connecting to a Database. For database connection examples applicable to various database kinds, see Database Connection Examples.

Data source options

When you right-click a data source name in the Project window, you can choose from several options depending on the current state (connected or disconnected) of the data source and whether or not the data source is a global resource. The corresponding keyboard shortcuts are shown to the right of the options if they are available.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connect</td>
<td>Connects to a data source if it is disconnected.</td>
</tr>
<tr>
<td>Disconnect</td>
<td>Disconnects from a data source if it is connected.</td>
</tr>
<tr>
<td>Remove</td>
<td>De1  Removes a data source from the project.</td>
</tr>
<tr>
<td>Rename</td>
<td>F2  Renames a data source. Note that only disconnected data sources can be renamed.</td>
</tr>
<tr>
<td>Convert to Global Resource</td>
<td>Converts the data source to an Altova Global Resource (see Altova Global Resources) and adds a database alias with the data source name to the GlobalResources.xml definition file. If an alias with that name already exists, a warning message will be displayed and the operation will fail.</td>
</tr>
<tr>
<td>Copy Global Resource into Project</td>
<td>Generates a copy of the global resource and adds it to the project as stand-alone data source. You will have to specify a name for the new data source. The original global resource</td>
</tr>
</tbody>
</table>
To copy a global resource into a project:

1. In the Project window, right-click a data source that has been added to the project as global resource and select **Copy Global Resource into Project** from the context menu.
2. Enter a name in the Set a Data Source Name dialog and click **OK**.
3. Optionally, remove the global resource from the project.

To remove a data source from a project:

Select the data source you want to remove and do one of the following:

- Right-click the data source and choose **Remove** from the context menu.
- Press **Delete**.

If the data source is connected, DatabaseSpy displays a warning that removing the data source will close the connection.

Renaming data sources

Data sources in projects can be renamed either in the Properties window or via the context menu directly in the Project window.

**Note:** You can only rename data sources that are currently disconnected. Both the **Rename** command in the context menu and the title bar in the Properties window are grayed out for connected data sources.

To rename a data source in a project:

1. Make sure that the data source is disconnected.
2. Select the data source you want to rename and do one of the following:
   
   - In the Properties window, double-click the title bar.
   - In the Project window, right-click the data source and select **Rename** from the context menu.
   - Press **F2**.

3. Enter the new name and press **Enter**.
4. **Save the project.**
6.2 Adding Files

You can add existing SQL scripts to your DatabaseSpy Project, or you can save designs, data comparisons, or schema comparisons in files and add them. The Project window provides folders for the different file types and you can define properties (e.g., data source to connect to, execution options for SQL, etc.) on file or folder level. This way, you have all the file that you may need at hand, even if they are stored in different locations. If you need to find the exact path to a file that has been added to a project, DatabaseSpy provides the following context menu option:

- Right-click a file in the Project window and select Locate File... from the context menu. DatabaseSpy opens the folder that contains the file in Windows Explorer.

To add files to a project:

1. In the Project window, right-click a folder and select Add Files to Project... from the context menu. Alternatively, click the Add files to the Project button in the Project window toolbar. The Open dialog appears.
2. Browse for the file that you want to add to the project.
3. Click Open. The selected file is added to the corresponding folder of the project.
4. Save the project file.

In addition, you can also save the content of the SQL Editor, Design Editor, Data Comparison or Schema Comparison window to a file and add this file to the project at the same time. For every file that is saved for the first time or under a new name, DatabaseSpy pops up the Add to Project dialog box.

The Add to Project dialog box also serves as a shortcut to the General options, allowing you to define that newly saved files be always added to the project automatically. In addition, you can also suppress the display of this dialog box in the future.

To save a file:

1. Make the SQL Editor, Design Editor, or Comparison window that contains the script, design, or comparison to be saved the active window and do one of the following:
   - Click the Save button in the Standard toolbar.
• Select the menu option **File | Save.**
• Press **Ctrl+S.**
• Right click the naming tab at the bottom of the document window and select **Save...** from the context menu.

2. Enter a name for the new file, select a folder and click the **Save** button. The Add to Project dialog box opens (if the dialog box does not pop up, check whether the **Do not show dialog** option is checked in the Newly saved files group box of the **General options**).

3. Do one or more of the following:

   • Click the **Add to Project** button to add the file the currently active project.
   • Click **Skip Project** to close the dialog box without adding the file to the project.
   • Select the **Always add newly saved files to the project** check box.
   • Select the **Do not ask this question again!** check box to suppress the display of the dialog box in the future.

   **To add the active file to the project:**

   1. Make the window that contains the file you want to add to the project the active window.
   2. Do one of the following:

      • In the Project window, click the **Add the Active File** icon in the toolbar, or right-click the respective folder and select **Add Active File to Project** from the context menu.
      • In the SQL Editor, Design Editor, or Comparison window, right-click the tab at the bottom of the Editor window and select **Add to project** from the context menu. If the file has not been saved yet, the Windows **Save As** dialog box opens where you can enter a name and path for the file.

      The file appears below the respective folder in the Project window.

      3. **Save the project file.**

   **To remove a file from a project:**

   Do one of the following:

   • Right-click the file and select **Remove** from the context menu.
   • Select the file and press **Delete**.
6.3 Favorites

Frequently used database objects that have been added to your favorites are displayed in the Favorites folder. All options for an individual object are available in the context menu and you can directly open the Online Browser by clicking the arrow to the right of the object name.

DatabaseSpy's Favorites feature allows you to mark frequently used objects in your project as favorites. These items then show up in the Favorites folder of the Project window and are shown bold in the Online Browser so that you have always quick access to them.

In the Project window, an arrow is shown in the Favorites folder next to the item name. When you click on this arrow, the Online Browser opens with the favorite item selected. Note that you can also add databases and schemas or individual table columns to the Favorites folder.

For every item in the Favorites folder, the relevant options are available in the context menu. For example, you can connect a data source directly from within the favorites folder.
To add items to the Favorites folder:

- In the Online Browser, right-click the respective tables or other database objects and select Add to/Remove from Favorites (Ctrl+F2) from the context menu.
- Alternatively, if you have activated the Enable full row selection check box in the Online Browser options, click the favorites icon that appears to the right of a database object if you move the mouse cursor over it in the Online Browser.

The tables or objects are added to the Favorites folder and are shown in bold type in the Online Browser. In addition, the favorites icon beneath the object name appears yellow when full row selection is enabled.

To view only the favorites in the Online Browser:

1. Click the Favorites icon to switch to the favorites view.

Note that the Favorites icon is now active and only database objects that are contained in the Favorites folder are displayed in the Online Browser.

2. Click the Favorites icon again to switch back to the normal Online Browser view.

To rename database objects in the Favorites folder:

1. Make sure that the corresponding data source of the favorites item is connected.
2. Select the database object you want to rename in the favorites folder and do one of the following:
   - In the Properties window, double-click the title bar.
   - In the Project window, right-click the database object in the favorites folder and select
3. Enter the new name and press **Enter**. A change script is generated in the Database Structure Change Script window.

4. Execute the change script.

**To remove a database object from the Favorites folder:**

Do one of the following:

- In the Project tab, right-click the object in the Favorites folder and select **Remove from Favorites (Del)**.
- In the Online Browser, right-click the object in its folder and select **Add to/Remove from Favorites (Ctrl+F2)**.
- When **full row selection** is enabled, in the Online Browser, move the mouse cursor over a favorite item and click the yellow favorites item to the right of its name.

**To remove all database objects from the Favorites folder:**

- In the Project tab, right-click the Favorites folder and select **Remove all Favorites**.
6.4 Properties

In DatabaseSpy you can view properties by selecting objects in (i) the Project window, (ii) the Online Browser, (iii) the Design Editor, or (iv) the Data or Schema Comparison window. In addition, you can define properties for designs, SQL files, and comparison files that have been added to a project. The properties are displayed in the Properties window.

Changing a property in the Property Window or in the Design Editor automatically generates an SQL change script which appears in the Database Structure Change Script window either automatically or after you have clicked the Update Change Script button, depending on how you have configured the Change Script options. Properties that cannot be edited are grayed out.

In the Online Browser, properties for all database objects as well as for any active data source connection, its database and/or schema(s) can be viewed in the Properties window. When folders are displayed, clicking a folders shows an overview of the folders content in the Properties window.

The properties that are displayed in the Properties window depend on the database object that is currently selected in the Online Browser, Design Editor, or Comparison window. If an object has child objects, the content of the Properties window changes in accordance with the level to which you expand the object, that is, only properties for expanded items are displayed in the Properties window.

For the data source connection, DatabaseSpy displays the same properties like in the Project window. The properties that are displayed when you click on a database in the Online Browser are for information purposes only and cannot be changed.

Object count

For every database object that contains child objects, an overview section is displayed. This section provides hyperlinks for counting the number of the individual children of the database object as well as a hyperlink for counting all children of the object. Note that the count is retrieved automatically if you expand the object in the Online Browser or show a table in the Design Editor.

To retrieve the number of child objects in the Overview section of the Properties window, you have therefore the following options:

- Click the "Update all Counts" hyperlink to retrieve the count for all child objects.
- Click the "Update Count" hyperlink for an individual database object to retrieve the count for this specific item.
Show a table in the Design Editor; this automatically retrieves the count for all child objects of the table.

- Right-click a table and select **Expand | Children** from the context menu. This expands all sub-folders of the table in the Online Browser and thus shows the number of child objects in the table properties.
- Expand one or more sub-folders in the Online Browser and then click the table again. The number of items contained in the folder is displayed in the table properties.

### Tables

Table properties can be viewed (i) in the Properties window and (ii) to some extent in the table design. If properties are displayed in the Properties window, it makes no difference whether a database object is selected in the Online Browser or in the Design Editor.

The Overview section lists the child objects of the table and you can retrieve the number of the individual children separately. In the Constraints section, you can see at a glance which constraints are defined on which columns for the table. Check Constraints on table level can even be edited in this section. Whereas the General section provides only read-only information, you can enter a new or change an existing description for the table in the Description section.

A table may contain the following sub-folders:

- **Columns**
  When you expand the Columns sub-folder under a table in the Online Browser or expand the Columns section in a table design in Design Editor, and select a column, the column properties are displayed in the Properties window. Here you can change the data type and the Nullable property in the General section, or enter a description in the Description section. The remaining sections (Overview and Advanced) are read-only.

- **Constraints**
  The constraints properties for check constraints include the name of the table the constraint is assigned to, the expression used for the constraint, and a description. You can change the expression and the description in the Properties window.

- **Keys**
  If you select a primary or unique key in the Online Browser or in the Design Editor, the Properties window displays the number of columns that are used to build the key as well as the table the key is assigned to. For foreign keys, also the referenced tables and columns as well as the action on delete and update are displayed in the properties.

- **Indexes**
  Index properties show information such as the number of columns involved, index type, and the column name an index is assigned to. The Options section provides additional read-only information.
Views
In the properties for views, DatabaseSpy displays the number of columns that are included in the view (provided that the object count has been retrieved), and the schema in which the view is defined. The Advanced section shows additional read-only information.

XML Schemas
The only option that you can change directly in the Properties window for XML schemas is the Decomposition check box. Any other property is read-only in the Properties window and can only be changed in the XML Schema management for databases dialog box.

Procedures
For procedures, only the number of parameters and the schema in which the procedure is defined are displayed in the Properties window. If you expand a procedure to show the parameters, you can also display the data type and the direction mode of a parameter in the Properties window. All properties for procedures are read-only.

Functions
The properties displayed for functions include the number of parameters, the schema, the Deterministic check box, and the language. If you expand a function to show the parameters, you can also display the data type and the direction mode of a parameter in the Properties window. All properties for functions are read-only.

Note: The constraints information can only be displayed if all the table's children objects have already been loaded. This can be achieved in one of the following ways:

- by expanding the table in the Online Browser
- by generating an SQL statement for that table in the SQL Editor
- by showing the table in the Design Editor

Changing table properties
All the table and columns properties that can be edited can be changed either in the Properties window of the Online Browser or in the property window in the Design Editor. In the table display in the Design Editor, you can also edit the data type or check or uncheck the Nullable check box.

To change the properties of a column:

1. Do one of the following:
   - In the Online Browser, select a column and change its properties in the Properties window of the Online Browser.
   - In a Design Editor window, select a column name, click the ball at the right edge of the table display and change the properties in the property window that appears.

The changed column icon appears to the left of the column name and the changed
2. If applicable, click the **Update Change Script** button to update the change script.

3. In the Database Structure Change Script window, click the **Execute Change Script** button.

### 6.4.1 Project Properties

The project properties are displayed in the **Properties window** when you click on an object in the **Project window**. The properties change dynamically when you click on the individual folders or files in a project and can be edited in the Properties window. Properties that cannot be edited are grayed out. All properties that you define for a folder (or sub-folder) are automatically inherited by the files that are contained in that (sub-)folder. You can, however, break that tie by defining separate properties for individual files or sub-folders.

If you have **defined properties for the different folders** in the Project window, any file that you add to your project will inherit these properties from its parent folder. You can change the properties for a file at any time. DatabaseSpy displays properties that deviate from the parent folder's values in **bold type**. Once you have changed a property of a file, the link between the file's property and its parent folder's property is broken and will also not be restored by choosing the identical value in the file's drop-down list. You can, however, **restore the folder-file connection** by using the respective command in the context menu.

**Example**

Let's assume you have defined a sub-folder for SQL Server-related files in your Project window, and that you have set the Database Kind property to "MS SQL Server" for that sub-folder (see screenshot below). Since no properties have been defined for the parent SQL folder, the **Database Kind** property appears in **bold type**.

![Example screenshot of Project window properties](image)

The file **SelectHostByYear.sql** in the SQL Server folder inherits the properties from the SQL
Server folder and the **Database Kind** property therefore appears in normal font type. However, the Data Source and Root Object properties have been changed and the **SQL Editor should require semicolons** check box has been activated, and these three properties are displayed in bold type.

If you deactivate the **SQL Editor should require semicolons** check box again, the property will still be displayed bold although the value is now identical to the parent folder’s value (see screenshot below). This indicates that the tie between the folder’s properties and the file’s properties has been broken and—although currently identical—an individual value has been defined for this property.

Once a property has been changed for an individual file, the tie between the file and its parent folder can only be re-established via the **Restore value to parent’s option** context menu command.

**To reset a file’s properties to its parent folder’s options:**

1. In the Project window, select the file and right-click the property you want to reset in the Properties window.
2. Choose **Restore value to parent’s option** from the context menu. The file inherits the property from the parent folder again.

For the project itself, the path to the project file and, optionally, a description are displayed in the Properties window.

**Data source properties**

You can define in the data source properties to automatically connect to the data source when the project is opened. To do so, activate the **Connect on Open Project** check box in the Options section of the data source properties.

If you prefer to view data sources in the Online Browser also when they are not connected, you can activate the **Always show in Online Browser** check box which is also located in the Options section.
The **Global Resource** check box is activated if the data source has been added to the projects as a global resource. Note that this property cannot be changed by deactivating the check box. You must [copy the global resource into the project](#) and remove the global resource from the project to convert a global resource into a local one.

The **Use ODBC Native Interface** check box is for advanced users who may wish to retrieve structural information about their databases using the API methods provided from ODBC directly rather than DatabaseSpy's internal SQL queries. This might be desired when the user is experiencing difficulties retrieving data, or feels the application is too slow when retrieving this information. The down side to this approach is that the amount of structural information that the user can retrieve via the ODBC interface is limited.

The **Driver Information** section lists name, version, issuing company, file name, full path, and date of the driver that is used for the selected data source connection.

You can also manually edit the connection details in the **Connection** section of the data source properties but keep in mind that a project might not be able to establish a connection to the data source if the connection properties have been manipulated. For security reasons, the password for the data source connection cannot be edited directly in the Properties. If you double-click into the **Password** field, an extra dialog box opens where you have to enter the existing password before you can define and confirm a new password.

Detailed properties of the individual database objects can be viewed by selecting the respective database object in the Online Browser. You must connect to a data source before you can view its database objects in the Online Browser.

**SQL folder properties**

When you select the **SQL** folder in the Project window, you can edit the properties that apply to the entire folder and are inherited by all files contained in this folder. These properties can be overridden by properties that you define on file or sub-folder level.

The General section provides three drop-down lists for database kind, data source, and root object as well as text fields containing the folder and project names. The Description section shows a text field for entering a description. Please note that the properties for database kind and root object are filled in automatically when you select a data source from the drop-down list. However, you can then change the root object, if applicable.

**Design and Favorites properties**

For the **Design** and **Favorites** folders, the Properties window provides drop-down lists for database kind, data source, and root object. In addition, a text field for entering a description is available. The Design properties include also a text field displaying the project name.

**Data Diff properties**

In the **Data Diff** folder, DatabaseSpy displays statistical information on the comparison file, and you have the possibility to edit the **compare options** as well as the options for string and xml comparison and the merge execution options on file level.

**Schema Diff properties**

In the **Schema Diff** folder, DatabaseSpy displays statistical information on the comparison file,
and you have the possibility to automatically start a comparison when the document is opened.

### 6.4.2 SQL Properties

The following properties of SQL files as well as SQL Editor windows (with or without SQL statements) are displayed in the Properties window:

#### Overview

<table>
<thead>
<tr>
<th>File Kind</th>
<th>Always reads &quot;SQL&quot; for SQL files.</th>
</tr>
</thead>
</table>

#### Options

<table>
<thead>
<tr>
<th>SQL Editor should require semicolons</th>
<th>Activate this check box to improve performance and reliability of all parser-dependent operations. Only statement that are terminated with a semicolon will be considered by the parser.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group statements for execution with</td>
<td>Here you can choose how statements should be grouped when the script in the SQL Editor window is executed.</td>
</tr>
</tbody>
</table>

#### General

<table>
<thead>
<tr>
<th>Database Kind</th>
<th>For unsaved SQL Editor windows, this drop-down list lets you define a database type. Note that this field will be adapted automatically if you choose a data source.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Source</td>
<td>Here you can choose from the data sources that have been added to the project. As several data sources may be active at one time, it is necessary to be able to assign data sources to SQL files as a group or individually.</td>
</tr>
<tr>
<td>Root Object</td>
<td>If a data source has already been selected, you can choose a root object from this drop-down list.</td>
</tr>
</tbody>
</table>

**Note**: Assignments made in the Project tab apply to the SQL files when they are opened or executed.

#### Description

<table>
<thead>
<tr>
<th>Description</th>
<th>Here you can enter a description of the file.</th>
</tr>
</thead>
</table>

#### Files

<table>
<thead>
<tr>
<th>Creation Date</th>
<th>Modification Date</th>
<th>Access Date</th>
<th>Displays the respective creation and modification dates and shows when the file has last been accessed.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>Description</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size</td>
<td>Shows the file size.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Read Only</td>
<td>These properties are read-only and can only be changed outside DatabaseSpy.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hidden</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full Path</td>
<td>Displays the full path to the file. To jump directly to this location, right-click the file in the Project window and select Locate File... from the context menu.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Default properties for SQL Editor windows
The following scenarios can occur when you open a new SQL Editor window:

- **No project**: If no project has been opened in the Project window, any new SQL Editor window that you open will have the properties Database Kind = "Unknown" and Data Source = "Offline".
- **Data source connected**: If you open an SQL Editor window immediately after you have connected to a data source, the connection properties of this data source will be used for that SQL Editor window. Note that the data source still has to be selected in the Project window.
- **Several data sources defined in one project**: If you have opened a project with several different data sources, you can set the connection properties by clicking on a particular data source before opening an SQL Editor window. If you select a disconnected data source, the Execution Target Bar provides you with a Connect button to establish a connection to the data source. Clicking on any other item in the Project window will open an SQL Editor in the Offline mode.

Working with SQL files in the Offline mode
One of the options available to you when selecting from the Data Source combo box is "Offline". Designating an SQL file as offline means that it is blocked from being executed. The file cannot be executed when opened in the SQL Editor or when selecting Execute SQL from the context menu in the Project window.

All SQL Editor commands and functions are available when editing this file however, you just have the added security of not being able to execute it without having to change the settings in the Properties window.

Defining individual settings for project SQL files
1. In the Project window, select an SQL file in the SQL folder.
2. In the Properties window, select the data source that you want to assign to the file from the Data Source field. Active data sources are highlighted in the Properties window as well as in the Data Source drop-down list.
3. If required (e.g., because the SQL file includes target keywords), choose either "Semicolons" or "SQL Grammar" from the Group statements for execution with drop-down list.
4. If you want the parser to consider only statements that are delimited by semicolons, activate the SQL Editor should require semicolons check box and select the desired option from the Group statements for execution with drop-down list.

If you have defined properties for the different folders in the Project window, any file that you add to your project will inherit these properties from its parent folder. You can change the properties for a
file at any time. DatabaseSpy displays properties that deviate from the parent folder's values in bold type. Once you have changed a property of a file, the link between the file's property and its parent folder's property is broken and will also not be restored by choosing the identical value in the file's drop-down list. You can, however, restore the folder-file connection by using the respective command in the context menu.

**Defining individual settings of a file opened in the SQL Editor**

1. In the SQL Editor, click the tab of the SQL file whose properties you want to define or change. The file settings are displayed in the Properties window.
2. Change the settings according to your needs by double-clicking the Data Source or Root Object field in the Properties window and choosing an option from the drop-down list.
3. If required (e.g., because the SQL file includes target keywords) choose either "Semicolons" or "SQL Grammar" from the **Group statements for execution with** drop-down list.
4. If you want the parser to consider only statements that are delimited by semicolons, activate the **SQL Editor should require semicolons** check box and choose the appropriate option from the **Group statements for execution with** drop-down list.
5. Save the SQL file.

**6.4.3 Design Properties**

In addition to the Properties window, you can show the properties of a column, an index, a key, or a check constraint directly in a Design Editor window. Design Editor's table display shows the data type and the **Nullable** check box for columns, the column and order for indexes, the column and referenced key for keys, and the expression for check constraints.

When you select an index, key, or check constraint in the table display in the Design Editor, the referenced column is automatically printed in bold.

![Design Editor](image)

When you click into an empty area of a Design Editor window, the design properties are displayed in the Properties window. Here you can change the data source or schema and view the file properties and path of the design file.
Overview

File Kind | Always reads "Design" for design files (*.qdes).

General

Database Kind | For unsaved SQL Editor windows, this drop-down list lets you define a database type. Note that this field will be adapted automatically if you choose a data source.

Data Source | Here you can choose from the data sources that have been added to the project. As several data sources may be active at one time, it is necessary to be able to assign data sources to SQL files as a group or individually.

Note: Assignments made in the Project tab apply to the SQL files when they are opened or executed.

Root Object | If a data source has already been selected, you can choose a root object from this drop-down list.

Description

Description | Here you can enter a description of the file.

Files

Creation Date
Modification Date
Access Date | Displays the respective creation and modification dates and shows when the file has last been accessed.

Size | Shows the file size.

Read Only
Hidden | These properties are read-only and can only be changed outside DatabaseSpy.

Full Path | Displays the full path to the file. To jump directly to this location, right-click the file in the Project window and select Locate File... from the context menu.

Note: The connection properties can only be changed for new designs. As soon as you show a table in a Design Editor window, the connection properties cannot be changed anymore.

To view the properties of a design file:

Do one of the following:
Click into an empty area of a Design Editor window.
If the design file has already been added to the project, click the .qdes file in the Design folder of the Project window.

The properties of the design are displayed in the Properties window.

6.4.4 Comparison Properties

When you click into an empty area of a Data Comparison or Schema Comparison window, the comparison properties are displayed in the Properties window. Here you can change the way tables and columns are compared, how the comparison file is stored in the project, and define several options for string and XML comparison. Properties that apply only to data comparisons are printed in italic type.

Overview

| File Kind | Reads "Data Comparison" for database data comparison files (*.dbdif) and "Structure Comparison" for database schema comparison files (*.dbsdif). |

Compare Options

| Compare | Changes between native comparison and string comparison. Note that XML comparison is only supported in native comparison mode. |
| Keep only different rows in memory | Stores only rows that contain differences in the database data comparison file. |
| Use native comparison for XML columns | The content of XML columns will be compared as native XML. If this option is activated, additional properties are available in the XML Compare Options section. |
| Append trailing zeros to float-numbers | Floating point numbers will be filled up with trailing zeros. |
| Ignore case | Different case of database data will be ignored during comparison. |
| Ignore whitespaces | Whitespace will not be considered for the comparison. |
| Start comparison when opening a document | A comparison will be started automatically if a comparison document is opened in DatabaseSpy. |
| Processing mode | Choose between sequential and parallel processing. |

String Options

| Treat [NULL] as empty string | NULL-values will be regarded as empty string for comparison. |
### Merge Execution Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use transactions for merge</td>
<td>Transactions will be used when changes are committed to the database as a result of a merge.</td>
</tr>
<tr>
<td>Rollback on errors</td>
<td>If an error occurs during the merge, the files will be rolled back to their original content.</td>
</tr>
</tbody>
</table>

### XML Compare Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compare whitespaces</td>
<td>Choose whether whitespace should remain unchanged, be normalized (i.e., all consecutive whitespace characters are reduced to one whitespace character), or be stripped (i.e., not considered) for comparison.</td>
</tr>
<tr>
<td>Ignore case</td>
<td>Different case will be ignored during comparison.</td>
</tr>
<tr>
<td>Don't ignore case in node names</td>
<td>Different case of node names will be regarded as difference.</td>
</tr>
<tr>
<td>Ignore namespace</td>
<td>Skips the namespace when comparing.</td>
</tr>
<tr>
<td>Ignore prefix</td>
<td>Ignores prefixes when comparing.</td>
</tr>
<tr>
<td>Ignore order of children</td>
<td>Compares nodes without considering the order in which child nodes appear.</td>
</tr>
<tr>
<td>Ignore order of attributes</td>
<td>Does not consider the order in which attributes appear.</td>
</tr>
<tr>
<td>Resolve entities</td>
<td>When activated, resolves all entities in the document, or compares entities as is when not activated.</td>
</tr>
<tr>
<td>Ignore text</td>
<td>Differences in corresponding text nodes will not be reported.</td>
</tr>
<tr>
<td>Ignore node depth</td>
<td>The additional depth of any element (i.e., more levels of descendants) relative to the depth of the corresponding element in the compared file will be ignored. This option must be unselected to enable merging and exporting differences.</td>
</tr>
<tr>
<td>Ignore Attributes</td>
<td>Nodes of type attribute will be ignored.</td>
</tr>
<tr>
<td>Ignore CDATA</td>
<td>Nodes of type CDATA will be ignored.</td>
</tr>
<tr>
<td>Ignore Comments</td>
<td>Nodes of type Comments will be ignored.</td>
</tr>
<tr>
<td>Ignore Processing Instructions</td>
<td>Nodes of type Processing Instruction will be ignored.</td>
</tr>
<tr>
<td>Ignore Doctype</td>
<td>Nodes of type DOCTYPE will be ignored.</td>
</tr>
<tr>
<td>Ignore XML declarations</td>
<td>Nodes of type XML Declaration will be ignored.</td>
</tr>
</tbody>
</table>
### Description

| Description | Here you can enter a description of the file. |

### Files

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Creation Date</strong></td>
<td>Displays the respective creation and modification dates and shows when the file has last been accessed.</td>
</tr>
<tr>
<td><strong>Modification Date</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Access Date</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Size</strong></td>
<td>Shows the file size.</td>
</tr>
<tr>
<td><strong>Read Only</strong></td>
<td>These properties are read-only and can only be changed outside DatabaseSpy.</td>
</tr>
<tr>
<td><strong>Hidden</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Full Path</strong></td>
<td>Displays the full path to the file. To jump directly to this location, right-click the file in the Project window and select <strong>Locate File</strong>... from the context menu.</td>
</tr>
</tbody>
</table>
Chapter 7

Browsing Data Sources
7  Browsing Data Sources

When you connect to a data source in DatabaseSpy, the data source is also displayed in the Online Browser, a powerful tool for analyzing, browsing, and searching for database objects, and for viewing the database structure of multiple databases simultaneously.

The Online Browser gives you an overview of the database objects on the database server(s) to which you are currently connected. Furthermore, you can show the row count for tables and views, generate SQL statements or retrieve data directly from the Online Browser and show them in the SQL Editor, or view the design of a database object in the Design Editor.

The following database objects may be displayed in the Online Browser:

- Databases
- Schemas
- Tables
- Views
- Procedures
- Columns
- Constraints
- Keys
Browsing Data Sources

- Indexes
- Data types
- XML Schemas (for DB2, SQL Server, and Oracle databases)
- Functions
- Triggers

**Layouts**

Different layouts for the objects in the Online Browser can be selected and you can apply filters to different folders as well as use the Object Locator to locate specific database objects in the Online Browser. Furthermore, you can also define favorites to facilitate quick access to objects that you use frequently.

**Connection method**

A check box is available in the Online Browser options that, when activated, shows also the connection method in the Project window as well as in the Online Browser together with the data source connection name.

**Data comparison**

When selecting tables and/or columns for comparison by clicking the Browse button in a Data Comparison window, DatabaseSpy displays the Select Database Objects for Comparison dialog box, which basically includes a variation of the Online Browser.
Display options in the Data Comparison window

In the Data Comparison window, the schema of compared tables is displayed by default. In the Data Compare options, you can disable this option, and you can also choose to display the tables’ data source name in the header of each component.
Expanding and Collapsing Elements

In the Online Browser, you can expand and collapse either individual elements or use the menu commands to expand or collapse all siblings or children of a certain element.

To expand or collapse a single element:

Do one of the following:

- To expand an element, click the "+" icon to the left of the element. Alternatively, select the element, and press the **Right Arrow** key or the **Plus Sign (↑)** key.
- To collapse an element, click the "-" icon to the left of the element. Alternatively, select the element, and press the **Left Arrow** key or the **Minus Sign (↓)** key.

To expand or collapse siblings or children:

Right-click an object in the Online Browser and select one of the following from the context menu:

- **Expand | Siblings**: Fully expands all contents of the objects that are on the same level as the selected object. For example, if you right-clicked on a table, all sibling tables and the selected table will be expanded.
- **Expand | Children**: Fully expands the descendent objects of the selected object.
- **Collapse | Siblings**: Collapses all contents of the objects that are on the same level as the selected object. For example, if you right-clicked on a table, all sibling tables and the selected table will be collapsed.
- **Collapse | Children**: Collapses the descendent objects of the selected object.
Counting Data Rows

You can display the number of rows contained in a table or view directly in the Online Browser without having to retrieve the data first. The context menu provides an additional Row Count sub-menu for this purpose, which contains options for showing/updating and clearing the row count. The Row Count sub-menu is also available for the Tables and Views folders and their sub-folders, allowing you to update the row count information for all tables or views with a single click.

When you move the mouse cursor over tables or views in the Online Browser, a hyperlink appears to the right of the object name. This hyperlink reads "(count)" if no row count has been done yet (see screenshot above), or "(n) update" if a number of n rows has already been retrieved. Clicking this hyperlink will also update the row count information.

To disable the row count feature, clear the Optional display of Table and View row counts check box in the Online Browser options.

To show the row count in the Online Browser:

1. Make sure that the Optional display of Table and View row counts check box is selected in the Online Browser options.
2. Do one of the following:
   - Right-click a table, view, or folder containing tables or views in the Online Browser and select Row Count | Show/Update from the context menu.
   - Place the mouse cursor over a table or view and click the (count) hyperlink that appears.
3. To update the row count information, repeat step 2. Note that the hyperlink reads (n) update, where n is the number of rows.

To hide the row count:

- Right-click a table, view, or folder containing tables or views in the Online Browser and select Row Count | Clear from the context menu.
7.3 Customizing the Browser Layout

By default, database objects are displayed in the Online Browser with minimum vertical spacing, so as to show as much information as possible. You can, however, change this setting in the Online Browser options.

**Default vertical spacing**  
![Default vertical spacing](image)

**Increased vertical spacing**  
![Increased vertical spacing](image)

To increase vertical spacing in the Online Browser:

1. Select the menu option **Tools | Options** or press **Ctrl+Alt+O**.
2. Change to the Online Browser page and deselect the **Reduce vertical spacing** check box in the Appearance group box.
3. Click **OK**.

Layouts

DatabaseSpy provides several predefined layouts for the display of the various database objects in the Online Browser. You can currently select from among the following layouts:

- The **Folders** layout organizes database objects into folders based on object type in a hierarchical tree. This is the default setting in DatabaseSpy.
- The **No Schemas** layout is similar to the Folders layout, except that there are no schema folders; tables are therefore not categorized by schema.
- The **No Folders** layout displays database objects in a hierarchy without using folders. For a better overview, you can activate the **Show labels in browser window** check box in Online Browser options, so that the name of each database object appears as a prefix.
• The Flat layout divides database objects by type in the first hierarchical level. For example, instead of columns being contained in the corresponding table, all columns are displayed in a separate Columns folder.

![Flat layout diagram]

• The Table Dependencies layout categorizes tables according to their relationships with other tables. There are categories for tables with foreign keys, tables referenced by foreign keys and tables that have no relationships to other tables.

![Table Dependencies layout diagram]

In the Online Browser options, you can define a default layout that DatabaseSpy uses when the Online Browser is displayed. Furthermore, you can decide in the options, whether or not the connection method should be displayed together with the data source connection name.

To select a layout for the Online Browser:

• In the Online Browser, click the layouts icon and select the desired layout from the drop-down list. Please note that the icon changes in accordance with the selected layout.
To define the default layout for the Online Browser:

1. Choose the menu option Tools | Options and select the Online Browser page of the Options dialog box.
2. In the Default Layout for Browser Window group box, select the desired layout from the drop-down list.
3. Click OK.

To sort tables into User and System tables:

1. In the Online Browser, right-click the "Tables" folder. A context-sensitive menu appears.
2. Select Sort into User and System Tables. The tables are sorted alphabetically in the "User Tables" and "System Tables" folders.

Note: You must be in the "Folders", "No Schemas" or "Flat" layout in order to access this function.
7.4 Selecting the Root Object

When you are connected to a data source in the Online Browser, for some of the databases you can select the root object whose contents you want to browse. The following procedure uses MS SQL Server as an example.

To select a root object in the Online Browser:

1. Click the arrow icon that is next to the currently selected database. A list of the root objects contained in the data source appears.

2. Select the desired root object from the list.
7.5 Displaying the Design of an Element

The Online Browser also allows you to view tables and their relationships in the graphical Design Editor. You can display one or more tables in a new Design Editor window or add one or more tables to a Design Editor window that is already open.

To show an object in a new Design Editor window:

- Right-click the object whose design you want to have displayed in the Design Editor and select Show in new Design Editor from the context menu. A Design Editor window opens and the selected object appears in it.

Note: Any number of tables can be selected in the Online Browser, press Shift+Click to select a contiguous group, or Ctrl+Click to select individual tables.

To add an object to the active Design Editor window:

- Right-click the object and select Add to Design Editor from the context menu.
7.6 Showing Referenced Tables

For any table that has references to other tables by means of foreign keys, you can identify the referenced table with a single mouse click.

**To show referenced tables in the Online Browser:**

1. In the Online Browser, right-click a foreign key in the "Keys" folder of a table.

2. Select *Show referenced table* from the context menu. The foreign key as well as the table it references are selected in the Online Browser.
7.7 Applying Filters

In DatabaseSpy’s Online Browser, you can filter the following database objects by name or part of a name:

- Schemas
- Tables
- Views
- Stored procedures
- Functions
- Packages
- XML Schemas

Objects are filtered as you type in the name. Filtering is case-insensitive by default, however you can also use case-sensitive filters by activating the corresponding check-box in the General options.

Note: The filter function is not supported if you are using No Folders layout.

To filter objects in the Online Browser:

1. If you haven't done that already, select a layout other than the "No Folders" layout. For example, click to select the "Folders" layout.

2. Click the Filter Folder contents icon in the toolbar or select a database object and press Ctrl+Alt+F to activate filtering. Filter icons appear next to all folders that appear in the currently selected layout.

3. Click the filter icon that is next to the folder you want to filter. Select the desired filtering option from the context menu that appears.

4. Next to the folder, the icon for the chosen filter type appears with an empty field next to it.
5. Expand the folder you are filtering to display the objects it contains.
6. In the field, enter the string you want to search for. The results are adjusted as you type.
7.8 Using the Object Locator

You can use the Object Locator in different ways. Either use the drop-down list to select one of the objects contained herein, or type a string in the text field of the drop-down list and further filter the list of objects contained in the list. Filtering is case-insensitive by default; however, you can also use case-sensitive filters by activating the corresponding check box in the General options.

To find database elements using the Object Locator:

1. If the Object Locator is not enabled, click the Object Locator icon in the Online Browser or press Ctrl+L.
2. Optionally, change the Object Locator context by clicking the arrow icon next to the drop-down list.
3. Enter the string you want to look for (for example, "feed"). The drop-down list displays all elements that contain that string.
4. Click the desired object to have it selected in the dialog box.

The icon opens a menu allowing you to further refine the search.
Using this menu, you can restrict the display of objects as follows:

<table>
<thead>
<tr>
<th>From current Data Source</th>
<th>Displays only objects from the currently selected data source.</th>
</tr>
</thead>
<tbody>
<tr>
<td>From Focused Item</td>
<td>Changes the display dynamically, depending on the folder or object that is currently selected.</td>
</tr>
<tr>
<td>All</td>
<td>Displays all objects from all data sources that are currently connected.</td>
</tr>
</tbody>
</table>
7.9 Hiding Irrelevant Items

For a better overview in large databases, the Select Database Objects for Comparison dialog box allows you to show only selected database items. This saves you from scrolling through the list of tables and columns and you can easily check whether all items you want to compare are properly selected.

Click **Show checked objects only** to display only selected items. When you do this, all unselected items are hidden and only the items that have been selected for comparison are displayed.
Chapter 8

Exploring and Changing the Database Structure
8 Exploring and Changing the Database Structure

Altova website: Database editor

In addition to writing SQL scripts that create or modify the structure of your database, you can also edit the structure of all your database tables in Design Editor. With Design Editor, you can examine the table structure in detail, add tables or columns to a database, edit their properties, and delete columns or entire tables. In addition, you can also create a primary key, foreign keys, unique keys, as well as indexes and check constraints. You can also rename or delete existing database objects directly from the Online Browser, see Renaming and Deleting Objects.

Note: Various limitations apply when editing existing database objects from either the Design Editor or Online Browser, as further mentioned in this documentation. When that is the case, the corresponding commands are disabled, or appropriate notification messages are displayed by DatabaseSpy. The limitations may vary by database kind and driver.

Any changes you make to the database structure (either from Online Browser or Design Editor) are not applied immediately but recorded in a change script which is displayed in the Database Structure Change Script window. To actually deploy the changes to the database, you must execute the change script.

Design Editor
To open a new Design Editor:

- Making sure that you have a data source connected, click the Design Editor icon in the Standard toolbar, or select the menu option File | New | Design Editor, or press Ctrl + D.

If you have more than one data source connected in your project, a new Design Editor window will always be connected to the active data source, that is, the one that is selected in the Online Browser.
8.1 Changing the Data Source of Design Editor

By default, the data source of the currently active Design Editor is displayed in the bottom left area of Design Editor and in the Execution Target Bar. You can change the data source of the active Design Editor provided that no objects have been added to the active Design Editor.

To change the data source assigned to a Design Editor window:

1. Click into the Design Editor window whose properties you want to change.
2. In the Properties window, select the data source and, if applicable, default schema from the respective drop-down lists.

Alternatively, if the Execution Target Bar is visible in the Design Editor, click the data source or root object in the Execution Target Bar to jump directly to the corresponding field in the Properties window. Note that only connected data sources are available in the drop-down list.
8.2 Viewing Table Structure

You can view the structure of any existing table in your database by dragging it from the Online Browser into the Design Editor window or by using the corresponding context menu option. The most important table and column details are immediately displayed in the Design Editor’s graphical view. Additional sections for indexes, keys, and check constraints can be expanded for the relevant details.

To show an existing table in the Design Editor:

Do one of the following:

- Right-click the table you want to examine in the Online Browser and select Design Editor | Show in new Design Editor from the context menu.
- If a Design Editor window is already open, you can also right-click the table and drag it into the Design Editor window or use the context menu command Design Editor | Add to Design Editor to add the table to the design.
- Select multiple tables in the Online Browser and drag them into Design Editor.
- Select an immediate parent folder containing database tables from the Online Browser and drag into Design Editor.

To auto-size a table:

- In a Design Editor window, click the Autosize icon at the bottom of the table.

To remove a table from a Design Editor window:

Do one of the following:

- Right-click the table and select Remove from Design from the context menu.
- Select a table and press Ctrl+Del.
- Select a table and choose the menu option Design Editor | Remove from Design.

Note: Removing a table from a design does not delete it from the connected database.

Table layout

You can define the default table layout in the Design Editor options, however you can also change the layout in the Design Editor itself. Apart from the optimized view which shows the fields Column Name, Type, and Nullable for each column, you can choose two more options for displaying tables in the Design Editor.

The compact view shows only the column, index, and constraint names as well as the icons that indicate the constraints that have been defined for a column or the index or constraint type, respectively.
Compact view

The **collapsed view** shows only the table header.

This view is particularly useful if you want to view all the tables and relations of the entire database and do not need detailed information about the individual tables.

**To view a table in the compact view:**

- Right-click the table in a Design Editor window and activate **Compact View** in the context menu.

**To switch off compact view for a table:**

- Right-click the table and deactivate **Compact View** in the context menu.

**To collapse or expand a table, do one of the following:**

- Click the arrow in the upper right corner of a table to toggle between collapsed and expanded view.
- If you want to expand or collapse several tables at a time, select the tables using Ctrl + Click and click **Expand selected Tables** or **Collapse selected Tables**, respectively, in the Design Editor toolbar.

### 8.2.1 Viewing Table Columns

When you drag a table into a Design Editor window or use the **Show in new Design Editor** command from the context menu of the Online Browser, the table appears in the Design Editor in
the optimized view: column name, data type, and the Nullable property are displayed and can be edited directly in the table design.

<table>
<thead>
<tr>
<th>Column</th>
<th>Type</th>
<th>Nullable</th>
</tr>
</thead>
<tbody>
<tr>
<td>AnimalTypeID</td>
<td>int</td>
<td></td>
</tr>
<tr>
<td>EnglishName</td>
<td>varchar(50)</td>
<td></td>
</tr>
<tr>
<td>LatinName</td>
<td>varchar(50)</td>
<td></td>
</tr>
<tr>
<td>AreaOfOrigin</td>
<td>varchar(50)</td>
<td></td>
</tr>
<tr>
<td>Category</td>
<td>int</td>
<td></td>
</tr>
</tbody>
</table>

Indexes (2)

Keys (3)

Check Constraints (0)

Every column that has a special quality, such as, for example, forming part of a relationship, is marked with an icon in front of its name in Design Editor. If a column has more than one constraint assigned, only the constraint with the highest priority is depicted in the column icon. The priority of the constraints is as follows:

<table>
<thead>
<tr>
<th>Constraint Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary key column</td>
<td>This column is used as the table's primary key.</td>
</tr>
<tr>
<td>Unique column</td>
<td>This column has a unique constraint defined and therefore accepts only data that is unique in the context of the column.</td>
</tr>
<tr>
<td>Referencing column</td>
<td>This column has a foreign key constraint assigned and references the primary key of a different table.</td>
</tr>
<tr>
<td>XML column</td>
<td>The data contained in this column are of type XML.</td>
</tr>
<tr>
<td>Checked column</td>
<td>This column has a check constraint defined which ensures that only approved values are present in the respective column.</td>
</tr>
<tr>
<td>Default value</td>
<td>A default constraint has been defined for this column.</td>
</tr>
</tbody>
</table>

Displaying additional information

When you right-click the header of the table design's Column section, you can select a number of additional properties (Default Value, Description, Identity, Increment, and Seed) to be displayed in the design. Check the properties you want to display in the context menu or select Show all additional columns.
8.2.2 Viewing Indexes

When you expand the Indexes section, the table's indexes are displayed in such a way that each column forming part of a particular index is shown in a row of its own and there is a separate column indicating whether it is an ascending or descending index.

The type of an index is indicated with icons. Non-clustered indexes do not have an icon. The following icons are used:

- Clustered index
- XML index (available only for columns of type XML)

You can rename an index, change, add, or remove columns, or modify the order directly in the table design. Indexes that have been created automatically for primary or unique keys cannot be modified.

To view the index properties in detail, select an index and view the properties in the Properties window.

8.2.3 Viewing Check Constraints

A check constraint is used to define a range of values that are accepted by a column. It uses a logical expression to determine the acceptable values. Check constraints can be defined on table level (i.e., several columns of a table are checked in the expression) or on a single column. Multiple check constraints can be applied to a single column.

Check constraints on table level are shown with an icon when you expand the Check Constraints section of a table design. They are displayed together with the expression(s) that are
used to validate the table.

<table>
<thead>
<tr>
<th>Check Constraint</th>
<th>Expression</th>
</tr>
</thead>
</table>

Check constraints on table level can be renamed and their expressions can be modified directly in the table design.

A check constraint on column level is indicated by the check column icon being displayed with the column the check constraint is defined for in the Columns section of the table design. Please note that this icon is not displayed if either a primary key, unique key, or foreign key is defined for this column, or if the column is of type XML, since all these qualities are of a higher priority and their corresponding icon will be displayed with the column.

You can edit the expression in the Properties window. To rename a check constraint on column level, right-click the constraint in the Online Browser and select Rename from the context menu.

### 8.2.4 Viewing Key Constraints

When you expand the Keys sections, the key constraints that have been defined for the table are displayed in such a way that each column forming part of a particular key is shown in a row of its own. For foreign keys, there is an additional column where the column that is referenced in another table is displayed.

<table>
<thead>
<tr>
<th>Key</th>
<th>Columns</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>PK_AnType</td>
<td>AnimalTypeID</td>
<td></td>
</tr>
<tr>
<td>FK_CategoryID</td>
<td>CategoryID</td>
<td>tblAnimalCategories</td>
</tr>
<tr>
<td>U_LatinName</td>
<td>LatinName</td>
<td></td>
</tr>
</tbody>
</table>

The type of a key constraint is indicated with icons. The following icons are used:

<table>
<thead>
<tr>
<th>Icon</th>
<th>Key Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary key</td>
<td>Primary key</td>
<td>This constraint is the primary key of the table. The primary key ensures that no duplicate data and no NULL values can be inserted into the respective column(s). Only one primary key is allowed in a table.</td>
</tr>
<tr>
<td>Unique key</td>
<td>Unique key</td>
<td>This constraint makes sure that the values entered in a specific column not participating in a primary key are unique. Multiple unique keys can be defined on a table and the NULL value is allowed in the respective table(s). Note, however, that the value NULL can only occur once per column. A unique key can be referenced by a foreign key.</td>
</tr>
</tbody>
</table>
| Foreign key | Foreign key | This constraint creates a foreign key relation where the primary or unique key of a table is referenced by a column in a different table. The primary key column or unique key column, respectively, in the first table is used as a foreign key in the referencing column of the second table. This way, the foreign key ensures that only data that is present in the primary or unique key column of the first table can be
You can rename a key constraint, change, add, or remove columns, or modify the reference of a foreign key directly in the table design.

To view the properties of a key constraint in detail, select a key constraint and view the properties in the Properties window.

### 8.2.5 Viewing Relationships Between Tables

When you drag into the Design Editor two or more tables that are related with each other, the relationships between these tables are shown with lines connecting the related tables. DatabaseSpy uses different colors to distinguish the individual relationships:

- **Green**: Self-reference, i.e. the table uses a key that is assigned to one or more of the table's own columns.
- **Blue**: Incoming reference, i.e. the selected table is referenced by a key used in another table.
- **Orange**: Outgoing reference, i.e. the table has a key defined that references one or several column(s) in another table.

Please note that the color of one and the same relation line may change depending on the table that is currently selected. For example, a foreign key relationship is displayed blue if you select the referenced table, and orange if you select the referencing table. The screenshot below shows an incoming relationship for `tblAnimalCategories`.

![Diagram showing incoming relationship](image)

The same relationship, however viewed from the referencing `tblAnimalTypes` table's point of view, is depicted with an orange relation line (see screenshot below).
The screenshot below illustrates a self relation that makes sure that the manager number ("MgrNo") of an employee's manager is contained in the list of employee numbers ("EmpNo").

### 8.2.6 Selecting Tables in Design Editor

Dragging on the Design Editor background creates a marquee which selects all the tables it encloses. The context menu of the Design Editor also contains several options in the Select sub-menu which allow you to select specific sets of tables.

To select only user tables, do one of the following:

- Right-click somewhere in the Design Editor window and choose Select | Select User
To select only system tables, do one of the following:

- Right-click somewhere in the Design Editor window and choose Select | Select System Tables from the context menu.
- Click somewhere in the Design Editor window and press Alt+S.
- Select the menu option Design Editor | Select System Tables.

To select all tables, do one of the following:

- Right-click somewhere in the Design Editor window and choose Select | Select All from the context menu.
- Click somewhere in the Design Editor window and press Ctrl+A.
- Select the menu option Design Editor | Select All.

To select several individual tables:

- Click a table and hold down the Ctrl or Shift key while selecting additional tables.

8.2.7 Finding Related Tables

In the Design Editor, you can display the relations between the individual tables. To facilitate this, DatabaseSpy provides an option in the context menu that automatically adds referenced or referencing tables to the active design. You can also save this design in a design file.

You can also define to highlight objects that form part of the currently selected relation in the Design Editor options. In this case, as depicted in the screenshot above, tables that are not part...
of the selected relation are grayed out. Also note that the referenced columns are printed bold in both tables so that you can view at a glance which columns are related with each other.

**To display related tables in the Design Editor:**

1. Right-click a table in the Design Editor and select **Add Related tables** from the context menu.
2. Choose one of the following options from the sub-menu:
   - Referenced Tables
   - Referencing Tables
   - All Relations

**To highlight objects of the currently selected relation:**

1. Make sure that the **Highlight active relations objects check box** is activated in the Design Editor options.
2. Click on a connection line. The connection line is highlighted and all tables that are not part of this relation are grayed out in the Design Editor window.
8.3 Creating Tables

Once you are connected to a data source, you can create a new table in DatabaseSpy in several ways.

Through a SQL Script

Open an SQL Editor window, enter the required SQL statement (the example below is applicable for SQL Server), and click Execute.

```
CREATE TABLE newTable (  
id INT NOT NULL,  
CONSTRAINT PK_newKey PRIMARY KEY (id)  
)
```

You must define at least one column for the new table. Additional columns can be included immediately when the table is created, or added later using drag and drop in the SQL Editor or the Design Editor.

From Design Editor

1. Open a Design Editor window (Ctrl+D).

2. Click the New Table button in the Design Editor toolbar (or select the menu option Design Editor | Create New Table), and add the required table objects (see also Designing Tables).

Note: By default, DatabaseSpy creates automatically the primary key for new tables. To disable this option, select the menu command Tools | Options | Design Editor, and then clear the option Automatically create primary key for new tables.

3. Click the Execute Change Script button in the Database Structure Change Script window.

By duplicating or converting an existing table

See Duplicating Tables and Converting Table Structures.
8.4 Duplicating Tables

To re-use the definition of an existing database table, you can automatically generate a `CREATE` statement in an SQL Editor window, edit it as required, and execute the script. This way, you can even duplicate tables from different databases, provided that you edit the SQL statements so as to comply with the syntax of the target database.

Alternatively, you can also use table structure converting feature.

To duplicate a table definition:

1. Right-click a table in the Online Browser and select **Show in new SQL Editor | Create** from the context menu.
2. Rename the table in the SQL Editor if you want to add the duplicate to the same database.
3. Optionally, edit the column and key properties.
4. If you want to add the table to a different database, change the active data source, see **Changing the Data Source of Design Editor**. In this case, make sure to edit the SQL syntax to comply with the target database.
5. Click **Execute**.
### 8.5 Converting Table Structures

DatabaseSpy allows you to convert the structure of a selected table so as to fit the syntax requirements of a database kind other than the table was initially created in. This can be done either in the Online Browser or the Design Editor by using Drag and Drop. DatabaseSpy creates a change script that must be executed to commit the changes to the database.

The following restrictions apply to the conversion of database tables:

- Properties that would require parsing (for example, check constraints or triggers) will not be converted
- Foreign keys will not be converted
- Indexes will not be converted

If database items cannot be converted into the target database, a warning message will be displayed in DatabaseSpy.

**To convert the structure of a table to a different database type:**

1. Open a Design Editor window for the target database. (The database connection details are always indicated in the lower left corner of Design Editor, see also Changing the Data Source of Design Editor.)
2. Optionally, display the source table in a Design Editor window of the source database.
3. Select a table in the Online Browser or Design Editor and drag it into the Design Editor window of the target database.
4. Execute the change script.
8.6 Renaming and Deleting Objects

Database objects can be renamed or deleted from various contexts:

- In the Online Browser, by using the context menu
- In the Design Editor
- It is also possible to rename an object by double-clicking its title in the Properties window.

When you rename or delete a database object, the change is not committed immediately to the database. Instead, a change script is generated in the Database Structure Change Script window, where you can review it before execution.

Support for renaming database objects is not uniform across all databases. The following table illustrates objects that can be renamed directly from the graphical user interface of DatabaseSpy, across various database kinds. Some databases may additionally support renaming of keys, check constraints, indexes, as well as stored procedures.

<table>
<thead>
<tr>
<th>Database kind</th>
<th>Rename table?</th>
<th>Rename column?</th>
<th>Rename view?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Firebird</td>
<td>-</td>
<td>Yes</td>
<td>-</td>
</tr>
<tr>
<td>IBM DB2</td>
<td>Yes</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>IBM DB2 for i</td>
<td>Yes</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Informix</td>
<td>Yes</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>MariaDB</td>
<td>Yes</td>
<td>Yes</td>
<td>-</td>
</tr>
<tr>
<td>MySQL</td>
<td>Yes</td>
<td>Yes</td>
<td>-</td>
</tr>
<tr>
<td>Oracle</td>
<td>Yes</td>
<td>Yes</td>
<td>-</td>
</tr>
<tr>
<td>PostgreSQL</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Progress OpenEdge</td>
<td>Yes</td>
<td>Yes</td>
<td>-</td>
</tr>
<tr>
<td>SQLite</td>
<td>Yes</td>
<td>-</td>
<td>Yes</td>
</tr>
<tr>
<td>SQL Server</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Sybase</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Teradata</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
To rename a database object:

1. Do one of the following:
   - In the Online Browser, select a database object and press **F2** or double-click its title bar in the Properties window.
   - In the Online Browser, right-click a database object and select **Rename** from the context menu.
   - In a Design Editor window, double-click the title bar of a table or the database object, or right-click and select **Rename Table** or **Rename Column** or **Rename Key** or **Rename Index** or **Rename Check Constraint**, respectively, from the context menu.

2. Change the name as desired and press **Enter**. DatabaseSpy generates the required script and displays it in the Database Structure Change Script window.

   ![Database Structure Change Script](image)

   **Note:** At this stage, the changes are not committed to the database yet. In the Online Browser, the icon ❌ appears to the left of the object name, which indicates that you are about to rename it. To undo the rename operation without committing it to the database, click **Refresh data source** in the Online Browser.

3. Optionally, to modify the generated script before running it, click the **Edit Change Script** button.

4. In the Database Structure Change Script window, click **Execute Change Script**.

Deleting database objects

In DatabaseSpy's Online Browser, you have several possibilities to delete a database object from a database:

- Right-click a database object and choose **Delete** from the context menu.
- Select a database object and press **Delete**.
- Right-click a database object and select **Show in new SQL Editor | Drop** from the context menu.

In a Design Editor window, you can do the following to delete a database object:

- Right-click a database object and choose **Delete selected Objects** from the context menu.
- Select a database object and press **Delete**.
All the options mentioned above are also valid if you have selected more than one database object.

While the changes are not committed to the database yet, the objects marked for deletion are displayed with a special "deleted object" icon (for example, ![deleted object icon] in case of tables). To actually delete the database object(s) from the database, execute the script in the Database Structure Change Script window (or, if applicable, in the SQL Editor).
8.7 Designing Tables in Design Editor

DatabaseSpy’s Design Editor provides various options to create or change the design of a table.

Drag and Drop
- Select a table, column, or primary key in the Online Browser or in a table design and drop it onto a table design of another table.
- Select a column in a table design and drop it onto the keys or index section of the same table

Context menu options
To display a context menu with various commands that let you modify the database structure, right-click any of the following parts of Design Editor:

- The table header, or any of the Keys, Indexes, or Constraints sections
- Any column

"Create New Object" button
Each section in a table design provides a Create New Object button for adding new database objects to a table. Clicking this button will immediately add a new column or check constraint, or pop up a menu where you can choose the type of key or index you want to define.

Menu commands
The command for adding new columns is also available in the Design Editor menu. Select the menu option Design Editor | Create New Column to add a new column to the active table design in the Design Editor.

Keyboard shortcuts
DatabaseSpy provides also the keyboard shortcut Alt+C for adding new columns in the Design Editor.

In addition to using Design Editor, you can always write and execute SQL statements in SQL Editor to achieve the same goal.

8.7.1 Adding Columns

DatabaseSpy provides different methods for adding columns to a table: you can either define a new column from scratch in the Design Editor, or re-use an existing column definition from a different table.

To create a new column:

1. In the Design Editor, do one of the following:
• Select the table and choose the menu option **Design Editor | Create New Column**.
• Press **Alt+C**.
• Right-click the table and select **Insert new | Column** from the context menu.
• Click the plus icon to the right of the last column name.

The column is inserted into the table and shows a New icon to the left of the column name which is highlighted for editing.

2. Enter a descriptive name for the column and press **Enter**. The SQL statement in the Database Structure Change Script window is updated.
3. Optionally, repeat steps 1 and 2 to insert additional columns.
4. Modify the column properties as required.
5. Optionally, change the column order by right-clicking a column and selecting **Move Column Up** or **Move Column Down** from the context menu.
6. Execute the change script.

**To duplicate columns from other tables:**

1. Select the column to be duplicated in the Online Browser or in the Design Editor and, keeping the mouse button pressed, drag it into the Columns section of the table design where you wish to add the column.
2. Optionally, edit the column properties and/or the column name.
3. Execute the change script.

**To generate SQL for creating a column using an existing column definition:**

1. In the Online Browser, right-click the column that serves as a model for the new column to be created.
2. Select the menu option **Show in new SQL Editor | Add** from the context menu.
3. In the SQL Editor, change the column name and edit the column definition, if required.
4. Click the **Execute** button or press **F5**.

### 8.7.2 Modifying Column Properties

When a column is selected either in the Online Browser or in a Design Editor window, its properties are displayed in DatabaseSpy’s Properties window. In addition, you can **show some of the properties** (data type, nullability, default value, description, identity, increment, and seed) directly in the Design Editor.

**Data type**

When you need to change the data type of a column, you can edit the **Type** field directly in the table design. DatabaseSpy assists you by displaying incomplete data type entries in gray and changing the color to black as soon as you have typed in a valid keyword. While you are typing, a drop-down list containing the available data types is displayed. Incorrect syntax is marked in red. For data types requiring a length, you can also type in “max” and thus set the length to the maximum allowed value.
Nullability
The Nullable check box can also be changed directly in the table design. Please note that NULL values are not permitted if a primary key is defined on that particular column and that you cannot deactivate the Nullable check box if NULL values are already present in the column.

Data length
Every data type has a default length defined that is automatically used when you select that particular data type. For some data types, you can increase or decrease this default length in the Properties window. Please consider that existing values may be truncated if you decrease the data length in an existing table.

Precision
In numeric columns, you can define the maximum number of digits to be used by a data type.

Scale
The Scale property defines the maximum number of digits to the right of the decimal point in numeric and decimal columns.

Description
You can add an individual description for each of the columns.

8.7.3 Deleting Columns
Several options are available for deleting an individual column, or several columns in bulk. To delete more than one column in one step, select the columns in the Online Browser or Design Editor while keeping the Ctrl key pressed (Ctrl-Click).

To delete a column from a table:

1. Do one of the following:
   - In the Online Browser, right-click a column and choose Delete from the context menu or press Del.
   - In the Design Editor, right-click and choose Delete selected Columns from the context menu or press Shift+Del.

   A change script is generated and the column is marked for deletion.

   - In the Online Browser, right-click a column and select Show in new SQL Editor | Drop from the context menu.

   A DROP statement is generated in a new SQL Editor window.

2. Depending on your choice in step 1, do one of the following:
In the Database Structure Change Script window, click the **Execute Change Script** button.
In the SQL Editor, click the **Execute** button or press **F5**.

### 8.7.4 Defining a Primary Key

By default, when creating a new table in DatabaseSpy's Design Editor, a primary key is automatically defined on the first column. This option can, however, be disabled in the Design Editor Options, you will then have to define a primary key manually. The instructions below show how to add a primary key in Design Editor. In addition, you can always enter and execute the appropriate SQL statement in an SQL Editor window.

1. If a table already has a primary key, no primary key may be defined when you show a table in a Design Editor window.
2. The column on which the primary key is defined must not be nullable (that is, the Nullable check box next to it must be cleared in the table design). If you attempt to create a primary key on a nullable column, a warning dialog box is displayed.

There are several ways to define a primary key in the Design Editor:

- Select the **Make Primary key** command from the context menu of a column in a table design.

- Drag a column from the Columns section and drop it onto the Key section of a table design. To create a primary key on multiple columns, first select multiple columns while holding the **Shift** key pressed, and then drag them into the Keys section. This menu is also displayed if you click the **Create new Key Constraint** icon in the Key section of the table design.
Right-click anywhere into the table design and select **Insert new | Key | Primary Key** from the context menu. Alternatively, expand the Keys section, click the **Create new Key Constraint** icon at the bottom of the Key column and select **Create Primary Key** from the menu that pops up.

Regardless of the approach chosen above, the primary key is added to the Key section of the table design.

By default, the name of the new primary key is `<generated>`, which means its name will be automatically generated by the database. This ensures uniqueness of the name in the database. If necessary, you can override the generated name. To do this, enter a descriptive name in place of `<generated>`, and press **Enter**.

If you override the generated name with a custom name, the new name must be unique; otherwise, errors will occur when the database change script is executed.

**Note:** In MySQL and MariaDB databases, the name of the primary key constraint is always **PRIMARY**. In SQLite, custom key names are ignored by the database; therefore, the primary key displayed in the Online Browser of DatabaseSpy appears with the name `<generated>`.

To add the primary key on multiple columns, click the **Add Column to Key** button (at the bottom of the "Columns" column) and choose a column from the drop-down list that opens. To remove a column from a primary key, right-click the column (in the "Columns" column), and then select **Delete selected objects** from the context menu.
As always when making changes to the database structure, a change script is generated which must be executed in order to actually create the primary key in the database.

Columns that have a primary key assigned are marked with the primary key icon in the Design Editor and the Online Browser.

### 8.7.5 Viewing and Modifying Primary Keys

After you have executed the change script, the primary key icon for columns is displayed to the left of the column name in the Columns folder of the Online Browser and when you show the table in the Design Editor. In the Online Browser, the name of the primary key constraint will also show up in the Keys sub-folder of the respective table and will be marked with the primary key icon.

In the Online Browser, the column definition can be viewed in detail by expanding the primary key entry in the Keys folder.

In the Design Editor, the column the primary key is assigned to is displayed in bold when you select the primary key constraint in the Keys section.
Modifying a primary key constraint
You can rename, delete or change the definition of a primary key constraint. Note that the primary key constraint is always deleted first and then recreated with the new definition. The respective SQL statement is generated automatically in the Database Structure Change Script window if you modify the primary key definition in the Design Editor. A primary key cannot be deleted if it is referenced by a foreign key in another table.

8.7.6 Defining and Modifying Unique Keys

This topic shows you how to define a unique key in the Design Editor. You can also define a unique key by entering and executing the appropriate SQL statement in an SQL Editor window.

When defining a unique key for a table, please consider that if the unique key constraint is applied to an existing column, this column must not contain duplicate values. The column may be nullable, however the NULL value can occur only once.

There are several ways to define a unique key in the Design Editor; the procedures are similar to those described for primary keys:

- Select the Make Unique key command from the context menu of a column in a table design
- Drag a column from the Columns section and drop it onto the Keys section of a table design
- Click the Create new Key Constraint icon in the Keys section of a table design
- Right-click anywhere into the table design and select Insert new | Key | Unique Key from the context menu

Regardless of the approach chosen above, the key is added to the Key section of the table design. By default, the name of the new unique key is <generated>, which means its name will be automatically generated by the database. This ensures uniqueness of the name in the database. If necessary, you can override the generated name. To do this, enter a descriptive name in place of <generated>, and press Enter.
If you override the generated name with a custom name, the new name must be unique; otherwise, errors will occur when the database change script is executed.

As always when making changes to the database structure, a change script is generated which must be executed in order to actually create the unique key in the database. DatabaseSpy performs a check as to whether the content in the constrained column is unique. If the check fails, a dialog box opens displaying a "duplicate key was found" error. The exact contents of the error message depends on the database type.

Columns that have a unique key assigned are marked with the unique key icon in the Design Editor and the Online Browser.

Viewing unique key constraints

After you have executed the change script, the unique key icon is displayed to the left of the column name in the Columns folder of the Online Browser and when you show the table in the Design Editor. In the Online Browser, the name of the unique key constraint will also show up in the Keys sub-folder of the respective table and will be marked with the unique key icon.
In the Online Browser, the column definition can be viewed in detail by expanding the unique key entry in the Keys folder.

In the Design Editor, the column the unique key is assigned to is displayed in bold when you select the unique key constraint in the Keys section.

**Modifying a unique key constraint**

You can rename, delete or change the definition of a unique key constraint. Note that the unique key constraint is always deleted first and then recreated with the new definition. The respective SQL statement is generated automatically in the Database Structure Change Script window if you modify the unique key definition in the Design Editor. A unique key cannot be deleted if it is referenced by a *foreign key* in another table.

### 8.7.7 Defining Foreign Keys

Foreign key constraints help preserve the integrity of the database. For example, let's assume that you are designing a database to manage employees in a company. The employees are stored in the *PERSON* table and the departments are stored in the *DEPARTMENT* table.

```
+----+-----------------+--------------------------+---------------+
| ID | NAME            | EMAIL                    | DEPARTMENT_ID |
+----+-----------------+--------------------------+---------------+
| 1  | Toby Hughey     | t.hughey@nanonull.com    | 1             |
| 2  | Mia Dahill      | m.dahill@nanonull.com    | 2             |
| 3  | Fred Weinstein  | f.weinstein@nanonull.com | 1             |
+----+-----------------+--------------------------+---------------+
```

*The PERSON table*
The DEPARTMENT table

Note that the DEPARTMENT_ID in the PERSON table points to the ID of the department in the DEPARTMENT table. This relationship can be enforced through a foreign key constraint between these two columns, so as to ensure that:

- Each person record in the PERSON table can reference any of the existing departments in the DEPARTMENT table (one to one relationship).
- If you ever attempt to delete a record from the DEPARTMENT table, and if there are PERSON records pointing to that DEPARTMENT, the database would return a legitimate validation error (for example, "Foreign key constraint failed").

You can create foreign key constraints either by writing a SQL query in SQL Editor, or you can design them visually from the Design Editor of DatabaseSpy. Note the following prerequisites:

- The columns that take part in the foreign key relationship must be of the same data type and length. In this example, it is assumed that both the column DEPARTMENT.ID and PERSON.DEPARTMENT_ID are of type "int".
- The referencing column (DEPARTMENT.ID, in this example) must be part of either a primary key or unique key.

Note: In SQL Server, you can also add a foreign key reference to a column if there is a unique index defined on it. This is also possible in newer versions of MySQL (provided that the storage engine is InnoDB).

There are several ways to define a foreign key in the Design Editor.

**Approach 1**

1. Add to the Design Editor both the table on which the foreign key should be and the referenced table.
2. Do one of the following:
   - Drag a column from the Columns section of a table design (or from the Online Browser) and drop it onto the Keys section of a table design.
   - Drag a primary key, unique key, or (in SQL Server) unique index from a table design (or from the Online Browser) and drop it onto the Keys section of a table design.

By default, a foreign key having the name `<generated>` is automatically created on the first column that has the same data type as the column that is referenced by the dragged key or index, respectively. This may or may not be the column on which you need the foreign key. Therefore, if applicable, double-click the column (in the Keys section, under "Columns") and select the correct column from the list.
Approach 2

1. Do one of the following:
   - Click the Create new Key Constraint icon in the Keys section of a table design.
   - Right-click anywhere into the table design and select Insert new | Key | Foreign Key from the context menu.

   A foreign key having the name <generated> is created automatically, without a reference to a particular table. To choose the referenced table, click [select the referenced table] and select the required table from the list.

2. If applicable, set the “from” and “to” columns for the foreign key, as follows:
   - To change the column on which the foreign key is, double-click the column (in the Keys section, under “Columns”) and select the appropriate entry from the list.
To change the column to which the foreign key points, double-click the column (in the Keys section, under "Reference"), and select the appropriate entry from the list.

**Naming foreign keys**

By default, the name of the foreign key is `<generated>`, which means its name will be automatically generated by the database. This ensures uniqueness of the name in the database. If necessary, you can override the generated name. To do this, enter a descriptive name in place of `<generated>`, and press Enter.

> If you override the generated name with a custom name, the new name must be unique; otherwise, errors will occur when the database change script is executed.

**Note:** In SQLite, custom key names are ignored by the database. The key name displayed in the Online Browser of DatabaseSpy is the internal key name as provided by the database.

**Duplicating foreign keys**

If you want to duplicate an existing foreign key, you can generate an SQL statement that adds a foreign key constraint to the table, as follows.

1. In the Online Browser, expand the Keys folder of the table that contains the foreign key you want to duplicate and right-click the foreign key.
2. Select **Show in new SQL Editor | Add** from the context menu.
3. In the SQL Editor, edit table name, column name, as well as the name of the foreign key as required.
4. Click the **Execute** button to execute the SQL statement and create the new foreign key.

**Cross-schema references**

Foreign keys can also reference a column in a table that is located in a different schema. When defining this reference using the Design Editor, tables in the same schema are printed black,
whereas tables located in a different schema are printed blue in the drop-down list that opens when you double-click a table name in the Reference column of a table design.

### 8.7.8 Viewing and Modifying Foreign Keys

After you have executed the change script, the foreign key icon for columns is displayed to the left of the column name in the Columns folder of the Online Browser and when you show the table in the Design Editor. In the Online Browser, the name of the foreign key constraint will also show up in the Keys sub-folder of the respective table and will be marked with the foreign key icon.

In the Online Browser, the column definition can be viewed in detail by expanding the foreign key entry in the Keys folder.

In the Design Editor, the column the foreign key is assigned to is displayed in bold when you select the foreign key constraint in the Keys section.
You can also display the referenced table in the Design Editor window. Right-click the table design and select **Add related tables | Referenced Tables** from the context menu. The table that is referenced by the foreign key constraint is added to the design. Click the connector line or the label to indicate all keys and columns that are involved in the foreign key relation.

**Modifying a foreign key constraint**

You can rename, delete or change the definition of a foreign key constraint. Note that the foreign key constraint is always deleted first and then recreated with the new definition. The respective SQL statement is generated automatically in the Database Structure Change Script window if you modify the foreign key definition in the Design Editor.

### 8.7.9 Defining and Modifying Check Constraints

Check constraints can be defined both on table and on column level and make sure that only valid data is entered into a specific column of a table. If the condition is not met, the respective column cannot be updated and new rows cannot be added (see screenshot below). DatabaseSpy outputs a corresponding message in the Message tab.
Note: Adding check constraints is not supported for the following databases: MariaDB, MySQL, SQLite.

To define a check constraint in the Design Editor:

1. Do one of the following:
   - Right-click into the table and select Insert new | Check Constraint from the context menu.
   - Expand the Check Constraints section by clicking the triangle at the right edge of the section header and click the Create new Check Constraint icon in the Check Constraint column.

A new check constraint is added to the "Check Constraints" section and highlighted for editing. By default, the name of the foreign key is <generated>, which means its name will be automatically generated by the database. This ensures uniqueness of the name in the database. If necessary, you can override the generated name. To do this, enter a descriptive name in place of <generated>, and press Enter.

If you override the generated name with a custom name, the new name must be unique; otherwise, errors will occur when the database change script is executed.

2. In the "Expression" column, enter the expression that is to be checked when data is committed to the database and press Enter.

As always when making changes to the database structure, a change script is generated which must be executed in order to actually create the check constraint in the database. DatabaseSpy performs a validation of the expression that will be used for the check constraint. While you are
defining a check constraint in the Design Editor, the Database Structure Change Script window
displays comments if the expression is invalid.

```plaintext
-- region adding check constraints
-- Error: missing expression for check constraint CK_1.
-- ALTER TABLE [zooDB].[dbo].[table1] ADD CONSTRAINT [CK_1] CHECK ( )
-- endregion adding check constraints
```

The following issues are validated and corresponding messages are displayed in the change
script:

- Missing expression
- Invalid identifier
- Textual or numeric constant not matching column data type
- Column data types not matching
- Invalid expression
- "IS NOT NULL" clause applied to a nullable column

**Viewing check constraints**

In the Design Editor, check constraints on table level are displayed in a separate section where
they can be edited and where you can add additional or delete unneeded check constraints.

Columns that have a check constraint assigned are marked with the check constraint icon in
the Design Editor and the Online Browser. Check constraints on column level can be edited in the
Properties window of the column to which they are applied. Please note that they do not show up
in the Check Constraints section of the table. To see the name and definition of this column's
constraint, you have to display the column properties in the Properties window.

In the Online Browser, check constraints appear in the constraints sub-folder of the table or
column, depending on whether the constraint has been defined on table or column level.

Check constraints on table level appear in the Constraints folder of the table they are assigned to.
Check constraints on column level are displayed under the Constraints folder of the column. Note that no Constraints folder on table level is available in this case.

**Modifying check constraints**

You can rename, delete or change the expression of a check constraint. Note that the check constraint is always deleted first and then recreated with the new definition. The respective SQL statement is generated automatically in the Database Structure Change Script window if you modify the check definition in the Design Editor.

When you rename a column that is used in a check constraint expression, DatabaseSpy automatically updates the check constraint in the change script that is used to rename that column.
Exploring and Changing the Database Structure

Designing Tables in Design Editor

If a column is deleted, any check constraints that reference this column are dropped as well.

Adding check constraints using SQL

If check constraints already exist in a table, you can add new constraints to the table also by right-clicking an existing check constraint and generating a statement that uses the properties of the existing item as default. After editing the properties as required and executing the SQL, a new check constraint is added to the database.

To add a check constraint to a table using SQL:

1. Connect to the database and show the respective data source in the Online Browser.
2. Expand the table to which you want to add a check constraint and right-click an existing constraint in the Constraints folder.
3. Select Show in new SQL Editor | Add from the context menu or, holding down the right mouse button, drag the constraint into an open SQL Editor window and choose Add from the popup. An ALTER TABLE statement is generated in the SQL Editor window.
4. Edit the statement as follows:
   a) Enter the path of the table that is to be checked after the ALTER TABLE part of the statement.
   b) Type the name of the new constraint after the ADD CONSTRAINT part of the statement.
   c) Edit the CHECK (Expression) section; enter the expression that is to be checked when the table is updated.
5. Click the Execute button to execute the statement and to add the new check constraint to the database.
6. In the Online Browser, right-click the database and choose Refresh from the context menu.
8.7.10 Defining and Modifying Default Constraints

The table design in the Design Editor provides an option in the context menu to define a standard value for a column. This command inserts the Default field into the column properties where you can then enter the actual standard value for the column.

To define a default value for a column:

1. In the Design Editor, right-click the column for which you want to define a default value and select **Create Default Constraint** from the context menu. In the column properties, the Default field is added to the General section and to the table design.

   Alternatively, right-click the header of the Columns section in the table design and activate the Default Value column. Double-click that column in the row of the column for which you want to define a default constraint.

2. Enter the default value into the Default field (either in the Properties window or directly in the table design).

As always when making changes to the database structure, a change script is generated which must be executed in order to actually create the default constraint in the database.

Viewing default constraints

After you have executed the change script and unless a constraint with a higher priority has already been defined for that particular column, the default \[\text{\textcolor{red}{\textbullet}}\] icon is displayed to the left of the column name in the Columns folder of the Online Browser and when you show the table in the Design Editor.

In the Online Browser, the name of the default constraint, which is composed of the column name plus the "Default_" prefix, shows up in the Constraints sub-folder of the respective column and is marked with the default constraint \[\text{\textcolor{red}{\textbullet}}\] icon.
The actual value of the default constraint, that is the default value that will be inserted into the column if a new row is added to the table, can be viewed in the Properties window of the respective column when displayed in the Design Editor.

Modifying default constraints
You can delete a default constraint or change its default value. Note that the default constraint is always deleted first and then recreated with the new value. The respective SQL statement is generated automatically in the Database Structure Change Script window if you change the default value in the Design Editor or in the Properties window.

To change the default value of a column:
1. In the Online Browser, select the column and make sure that its properties are being displayed. Alternatively, display the Default Value field in the table design.
2. Edit the default value in the Default field of the General section, or in the appropriate row of the Default Value column in the table design, respectively.
3. Execute the change script.

To delete a default constraint:
1. In the Online Browser, select the column and expand its Constraints sub-folder.
2. Right-click the default constraint and select Delete from the context menu or select the constraint and press Del.
3. Execute the change script.

8.7.11 Creating Identifier Columns

Some databases provide a special column kind which is known as "identifier", or "auto-increment" column. When a column is defined as an identity column, the database will automatically generate a unique, incremental value for this column whenever a new row is inserted into the table. Support for identifier columns varies by database.

Note: The Design Editor does not support defining identifier columns for the following database types: Firebird, Informix, Oracle, PostgreSQL, Progress OpenEdge, Teradata, and SQLite.

When supported by the database, a property called Auto Increment (or Identity, in some databases) becomes available in the Properties window when you click the column in the Design
Editor (provided that the column is of numeric type, see "Prerequisites" below). Databases such as IBM DB2 and SQL Server also let you specify the Seed and Increment properties, in addition to the Identity property.

![Properties window (SQL Server database)](image)

Prerequisites:

- Typically, you can create identity columns at the table creation time, not later. Some databases (Microsoft Access, Microsoft SQL Server) let you specify a column as identity when you add a new column to an existing table.
- The column must not be nullable. In other words, the Nullable check box must not be selected in the Properties window (or in the table design).
- The column must have a numeric type (such as INT, INTEGER, SMALLINT, BIGINT, or even DECIMAL with a scale of 0). Other numeric types may qualify, depending on the database.

To create an identity column:

1. In the Design Editor or in the Online Browser, select the column you want to use as an identity column.
2. In the Properties Window, select the Identity check box (or the Auto Increment check box, depending on the database).

Note: In Microsoft Access, the column data type will be automatically converted to COUNTER when you select the Auto Increment check box. This data type is specific to Microsoft Access, it ensures that the value will be auto-incremented.
3. If applicable, change the default values in the **Seed** and **Increment** fields. **Seed** specifies the initial value that will be generated by the database while **Increment** specifies by how much the initial value should be incremented on each insert. Normally, these values are 1 and 1, respectively.

As always when making changes to the database structure, a change script is generated which must be executed in order to actually create the identifier column in the database. DatabaseSpy performs a validation of the column definition that will be used for the identifier column. The image below illustrates a script where validation has failed because the column is nullable and not of numeric type:

![Database Structure Change Script]

A valid script, on the other hand, could look like:

![Database Structure Change Script]

If the script is valid and you wish to commit the changes to the database, click **Execute** in the Database Structure Change Script window.
8.8 Indexes

Indexes can make queries of a database considerably faster since only the indexed columns have to be queried. Some indexes are created automatically when you define a primary or unique key on a column. In addition to automatically-generated indexes, you can also add indexes explicitly, either at table design time, or later. Where supported by the database, DatabaseSpy allows for the definition of clustered, non-clustered, and XML indexes.

<table>
<thead>
<tr>
<th>Database kind</th>
<th>Clustered index</th>
<th>Non-clustered index</th>
<th>XML index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>-</td>
<td>Yes, non-unique</td>
<td>-</td>
</tr>
<tr>
<td>Firebird</td>
<td>-</td>
<td>Yes</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• unique</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• non-unique</td>
<td></td>
</tr>
<tr>
<td>IBM DB2</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• unique</td>
<td></td>
</tr>
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<td></td>
<td></td>
<td>• non-unique</td>
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<td>IBM DB2 for i</td>
<td>Yes</td>
<td>Yes</td>
<td>-</td>
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<td>• unique</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>• non-unique</td>
<td></td>
</tr>
<tr>
<td>Informix</td>
<td>-</td>
<td>Yes, non-unique</td>
<td>-</td>
</tr>
<tr>
<td>MariaDB</td>
<td>-</td>
<td>Yes</td>
<td>-</td>
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<td></td>
<td></td>
<td>• non-unique</td>
<td></td>
</tr>
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</tr>
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<td></td>
<td></td>
<td>• non-unique</td>
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</tr>
<tr>
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<td></td>
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<td>• unique</td>
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<td></td>
<td>• non-unique</td>
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<tr>
<td></td>
<td></td>
<td>• bitmap</td>
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</tr>
<tr>
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<td></td>
<td></td>
<td>• unique</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• non-unique</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The access method can be defined (such as btree, hash, gist, spgist, gin, and brin).</td>
<td></td>
</tr>
<tr>
<td>Progress OpenEdge</td>
<td>-</td>
<td>Yes</td>
<td>-</td>
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<td>• unique</td>
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<td>• non-unique</td>
<td></td>
</tr>
<tr>
<td>Database kind</td>
<td>Clustered index</td>
<td>Non-clustered index</td>
<td>XML index</td>
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<tr>
<td>SQLite</td>
<td>-</td>
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<td>• non-unique</td>
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</tr>
<tr>
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<td>Yes</td>
<td>Yes</td>
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<td></td>
<td>• non-unique</td>
<td>• non-unique</td>
<td></td>
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<tr>
<td>Sybase</td>
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<td>Yes</td>
<td>-</td>
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<td></td>
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<td>• unique</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• non-unique</td>
<td></td>
</tr>
<tr>
<td>Teradata</td>
<td>-</td>
<td>Yes, see also the note below</td>
<td>-</td>
</tr>
</tbody>
</table>

**Teradata databases**

For Teradata databases, you can manually create from Design Editor only secondary unique and non-unique indexes. To do this, right-click a table column in Design Editor, and select **Make index | Non Clustered Index** from the context menu. To specify that the index should be unique, select the **Unique** check box in the Properties window.

In addition, with Teradata databases, a primary non-partitioned index is always created automatically for the first column in the table, even if you disabled the option **Automatically create primary key for new tables** from **Tools | Options | Design Editor**. Therefore, if you create a primary key manually from Design Editor, do not additionally create an index for that column; otherwise, the database change script will fail.

**8.8.1 Creating and Modifying Indexes in Design Editor**

In the Design Editor, indexes are shown in a separate section of the table display. Here you see at a glance which columns are included in the index definition, and whether they will be queried in ascending or descending order. Indexes generated automatically have the same name as the corresponding primary or unique key. These indexes are displayed in the Indexes section but cannot be modified.
To define an index in the Design Editor:

1. Do one of the following:
   - Right-click the column where you want to create the index definition, and select Make Index from the context menu.
   - Click the column and, keeping the mouse button pressed, drag it into the Index section.
   - Right-click into the table and select Insert new | Index from the context menu.
   - Expand the Index section (by default, it is collapsed) and click Create new index.

2. Select the appropriate index type (non-clustered, clustered, or XML index) from the submenu that opens. The types of indexes that are available depend on the database kind you are using.

3. Optionally, change the index properties in the Properties window. Available options vary by database kind. To see the available options in the Properties window, first click the index in Design Editor.

4. In the Index column, enter a descriptive name and press Enter.

5. In the Columns column, optionally double-click the column and select a different column from the drop-down list.

6. Click into the Order column and select either ascending or descending sort order and press Enter.

7. Optionally, click the plus symbol and select a column from the drop-down list and repeat this step to add one or more additional columns to the index definition.

8. Click Execute to run the generated database change script.

Note the following:
Normally, only one clustered index can be defined per table. If a clustered index already exists, the option to add a clustered index is disabled.

In MariaDB, MySQL, and SQLite databases, a unique key will be created automatically by the database when you add a unique index (after the database change script is executed, see step 8).

### 8.8.2 Creating Indexes Based on an Existing Index Definition

If indexes already exist in a table, you can add new indexes to the table also by right-clicking an existing index and generating a statement that uses the properties of the existing item as default. After editing the properties as required and executing the SQL, a new index is added to the database.

**To add an index to a table using SQL:**

1. Connect to the database and show the respective data source in the Online Browser.
2. Expand the table to which you want to add an index.
3. Right-click an existing index in the Index folder, and select **Show in new SQL Editor | Create** from the context menu. Alternatively, holding down the right mouse button, drag the index into an open SQL Editor window and choose **Create** from the context menu. An SQL statement is generated in the SQL Editor window.
4. Edit the statement as required.
5. Click the **Execute** button to execute the statement and to add the new index to the database.
6. In the Online Browser, right-click the database and choose **Refresh** from the context menu.
8.9  Views

In DatabaseSpy you can create a view from a SELECT statement in the SQL Editor, or copy the
definition of an existing view via the context menu in the Online Browser. This way, you have
frequently used complex queries stored in database and can later execute them with a single
mouse click or use them as a basis for more fine-tuned queries.

Views are displayed in the Views folder of the Online Browser. You may have to refresh the data
source to view a newly created view in the Online Browser. The context menu provides several
options to manage the views in your database (see also Generating SQL Statements).

The SQL syntax in the instructions below may vary depending on the database kind you are
working with.

To create a view in SQL Editor:

1. Create a query by typing in SQL statements or opening an SQL file.
2. Right-click in the SQL Editor window and select Create View As from the context menu.
   Alternatively, you can also select the menu option SQL Refactoring | Create View As.
   The statement CREATE VIEW [View1] AS is automatically inserted in front of the
   query and the view name View1 is automatically highlighted.
3. Change the view name to a more descriptive one. If a view with this name already exists,
   an error will occur.
4. Click the Execute button or press F5 to create the view.
5. Refresh the data source to display the view in the Online Browser.

Be aware that, if your SELECT query retrieves data from more than one table, and if identical
column names exist in selected tables, then ambiguous column names may occur in queries
such as SELECT * FROM table1, table2. Creating views from SELECT queries which contain
ambiguous columns is not supported and produces an error. The text of the error is different for
each database kind and may not necessarily reflect the exact cause. Therefore, before creating
views from a SELECT query, make sure that it does not contain ambiguous column names. For
example, if the table INVOICE has a column "id" and the table INVOICEDATA has a column "id",
an error would occur for a statement such as:

```
CREATE VIEW `View1` AS SELECT * FROM invoice, invoicedata WHERE invoice.id = invoicedata.id;
```

However, the error would be eliminated with a statement such as:

```
CREATE VIEW `View1` AS SELECT invoice.id AS id1, invoicedata.id AS id2 FROM invoice, invoicedata WHERE invoice.id = invoicedata.id;
```

Note the syntax in code listings above applies to MySQL.
To create a view based on an existing view:

1. In the Online Browser, right-click an existing view and select Show in new SQL Editor | Create from the context menu. A CREATE VIEW statement with the definition of the existing view is displayed in a new SQL Editor window.
2. Type a new name after the CREATE VIEW part of the statement and modify the SELECT part accordingly.
3. Click the Execute button or press F5 to create the view.
4. Refresh the data source to display the view in the Online Browser.

To modify a view:

1. In the Online Browser, right-click an existing view and select Show in new SQL Editor | Alter from the context menu. An ALTER VIEW statement with the definition of the existing view is displayed in a new SQL Editor window.
2. Modify the view as required.
3. Click the Execute button or press F5 to modify the view.
8.10 Stored Procedures

Stored procedures can improve the performance of distributed applications by reducing the data traffic between server and client installations. Please note that you must register a stored procedure with the database before it can be called by a client program.

In DatabaseSpy, stored procedures that are registered with the database are displayed in a separate folder in the Online Browser. A context menu provides several maintenance options and, in addition, facilitates the creation of SQL statements for creating, altering, dropping, or executing the stored procedure (see Generating SQL Statements).

DatabaseSpy provides sub-folders for the procedures where the parameters are displayed. The definitions can be edited and renamed in the Properties window.

You can add stored procedures to the favorites, rename, or delete them. When deleting a stored procedure, a database structure change script is generated which must be executed in order for the deletion to take effect.
8.11 Triggers

Triggers are user-defined functions that are executed automatically after a CREATE, UPDATE, or DELETE statement on tables or views is executed. In SQL Server 2005, triggers can also be fired on database level.

If a trigger is defined for a particular table, view, or—with SQL Server 2005—database, the SQL statement(s) in the trigger definition are executed automatically before, after, or instead of the statement that activates the trigger.

You can use an existing trigger as a basis for creating a new trigger definition or delete a trigger from the database. The context menu in the Online Browser provides several options in this respect (see Generating SQL Statements).
8.12 User-defined Functions

DatabaseSpy supports user-defined functions and displays them in a separate folder on the schema/database level. For each function, a Parameters sub-folder is provided where the function's parameters and their data types are listed.

Functions can be added to the favorites. Some maintenance options applicable to functions are available through the context menu (see Generating SQL Statements). Please note that functions are not supported in Access databases.

Be sure to always add the schema prefix to the function name when you select a function.
8.13 Creating Packages

DatabaseSpy supports the definition of PL/SQL packages for Oracle databases. Packages are objects that group related PL/SQL types, items, and subtrees into modules and thus allow you to re-use code.

Packages consist of a package specification and an optional package body. The specification is the interface and the body defines cursors and subprograms.

Packages are defined with the commands:

`CREATE [OR REPLACE] PACKAGE package_name
...
[CREATE [OR REPLACE] PACKAGE BODY package_name
...

...`
8.14 Opening, Saving, and Printing Design Files

The contents of the Design Editor can be saved for later use as a design file, exported as an image, or sent to a printer. DatabaseSpy design files have the .qdes extension.

Saving design files

DatabaseSpy provides several options for saving designs in the Design Editor:

- **Design file (*.qdes)**: These files can only be opened in DatabaseSpy
- **Image (*.png, *.emf)**: Designs that have been saved as image can be opened with any picture viewer.

To save a design as .qdes design file:

1. Make the Design Editor window that you want to save the active window.
2. Do one of the following:
   - Right-click the tab of the Design Editor window and choose Save or Save As... if you want to save a design file under a new name or path.
   - Press Ctrl+S.
   - Click the Save button in the Standard toolbar.

To save a design as image:

1. If you have maximized the Design Editor window, click the Restore button in the upper right corner of the Design Editor.
2. Resize the window and arrange the table(s) as desired. The borders of the window define the white space that surrounds the image.
3. To save the image, do one of the following:
   - Click the Save Diagram as Image icon in the toolbar of the Design Editor window.
   - Choose the menu option Design Editor | Save Diagram as Image.
   - The standard Windows Save As dialog box appears.
4. Enter name and path for the image.
5. In the Save as type drop-down list, select whether you want save the file as portable network graphic (PNG) or enhanced metafile (EMF).
6. Click Save.

Opening design files

To open an existing design file, do one of the following:

- Select the menu option File | Open | Open File..., or press Ctrl+O, and browse for the design file.
• Double-click the design file in the Project window.

Note: If the design file has a data source which is not currently connected in your project, you are prompted to connect to the data source first, see also Changing the Data Source of Design Editor. Likewise, if you attempt to open a design whose data source does not exist in the current project, you are prompted to add a connection first.

Printing Designs
Designs in the Design Editor can also be printed. You can print out an entire design or select a number of objects to print only the selection. In the General options, you can define whether or not the program logo is to be printed on top of the page. A print preview is available for you to check the layout of the printed page before sending it to the printer.

To print a design file:

1. Click in the Design Editor window to make it active.
2. Select the menu option File | Print..., or press Ctrl+P, or click the Print icon in the Standard toolbar. The Print dialog box appears.
3. In the What group box, define whether to print the whole diagram or only the selected objects.
4. Choose the appropriate zoom factor in the Zoom group box. The Use optimal option ensures that the design is printed on one page.
5. Optionally, define the printer setup by clicking the Print Setup button.
6. Optionally, click the Preview button to preview the print-out before actually sending it to the printer.
7. Click Print.

To preview a design file before printing:

1. Click in the Design Editor window to make it active.
2. Select the menu option File | Print Preview, or press Ctrl+P, or click the Print icon in the Standard toolbar. The Print dialog box appears.
3. In the Print dialog box, click Preview.
Chapter 9

Retrieving and Editing Data
Retrieving and Editing Data

Altova website: Database tool

In DatabaseSpy, you can retrieve database data directly from the Online Browser or from a table design in the Design Editor using the Retrieve data option in the context menu. The required query is generated and executed with one single mouse click and the data is displayed in a Result tab of the SQL Browser. You can choose to retrieve all rows at once or only a particular number of rows at a time.

If you need to edit data after retrieving it, DatabaseSpy provides the Edit Data option in the context menu of the Online Browser for this purpose. The Result window is switched into the Editing mode in this case, indicating this condition in its status bar.

You can also select individual columns of a table when using the Retrieve data and Edit data commands. Only data from these columns will be retrieved in this case. Note, however, that all columns may be retrieved if you have deactivated the Generate SELECT statements with full column list check box in the SQL Generation options.

To retrieve data:

- In the Online Browser, right-click the object(s) you want to retrieve data from and select Retrieve data | All rows (Ctrl+Alt+R) or Retrieve data | First n rows (Ctrl+Alt+T) from the context menu.
- In the Design Editor, right-click either the title bar or one or several individual columns (using Ctrl+click) in a table design and select Retrieve data | All rows (Ctrl+Alt+R) or Retrieve data | First n rows (Ctrl+Alt+T) from the context menu.

An SQL Editor window opens which displays the query for the data retrieval. If you have selected objects from different tables, separate SELECT statements for the individual tables are created. The results of the query are displayed in the Result window below.

To retrieve data for editing:

- Provided that direct editing of database data is supported for the respective data source
connection, right-click a table or column in the Online Browser and select **Edit Data** from the context menu.

**Partial retrieval**
In the **SQL Editor options**, you can define the number n of rows to be retrieved if you select the **Retrieve data | First n rows** option from the context menu. You can then use the **toolbar icons of the Result window** to retrieve the data in fractions.

**Stopping the retrieval**
While data is being retrieved, the status bar of the Result tab counts up the rows already retrieved and displays the execution time. In addition, the tab of the respective SQL Editor window shows an icon at the left side, indicating that data is still being retrieved.

While data is being retrieved, the **Execute** button is replaced by the **Stop Retrieval** button in the SQL Editor toolbar. You can stop the retrieval process at any time by clicking the **Stop Retrieval** button. The status bar indicates that the retrieval has been stopped.

To stop the retrieval of database data:

- Click the **Stop Retrieval** button which is visible in the SQL Editor toolbar while data is being retrieved.

To resume the interrupted retrieval of database data:

Do one of the following:

- To retrieve the next n rows of data, click the **Retrieve next n rows** icon or right-click anywhere in the **Result** tab and select **Retrieve next n rows** from the context menu.
- To retrieve all outstanding data, click the **Retrieve outstanding rows** icon or right-click anywhere in the **Result** tab and select **Retrieve outstanding rows** from the context menu.

**Editing database data in the Result window**
To be able to edit the data contained in your database tables, DatabaseSpy provides two different approaches: You can either **generate the corresponding SQL statements** and execute them in the SQL Editor or, more conveniently, retrieve data and edit it directly in the Result window.
The Result window has to be enabled for editing before you can make any changes to the data displayed in the result grid. For this purpose, the context menu of the Online Browser as well as the context menu that opens when you right-click into a table design in the Design Editor provides the **Edit Data** command which is available on table and column level. This command generates a SELECT statement which appears in a new SQL Editor window and is executed immediately, thus switching the Result window into the Editing mode.

In addition, also the **Execute for Data Editing** button is available in the SQL Editor toolbar, allowing you to execute a SELECT statement and, at the same time, switch the Result window into the Editing mode. This is particularly useful if you have already retrieved data and now want to update some of the records. The table below shows the editing options for the individual data source connections.

**To select data for editing in the Result window:**

Do one of the following:

- In the Online Browser or in a Design Editor window, right-click the table or column you want to edit, and choose **Edit Data** from the context menu. A SELECT statement is created and executed automatically in the SQL Editor.
- **Generate a SELECT statement** in a new SQL Editor window and click the **Execute for Data Editing** button, if available for the currently used data source connection.

**Note:** Not all editing options (update, insert, or delete row) may be available, depending on the data source connection you are currently using, and on whether the table you are editing has or has not a primary key defined.

The following restrictions apply when editing data in the Result window:

- Only SELECT statements may be present in the SQL Editor window if the **Execute for Data Editing** command is used. If you click the **Execute for Data Editing** button while any other statement is in the SQL Editor, the statement will be executed without switching the Result window into the Editing mode.
- Tables that do not have a primary key defined are only partly supported for editing. DatabaseSpy displays a warning dialog box if you select the **Edit Data** command for such a table.
The **Show Details >>** button allows you to display the reason why the editing command has failed. If you do not want to have this dialog box displayed, select the **Don't show this dialog again!** check box or disable this feature in the **SQL Editor options**. Upon clicking **OK** in the dialog box, DatabaseSpy executes the statement and disables the editing functions in the Result window. You can then, however, insert new rows into such tables or save the content of XML fields as XML files.

- All columns that form part of the table’s primary key must be included in the statement that is used for populating the result grid with records. A warning dialog box similar to the one above (“Editing of data is limited for this statement”) will be displayed if you omit such a column in your SELECT statement.
- Columns that are the result of an equation or have certain properties such as autoincrement, timestamp, etc., are excluded from editing. If such columns are present, a warning dialog box similar to the one above appears before the results are displayed. You can, however, still edit the remaining columns of the table.
9.1 Viewing Results

When an SQL Editor window includes more than one statement, the results of a query are by default displayed in separate result tabs with consecutive numbers: Result1, Result2, etc. To change this default display mode, turn on the Show multiple results stacked option in the SQL Editor toolbar. When executing a script containing more than one query, only one result tab is displayed, and the results of the individual queries are displayed in separate panes of that tab. Note that you can change the display mode also after the query has been executed.

To display multiple queries in one result tab:

1. In the SQL Editor toolbar, switch the Show multiple results stacked option on.
2. Click the Execute button or press F5.

Only one result tab has been created. It consists of two panes however, each containing the result of the individual queries.

Viewing statistical data

The status bar of the Result window can display statistical information about any cells selected in the result grid, which includes:

- Number of selected cells (in the status bar, this statistic is shown as Count)
- Number of selected cells that have a numerical data type (Numeric count)
- The average value of all selected numeric cells (Average)
- The minimum and maximum value of all selected numeric cells (Min and Max)
- The sum of all selected numeric cells (Sum)
- The data type of a cell.

To view statistical information in the Result window, select one or more cells in the result grid. The values for the activated statistical fields are displayed in the status bar.
Not all statistics are enabled by default. To enable or disable a particular statistic, right-click the status bar and select the corresponding option from the context menu.

Note that the Count option displays the number of all selected cells, while the Numerical Count omits cells that do not have a numerical data type. Naturally, the Average, Min, Max, and Sum values are based on the numerical count.

When a single cell is selected, its data type is additionally displayed in the status bar.

Preserving results
If you want to keep a particular result, you can pin the corresponding tab in the Result window.

DatabaseSpy offers a toolbar button as well as several options in the context menu that opens when you right-click a tab in the Result window for this purpose. When the button is toggled on, the Result tab remains visible even if different queries are executed and new Result tabs are generated. Pinned result tabs show a different icon.

Note that pinned results show a different icon in the tab. When viewing pinned results, please bear in mind that the SQL statement displayed in the SQL Editor window above the Result tab might have been changed since the query has originally been executed and that re-executing the query may display a different result.
To pin a result tab:

1. **Execute a query** and display its results in the Result window.
2. In the Result window, do one of the following:
   - To pin an individual result, click the **Keep result visible** button in the toolbar of the respective Result window or right-click the tab and select **Keep result visible** from the context menu.
   - To pin all results that are currently displayed in the Result window, right-click any result tab and select **Keep all results visible** from the context menu.

   Any pinned tab is kept in the Result window even if new queries are executed, and new Result tabs are generated.

To release a pinned result tab:

Do one of the following:
- To unpin a result, click the **Keep result visible** icon again, or right-click a pinned result tab and choose **Remove permanent visibility for result** from the context menu.
- To unpin all results in the Result window, right-click any result tab and select **Remove permanent visibility for all results** from the context menu.
### 9.2 Viewing Large Data Cells

In data cells containing a large amount of text, the Result tab displays only the first part of the text followed by an ellipsis (...). In this case, also the **Auto Size Columns** option in the context menu is limited to displaying 250 pixels. You can, however, always drag the column border to show more text.

**Expanding cells temporarily**

If cell content is larger than the currently visible cell width (e.g., in tables with a large number of columns), the width of a certain cell is temporarily extended if you move the mouse cursor over the data cell (see screenshot below). This applies also to column headings.

<table>
<thead>
<tr>
<th>45</th>
<th>5044</th>
<th>Penny</th>
<th>44</th>
<th>2</th>
<th>1</th>
<th>female</th>
<th>4</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>46</td>
<td>5045</td>
<td>Auntie</td>
<td>31</td>
<td>2</td>
<td>105</td>
<td>female</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>47</td>
<td>5046</td>
<td>Snuffelupagus</td>
<td>2</td>
<td>134</td>
<td>male</td>
<td>11</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>5047</td>
<td>vValter</td>
<td>1</td>
<td>3</td>
<td>12</td>
<td>male</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>49</td>
<td>5048</td>
<td>Maggie</td>
<td>1</td>
<td>3</td>
<td>9</td>
<td>female</td>
<td>3</td>
<td>8</td>
</tr>
</tbody>
</table>

**To expand single data cells temporarily:**

- Place the mouse cursor over the cell you want to expand.

**Using the Data Inspector**

Where the temporary expansion of long data cells is insufficient, for example if you want to check the content of XML columns, DatabaseSpy provides the **Data Inspector** to display data cells containing a large amount of data.

The Data Inspector window can be displayed by clicking the **Show the Data Inspector window** icon in the toolbar of the Result window or Database Data Comparison Result window, respectively, or by choosing the menu option **View | Data Inspector window**.
To view data using the Data Inspector:

1. In the Result window or Database Data Comparison Result window, select a data cell and click the Show the Data Inspector window icon in the toolbar. Optionally, select the menu option View | Data Inspector Window. The Data Inspector window opens and shows the content of the selected data cell.

2. Optionally, click the Word wrap button to wrap the text in the Data Inspector window.

3. Optionally, click the Pretty Print button to display the text in a hierarchical way.

4. Optionally, click the Save As button to save the content as text or XML.
9.3 Searching and Sorting

Data that has been retrieved from a database is displayed in DatabaseSpy’s Result window. If you are searching for a particular string in your data, you can either create an appropriate SELECT statement using a WHERE clause to retrieve only rows that include that string, or, you can make use of DatabaseSpy’s search functionality directly in the Result window. This allows you to search for text in all the columns included in the result of a database query. You can also restrict the search to a particular column, row, or custom selection in the Result window.

You can call the Find dialog box by clicking the Find button in the Result window toolbar, or by pressing the standard shortcut Ctrl+F when the cursor is in the Result window.

The Find button is also available when the Result window is in the Editing mode.

To search for text in the Result window:

1. Retrieve data from the table you want to search.
2. Optionally, select the column or row where you would like to search for text. You can also select multiple cells by clicking while holding the Ctrl key pressed—in this case, the search will be restricted only to selected cells.
3. In the Result window, click the Find button. Alternatively, click into the result grid and select the menu option Edit | Find... or press Ctrl+F.
4. Type the string you are looking for into the Find what field.
5. Optionally, select the Match whole word only check box if you want to restrict your search to entire words that match the search term.
6. Optionally, select the Match case check box if you want to consider the case when searching.
7. Click Find next to start the search. The first occurrence of the search term is highlighted in the result grid.
8. Optionally, click Find next again to jump to the next occurrence of search term or click Find prev to jump to the previous occurrence of the search term, if available.
9. To quit the search, click **Cancel** or press **Esc**.

**Sorting results**

By default, the data is sorted according to its primary key column in ascending order. You can change the sort order in the result grid using the context menu, or by clicking the sorting arrows in the column headers, provided that this option has been activated in the [SQL Editor options](https://www.altova.com/databaseSpy.html).

If sorting symbols are displayed in the column headers, you can click them to toggle the sorting order in the sequence ascending – descending – default. The shape of the respective sorting symbol changes accordingly.

In the example illustrated in the screenshot above, data is sorted in ascending order according to the "BirthDate" column.

**To sort data in the result grid:**

Do one of the following:

- Right-click anywhere in the column to be sorted and select either **Ascending** or **Descending** from the **Sorting** sub-menu of the context menu.
- Click the sorting symbol in any of the column headers to sort the data. The data is sorted according to the contents of that column in ascending order. Click the same column again to sort in descending order. A third click restores the default sort order.

**To restore the default sort order:**

- Right-click anywhere in the table and choose **Sorting | Restore default** from the context menu.

<table>
<thead>
<tr>
<th>BirthID</th>
<th>BirthDate</th>
<th>Mother</th>
<th>Father</th>
<th>Veterinarian</th>
<th>NumberInLitter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2005-01-16</td>
<td>5056</td>
<td>5055</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>2005-09-14</td>
<td>5051</td>
<td>5050</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>2005-11-07</td>
<td>5053</td>
<td>5054</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>
9.4 Printing Results

Data cells that you select in the result grid can be printed via the menu command **File | Print Preview**. This opens the selected cells in a separate pane, where you can zoom into or out of the grid and send the data to the printer. Alternatively, you can also use the **File | Print...** command, which opens the Print dialog box with the Selection option preselected in the Print range group box. Note that in the latter case no preview or zooming options are available.

<table>
<thead>
<tr>
<th>Employee ID</th>
<th>Supervisor ID</th>
<th>Last Name</th>
<th>First Name</th>
<th>Position</th>
<th>Birth Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Davolio</td>
<td>Nancy</td>
<td>Sales Representative</td>
<td>1972-12-06</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>Fuller</td>
<td>Andrew</td>
<td>Vice President, Sales</td>
<td>1969-02-19</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>Leverling</td>
<td>Janet</td>
<td>Sales Representative</td>
<td>1971-08-30</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>Peacock</td>
<td>Margaret</td>
<td>Sales Representative</td>
<td>1973-09-15</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>Buchanan</td>
<td>Steven</td>
<td>Sales Manager</td>
<td>1975-03-04</td>
</tr>
<tr>
<td>6</td>
<td>5</td>
<td>Suyama</td>
<td>Michael</td>
<td>Sales Representative</td>
<td>1963-07-02</td>
</tr>
<tr>
<td>7</td>
<td>5</td>
<td>King</td>
<td>Robert</td>
<td>Sales Representative</td>
<td>1972-05-29</td>
</tr>
<tr>
<td>8</td>
<td>5</td>
<td>Callahan</td>
<td>Laura</td>
<td>Inside Sales Coordinator</td>
<td>1974-01-09</td>
</tr>
<tr>
<td>9</td>
<td>5</td>
<td>Dodsworth</td>
<td>Anne</td>
<td>Sales Representative</td>
<td>1976-01-27</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
<td>Hellstern</td>
<td>Albert</td>
<td>Business Manager</td>
<td>1968-03-13</td>
</tr>
<tr>
<td>11</td>
<td>10</td>
<td>Smith</td>
<td>Tim</td>
<td>Mail Clerk</td>
<td>1973-05-06</td>
</tr>
<tr>
<td>12</td>
<td>10</td>
<td>Patterson</td>
<td>Caroline</td>
<td>Receptionist</td>
<td>1979-09-11</td>
</tr>
<tr>
<td>13</td>
<td>2</td>
<td>Brind</td>
<td>Justin</td>
<td>Marketing Director</td>
<td>1977-10-06</td>
</tr>
<tr>
<td>14</td>
<td>13</td>
<td>Martin</td>
<td>Xavier</td>
<td>Marketing Associate</td>
<td>1975-11-30</td>
</tr>
</tbody>
</table>

The example above shows the result of a retrieval of an employees table. You can select particular names in this result (e.g., all the managers) and print only their names and positions (see screenshot below). Only selected rows and columns will be printed.
9.5 Updating Data

To update data in the Result window, first select data for editing. This switches the Result window into the Editing mode, which is indicated by the "Editing Mode" message in the status bar.

To edit records, double-click the cell you want to edit and proceed like in any spreadsheet application. You can use the context menu to copy, cut, paste, delete, or select all content or to undo your editing action. You can also paste into the Result grid cell ranges copied from another Result grid or from external files such as Microsoft Excel spreadsheets (see also Adding and Copying Rows).

The updated data is not immediately committed to the database but only displayed in the Result grid. To actually commit the update to the database, the Result window provides a Commit button in its toolbar.

Data cells that have been edited are indicated by a different background color. The color informs you if there are potential problems with the entered data. For example, if the entered text is not suitable for the data type of the column, the background color of the cell turns red.

If XML columns are present in the Result window, an additional button for each row appears inside the XML column: . Clicking this button allows you to load an XML file into this XML cell or to save the XML content of the respective cell as XML file. Furthermore, you can assign an XML schema to the XML cell, provided that the current data source connection supports this feature. In databases where XML columns are currently not supported by DatabaseSpy, this icon changes to and you can only save the XML content of the respective cell to a file.

In the Editing mode, the toolbar shows the following additional commands:

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>Appends a new row. This command is also available in the context menu, when your right-click a cell. See also Adding and Copying Rows.</td>
</tr>
</tbody>
</table>
Deletes an existing row. This command is also available in the context menu, when your right-click a cell.

Undoes all changes made to the Result grid (provided that they have not been committed to the database yet). To undo the editing of a particular cell, right-click it, and select **Undo Changes for this Cell** from the context menu.

Sets the currently selected cell(s) to the default database value. This command is also available in the context menu, when your right-click a cell. Note that the command (and its corresponding button) is enabled only if the database column provides a default value.

Set the currently selected cell(s) to a **NULL** value. This command is also available in the context menu, when your right-click a cell. Note that the command (and its corresponding button) is enabled only if the corresponding database column allows nulls.

When you finished editing data, click **Commit** to send the changes to the database. DatabaseSpy automatically creates the required SQL statements and executes them. If the execution fails, you can view the statements in the Output window and check why they have not been executed successfully.

In such a case, the edited cell remains marked modified in the Result window, however if you choose to retrieve data once again, the (incorrect) update will be lost if you confirm the corresponding warning that pops up in a message box.

**Using SQL**

If you prefer to update data by means of SQL statements, DatabaseSpy can generate the required SQL statement with a click of the mouse (see also **Generating SQL Statements**). You can either update an entire row or only particular columns of a table. The corresponding SQL statement appears in an SQL Editor window where you can enter the new values.

```
UPDATE [Department] SET [id] = 1, [name] = ' ';  
```

Take a look at the **Department** table in your Access tutorial database.
Let's assume you want to change the "Art" department to "Music" and the ID from "2" to "3", you would have to edit the SQL statement as follows:

```
1 UPDATE [Department] SET [id]=3, [name]='Music'
    WHERE [id]=2 ;
```

To update a table by means of SQL statements:

1. Connect to the database and show the respective data source in the Online Browser.
2. Optionally, right-click the table you want to update and choose Retrieve data | All rows to see the data that is contained in the table.
3. Do one of the following:
   • Select the respective table you want to update.
   • Expand the respective table to see its columns and select the column(s) you want to update.
4. Right-click and select Show in new SQL Editor | Update from the context menu or, holding down the right mouse button, drag the selected objects into an open SQL Editor window and choose Update from the popup. An UPDATE statement for all the selected objects is generated in the SQL Editor.
5. Enter the new values after the equals sign of the respective column.
6. Add a WHERE statement to select only a particular row. Note that all rows of the table will be updated with the same values if the WHERE statement is omitted.
7. Click the Execute button to execute the statement and to update the data in the database.
9.6 Editing XML Columns

Columns of type XML cannot be edited directly, however you can use the context menu to change the XML instance of an individual data cell. Clicking the Browse button that is located inside the XML column shows a popup menu allowing you to save the XML instance or load a different XML instance from the file system. It is also possible to assign an XML schema to the selected data cell.

<table>
<thead>
<tr>
<th>ID</th>
<th>NAME</th>
<th>STATUS</th>
<th>CONTACTINFO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ella Kimpton</td>
<td>Gold</td>
<td>&lt;?xml version=&quot;1.0&quot; encoding=&quot;UTF-8&quot; ?&gt;Client...</td>
</tr>
<tr>
<td>2</td>
<td>Chris Bontero</td>
<td>Gold</td>
<td>&lt;?xml version=&quot;1.0&quot; encoding=&quot;UTF-8&quot; ?&gt;Client...</td>
</tr>
<tr>
<td>3</td>
<td>Lisa Hansen</td>
<td>Silver</td>
<td>Load XML Document from File... &lt;?xml version=&quot;1.0&quot; encoding=&quot;UTF-8&quot; ?&gt;Client...</td>
</tr>
<tr>
<td>4</td>
<td>Rita Gomez</td>
<td>Silver</td>
<td>Save XML Document to File... &lt;?xml version=&quot;1.0&quot; encoding=&quot;UTF-8&quot; ?&gt;Client...</td>
</tr>
<tr>
<td>5</td>
<td>Paula Lipanski</td>
<td>Standard</td>
<td>Assign XML Schema... &lt;?xml version=&quot;1.0&quot; encoding=&quot;UTF-8&quot; ?&gt;Client...</td>
</tr>
<tr>
<td>6</td>
<td>Tina Wang</td>
<td>Silver</td>
<td>&lt;?xml version=&quot;1.0&quot; encoding=&quot;UTF-8&quot; ?&gt;Client...</td>
</tr>
</tbody>
</table>

The XML instances stored in an XML data cell in the database can be changed by selecting an XML file from the file system. DatabaseSpy presents the standard Windows Open dialog box for this purpose.

To change the XML instance of a database data cell:

1. Click the Browse button inside the data cell you want to edit.
2. From the menu that appears, select Load XML Document from File... or Save XML Document to File....
3. Do one of the following:
   - In the Open dialog box, browse to the desired XML instance and click Open.
   - In the Save As dialog box, select the folder where you want to save the XML file, enter a name for the file, and click Save.
4. To commit your changes to the database, click the Commit button in the Result window toolbar.
9.7 Editing Binary Columns

Binary content can be stored in databases using the following data types:

<table>
<thead>
<tr>
<th>Database Type</th>
<th>Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oracle</td>
<td>BLOB, LONG RAW, RAW, BFILE</td>
</tr>
<tr>
<td>MS SQL Server</td>
<td>binary, varbinary, image</td>
</tr>
<tr>
<td>MS Access</td>
<td>BINARY, IMAGE</td>
</tr>
<tr>
<td>MySQL</td>
<td>binary, tinyblob, varbinary, blob, mediumblob, longblob</td>
</tr>
<tr>
<td>IBM DB2</td>
<td>BLOB</td>
</tr>
<tr>
<td>IBM DB2 for i</td>
<td>BLOB, BINARY LARGE OBJECT, BINARY, VARBINARY</td>
</tr>
<tr>
<td>SQLite</td>
<td>BLOB</td>
</tr>
<tr>
<td>Sybase</td>
<td>binary, varbinary, image</td>
</tr>
<tr>
<td>PostgreSQL</td>
<td>byte array</td>
</tr>
</tbody>
</table>

In DatabaseSpy you can choose to (i) save binary content from the result grid to a file, or (ii) load binary content from a file and store it in the database. The respective menu entries are available when you click the button inside a data cell of the result grid.

To change the binary content of a database data cell:

1. Click the Browse button inside the data cell you want to edit.
2. From the menu that appears, select **Load Binary from File...** or **Save Binary to File...**.
3. Do one of the following:
   - In the Open dialog box, browse to the desired binary file and click **Open**.
   - In the **Save As** dialog box, select the folder where you want to save the binary file, enter a name for the file, and click **Save**.
4. To commit your changes to the database, click the **Commit** button in the Result window toolbar.

**Note:** MS Access does not support the loading of a binary file in a binary column.
**Note:** When connecting to PostgreSQL through the ODBC driver, select the **bytea as LO** check box on the second page of the advanced data source options of the PostgreSQL driver settings.
9.8 Inserting Data

In DatabaseSpy, you have several possibilities to populate your tables with data:

- Import database data from CSV or XML files, see Importing Database Data
- Manually add new rows directly into the Result grid. You can also paste into the Result grid cell ranges copied from another Result grid or from external files such as Microsoft Excel spreadsheets, see Adding and Copying Rows.
- Generate multiple INSERT statements by means of SQL templates and run them against the database, see SQL Templates

When you want to add only a few rows of data, you can also generate INSERT statements and enter the values manually in the SQL Editor. You can enter data for a particular column or for the entire row of a table.

To insert data using INSERT statements:

1. Connect to the database and show the respective data source in the Online Browser.
2. Right-click the table and select Show in new SQL Editor | Insert from the context menu. Alternatively, hold down the right mouse button, drag the table into an open SQL Editor window and select Insert from the context menu. An INSERT INTO... statement is generated in the SQL Editor.
3. Enter the desired values in the VALUES ( , , , , ) part of the statement (the number of commas depends on the number of columns in the respective table). If required, check the data type of the individual columns in the Properties window of the Online Browser.
4. Click the Execute button to execute the statement and to insert the data into the database.
5. Optionally, save the SQL statement if you need to insert the same kind of data frequently, see Opening, Saving, and Closing SQL Files.

To insert data only into specific columns of a table:

1. Connect to the database and show the respective data source in the Online Browser.
2. In the Online Browser, expand the table you want to edit to and select the column(s) into which you want to insert data.
3. Right-click and select Show in new SQL Editor | Insert from the context menu. Alternatively, hold down the right mouse button, drag the column(s) into an open SQL Editor window and select Insert from the context menu. An INSERT INTO... statement is generated in the SQL Editor.
4. Enter the desired value(s) in the VALUES ( ) part of the statement. You may also have to enter the primary key for the new table row. Add the name and the value of the primary key to the statement in this case.

**Note:** If your table contains columns that are not nullable, you must also enter values for these columns.

5. Click the Execute button to execute the statement and to insert the data into the database.
6. Optionally, save the SQL statement if you need to insert the same kind of data frequently, see Opening, Saving, and Closing SQL Files.
## 9.9 Adding and Copying Rows

New rows can be added in the result grid of the SQL Editor, provided that data was retrieved in Editing mode, see Retrieving and Editing Data. The toolbar of the Result window provides the **Append a new row** command for this purpose. This command inserts an empty row where you can enter data and save the record using the **Commit** button.

You can define in the SQL Editor options that the respective default values of the individual columns be inserted into new rows. In the example above, only the columns `created_at` and `updated_at` have a default value defined; DatabaseSpy hence populates them automatically. If the default property has not been set accordingly, a blank row will be inserted into the result grid.

In addition to editing rows manually, you can also paste into the result grid entire cell ranges (rows, columns, or both) from external files such as Microsoft Excel spreadsheets. The external cell ranges can be pasted over existing cells of the Result grid.

To paste clipboard data from external files into new rows, first click **Append a new row** to create the required number of rows, and then paste the clipboard cells at the desired location. The **Paste** command is available both as a keyboard shortcut (Ctrl+V) or from the **Edit | Paste** menu.

If you are pasting data from a different result grid of DatabaseSpy, it is possible to create the required number of new rows automatically as you paste data. To do this, right-click the Result window and select the **Paste as new rows** (Ctrl+Shift+V) command from the context menu.

### Adding new records to incomplete selections of data

When not the entire table but a collection of individual columns is selected for data editing, the following restrictions apply when a new row is to be inserted into the result grid:

- The column(s) containing the table's primary key must be included to make data editing possible.
- All columns with the "Nullable" property set must be included unless they have a default value defined.

Using the table below as example, let's assume that both the NAME and the STATUS columns are not nullable, but only the STATUS column has a default value ("Standard") defined.
We could further assume that each new customer is automatically assigned status “Standard” and thus omit the STATUS column when creating new customers. Adding new rows is possible in this case since the default value is automatically assigned when the record is committed to the database.

When checking the results of the entire table, you will see that the default value “Standard” has been automatically inserted into the Status column of the new record.

However, if you omit, for instance, the Name column, a warning message (“Editing of data is limited for this statement”) is displayed when you select the Edit Data command. If you do not want to have this dialog box displayed, select the Don’t show this dialog again! check box or disable this feature in the SQL Editor options. After clicking OK, you can still edit data in the Result window but the Append a new row button and context menu option are disabled.
Copying rows

If you need to duplicate some of the data stored in your database tables, DatabaseSpy provides a feature allowing you to copy data from the result grid and append that content to the grid in a new row. You can either copy an entire row or individual cells. If you copy data from more than one row and append it as new rows, DatabaseSpy will create as many new rows as there were to host the original data.

To copy a row and append it to the result grid:

1. Make sure that the Result window is in the Editing mode.
2. In the Result window, right-click into the row you want to copy and choose Selection | Row from the context menu. Alternatively, click several individual data cells using Ctrl+Click.
3. Right-click anywhere into the Result window and choose Copy selected cells from the context menu or click Ctrl+C.
4. Right-click anywhere into the Result window and choose Paste as new rows from the context menu or click Ctrl+Shift+V.

Copying records and using data outside DatabaseSpy

You can use the clipboard to export selected records to any other application that supports the clipboard. It might be helpful to include also the headers of the selected data, even if only a fraction of a record set is copied. The context menu in the Result tab provides the Copy selected cells with header command for this purpose. The corresponding header will be copied to the clipboard together with each selected cell.
9.10 Deleting Data

To delete a row from a table, DatabaseSpy provides the Show in new SQL Editor | Delete data option in the context menu of the Online Browser. Selecting this option generates a DELETE statement in a new or existing SQL Editor window.

Be sure to edit this statement in order to delete the row(s) that are obsolete since executing the statement as is will not delete any rows from the selected table (the default statement selects rows where the primary key is NULL).

To delete data from a table:

1. Connect to the database and show the respective data source in the Online Browser.
2. Optionally, right-click the table you want to update and choose Retrieve data | All rows to see the data that is contained in the table.
3. In the Online Browser, right-click the respective table and select Show in new SQL Editor | Delete data from the context menu or, holding down the right mouse button, drag the table into an open SQL Editor window and choose Delete data from the popup. A DELETE statement for the selected table is generated in the SQL Editor and a default WHERE statement is added.
4. Edit the WHERE statement accordingly to select only a particular row for deletion.
5. Click the Execute button to execute the statement and to delete the data from the database.

Deleting data in the Result window

You have two options to delete records in the Result window: Either set a particular database field to NULL or delete an entire row. Both options are provided in the context menu that is available when the Result window is in the Editing mode. The affected fields or rows are marked modified until the changes are committed to the database. This enables you to also undo the editing if the need should arise.

<table>
<thead>
<tr>
<th>ID</th>
<th>NAME</th>
<th>STATUS</th>
<th>CONTACTINFO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ella Kimpton</td>
<td>Gold</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Chris Bontempo</td>
<td>Gold</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Lisa Hansen</td>
<td>Gold</td>
<td>NULL</td>
</tr>
<tr>
<td>4</td>
<td>Rita Gomez</td>
<td>Silver</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Paula Lipencki</td>
<td>Standard</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Tina Wang</td>
<td>Silver</td>
<td></td>
</tr>
</tbody>
</table>

In the screenshot above, the CONTACTINFO field has been set to "NULL" for the third record, and the entire fifth record has been deleted. Note that the changes have not yet been committed to the database and can still be undone.
To set a database field to NULL:

1. Right-click the database field you want to change and select **Set Null** from the context menu.
2. Click the [Commit] button.

To delete a row of records in the result grid:

1. Right-click one of the fields in the row you want to delete and select **Delete Row** from the context menu or click anywhere into the row and click the **Delete row** button. The row is marked for deletion *(see screenshot above)*.
2. Click the [Commit] button.

To restore deleted rows in the database:

- Provided that the modified fields in the result grid have not been committed to the database yet, right-click into the deleted row and select **Undo changes for this Cell** from the context menu. The entire row of records is restored in the result grid.
Chapter 10

Displaying Charts
10 Displaying Charts

After you have retrieved data and displayed the record set in a result window, you can open a chart that depicts the selected data. Several types of charts, such as pie chart, bar chart, line chart, area chart, or gauge chart, are available and the appearance of the chart can be customized. Charts are displayed in the Charts window at the bottom of the application, this is where you can also change the chart type and appearance, define what data is to be displayed and how, or export the chart to file, clipboard, or printer.

The easiest way to display a chart window in DatabaseSpy is to retrieve data and then click the Show Data in Chart Window button in the Result window toolbar. This opens the Select columns dialog box which lists all the columns that have been retrieved into the Result window. You can deactivate unwanted columns and change the sequence of the selected columns by dragging them to the desired position in the dialog box.

Unchecked columns can later be activated again when you choose the chart data in the Chart Data dialog box.

If you have retrieved all columns of a table but want to display only specific columns in a chart, you can select one or several columns in the Result window before you click the Show Data in
Chart Window button. Then only the selected columns will appear in the Select columns dialog box and only these columns can be used for the chart.

You can choose the X-axis for the chart from the First Column (Category/X-Axis) drop-down list or leave the default setting "Auto Enumerated (not coming from source data)". In the latter case, all available columns are depicted on the Y-axis and an auto-generated value is used for the X-axis.
10.1 About Charts

Charts provide a graphical representation of data in the source document. A chart is set up by defining XPath expressions to specify a sequence of items for each axis of the chart. DatabaseSpy then automatically generates the chart. The table below shows the types of charts that can be created, and the kind of data items that are required for each of the chart's axes.

<table>
<thead>
<tr>
<th>Chart type</th>
<th>X-Axis (Category)</th>
<th>Y-Axis (Value)</th>
<th>Number of Series (on Z-Axis)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pie Charts (2D, 3D)</td>
<td>Text</td>
<td>Numeric</td>
<td>1</td>
</tr>
<tr>
<td>Bar Charts Ungrouped (2D, 3D)</td>
<td>Text</td>
<td>Numeric</td>
<td>1</td>
</tr>
<tr>
<td>Bar Charts Grouped (2D, 3D)</td>
<td>Text</td>
<td>Numeric</td>
<td>&gt; 1</td>
</tr>
<tr>
<td>Category Line Graphs</td>
<td>Text</td>
<td>Numeric</td>
<td>1 line = 1 series</td>
</tr>
<tr>
<td>Value Line Graphs</td>
<td>Numeric</td>
<td>Numeric</td>
<td>1 line = 1 series</td>
</tr>
<tr>
<td>Area and Stacked Area Charts</td>
<td>Text</td>
<td>Numeric</td>
<td>1 area = 1 series</td>
</tr>
<tr>
<td>Candlestick Charts</td>
<td>Text</td>
<td>Numeric</td>
<td>3 or 4</td>
</tr>
<tr>
<td>Gauge</td>
<td>—</td>
<td>Numeric</td>
<td>1</td>
</tr>
<tr>
<td>Overlay Charts</td>
<td>Text</td>
<td>Numeric</td>
<td>= 1 or &gt; 1 per chart</td>
</tr>
</tbody>
</table>
10.2 Chart Data Selection

The Select Data dialog box allows you to add and delete series as well as to define the column or data range that should be illustrated by a particular series. The available columns are displayed in a list box at the bottom of the dialog box. You can add and remove columns by clicking the Select Columns button and activate the required columns in the Select columns dialog box that appears (note that columns can only be added to, or removed from, this dialog box via the Result window).

In the Axis Values group box, you can define a column, row, or data range that is used as an X-axis for all series. To specify the column, row, or data range for the Y-axis, select a Series in the Series group box and then click into the Y (selected series) field in the Axis Values group box. An asterisk appears next to the field to mark it as the field that can be edited.

In Value Line Charts, you can add an additional X-axis for the selected series if, for example, the X-axes of two series do overlap but do not match entirely. Then the additional axis can be laid over the default axis, which allows to display the data in the correct place.
For Candlestick Charts, please note that the sequence of the series is important in order to display the chart correctly. A corresponding note is displayed in the Select Data dialog box.

Adding, deleting, and renaming series

The Series group box shows all the data series that are currently included in the chart. You can rename a series by clicking its name in the group box and enter the new name. A series can be removed from the chart by clicking the Delete button. To add a series to the chart, click the Add button, enter a descriptive name, and assign a column, row, or data range to the Y-axis.

To add a series to a chart:

1. Make sure that the column you want to display in the chart is listed in the list box at the bottom of the dialog box.
2. Click the Add button in the Series group box and give the new series a descriptive name.
3. Click into the Y (selected series) field to select it for editing.
4. In the list box below, click into the column, row, or data range you want to assign to the series (or type the corresponding letter into the Y (selected series) field. You can also select a single value or a value range from the list box.
5. In Value Line Charts, optionally assign an individual X-axis in the same way.
6. Optionally, click the **Apply** button to see a preview of the new series.
7. Click **OK**.

**Reloading source data**

If the result grid that has been used to create a particular chart has changed since the chart was originally generated, the source data has to be reloaded. This can be done either automatically or by clicking the **Reload** button in the Chart window toolbar. The content of a result grid may change because it is in the Editing mode and the data has been edited—such changes will be depicted in the chart immediately if the **Auto** toggle is activated—or because the result grid has been closed or the underlying SQL script has been changed and/or re-executed.

If the name of a result grid changes, the connection to the chart is broken and DatabaseSpy displays the Select Result grid dialog box when you click the **Reload** button or when automatic reloading occurs.

![Select Resultgrid dialog box](image)

Choose one of the available result grids and click **OK**.
10.3 Exporting Charts

The toolbar of the Charts window provides the Export button which, when clicked, opens a sub-menu with the following options:

- **Save chart in file...**: Opens the Image Size dialog box where you can enter the height and width of the image in pixels. Upon clicking OK, the Save As dialog box is displayed where you can specify a name and path for the image file and choose from among several image types (such as PNG, BMP, GIF, and JPG).

- **Copy current image to clipboard**: Copies an image of the chart to the clipboard; the content of the clipboard can then be pasted into an external application such as Paint. Note that the chart will be copied exactly as it is displayed in the Charts window, so you would have to adjust the size before you execute the copy or use the option **Copy resized image to clipboard**.

- **Copy resized image to clipboard...**: Opens the Image Size dialog box where you can enter the height and width of the image in pixels. Upon clicking OK, the image is resized before it is copied to the clipboard.

- **Print this chart...**: Sends the content of the Charts window to a printer.

**Printing a chart**

When printing charts in DatabaseSpy, you can specify how much of the page size the chart should occupy. After you have selected the **Print this chart...** command a Print dialog box is displayed where you can enter the percentage of page height and width.

![Print dialog box](image)

After you have clicked **Print**, the Print dialog box for your printer is displayed where you can change the properties (orientation, paper format, etc.) if needed. The chart will be printed with the name of the result grid where the data originates from, DatabaseSpy logo, date and time in the header.

Some chart settings require transparency for drawing the chart which may cause problems on printing. You can automatically set the following options to printing compatible settings before the print is started:

- **Transparency for pie charts and area charts**: transparency will be set to 0 for printing
- **Dropshadow on nonsolid background in 3d pie charts**: dropshadow will be deactivated for printing

A corresponding dialog box pops up where you can choose to change the settings or print the chart with the existing settings.
10.4 Chart Overlays

For some chart types (Bar Chart, Stacked Bar Chart, Line Chart, Area Chart, Stacked Area Chart, and Candlestick Chart), you can display several charts as overlays in one Charts window. This way you can combine charts of different type containing data even from different databases in one Charts window.

A separate Y axis will be displayed for each overlay chart and can be labeled. Note that an overlay will always be displayed in front of the existing chart(s), you should, therefore be careful if you combine different chart types in one Charts window as, for example, area charts displayed as overlay may hide bar or line charts. By default, subsequent colors from the color schema of the Main chart will be used for the overlay. You can, however, also deactivate the Use subsequent colors from previous chart layer radio button in any layer and define a different color schema for this particular layer. Note that this color schema will be used for subsequent layers if these have the Use subsequent colors from previous chart layer radio button activated.

Chart overlays are managed by clicking the Overlays button in the menu bar of the Charts window; this will open the Overlays menu where you can add and remove overlays and select the active chart. Note that any changes you make to chart type and/or appearance, and in the Select data dialog box apply only to the active chart! Tip: You can use targets for the SQL statements that retrieve the source data of the charts; this way it is easier to identify the various layers in the Overlays menu (see screenshot below).
To create a chart overlay:

1. Create a chart (the Main Chart).
2. In the Charts window, click the Overlays button and choose Append from the drop-down menu.
3. Do one of the following:
   - Create a new chart from the existing Result window.
   - Create a new query in an SQL Editor window or from the Online Browser and click the Show data in Chart window button.
   - The new chart is displayed as overlay of the existing chart(s) in the same Charts window.
4. In the Change Type dialog box, which appears automatically for the first overlay of each tab in the Charts window, define the type of the overlay chart.
5. Optionally, change the appearance of the overlay chart.

To remove a chart overlay:

1. In the Charts window, click the Overlays button and, in the drop-down menu, select the chart that you want to remove.
2. Select Delete Current from the Overlays menu.

Changing the chart type of the Main chart

When you have selected the Main chart as the active chart, you can change the chart type also to types that do not support overlays (i.e., pie charts and gauge charts as well all types of 3d charts). In such a situation all overlays will be removed from the Charts window and DatabaseSpy displays a warning message.
You try to switch to a chart type that does not support overlays. All your overlays will be removed. Continue?

Yes  No
10.5 Chart Settings and Appearance

Chart settings are organized as follows:

- **Basic Chart Settings**: The most basic setting is the chart type. To select the chart type, click **Change Type** in the toolbar of the chart window. The **Change Type dialog** is displayed.
- **Advanced Chart Settings**, which enable you to change the appearance of a chart (its title, legend, colors, fonts, etc). Advanced settings are defined in the **Change Appearance dialog**. To access this dialog, click **Change Appearance** in the toolbar of the chart window.

10.5.1 Basic Chart Settings

*This section:*

- Setting the chart type
- List of chart types
- Other basic settings

**Setting the chart type**

The most basic chart setting is the chart type. To select the chart type, click **Change Type** in the toolbar of the chart window.

**Chart types**

The various types of charts that are available are listed below. In the **Change Type dialog (screenshot above)**, select the chart type you want and click **OK**.

* **Pie charts**

  In pie charts, one column/axis provides the values, another column/axis provides labels for these values. The labeling column/axis can take non-numeric values.
**Bar charts**

Bar charts can have two sets of values used along two axes (below).

They can also use three sets of values, as in the example below: (i) continent, (ii) year, (iii) sales volume. Bar charts can be displayed in 2D (below) or 3D (above).
A three-axis bar chart can also be stacked if you need to show totals. Compare the stacked chart below with the chart above. The stacked chart shows the total of sales on all continents.

### Yearly Sales: Regional and Total
![Yearly Sales: Regional and Total](image)

#### Line charts
The difference between a line chart (below left) and a value line chart (below right) is that value line charts only take numerical values for the X-axis. If you need to display line charts with text values on the X-axis, use line charts.
Area charts

Area charts are a variation of line charts, in which the areas below the lines are also colored. Note that area charts can also be stacked (see bar graphs above).


Candlestick charts

A candlestick chart can be used to depict price movements of securities, commodities, currencies, etc over a period of time. The chart indicates not only how prices developed over time, but also the daily close, high, low, and (optionally) open. The Y-axis takes three or four series (close, high, low, and (optionally) open). The screenshot below shows a four-series candlestick chart.

Gauge charts

- Gauge charts
Gauge charts are used to illustrate a single value and show its relation to a minimum and a maximum value.

Other basic settings
In the Chart Settings pane, you can also set the title of the chart (see screenshot below).

### 10.5.2 Advanced Chart Settings

This section:

- Accessing the advanced settings
- Overview of advanced settings
- Loading, saving, resetting chart settings
Accessing the advanced settings

To access a chart's advanced settings do the following: Click **Change Appearance** in the toolbar of the chart window. This displays the Change Appearance dialog for that particular chart type (*the screenshot below shows the Change Appearance dialog of a pie chart*).

![Change Appearance dialog](image)

Overview of advanced settings

The advanced settings are organized into tabs that are common to all chart types and those that are specific to a single chart type.

**Common chart settings**

**General**

The chart title (*see screenshot below*) is the same as the basic setting (*see above*) and can be edited as an advanced setting also. Other settings in this dialog are the background color of the chart and the plot. In the screenshot below, the plot has been given a pale green background color. An image file can also be set as the background image of the chart and/or the plot. This image can be stretched to cover the entire area of the chart or plot; zoomed to fit so that the zoom matches one of the two dimensions (of chart/plot); centered; or tiled. The legend is the key to the color codes in the chart, and it can be turned on or off.
Color scheme

Four predefined color schemes are available plus a user-defined color scheme. You can modify any of the color schemes by adding colors to and/or deleting colors from a scheme. The color scheme selected in this tab will be used in the chart.

Sizes

Sizes of various aspects of the chart can be set, either as pixels or as a percentage ratio.

Font

The font properties of the chart title and of legends and labels can be specified in this tab. Sizes can be set as a percentage of the chart size or absolutely as points.

Load/Save button

Settings can be saved to an XML file and can be loaded from an XML file having the correct structure. To see the structure, save the settings of a chart and then open the XML file. Clicking this button also gives you the option of resetting chart settings to the default.

Type-specific chart settings

Pie charts

Settings for: (i) the angle from which the first slice should be drawn; (ii) the direction in which slices should be drawn; (iii) the outline color; (iv) whether the colors receive highlights (in 3D
pie charts: whether dropshadows and transparency are used); (v) whether labels should be
drawn; and (vi) whether values and percentages should be added to labels and how many
decimal places should be added to the percentages.

**Bar charts**
Settings for: (General) Drawing the X and Y axes exchanged generates a horizontal bar
chart; (Bar) Bar outlines and dropshadows (dropshadows in 2D bar charts only); (X-Axis)
Label and color of the x-axis, and vertical gridlines; (Y-Axis) Label and color of the y-axis,
horizontal gridlines, the range of values to be displayed, and the tick marks on the y-axis; (Z-
Axis, 3D only) Label and color of the z-axis; (3D) the vertical tilt, horizontal rotation, and the
width of the view.

**Line graphs**
Settings for: (General) Drawing the X and Y axes exchanged; (Line) including the plot points
or not; (X-Axis) Label and color of the x-axis, and vertical gridlines; (Y-Axis) Label and color
of the y-axis, horizontal gridlines, the range of values to be displayed, and the tick marks on
the y-axis.

**Gauge charts**
Settings for: (i) the angle at which the gauge starts and the angular sweep of the scale; (ii)
the range of the values displayed; (iii) the interval and color of major and minor ticks; (iv)
colors of the dial, the needle, and the border.

**Area charts**
The transparency of areas can be set as a value from 0 (no transparency) to 255 (maximum
transparency). In the case of non-stacked area charts transparency makes parts of areas
that lie under other areas visible to the viewer. Outlines for the areas can also be specified.

**Candlestick charts**
The fill color can be specified for the two situations: (i) when the closing value is greater than
the opening value, and (ii) when the opening value is greater than the closing value. In the
latter case, the Series color is also available as an option. The Series color is specified in
the Color Schema tab of the Change Appearance dialog.

### Loading, saving, resetting chart settings
Chart settings that are different from the default settings can be saved in an XML file. These
settings can subsequently loaded as the settings of a chart, which can help you save time and
effort. The **Load/Save** button (see first screenshot in this section) provides the following options
when clicked:
• **Set to default**: Rejects changes made to the settings, and restores the default settings to all settings sections.

• **Load from file**: Enables settings to be imported that have been previously saved in an XML file (see next command). The command displays the Open dialog, in which you enter the location of the required file.

• **Save to file**: Opens the Save As dialog box. You can specify an XML file in which to save the settings. This file lists those settings that are different from the default settings.

### 10.5.2.1 General

The General section of the Change Appearance dialog box lets you define the title of the chart, add or remove a legend, and define background pictures and colors and—for bar, line, area, and candlestick charts—orientation of the chart.

**Chart**

Enter a descriptive title for your chart into the Chart Title field and select a background color for the entire chart from the drop-down list. You can choose a solid background, vertical gradient, or horizontal gradient and define start and end colors for the gradient, if applicable. In addition, or instead of a colored background, you can also define a background image and choose one of the available display options from the drop-down list:

- Stretched: the image will be stretched to the height and width of the chart
- Zoom to Fit: the image will be fit into the frame of the chart and the aspect ratio of the image will be maintained
- Center: the image will be displayed in its original size in the center of the chart
- Tiled: if the image is smaller than the chart, duplicates of the image will be displayed to fill the background area

The Draw Legend check box is activated by default, clear the check box if you do not want to display a legend in your chart.
Plot
The Plot is the area where the actual data of the chart is displayed. You can draw a border around the plot and specify a different background color and/or image for the plot area. In the screenshot below, the background color of the chart has been changed to gray (vertical gradient) whereas the plot is still white, a red border has been drawn around it, and a background image has been added.

Orientation
If you have a small series of large values it may be convenient to swap the X and Y axis for a better illustration. Note that in the screenshot below also the background color of the plot has been set to “Transparent” and the background image has been applied to the chart.

Note that this option is not available for pie and gauge charts.
10.5.2.2 **Type-Related Features**

For each of the chart types, and even for the various sub-types, the **Change Appearance** dialog box provides a section where you can define the type-related features of the chart.

**Pie chart**

Most settings are the same for the 2d and 3d versions. In 2d pie charts, you can additionally draw highlights.

In 3d pie charts, you can display drop shadows, add transparency and define the 3d tilt.

The **Start Angle** value defines where the first row of the selected column will be displayed in the chart. An angle of 0 degrees corresponds to 12 o'clock on a watch.

You can show labels in addition to, or instead of, the legend, add values and/or percentage to the labels, and define for the percentage values the number of decimal digits to be displayed.

The color that you can select next to the **Draw Outline** check box is used for the optional border drawn around the chart and the individual pie segments. The **Clockwise** check box allows you to specify whether the rows should be listed clockwise or counter-clockwise.
In 3d pie charts, you can draw a drop shadow and define its color, add transparency to the chart, and define the 3d tilt. In 2d charts, the Draw Highlights option adds additional structure to the chart.

**Bar chart**

- Add an outline to the bars and define its color.
- In 2d bar charts, you can also draw a drop shadow and define its color (this option is not available for 3d bar charts).
- By default, the shape of the bars resembles a cylinder, however you can also choose "Vertical Gradient" or "Solid" from the Fill style drop-down list.
- The values of a bar (corresponding to the height of the bar on the Y-axis) can be drawn on the bar. The font of the values can be specified in the Fonts settings.
- The distance between the series of a bar-group and between bar-groups can be specified as a decimal fraction of the width of a single bar. For example, in the screenshot below, which shows bar-groups that each consist of a blue series and a green series, the distance between the series has been set to a 25% (=0.25) of the width of a bar; the distance between bar-groups has been set to 100% (=1.0) of the width of a bar.
Line chart

To draw connection shapes that mark the values in line charts, you need to activate at least one check box in the Draw Connection Shapes group box. You can use five different shapes to mark a series: square, rhomb, triangle, inverted triangle, and circle. If there are more than five series in your chart you can combine the connection shapes by selecting more than one option in the Draw Connection Shapes group box. In the screenshot below, both Filled and Slashed have been selected and the Slashed type is used for the sixth series and beyond.

The Draw Line option enables the graph to be drawn with (i) only connection shapes, or (ii) with connection shapes joined by a line.

Connection shapes are available for both line charts and value line charts.

Area chart

Among the properties that you can change for area charts is transparency; this way you can prevent that one series is hidden by another series in the chart. In addition, you can add an outline to the individual data areas and define its color (see screenshot below).
Candlestick chart

If both opening and closing value are defined as series, you can choose the colors and whether or not the candle should be filled if the closing value is greater than the opening value.
The Start value in the Angles group box defines the position of the 0 mark and the Sweep value is the angle that is used for display. In the Value Range group box you can define the minimum and maximum values to be displayed. Tick marks are displayed with (major ticks) or without (minor ticks) the corresponding value; you can define separate colors for them. In the Colors group box you can define colors for the dial fill, needle, needle base (hides the first part of the needle in the center of the chart), and the border that surrounds the chart. The current value and an extra label can be shown at any angle you like.

10.5.2.3 Colors

Depending on the chart type you have selected, DatabaseSpy provides two different sections for the definition of colors to be used in charts:

- Color Schema for pie, bar, line, area, and candlestick charts
- Color Range for gauge charts

Color Schema

The Color Schema section of the Change Appearance dialog box provides four predefined color
schemas (i.e., default, grayscale, colorful, and pastel) that can be customized; in addition you can also define your own color schema from scratch.

The top color will be used for the first series, then the second color and so on. You can change the order or the colors by selecting a color and dragging it to its new positions with the mouse. To add a new or delete an unwanted color, click the corresponding button. In candlestick charts, only the first color will be used.

If you have appended one or several layers of overlay charts to a Charts window, the Color Schema section of the Change Appearance dialog box contains the additional radio button Use subsequent colors from previous chart layer which is activated by default.

When the radio button is activated, the color schema from the previous layer will be used and you cannot choose a separate color schema for the overlay. The series of the active layer will be displayed using subsequent colors from the color schema of the previous layer. This way, all series of the Charts window have different colors and can therefore be distinguished more easily.

You can break this link on any additional layer that you add and choose a different color schema that then can also be re-used in subsequent layers.

**Color Range**

In gauge charts, you can customize the appearance of the gauge by applying colors to certain value ranges.
The definition shown in the screenshot above will appear in the gauge charts as follows:

10.5.2.4 X-Axis

In the X-axis section of the Change Appearance dialog box, you can enter a label for the axis, and define colors for the axis and the grid lines (if displayed). You can also define whether or not you want to display tick marks and axis values. This section is the same for all bar, line, area, and candlestick charts. The Show Categories options enables you to specify that only a subset of all categories (X-Axis values) are displayed, that is, only the ticks, grid lines, and values of the selected categories will be displayed. Create the subset of displayed categories by entering (i) the index of the first value to display, and (ii) the number of indices to step. For example, if there are 101 categories, from 1900, 1901, 1902 ... 1999, 2000, then you can show every tenth year from 1900 to 2000 by setting First index to 1 and Step to 10.
In Value Line Charts however, you can also define the value range, and define at what interval tick marks should be displayed.
**Label**
The text entered into the Label field will be printed below the axis as a description of the X-axis.

**Range**
By default, the Auto radio button is selected in the Range group box. If you want to display a fragment of the chart in greater detail, activate the Manual radio button and enter minimum and maximum values into the respective fields. If the column that is used for the X-axis does not include zero, you can deactivate the Include Zero check box and the X-axis will start with the minimum value that is available in the series. The Invert Axis option enables you to invert the values of the Y-Axis. For example, if the values run from the 0 to 360, selecting this option will generate the Y-Axis so that 360 is at the origin and the values progress down to 0 as the Y-Axis goes upwards.

**Line**
The axis is displayed in the color that you choose from the Line drop-down-list. You can use one of the preselected colors, or click the Other color... button to choose a standard color or define a custom color. Click the Select... button on the Custom tab and use the pipette to pick a color that is displayed somewhere on your screen.

**Grid lines**
If the Show Grid lines check box is activated, you can choose a color from the corresponding drop-down list box.

**Tick Interval**
If you are not satisfied with the default tick marks, you can activate the Manual radio button in the Tick Interval group box and enter the difference between the individual tick marks into the corresponding field.

**Tick Drawing**
You can switch the display of tick marks on the axis and/or axis values on or off.

**Axis Position**
From the drop-down list, you can choose the position where the axis is to be displayed. When selecting “At Value / On Category Number”, you can also position the axis anywhere within the plot.

### 10.5.2.5 Y-Axis

In the Y-axis section of the Change Appearance dialog box, you can enter a label for the axis, define colors for the axis and the grid lines (if displayed), define the value range, and decide if and where tick marks should be displayed and whether or not you want to show the axis values. This section is the same for all bar and line charts.
Label
The text entered into the Label field will be printed to the left of the axis as a description of the Y-axis.

Range
By default, the Auto radio button is selected in the Range group box. If you want to display a fragment of the chart in greater detail, activate the Manual radio button and enter minimum and maximum values into the respective fields.

If the column that is used for the X-axis does not include zero, you can deactivate the Include Zero check box and the X-axis will start with the minimum value that is available in the series.

The Invert Axis option enables you to invert the values of the Y-Axis. For example, if the values run from the 0 to 360, selecting this option will generate the Y-Axis so that 360 is at the origin and the values progress down to 0 as the Y-Axis goes upwards.

Line
The axis is displayed in the color that you choose from the Line drop-down-list. You can use one of the preselected colors, or click the Other color... button to choose a standard color or define a custom color. Click the Select... button on the Custom tab and use the pipette to pick a color that is displayed somewhere on your screen.

Grid lines
If the Show Grid lines check box is activated, you can choose a color from the corresponding
display drop-down list box.

**Tick Interval**
If you are not satisfied with the default tick marks, you can activate the Manual radio button in the Tick Interval group box and enter the difference between the individual tick marks into the corresponding field.

**Tick Drawing**
You can switch the display of tick marks on the axis and/or axis values on or off.

**Axis Position**
From the drop-down list, you can choose the position where the axis is to be displayed. When selecting “At Value / On Category Number”, you can also position the axis anywhere within the plot.

### 10.5.2.6 Z-Axis

In the Z-axis section of the Change Appearance dialog box, you can enter a label for the axis, define colors for the axis, and decide whether or not you want to show tick marks on the axis. This section is the same for all 3d bar charts (Bar Chart 3d and Bar Chart 3d Grouped).

<table>
<thead>
<tr>
<th>Label</th>
<th>Line</th>
<th>Tick Drawing</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Label Field" /></td>
<td><img src="image" alt="Line Color" /></td>
<td><img src="image" alt="Tick Drawing Options" /></td>
</tr>
</tbody>
</table>

**Label**
The text entered into the Label field will be printed to the right of the axis as a description of the Z-axis.

**Line**
The axis is displayed in the color that you choose from the Line drop-down-list. You can use one of the preselected colors, or click the Other color... button to choose a standard color or define a custom color. Click the Select... button on the Custom tab and use the pipette to pick a color that is displayed somewhere on your screen.

**Tick Drawing**
You can switch the display of tick marks on the axis on or off.
10.5.2.7  3D Angles

In 3d bar charts you can customize the 3d appearance of the chart in the 3d Angles section of the Change Appearance dialog box.

The Tilt value determines the rotation around the X-axis, whereas the Rotation value defines the rotation around the Y-axis. You can automatically adapt the size of the chart axis to the Chart window width by activating the corresponding check box.

If the Automatic Chart Axis Size check box is activated, DatabaseSpy will automatically calculate the optimum size of the X-axis as well as the Y-axis for the current Chart window size. The width and height of the chart will change dynamically when you resize the Chart window.

10.5.2.8  Sizes

In the Sizes section of the Change Appearance dialog box, you can define different margins as well as the size of axis and gauge ticks. Note that not all the properties listed below are available for all chart types.

**General**
- Outside margin: Space between the plot and the edge of the Chart window.
- Title to Plot: Space between the chart title and the upper edge of the plot.
- Legend to Plot: Space between the lower edge of the plot and the legend.

**Pie**
- Plot to Label: In pie charts, the space between the most left and right edge of the pie and its labels.
- Pie Height: In 3d pie charts, the height of the pie.
- Pie Drop: In 3d pie charts, the length of the shadow (if it is activated in the Pie section).
- Shadow:

**X-Axis**
- X-Axis to Axis Label: In 2d bar charts and line charts, the space between the X-axis and the plot.
- X-Axis Tick Size: In bar and line charts, the length of the ticks on the X-axis.

**Y-Axis**
- Y-Axis to Axis: In bar and line charts, the space between the Y-axis and its label.
### Displaying Charts

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Label</strong></td>
<td>In 2d bar and line charts, the space between the Y-axis and the plot.</td>
</tr>
<tr>
<td><strong>Y-Axis to Plot</strong></td>
<td>In bar and line charts, the length of the ticks on the Y-axis.</td>
</tr>
<tr>
<td><strong>Z-Axis</strong></td>
<td>In 3d bar charts, the space between the Z-axis and its label.</td>
</tr>
<tr>
<td><strong>Z-Axis to Axis Label</strong></td>
<td>In 3d bar charts, the length of the ticks on the Z-axis.</td>
</tr>
<tr>
<td><strong>Label</strong></td>
<td>In line charts, the size of the squares that mark the values in the chart.</td>
</tr>
<tr>
<td><strong>Connection</strong></td>
<td>In 3d bar charts, defines the relation between the length of the X-axis and the Chart window size. Please note that the Automatic Chart Axis Size check box in the 3d Angles section must be deactivated, otherwise the size will still be calculated automatically.</td>
</tr>
<tr>
<td><strong>Shape Size</strong></td>
<td>In 3d bar charts, defines the relation between the length of the Y-axis and the Chart window size. Please note that the Automatic Chart Axis Size check box in the 3d section must be deactivated, otherwise the size will still be calculated automatically.</td>
</tr>
<tr>
<td><strong>Z-Axis Series Margin</strong></td>
<td>In 3d bar charts, the distance on the Z-axis between the individual series.</td>
</tr>
<tr>
<td><strong>Gauge</strong></td>
<td>In round gauge charts, the width of the border around the gauge.</td>
</tr>
<tr>
<td><strong>Border Width</strong></td>
<td>In round gauge charts, the space between the inner edge of the border and the ticks that mark the values.</td>
</tr>
<tr>
<td><strong>Border to Tick Distance</strong></td>
<td>In round gauge charts, the length of the major ticks (i.e., ticks that show a label).</td>
</tr>
<tr>
<td><strong>Major Tick Length</strong></td>
<td>In round gauge charts, the width of the major ticks (i.e., ticks that show a label).</td>
</tr>
<tr>
<td><strong>Major Tick Width</strong></td>
<td>In round gauge charts, the length of ticks that do not have a value displayed.</td>
</tr>
<tr>
<td><strong>Minor Tick Length</strong></td>
<td>In round gauge charts, the width of ticks that do not have a value displayed.</td>
</tr>
<tr>
<td><strong>Minor Tick Width</strong></td>
<td>In round gauge charts, the length of ticks that do not have a value displayed.</td>
</tr>
<tr>
<td><strong>Needle Length</strong></td>
<td>In round gauge charts, the length of the needle. (Note that the percentage is calculated from the diameter of the gauge, so if you choose a value greater that 50%, the needle will point to somewhere outside the gauge!)</td>
</tr>
<tr>
<td><strong>Needle Width at Base</strong></td>
<td>In round gauge charts, the width of the needle at the center of the gauge.</td>
</tr>
<tr>
<td><strong>Needle Base Radius</strong></td>
<td>In round gauge charts, the radius of the base that covers the center of the gauge.</td>
</tr>
<tr>
<td><strong>Gauge Color Range</strong></td>
<td>In round gauge charts, the space between the inner edge of the border and the Range Distance outer edge of the color range.</td>
</tr>
</tbody>
</table>
Color Range Width In round gauge charts, the width of the customizable color range. (Note that the percentage is calculated from the diameter of the gauge!)

10.5.2.9 Fonts

The Fonts section of the Change Appearance dialog box lets you configure fonts for objects in the Chart window.

Font settings

You can choose the font face, size, and style for the individual elements displayed in the Chart window. You can define the size as a percentage of the chart size and define a minimum size in points, or specify an absolute value (in points). To apply the same font and/or size to all text elements, activate the respective Use the same for all check box.

The element names in the list box are defined as follows:

- **Title**: The name of a chart
- **Legend**: The key to the colors used in the chart
- **Labels**: The designation of the pies of a pie chart
- **Axis Title**: The name of the X, Y, and Z axis in a bar or line chart
- **Axis Values**: The units displayed on an axis in a bar or line chart
- **Tick Values**: The units displayed on a gauge chart
- **Values**: The values displayed on the bars of a bar chart
Chapter 11

Working with SQL
11 Working with SQL

Altova website: 🌐 SQL editor

The SQL Editor is the area where you can create, display, edit, and execute the SQL statements that are required for your database work. You can save SQL scripts that you have created in the SQL Editor and add them to your project. In addition, you can also open existing SQL files and display them in the SQL Editor.

The SQL Editor is started automatically when you open an SQL file or generate a statement from an existing database object. Apart from that, you can always open a new SQL Editor window as follows:

- Click the SQL Editor icon in the Standard toolbar, or select the menu option **File | New | SQL Editor**, or press **Ctrl+N**.

As soon as an SQL Editor window is active, the SQL Editor menu and toolbars are available. In addition, each SQL Editor window has a toolbar of its own which provides buttons for executing SQL as well as various text selection and display options discussed further in this chapter.

**Note:** A new SQL Editor window is automatically associated with the data source that is active in the Online Browser or Project Window. The active data source is displayed at all times in the Execution Target Bar. That is, all commands issued from SQL Editor will affect this particular data source only. If there are multiple data sources, the SQL Editor belongs to the one which was last clicked before you opened the SQL Editor. Any subsequent SQL Editor windows that you open will inherit the currently active data source.

If there is no data source connected, the SQL Editor window is in the "Offline" state. You can easily change the data source to which the SQL Editor window is connected, as shown below.

**To assign a data source to an SQL Editor window:**

1. Click into the SQL Editor window whose properties you want to change.
2. In the Properties window, select the data source, and, if applicable, the root object.
To jump to the Properties window, click the Unknown or Offline hyperlinks in the Execution Target Bar (provided that the Show/Hide Execution Target Bar button is toggled on). In the image below, no data source is assigned yet to the SQL Editor window, which is why the Execution Target bar displays "Unknown - Offline" as execution target.

You can edit SQL statements in the SQL Editor like in any other text editor using the standard text manipulation commands such as Copy (Ctrl + C), Paste (Ctrl + V), and Cut (Ctrl + X). In addition, the SQL Editor provides features such as syntax coloring, comments, bookmarks, regions, and text highlighting (see SQL Editor Features). Also, the SQL Editor provides advanced Find and Replace functionality, including the ability to search and replace using regular expressions (see Finding and Replacing Text).

The auto-completion feature can assist you with entering statements into SQL Editor (see Auto-completion). You can also drag existing database objects into the SQL Editor window to create SQL statements automatically (see Generating SQL Statements).

When SQL Editor contains multiple statements, you can choose to execute them in bulk, if supported by the database type or driver, or sequentially (see Executing SQL). It is also possible to give custom descriptive names to the resulting tabs (see Naming Result Tabs).

The appearance of SQL statements in the SQL Editor can be configured in the SQL Formatting Configurations dialog box. For example, you can configure to generated SELECT statements so that a line break should always occur before each FROM keyword. The formatting syntax can be fine-tuned not only for each database kind, but also at statement level (see Formatting SQL).

When you need to export only a subset of data from the database, you can write or generate the required SELECT statement in the SQL Editor, and then proceed to exporting results (see Selecting Data for Export). SQL Editor can also be used to create views directly from SQL statements (see Views).

The text displayed in the SQL Editor can be printed and also previewed before printing (see Printing SQL).
## 11.1 Generating SQL Statements

In DatabaseSpy, you can automatically generate SQL statements based on existing objects displayed in the Online Browser. You can either drag a database object from the Online Browser into an SQL Editor window, or right-click a database object in the Online Browser and use the context menu. The objects from which you can generate SQL statements (or extract information such as name and path) are as follows:

- Tables
- Columns
- Keys
- Indexes
- Triggers
- Views
- Procedures
- Functions

The following table shows which SQL statements can be generated (or information be extracted into the SQL Editor) for each database object type.

<table>
<thead>
<tr>
<th></th>
<th>Select</th>
<th>Name</th>
<th>Path</th>
<th>Create</th>
<th>Drop</th>
<th>Add</th>
<th>Alter</th>
<th>Rename</th>
<th>Insert</th>
<th>Update</th>
<th>Delete data</th>
<th>Execute</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-</td>
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<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Note:** The syntax of the statements may vary depending on the database kind you are using.

<table>
<thead>
<tr>
<th>SQL Statement</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select</td>
<td>Creates a SELECT statement that retrieves data from (i) all columns of the source table, (ii) the selected column(s) of the parent table, or (iii) all columns that are included in a view. Basically, this is the same procedure as when selecting Retrieve data from the context menu, however the query is not automatically executed in this case.</td>
</tr>
<tr>
<td>Name</td>
<td>Returns the name of the selected database object. You can also select several objects. The names are printed in individual lines, separated by commas.</td>
</tr>
<tr>
<td>Path</td>
<td>Returns the full path of the selected database object (for example, Database.Schema.Table.Column). You can also select several objects. The paths are printed in individual lines, separated by commas.</td>
</tr>
</tbody>
</table>
| Create | Generates a CREATE statement based on the selected database object. Depending on the selected database object, you have to edit this statement as follows:  
- Edit the **index** name as well as the properties, and enter the appropriate column to create a new index for the parent column of the selected index.  
- Edit the **trigger** name as well as the table that invokes the trigger, and enter the action that is to be triggered.  
- Edit procedure name and parameters, and adapt the body accordingly to create a new **stored procedure**.  
- Edit the **function** name as well as the body of the function. Define additional or remove parameters, if required. |
| Drop | Creates a DROP or ALTER statement, respectively, that deletes the selected database object from the database. |
| Add | Generates an ALTER statement that (i) adds a new column to the parent table of the selected column and uses the name and definition of the selected column as default values, or (ii) adds a constraint and uses the properties of the selected constraint as default. The default values have to be edited. |
| Alter | Generates an ALTER statement that allows you to edit the properties of the selected database object. |
| Rename | Allows you to rename the selected table, column, or view. Change this parameter to the desired new table name.  
**Please note:** This command is not available for Microsoft Access databases. |
| Insert | Allows you to insert data into the selected table, column, or view. By default, no default values specified. You must edit the statement and specify the values that are to be inserted into the table. When inserting data into individual columns, or if the primary key is not included in the view, you must also specify a value for the primary key unless an IDENTITY statement has been used for auto-generation of a primary key when the table was created. |
| Update | Creates an UPDATE statement that updates (i) all columns of the selected table, (ii) the selected column, or (iii) the columns that are included in the selected view. No default is specified for the new values. Note that this command will update all rows with the same values if no WHERE statement is added to select a specific row. |
| Delete data | Generates a DELETE statement that deletes data (i) from the selected table and adds a WHERE clause using the table's primary key to specify the row to be deleted, or (ii) from the parent table of the selected view. Note that this command will delete all rows of the table if no WHERE statement is added. |
| Execute | Declares the parameters needed for execution and creates an EXEC statement that executes the stored procedure with the required parameters. |

**Generating SQL statements with drag and drop**

When you drag a table or column from the Online Browser and drop it into an SQL Editor window, a SELECT statement is generated by default. The kind of statement that should be generated for any database object is configurable in the Online Browser options. For example, you can...
configure that dropping a table into the SQL editor should generate an UPDATE statement, not a SELECT.

**To generate SQL statements using the default configured statement type:**

- Drag and drop one or several database objects from the Online Browser into an existing SQL Editor window. An SQL statement appears in the SQL Editor. Note that one statement per table will be generated if you select objects from different tables.

You can also right-click a database object and drag it into an open SQL Editor window. In this case, when you release the mouse button, a context menu opens from which you can choose the desired statement type to be generated (for example, SELECT, INSERT, UPDATE, etc.).

**To generate SQL statements of specific type:**

1. Right-click one or several database objects in the Online Browser and use drag right to drop the object(s) into an existing SQL window.
2. Select from the context menu the type of SQL statement you want to generate.

You can define several additional options that determine how the generated SQL statement appears in the SQL Editor. In the example below, the **Append semi-colons to statement end** has been activated in the SQL Generation options. This causes the semi-colon character to appear at the end of the statement. Also, the **Enable SQL Formatting for the SQL Editor** has been deactivated in the SQL Formatting options. This causes the FROM keyword to appear on the same line as the SELECT keyword (if SQL formatting had been enabled, a line break would have been automatically inserted before the FROM keyword).

```
SELECT [Address] FROM [ZooDB].[dbo].[tblZookeepers];
```

**Generated SELECT statement**

**Generating statements in a new SQL Editor window**

If you want your SQL statements to be generated in a new SQL Editor window, do the following:

1. Right-click a database object in the Online Browser and select **Show in new SQL Editor** from the context menu.
2. From the sub-menu, select the appropriate statement you want to use (for example, SELECT, INSERT, etc).
11.2 Generating Complete DDL Scripts

DatabaseSpy enables you to generate DDL (Data Definition Language) statements for all objects of a database or schema, as one SQL script. Generating the complete DDL scripts of a database or schema may be useful, for example, if you want to re-create the structure of that schema or database on another server or environment, or if you want to back up the current database structure, or if you want to create a text snapshot of the current database structure for comparing it later to another snapshot.

To generate complete DDL scripts from a schema or database:

1. In Online Browser, identify the folder that is the immediate parent of all "Tables", "Views", "Stored Procedures", etc folders of the current database or schema. For example, if you want to generate the complete DDL scripts of the "dbo" schema in the ZooDB tutorial database, this folder is "dbo". For more information about creating the tutorial ZooDB database, see Creating the Tutorial Database.

   If the current database kind supports multiple schemas (like the ZooDB database above), it is possible to generate DDL scripts for multiple schemas in one operation (each schema in a separate file). To select multiple schemas, click the required schemas while holding the Shift key pressed.

   Note that, in this example, the immediate parent of all tables, views, procedures etc is a schema. However, it may be the root database object (and thus have a different appearance) in other database kinds (since the structure displayed in the Online Browser depends on the kind of the currently connected database).

2. Right-click the folder identified in step 1 ("dbo", in this example), and select the command Show in new SQL Editor | Complete DDL Script from the context menu.

   When you run the Complete DDL Script command, DatabaseSpy analyzes all database objects...
(tables, views, stored procedures, and so on), and then generates their corresponding DDL statements in a new SQL Editor window. If multiple schemas were selected, the corresponding DDL scripts will be in a new SQL Editor window. While DDL statements are being generated, you are informed of the progress in the Output window as well as through a dialog box from where you can also cancel the operation.

Once DDL statement generation is complete, you can save the script to a file (see Opening, Saving, and Closing SQL Files).
11.3 Opening, Saving, and Closing SQL Files

Any file that is stored in the file system can be opened via the File | Open menu (Ctrl+O) and will be displayed under its file name in a new SQL Editor window.

```
1   -- target: animalTypeCountQuery
2   SELECT COUNT (ZooDB.dbo.tblAnimalTypes.EnglishName)
3   FROM ZooDB.dbo.tblAnimalTypes, ZooDB.dbo.tblAnimalCategories
4   WHERE ZooDB.dbo.tblAnimalTypes.Category=ZooDB.dbo.tblAnimalCategories.CategoryID AND
5   ZooDB.dbo.tblAnimalCategories.Category='perch-like';
6
7   -- target: animalNameQuery
8   SELECT EnglishName, LatinName
9   FROM ZooDB.dbo.tblAnimalTypes
10  INNER JOIN ZooDB.dbo.tblAnimalCategories
11  ON ZooDB.dbo.tblAnimalTypes.Category=ZooDB.dbo.
```

If an SQL file that has already been added to the project, it can be opened from the Project window and will be displayed under its file name in a new SQL Editor window. A file that has been added to the Global Resources can be opened via the File | Open | Open Global Resource... menu and will be displayed under its Alias name in a new SQL Editor window.

To open an SQL file:

- Select the menu option File | Open | Open File... or press Ctrl+O. The standard Windows Open dialog box appears. Select an SQL (*.sql) file and click Open.
- In the Project window, in the SQL folder do one of the following:
  - Select an SQL file and double-click the file name.
  - Right-click the file and select Open from the context menu.

The SQL file is displayed in a new SQL Editor window.

To open a global resource:

- Select the menu option File | Open | Open Global Resource... to display the Choose Global Resource dialog box and do one of the following:
  - Select a file-type global resource under the Files directory and click OK. The file is displayed under its Alias name in a new SQL Editor window.
  - Select a folder-type global resource under the Folders folder and click OK. The standard Windows Open dialog box appears and displays the content of the directory that is defined for the active configuration. Select a file and click Open. The file is displayed under its file name in a new SQL Editor window.
Alternatively, do the following:

1. Select the menu option Tools | Global Resources or, in the Global Resources toolbar, click the Manage Global Resources button.
2. Under the Files folder, click the Alias name of the SQL file you want to open.
3. Click the View button. The file is opened with the configuration that is selected in the drop-down list of the Global Resources toolbar. If the selected configuration is not applicable, the SQL file opens with the Default configuration.

Reparsing
It may occur that a script contains parsing errors when it is first displayed in the SQL Editor. If, for example, the execution blocks are not set correctly, such a script would produce an error when being executed. (To check the execution blocks, toggle on the Show groupings for execution icon.) Also the syntax highlighting may not be displayed correctly when the script is initially parsed or edited by the user. To correct such errors, the SQL Editor toolbar provides the Reparse the whole document button.

To correct a SQL script with parsing errors:

- In the SQL Editor toolbar, click the Reparse the whole document button.

Saving and closing
DatabaseSpy offers several options for saving SQL statements in, or closing one or several windows of, the SQL Editor:

- Save: saves the contents of the active window to the file from which it has been opened.
- Save As: pops up the familiar Windows Save As dialog box, in which you enter the name and location of the file you wish to save the active file as.
- Save All: saves all modifications that have been made to any open documents.
- Close: closes the active window.
- Close All: closes all open windows.
- Close All But Active: closes all open windows but leaves the active file open in the SQL Editor.

For all Close commands, if the file was modified (indicated by an asterisk * after the file name in the title bar), you will be asked if you wish to save the file first.

All commands except Close All But Active are available in the File menu, and all commands that affect only one particular window are included in the context menu that opens when you right-click the tab of the respective SQL Editor window.
In addition to the menu commands listed above, you can also use the keyboard shortcut **Ctrl+S** to save the active SQL file.

**Saving SQL scripts**

You can save any SQL that appears in an SQL Editor window and re-use the script later on. If the content of an SQL Editor window has already been saved, the file name appears in the title bar of the SQL Editor window. Unsaved files can be identified by the asterisk to the right of the generic title in the title bar.

A saved SQL script can be made available for all Altova applications by defining it as a global resource. Global resources can be used in all Altova applications that share the same Global Resources XML File.

**To save the content of an SQL Editor window to a file:**

1. Do one of the following:
   - Right-click the tab of the respective SQL Editor window and choose **Save...** from the context menu.
   - Make the SQL Editor window you want to save the active window and press **Ctrl+S**.

2. If you save the file for the first time, choose a name and path for the file in the **Save As...** dialog box and click **Save**.

**To save an SQL file under a new name:**

1. Right-click the tab of the respective SQL Editor window and choose **Save As...** from the context menu.
2. In the **Save As...** dialog box, choose a new name and path for the file and click **Save**.
11.4 Formatting SQL

The appearance of SQL code can be customized separately for each database kind that is supported by DatabaseSpy. In the SQL Formatting page of the Options dialog box, you can furthermore disable this formatting for the SQL Editor and/or the Database Structure Change Script window. Both check boxes are activated by default.

Any changes you make to the default formatting are recorded in a configuration file, at the following path: ..\Documents\Altova\DatabaseSpy2019\SQLFormattingConfigurations.qfmt. Please note that the configuration file is not automatically transferred during upgrades if the installation folder changes. After upgrading to a new major version, you have to copy the configuration file to the new installation folder (..\Documents\Altova\DatabaseSpy<Version>) yourself.

Note: As of version 2009, a new version number is used for configuration files. Therefore, configurations that have been saved in DatabaseSpy 2009 cannot be opened in earlier releases.

The formatting is applied when you generate SQL (see Generating SQL Statements). In addition, you can always click the Apply SQL Formatting to the active SQL Editor button.

You can format the way SQL code is displayed separately for a variety of database kinds:

- MS SQL Server 2005
- MS SQL Server 2008 and greater
- MS Access 2003 and greater
- MySQL 5 and greater
- Oracle 9 and 10
- Oracle 11 and greater
- IBM DB2 8 and greater
- IBM iSeries 5.4 and greater
- IBM Informix 11.1 and greater
- Sybase 12 and greater
- SQLite 3 and greater
- PostgreSQL 8.3 and greater
- Firebird
- Progress OpenEdge
- Any Other Database (ANSI 2003 syntax)

The SQL Formatting Configurations dialog box displays a tree structure which allows you to define either the general formatting options on root level or specify formatting options more specifically for the individual statement types.
In the Preview group box, the options are immediately applied to a sample statement. Selecting a specific statement type in the tree structure displays the relevant part of the sample statement in the Preview group box.

Options on root level

If you select the root level of a database type, you can either deactivate the formatting options for this individual database type (without deactivating the SQL formatting feature as a whole), or define which case should be used for identifiers, functions, and keywords, when to add spacing and blank lines, and how far text should be indented.

To deactivate SQL formatting for a certain database kind:

1. Select the menu option **Tools** | **Options** or press **Ctrl+Alt+O** to open the Options dialog box and click the **SQL Formatting Configurations...** button on the SQL Formatting page.
2. In the SQL Formatting Configurations dialog box, select the respective database kind from the drop-down list in the Configurations group box.
3. In the Options section, select the **Ignore All** check box.

Options for the individual statement types

When you select one of the statement types in the tree structure, the corresponding formatting options are displayed in the window on the right side of the dialog box. Different options are
available for the individual statement types.

The header of the options list provides an icon on the right edge that displays the properties inherited from the root level. If you click the Show inherited properties icon, the options from the root level are displayed and you can change the settings for the selected statement type. Note that these changes apply only to the selected statement type; for all other parts of the statements, the settings defined on the root level are still valid! Options that differ from those defined on root level appear in bold type. These options remain also visible if you click the Hide inherited properties button.

You can customize the display of the following statement types:

- **Select**
  - Statement
  - New line before ORDER BY
  - Select Items List
  - First item on new line
  - Subsequent select list items on new lines
  - FROM Clause
  - New line before FROM
  - First table source on new line
  - Subsequent table sources on new lines
  - WHERE Clause
  - New line before WHERE
  - First search condition on new line
  - Subsequent search conditions on new lines

- **Create Table**
  - Statement
  - First column/key/index/etc. on new line
  - Subsequent columns/keys/indices/etc. on new lines
  - New line before the table definition

- **Create Function**
  - Statement
  - Indent contents

- **Alter Table**
  - Statement
  - New line before (ADD) CONSTRAINT
  - New line before FOREIGN KEY
  - New line before REFERENCES
  - New line before PRIMARY KEY
  - New line before UNIQUE

- **Alter Function**
  - Statement
  - Place BEGIN and END on new lines
  - Indent contents

- **Update**
  - Columns List
  - New line before columns list
  - First column on new line
  - Subsequent columns on new line
WHERE Clause
New line before WHERE
First search condition on new line
Subsequent search conditions on new lines

- **Insert**
  - Columns List
    - New line before columns list
    - First column on new line
    - Subsequent columns on new line
  - Values List
    - New line before values list
    - First value on new line
    - Subsequent values on new line

- **Create Procedure**
  - General Formatting
  - Disable all formatting
  - New line before definition

- **Create Trigger**
  - General Formatting
  - Disable all formatting
  - New line before definition

- **Alter Procedure**
  - General Formatting
  - Disable all formatting
  - New line before definition

- **Create View**
  - General Formatting
  - Disable all formatting
  - New line before definition

- **Alter View**
  - General Formatting
  - Disable all formatting
  - New line before definition

**Note:** Some statement types listed above are not available for configuration when they are not applicable to the selected database kind.

**Removing formatting and comments**

You can remove all additional whitespace and line feeds that have been added by the Format SQL command or because of the default setting for formatting SQL in the SQL Formatting options. The menu option SQL Refactoring | Remove Comments and Formatting not only deletes all these characters but also removes any text that is located between block comments or after line comments.
The left pane shows a SELECT statement when SQL formatting is enabled in the SQL Formatting options and the Whitespace markers and End-of-Line markers options are activated in the Text View Settings. The right pane shows the same statement with the same options after the Remove Comments and Formatting command has been selected.

Removing comments

If you want to get rid of all that text in your statement that has been commented out, you can use the Remove comments option in the SQL Refactoring menu. Any text that is enclosed by block comment characters or appears after a line comment will be deleted from the active SQL Editor window (see screenshot below).
11.5 SQL Editor Features

The SQL Editor has multiple visual aids to make the display, editing and navigation of text easier. These include:

- Line numbers
- Syntax coloring
- SQL statement selection and navigation
- Bookmarks
- Regions
- Source folding
- End-of-Line and whitespace markers
- Zooming
- Word wrapping
- Text highlighting

Where applicable, you can toggle or customize the features above from the **Text View Settings** dialog box. Settings in the **Text View Settings** dialog box apply to the entire application—not only to the active document.

![Text View Settings dialog box](image)

To open the **Text View settings** dialog box, do one of the following:
• On the SQL Editor menu, select **Text View Settings**.
• Right-click the SQL Editor, and select **Text View Settings** from the context menu.

Some of the navigation or viewing aids can also be toggled from the application menu, toolbars, or keyboard shortcuts. For reference to all applicable shortcuts, see the "Key Map" section of the **Text View Settings** dialog box illustrated above.

**Line numbers**
Line numbers are displayed in the line numbers margin, which can be toggled on and off in the **Text View Settings** dialog box. When a section of text is collapsed, the line numbers of the collapsed text are also hidden.

**Syntax coloring**
Syntax coloring is applied according to the semantic value of the text. You can enable or disable syntax coloring from the **Tools | Options** menu, **SQL Editor** group.

**Statement selection and navigation**
The following buttons in the SQL Editor toolbar allow you to select text, depending on where the cursor is positioned.

- **Next statement (Alt+Down):** Selects the statement after the statement where the cursor is currently located.
- **Previous statement (Alt+Up):** Selects the statement before the statement where the cursor is currently located.
- **Last statement (Alt+End):** Selects the last statement in the SQL Editor.
- **First statement (Alt+Home):** Selects the first statement in the SQL Editor.
- **Current statement (Shift+Alt+Enter):** Selects the statement where the cursor is currently located. Alternatively, you can also triple-click into a statement or click into any of the margins, if visible.

**Bookmarks**
Lines in the document can be bookmarked for quick reference and access. If the bookmarks margin is toggled on, bookmarks are displayed in the bookmarks margin.

```
1  SELECT [id], [name], [descr], [deptid], [teacherid],
[upperlimit] FROM [Course];
2  SELECT [id], [name] FROM [Department];
3  SELECT [id], [name] FROM [Teachers];
```

Otherwise, bookmarked lines are highlighted in cyan.
Regions

In the SQL Editor, regions are sections of text that you mark and declare as a unit to structure your SQL scripts. The benefit of regions is that their enclosed text can be easily collapsed or expanded, and thus simplify navigation in long scripts (see also "Source folding" below). It is also possible to nest regions within other regions.

To create a region:

1. In the SQL Editor, select the statements you want to make into a region.
2. Click the Add Region button in the SQL Script toolbar or select the menu option SQL Editor | Insert Region.

To remove a region:

- Delete the -- region and -- endregion comments.

Source folding

Source folding refers to the ability to expand and collapse regions and is displayed in the source folding margin. The margin can be toggled on and off in the Text View Settings dialog box. To expand or collapse portions of text, click the "+" and "-" nodes at the left side of the window. Any
portions of collapsed code are displayed with an ellipsis symbol. To preview the collapsed code without expanding it, move the mouse cursor over the ellipsis. This opens a tooltip that displays the code being previewed, as shown in the image below. Note that, if the previewed text is too big to fit in the tooltip, an additional ellipsis appears at the end of the tooltip.

```
1  -- region Department
2  INSERT INTO [Department] ( [id], [name] ) VALUES ( 0, 'Science' );
3  INSERT INTO [Department] ( [id], [name] ) VALUES ( 1, 'Math' );
4  INSERT INTO [Department] ( [id], [name] ) VALUES ( 2, 'Art' );
5  -- endregion
```

The **Toggle All Folds** command toggles all regions to their expanded or collapsed forms.

### End-of-line markers, whitespace markers

End-of-line (EOL) markers and whitespace markers can be toggled on in the **Text View Settings** dialog box. The image below shows a document where both end-of-line and whitespace markers are visible. An arrow represents a tab character, a "CR" is a carriage return, and a dot represents a space character.

```
1  -- region Department
2  INSERT INTO [Department] ( [id], [name] ) VALUES ( 0, 'Science' );
3  INSERT INTO [Department] ( [id], [name] ) VALUES ( 1, 'Math' );
4  INSERT INTO [Department] ( [id], [name] ) VALUES ( 2, 'Art' );
5  -- endregion
```

### Zooming in and out

You can zoom in and out by scrolling (with the scroll-wheel of the mouse) while holding the Ctrl key pressed. Alternatively, press the "-" or "+" keys while holding the Ctrl key pressed.

### Word wrapping

To toggle word wrapping in the currently active document, select the **SQL Editor | Word Wrap** menu command, or click the **Word Wrap** toolbar button.

### Text highlighting

When you select text, all matches in the document of the text selection that you make are highlighted automatically. The selection is highlighted in pale blue, and matches are highlighted in pale orange. The selection and its matches are indicated in the scroll bar by gray marker-squares. The current cursor position is given by the blue cursor-marker in the scroll bar.
To switch text highlighting on, select **Enable auto-highlighting** in the Text View Settings dialog box. A selection can be defined to be an entire word or a fixed number of characters. You can also specify whether casing should be taken into account or not.

For a character selection, you can specify the minimum number of characters that must match, starting from the first character in the selection. For example, you can choose to match two or more characters. In this case, one-character selections will not be matched, but a selection consisting of two or more characters will be matched. So, in this case, if you select `t`, then no matches will be shown; selecting `ty` will show all `ty` matches; selecting `typ` will show all `typ` matches; and so on.
11.6 Executing SQL

SQL statements that have been created in the SQL editor or SQL files that have been opened in the SQL Editor can be executed directly from the SQL Editor. The Execute command can be called via the SQL Editor menu, via a keyboard shortcut or by clicking a toolbar icon.

To execute SQL in an SQL Editor window:

1. Make the SQL Editor window in which you want to execute SQL the active window.
2. Optionally, select the statement or statements you want to execute.
3. Click the Execute button, or select the menu option SQL Editor | Execute, or press F5.
   If the data source is not connected, a popup message is displayed asking whether you would like to connect to the data source (provided that the SQL file is not set to Offline).
4. If applicable, click Yes in the message box to connect to the data source.
   All SQL statements that are in the SQL Editor, or the selected statements, respectively, are executed. The results appear in separate result windows, one for each statement.
5. Click the respective tabs to access the individual results.

Alternatively, you can also execute SQL scripts in the Project window if the SQL files are included in the project.

To execute an SQL file:

1. In the Project window, select an SQL file that you want to execute.
2. Right-click the file and choose Execute SQL from the context menu. If the data source is not connected, a popup message is displayed asking whether you would like to connect to the data source.
3. If applicable, click Connect in the message box to connect to the data source. The SQL script opens in a new SQL Editor window and is executed immediately.

Execute for Data Editing
When supported in the active data source connection, you can also execute a SELECT statement for data editing in the Result window. In this case, the Execute for Data Editing button will be enabled in the toolbar of the SQL Editor and the Execute for Data Editing command will be available in the SQL Editor menu.

To execute SELECT statements for data editing:

1. Generate a SELECT statement in an SQL Editor window that is connected to a data source that supports data editing from within the SQL Editor.
2. Click the Execute for Data Editing button or select the menu option SQL Editor | Execute for Data Editing. The Result window is switched into the Editing mode and you can edit the database data directly in the result grid.
Asynchronous execution and retrieval
DatabaseSpy uses asynchronous execution and retrieval when a query is started in the SQL Editor or from within a Design Editor or Data Comparison window. While the execution is in progress, DatabaseSpy displays a message in the Message window.

<table>
<thead>
<tr>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>Execution in progress...</td>
</tr>
</tbody>
</table>

In large databases, you can cancel the execution by clicking the Stop Execution/Retrieval button in the SQL Editor toolbar while the execution is in progress and retrieval has not yet been started. This way, you can abort an execution when you notice that the retrieval would take too much time, and refine the query.

After you have canceled an execution or retrieval, an "Execution was cancelled" message is displayed in the status bar of the Result window, and you can edit your query as required and restart the execution.

Defining the execution mode
You can choose whether you want to send the SQL that is contained in the active SQL Editor window to the database engine as a whole, or as separate batches. The Properties window provides the options SQL Editor should require semicolons and Group statements for execution with for this purpose.

The Group statements for execution with list provides the following options:

- **Semicolons**: The parser uses semicolons as statement separator. Any SQL code that is terminated by a semicolon is considered a statement and sent to the server separately. If semicolons are missing from your SQL script, a dialog box may prompt you to add them automatically.
- **No Grouping**: The script is sent to the server as a whole, without any modification. If the script contains multiple statements, and if the driver is known not to support executing multiple statements in bulk, this option is not meaningful. In this case, a dialog box may prompt you about this limitation.
- **SQL Grammar**: The respective flavor of SQL grammar is used to separate the statements when sending them to the server.
- **GO keyword**: A GO keyword must be present in the SQL script to separate execution blocks.

Showing execution groups
The toolbar in the SQL Editor provides the Show groupings for execution button which allows for a graphical illustration of the statement blocks that will be sent to the database engine for execution.
In the screenshot above, the groupings for execution are displayed when the "Semicolons" option is selected in the Group statements for execution with drop-down list.

Execution timeout
You can define a timeout for the execution of queries in the Retrieval settings group box of the SQL Editor options. DatabaseSpy will attempt to stop retrieving data after the specified amount of time has elapsed. Note that the database kind and database driver must support setting a command timeout; otherwise, the query will continue running beyond the timeout period. In this case, you can stop execution using the Stop Execution/Retrieval button; however, be aware that some drivers might not support cancelling the execution.

Abort execution on error
When the SQL Editor window is open, the Properties window includes a property called Abort execution on error. This option may be useful when you execute SQL scripts that contain multiple statements, and, if any statement fails, you would like the execution to stop at the corresponding statement. To enable this behavior, select the Abort execution on error check box.
Consider the following example: you would like to run against the database a script which contains multiple INSERT statements. If the **Abort execution on error** check box is enabled, and an INSERT statement fails, the script will stop running at the INSERT statement which failed. In this case, any subsequent INSERT statements will not be executed. If the **Abort execution on error** check box is disabled, and an INSERT statement fails, the script will proceed to executing the rest of the INSERT statements, until the end of the script.

The execution status of the script (including the number of affected rows) can be viewed in the Message window, along with additional information about the error which occurred (if any). Click the underlined text in the Messages window to jump to the corresponding line in the SQL Editor.
11.7 Auto-Completion

When entering an SQL statement in the SQL Editor, auto-completion helps you by offering lists of appropriate keywords, data types, identifiers, separators, and operators depending on the type of statement you are entering. By default, auto-completion is invoked automatically in certain contexts (for example, when you start typing a statement).

Auto-completion

Use the Up and Down keyboard keys to navigate through the list of suggestions. To pick a suggested entry, click it or press Enter.

To disable auto-completion suggestions:

1. On the Tools menu, click Options (or press Ctrl+Alt+O).
2. Click SQL Editor.
3. Under Entry Helpers, clear the Automatically open check box.

To invoke auto-completion suggestions manually as and when required:

- In the SQL Editor, press Ctrl+Space.

For example, in the image below, auto-completion has been invoked manually by pressing Ctrl+Space. The goal here is to quickly select a table available in the [dbo] schema of a SQL Server database.

Auto-completion invoked manually

The object types that may appear in the auto-completion window can be identified by icon type, as follows:
- Schemas
- Tables
- Views
- Columns
- Functions
- Data types
- Procedures
- Keywords
- Separators
11.8 Commenting Out Text

In the SQL Editor it is possible to comment out statements, parts of statements, or groups of statements. These statements, or the respective parts of them, will be skipped when the SQL script is being executed.

To comment out a section of text:

1. Select a statement or part of a statement.

```sql
-- target: AnimalNameQuery
SELECT EnglishName, LatinName
FROM ZooDB.qa_usr.tblAnimalTypes
INNER JOIN ZooDB dbo.tblAnimalCategories
ON ZooDB.qa_usr.tblAnimalTypes.Category=ZooDB dbo.tblAnimal
AND ZooDB dbo.tblAnimalCategories.Category='perch-like'
ORDER BY LatinName ASC
```

2. Click the Comment/Uncomment selected block button in the SQL Script toolbar or select Insert | Insert/Remove Block Comment from the SQL Editor menu. The statement is commented out.

```sql
-- target: AnimalNameQuery
SELECT EnglishName, LatinName
FROM ZooDB.qa_usr.tblAnimalTypes
INNER JOIN ZooDB dbo.tblAnimalCategories
ON ZooDB.qa_usr.tblAnimalTypes.Category=ZooDB dbo.tblAnimal
/*AND
ZooDB dbo.tblAnimalCategories.Category='perch-like'*/
ORDER BY LatinName ASC
```

To comment out text line by line:

1. Put the cursor in a statement at the point from which you want to comment it out.

```sql
-- target: AnimalNameQuery
SELECT EnglishName, LatinName
FROM ZooDB.qa_usr.tblAnimalTypes
INNER JOIN ZooDB dbo.tblAnimalCategories
ON ZooDB.qa_usr.tblAnimalTypes.Category=ZooDB dbo.tblAnimal
AND
ZooDB dbo.tblAnimalCategories.Category='perch-like'
ORDER BY LatinName ASC
```

2. Click the Comment/Uncomment selected lines button in the SQL Script toolbar or select Insert | Insert/Remove Line Comment from the SQL Editor menu. The
statement is commented out from the current position of the cursor to the end of the line.

```
-- target: AnimalNameQuery
SELECT EnglishName, LatinName
FROM ZooDB.qa_usr.tblAnimalTypes
INNER JOIN ZooDB.dbo.tblAnimalCategories
ON ZooDB.qa_usr.tblAnimalTypes.Category=ZooDB.dbo.tblAnimalCategories.Category='perch-like'
-- ORDER BY LatinName ASC
```

To remove a block comment or a line comment:

1. Select the part of the statement that is commented out. If you want to remove a line comment, it is sufficient to select only the comment marks `--` before the comment.
2. Do one of the following:

   - Click the Comment/Uncomment selected block button in the SQL Script toolbar or select Insert | Insert/Remove Block Comment from the SQL Editor menu.
   - Click the Comment/Uncomment selected lines button in the SQL Script toolbar or select Insert | Insert/Remove Line Comment from the SQL Editor menu.
11.9 Naming Result Tabs

When you execute a script that contains more than one SELECT query, the results of each query are displayed in separate result windows. By default, these windows are called "Result1", "Result2", etc. Using targets, you can specify more meaningful names for query result windows.

Prerequisites

- The Show multiple results stacked option must be switched off.
- Select either "Semicolons" or "SQL Grammar" in the Group statements for execution with drop-down list in the Properties window. Otherwise, the query is still executed, but the results are displayed in unnamed result tabs.

To name a target result window:

1. Place the cursor anywhere in the SELECT statement. Click the Current statement button (Shift+Alt+Enter) in the SQL Editor window. This selects the entire statement.

2. Click the Define Target Name button in the SQL Script toolbar. The text -- target: Result appears above the statement.

   ```sql
   -- target: Result
   SELECT [ZookID], [FirstName], [LastName], [Address], [City], [State], [Telephone], [DOB] FROM [ZooDB].[dbo].[tbl2zookeepers];
   ```

3. Change the text "Result" as desired.

   ```sql
   -- target: zookeepers
   SELECT [ZookID], [FirstName], [LastName], [Address], [City], [State], [Telephone], [DOB] FROM [ZooDB].[dbo].[tbl2zookeepers];
   ```

4. In the Properties window, make sure that either "Semicolons" or "SQL Grammar" is selected in the Group statements for execution with drop-down list.

5. Click the Execute button or press F5.

   The results appear in a Result window that has a tab with the text that you specified as target, e.g., zookeepers.
```sql
-- target: zookeepers
SELECT [ZooID],[FirstName],[LastName],
       [Address],[City],[State],[Telephone],[DOB]
FROM [ZooDB].[dbo].[tblZookeepers];
```

<table>
<thead>
<tr>
<th>ZooID</th>
<th>FirstName</th>
<th>LastName</th>
<th>Address</th>
<th>City</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Annette</td>
<td>Bearug</td>
<td>451 Capybara Lane</td>
<td>Newark</td>
<td>NJ</td>
</tr>
<tr>
<td>2</td>
<td>Bob</td>
<td>Barker</td>
<td>68 Cego Boulevard</td>
<td>Philadelphia</td>
<td>PA</td>
</tr>
<tr>
<td>3</td>
<td>Oliver</td>
<td>Birdsong</td>
<td>987 Flamingo Avenue</td>
<td>Harrisburg</td>
<td>PA</td>
</tr>
<tr>
<td>4</td>
<td>Jenny</td>
<td>Lionheart</td>
<td>276 Cheetah Street</td>
<td>Sayre</td>
<td>PA</td>
</tr>
</tbody>
</table>

Execution was successful.
Rows: 15, Cols: 8  0.250 sec  10:47:39
11.10 Finding and Replacing Text

To start a search in the SQL Editor, press Ctrl+F (or select the menu command Edit | Find). You can then search in the entire document or within a text selection for a search term that you enter in the dialog.

- Enter a string to find, or use the combo box to select a string from one of the last 10 strings.
- When you enter or select a string to find, all matches are highlighted and the positions of the matches are indicated by beige markers in the scroll bar.
- The currently selected match has a different highlight color than the other matches, and its position is indicated in the scroll bar by the dark blue cursor-marker.
- The total number of matches is listed below the search term field, together with the index position of the currently selected match. For example, **2 of 4** indicates that the second of four matches is currently selected.

- You can move from one match to the next, in both directions, by selecting the **Previous** (Shift+F3) and **Next** (F3) buttons at bottom right.

- To switch between the Find and Replace modes, click the down-arrow button at top left.

- To close the Find dialog, click the **Close** button at top right, or press **Esc**.

Note the following points:

- The Find dialog is **modeless**. This means that it can remain open while you continue to use Text View.
- If text is selected prior to opening the dialog box, then the selected text is automatically inserted into the search term field.
- To search within a selection, do the following: (i) Mark the selection; (ii) Toggle on the **Find in Selection** option to lock the selection; (iii) Enter the search term. To search within another selection, unlock the current selection by toggling off the **Find in Selection** option, then make the new selection and toggle on the **Find in Selection** option.
- After the Find dialog is closed, you can repeat the current search by pressing **F3** for a forward search, or **Shift+F3** for a backward search. The Find dialog will appear again in this case.
Find options
Find criteria can be specified via buttons located below the search term field. When an option is toggled on, its button color changes to blue. You can select from the following options:

<table>
<thead>
<tr>
<th>Option</th>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Match case</td>
<td>![Aa]</td>
<td>Performs a case-sensitive search when toggled on (&quot;Address&quot; is not the same as &quot;address&quot;).</td>
</tr>
<tr>
<td>Match whole word</td>
<td>![Abc]</td>
<td>Only the exact words in the text will be matched. For example, for the input string fit, with Match whole word toggled on, only the word fit will match the search string; the fit in fitness, for example, will not.</td>
</tr>
<tr>
<td>Regular expression</td>
<td>![.*)]</td>
<td>If toggled on, the search term will be read as a regular expression. See &quot;Using regular expressions&quot; below.</td>
</tr>
<tr>
<td>Find anchor</td>
<td>![I]</td>
<td>When a search term is entered, the matches in the document are highlighted and one of these matches will be marked as the current selection. The Find anchor toggle determines whether that first current selection is made relative to the cursor position or not. If Find anchor is toggled on, then the first currently selected match will be the next match from the current cursor location. If Find anchor is toggled off, then the first currently selected match will be the first match in the document, starting from the top.</td>
</tr>
<tr>
<td>Find in selection</td>
<td>![E]</td>
<td>When toggled on, locks the current text selection and restricts the search to the selection. Otherwise, the entire document is searched. Before selecting a new range of text, unlock the current selection by toggling off the Find in Selection option.</td>
</tr>
</tbody>
</table>

Using regular expressions
You can use regular expressions (regex) to find a text string. To do this, first, switch the Regular expression option on. This specifies that the text in the search term field is to be evaluated as a regular expression. Next, enter the regular expression in the search term field. For help with building a regular expression, click the Regular Expression Builder button, which is located to the right of the search term field. Click an item in the Builder to enter the corresponding regex metacharacter/s in the search term field. The screenshot below shows a simple regular expression to find email addresses.
The following custom set of regular expression metacharacters are supported when finding and replacing text.

<table>
<thead>
<tr>
<th>Character</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>.</td>
<td>Matches any character. This is a placeholder for a single character.</td>
</tr>
<tr>
<td>(abc)</td>
<td>The ( and ) metacharacters mark the start and end of a tagged expression. Tagged expressions may be useful when you need to tag (&quot;remember&quot;) a matched region for the purpose of referring to it later (back-reference). Up to nine sub-expressions can be tagged (and then back-referenced later). For example, \1 matches the string the the. This expression can be literally explained as follows: match the string &quot;the&quot; (and remember it as a tagged region), followed by a space character, followed by a back-reference to the tagged region matched previously.</td>
</tr>
<tr>
<td>\n</td>
<td>Where n is 1 through 9, n refers to the first through ninth tagged region (see above). For example, if the search string was Fred([1-9])XXX and the replace string was Sam\1YYY, when applied to Fred2XXX this would generate Sam2YYY.</td>
</tr>
<tr>
<td>&lt;&gt;</td>
<td>Matches the start of a word.</td>
</tr>
<tr>
<td>&gt;</td>
<td>Matches the end of a word.</td>
</tr>
<tr>
<td>\</td>
<td>Escapes the character following the backslash. In other words, the expression \x allows you to use the character x literally. For example, \a would be interpreted as a and not as the start of a character set.</td>
</tr>
<tr>
<td>[...]</td>
<td>Matches any characters in this set. For example, [abc] matches any of the characters a, b or c. You can also use ranges: for example [a-z] for any lower case character.</td>
</tr>
<tr>
<td>[^...]</td>
<td>Matches any characters not in this set. For example, [^A-Za-z] matches any character except an alphabetic character.</td>
</tr>
<tr>
<td>^</td>
<td>Matches the start of a line (unless used inside a set, see above).</td>
</tr>
<tr>
<td>$</td>
<td>Matches the end of a line. For example, A+$ matches one or more A’s at end of line.</td>
</tr>
<tr>
<td>*</td>
<td>Matches zero or more occurrences of the preceding expression. For example, Sa*m matches Sm, Sam, Saam, Saaam and so on.</td>
</tr>
</tbody>
</table>
Finding and Replacing Text

To replace text, do the following:

1. Press Ctrl+H (or select the menu command Edit | Replace) to open the Replace dialog. (Alternatively, you can switch to Replace mode of the Find/Replace dialog by clicking the down-arrow button at the top left of the dialog.)

2. Enter the string to be replaced in the Find field, and enter the new string in the Replace field. The number of text matches to replace and the index of the currently selected match is displayed below the Replace field. Also, the locations of matches are indicated in the scroll bar by beige markers.

3. The Replace Next and Replace All buttons are located to the right of the Replace field. If you click Replace Next, one of the following happens: (i) If the cursor is located adjacent to a match or inside a match, then the match is replaced; (ii) if the cursor is located outside a match, it jumps to the next match. Click Replace All to replace all matches.

Note the following points:

- To replace text within a selection—rather than the entire document—do the following: (i) Mark the selection; (ii) Toggle on the Find in Selection option to lock the selection; (iii) Enter the Find and Replace text strings; (iii) Click Replace Next or Replace All as required. To replace text within another selection, unlock the current selection by toggling off the Find in Selection option, then make the new selection and toggle on the Find in Selection option to lock the new selection.
- To undo a replace action, press Ctrl+Z or select Edit | Undo.

Finding and replacing special characters

You can search for any of the following special characters within text, provided that the Regular expression option is enabled:

- \t (Tab)
- \r (Carriage Return)
- \n (New line)
- \ (Backslash)

For example, to find a tab character, press Ctrl + F, select the \t option, and then enter in the Find dialog box.
The special characters above can also be used as replacement text. For example, to replace all occurrences of semi-colon by carriage returns within the text "A;B;C;D", use the following find and replace options:

```
\r
```

The outcome is:

```
A
B
C
D
```
11.11 Selecting Data for Export

In addition to DatabaseSpy’s powerful export function, you can use SELECT statements to retrieve data from a table and export only this particular data to a range of file formats such as XML or HTML. The SQL Editor window provides an additional Export button to open the Export database data dialog box to facilitate this. When you click this button, the dialog box opens with the SQL radio button activated and the content of the SQL Editor window inserted into the Source group box.
Note: Clicking the Export button in the Tools toolbar will also open the Export database data dialog box. However, in this case the Table radio button will be preselected and you would have to type in or paste the SQL code manually.
To export data using SQL statements in an SQL Editor window:

1. Make the SQL Editor window whose SQL statements you want to use for export the active window.
2. Press the Export button in the SQL Editor window.
   The Export database data dialog box opens. The SQL statements that are currently in the SQL Editor appear in the Source group box.
3. Optionally, enter a file prefix that will be added to the file name.
4. Do one of the following:
   - Activate the Path radio button and enter the Path you want the destination files to appear in.
   - Activate the Export to XMLSpy radio button if you want your exported data to be displayed in XMLSpy. Note that this option is not available for export to Excel files, or if XMLSpy is not installed on your computer.
5. Optionally, click the Options tab to change the options for XML, XML Structure, CSV, HTML, or Excel.
6. Click the Export button when all the settings are correct.
7. Click OK. The data is exported as Table1 in the desired format and either stored under the path you specified or opened in XMLSpy for further editing.
11.12 Printing SQL

You can print the content of the SQL Editor like in any other text editor. When turning on the line numbers margin, you can also print out line numbers.

**Note:** The source folding margin has no effect on the print-out (that is, the expand/collapse icons will not show up in the print-out). If any bookmarks are defined in the bookmark margin, the line where the bookmark occurs will appear highlighted on the printed page.

A print preview is available for you to check the layout of the printed page before sending it to the printer.

To print the content of an SQL Editor window:

1. Click in the SQL Editor window to make it active.
2. Select the menu option **File | Print...**, or press **Ctrl+P**, or click the **Print** icon in the **Standard toolbar**.
3. In the **Print range** group box, define whether you want to print all or specific pages or only the selected part of the SQL.
4. Optionally, define the printer setup by clicking the **Properties** button.
5. Click **OK**.

To preview SQL before printing:

1. Click in the SQL Editor window to make it active.
2. Select the menu option **File | Print Preview**.
3. In the print preview, do one of the following:
   - Click the **Print** button to print the file.
   - Click **Close** to return to the SQL Editor.
11.13 SQL Templates

With DatabaseSpy Enterprise Edition, you can create and run SQL statements which contain parameters (subsequently referred to as "SQL Templates"). The only difference between standard SQL queries and SQL templates is that the latter contain parameter placeholders. For example, the SELECT statement below is a template which defines two parameters, :color and :size.

```
SELECT id FROM products WHERE color = :color AND size > :size;
```

You can define parameters not only in SELECT statements but also in other statement types (such as INSERT or UPDATE). For example, an INSERT statement with parameters could look like:

```
INSERT INTO users (first_name, last_name, email, created_at, updated_at) VALUES (:fname, :lname, :email, CURRENT_TIMESTAMP, NULL);
```

INSERT templates such as the one above can greatly simplify the transfer of large amounts of data from one table or view to another (even across various databases). Specifically, when you need to populate a table, multiple INSERT statements can be generated in a few simple steps from the given template, as further described below.

Note the following:

- In order to be recognized by DatabaseSpy as such, parameters within SQL statements must be preceded by a colon (:) character.
- Parameters may substitute values inside statements; however, in order to prevent SQL injections, they may not be used to substitute SQL reserved keywords or identifiers (such as column or table names).
- Parameters are by default treated as text, and parameterized queries will fail with certain database connections unless you explicitly change the parameter type (see the next section below, "Changing the parameter type").

Changing the parameter type

By default, parameters are treated as type text or varchar, which makes parameterized queries fail with certain database drivers (for example, with ADO.NET or JDBC connections to SQL Server). In such cases, you can explicitly specify the type, and, if applicable, the precision, scale, or the size of the parameter by adding a comment immediately after the parameter.

For string types, consider the following example:

```
SELECT [col1], [col2]
FROM [mytable] WHERE col1 = :p1 /*# varchar, size:max */
```

In the code listing above, the parameter type is explicitly set as varchar and its size is set to max. The modifier length can also be used instead of size.

For numeric types, consider the following example:
In the code listing above, the type of parameter p1 is explicitly set as `decimal`, the `precision` (total number of digits) is set to 23, and the `scale` (number of digits right of the decimal point) is set to 4. You can also use the short name `prec` for precision. Both `precision` and `scale` require integer values.

Below are a few other examples of attributes that may follow a parameter (make sure to adjust the details as required by your database):

```sql
/*# float */
/*# decimal, precision:23, scale:4 */
/*# decimal, prec:23, scale:4 */
/*# varchar, size:max */
/*# nvarchar, size:32 */
/*# varchar, length:255 */
/*# number, precision:38, scale:0 */
```

Note the following:

- The character # explicitly instructs DatabaseSpy to handle the corresponding parameter with the declared type and size.
- The data type and the attributes following it must be separated by a comma. Each attribute must also be separated by a comma.
- Attributes other than `prec` or `precision`, `scale`, `size` or `length` will not be recognized. All, some, or none of these attributes may be required in order to run the parameterized query successfully, depending on the database driver and how much information it is able to determine automatically when the statement is prepared.

**Running a query with parameters**

1. Enter or generate a SQL statement in SQL Editor, and make sure that it contains at least one parameter. For example, the `INSERT` statement below contains three parameters:
2. Click the **Execute** or **Execute for Data Editing** button in the SQL Editor's toolbar.

3. Fill in the required parameter values, for example:

![Parameter values window](image)

You can also supply multiple parameter rows to the query. To do this, click either the **Append New** or **Insert New** button. The **Append New** button adds a parameter row after all existing rows, while **Insert New** inserts a parameter at the current position (for example, between two existing rows).
4. Click **OK**. DatabaseSpy executes the query with supplied parameters and displays the execution result in the **Result** tab.

Note the following:

- If the SQL Editor contains multiple SQL statements, the "Parameter values" dialog box contains a tab for each SQL statement where parameters exist. Also, multiple **Result** tabs are displayed after you run the query (one **Result** tab for each statement containing parameters).
- DatabaseSpy remembers the last 25 parameter values entered in the "Parameter Values" dialog box. To use a previous value, select it from the drop-down list available for each parameter.

**Saving parameterized queries as SQL Template**

A query which contains parameters can be saved for later use, similar to how this works for standard SQL files. To save the contents of the SQL Editor as SQL template, do one of the following:

- In the **File** menu, click **Save** (or **Save As**).
- Click the **Save** toolbar button.
- Press **Ctrl + S**.

SQL template files are saved with .sql extension, like other SQL scripts. To help you distinguish between SQL templates and other SQL scripts, the DatabaseSpy project contains a specially designated folder called "SQL Templates".
All SQL templates created for the project must be in the "SQL Templates" folder. Only when a SQL template is inside the "SQL Template" folder can DatabaseSpy execute it with values, as further described below.

Executing SQL templates
You can execute SQL templates against sets (rows) of dynamically supplied values. Executing a SQL template means that DatabaseSpy replaces all parameter placeholders found in the template with the values you supply, creates a new SQL statement for each value (or row of values, depending on the case), and runs it against the database. As a result, it is possible to generate and run a very large number of SQL statements with a click of a button.

Prerequisites
1. Create a SQL Template by typing it in the SQL Editor window. For example, the SQL template below takes three parameters: :fname, :lname, and :email.

   ```sql
   INSERT INTO users (first_name, last_name, email, created_at, updated_at)
   VALUES (:fname, :lname, :email, CURRENT_TIMESTAMP, NULL);
   ```

   As an alternative to typing the statement, you can also right-click a table in the Online Browser, generate the INSERT statement, and modify it to add the required parameters, see Generating SQL Statements.

2. Save the SQL Template and add it to your DatabaseSpy project. The SQL template must be inside the "SQL Templates" folder of the project.

   At this stage, you can also test whether the new SQL Template executes successfully, by
running it with some manually-entered parameters. To test the SQL template, click **Execute** and enter the required parameters when prompted, see Running a query with parameters.

To execute a template with values:

1. Connect to a data source and retrieve data from the table which contains the values you want to supply as input to the SQL template (for example, right-click a table in the Online Browser, and select **Edit Data** from the context menu).
2. Hold the **Ctrl** key pressed and select one or more cells from the **Results** grid. To select multiple columns, click on their header while holding the **Ctrl** key pressed. The SQL template will be executed as many times as there are rows in the selection. Note that the number of selected columns must correspond to the number of parameters that the SQL template accepts, therefore:
   - If the template accepts only one parameter, all the selected cells (one or more rows) must be in the same column.
   - If the template accepts multiple parameters, there must be as many selected columns as there are parameters.

   For example, for an INSERT template with three parameters like the one illustrated above, the following selection is valid:

<table>
<thead>
<tr>
<th>id</th>
<th>first_name</th>
<th>last_name</th>
<th>email</th>
<th>created_at</th>
<th>updated_at</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Marquita</td>
<td>Bailey</td>
<td><a href="mailto:m.bailey@nanonull.com">m.bailey@nanonull.com</a></td>
<td>2017-08-14 08:36:39</td>
<td>[NULL]</td>
</tr>
<tr>
<td>2</td>
<td>Sharda</td>
<td>Junker</td>
<td><a href="mailto:s.junker@nanonull.com">s.junker@nanonull.com</a></td>
<td>2017-08-14 08:36:39</td>
<td>[NULL]</td>
</tr>
<tr>
<td>3</td>
<td>Totie</td>
<td>Rea</td>
<td><a href="mailto:t.rea@nanonull.com">t.rea@nanonull.com</a></td>
<td>2017-08-14 08:36:39</td>
<td>[NULL]</td>
</tr>
<tr>
<td>4</td>
<td>Tobie</td>
<td>Hughey</td>
<td><a href="mailto:t.hughey@nanonull.com">t.hughey@nanonull.com</a></td>
<td>2017-08-14 08:36:39</td>
<td>[NULL]</td>
</tr>
<tr>
<td>5</td>
<td>Edith</td>
<td>Lafreniere</td>
<td><a href="mailto:e.lafreniere@nanonull.com">e.lafreniere@nanonull.com</a></td>
<td>2017-08-14 08:36:39</td>
<td>[NULL]</td>
</tr>
</tbody>
</table>

   A selection of multiple rows which are not necessarily consecutive is also valid, for example:

<table>
<thead>
<tr>
<th>id</th>
<th>first_name</th>
<th>last_name</th>
<th>email</th>
<th>created_at</th>
<th>updated_at</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Marquita</td>
<td>Bailey</td>
<td><a href="mailto:m.bailey@nanonull.com">m.bailey@nanonull.com</a></td>
<td>2017-08-14 08:36:39</td>
<td>[NULL]</td>
</tr>
<tr>
<td>2</td>
<td>Sharda</td>
<td>Junker</td>
<td><a href="mailto:s.junker@nanonull.com">s.junker@nanonull.com</a></td>
<td>2017-08-14 08:36:39</td>
<td>[NULL]</td>
</tr>
<tr>
<td>3</td>
<td>Totie</td>
<td>Rea</td>
<td><a href="mailto:t.rea@nanonull.com">t.rea@nanonull.com</a></td>
<td>2017-08-14 08:36:39</td>
<td>[NULL]</td>
</tr>
<tr>
<td>4</td>
<td>Tobie</td>
<td>Hughey</td>
<td><a href="mailto:t.hughey@nanonull.com">t.hughey@nanonull.com</a></td>
<td>2017-08-14 08:36:39</td>
<td>[NULL]</td>
</tr>
<tr>
<td>5</td>
<td>Edith</td>
<td>Lafreniere</td>
<td><a href="mailto:e.lafreniere@nanonull.com">e.lafreniere@nanonull.com</a></td>
<td>2017-08-14 08:36:39</td>
<td>[NULL]</td>
</tr>
</tbody>
</table>

3. Right-click the selection and select **Execute template with values** from the context menu. All generated statements are displayed in the SQL Editor and executed.
11.14 Conditional Formatting

When you run SELECT statements in the SQL Editor, the retrieved data is displayed in the Result window (or multiple Result windows, if multiple queries were executed). You can change the appearance of retrieved data (such as color, background, font weight) based on custom SQL conditions. For example, you can have certain values in the Result grid formatted with yellow background if they exceed some threshold.

The image below illustrates an example of conditional formatting in a SQLite database. This example project is available at the following path: Altova\DatabaseSpy2019\DatabaseSpyExamples\Tutorial\NanonullEnterprise.qprj. In this example, the goal is to apply conditional formatting as follows:

- Records where the quantity exceeds 200 must have coral background and bold font
- Records where the quantity is less than 10 must have turquoise background and italic font.

```
SELECT "id",
   "name",
   "quantity",
   CASE
     WHEN "quantity" > 200
       THEN 'font:bold;background-color:coral;'
     WHEN "quantity" < 10
       THEN 'font:italic;background-color:#AEEE;' 
   END AS "DbSpyRowSettings"
FROM "main"."products";
```

As illustrated above, in order to support conditional formatting, the SQL statement must include...
an alias column that must be conventionally named **DbSpyRowSettings**. This instructs DatabaseSpy to process this column as conditional formatting instructions. Note that the alias column consists of a "CASE" construct. The WHEN branch is the SQL expression where you supply the condition to check for, in the corresponding database grammar. The THEN branch is a string that specifies formatting styles such as font weight or background color. This string must be quoted, in the grammar specific to the database, so that it looks like a string to the database.

The SQL syntax that defines an alias column depends on the database type. Refer to the documentation of the database vendor for details.

The styles you can use are as follows:

<table>
<thead>
<tr>
<th>Style</th>
<th>Remarks</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text styles</td>
<td>Text can be formatted as bold, italic or underline.</td>
<td>font:bold, font:italic, font:underline</td>
</tr>
<tr>
<td>Text colors</td>
<td>Text color can be expressed as a hexadecimal value (case insensitive) or as a named color. For reference to all the named colors you can use, see <a href="https://www.w3.org/TR/2003/REC-SVG11-20030114/types.html">https://www.w3.org/TR/2003/REC-SVG11-20030114/types.html</a>, Section 4.2.</td>
<td>color: yellow, color: #FFFF00</td>
</tr>
<tr>
<td>Background colors</td>
<td>Background colors can have the same values as text colors.</td>
<td>background-color: gold, background-color: #FFD700</td>
</tr>
</tbody>
</table>

Remarks:

- You can use multiple styles separated by semi-colons, for example: `background-color:gold; font: bold; color: blue;`. Whitespace between styles is not relevant.
- If the styles you entered are not recognized, DatabaseSpy will ignore them without displaying any errors or warnings.
- The **DbSpyRowSettings** column may appear at any location in the column list.
- The case of the **DbSpyRowSettings** column or the case of styles is not relevant.
- When a conditionally formatted cell, column or row is in focus (selected), the background color has no effect. Only text color and font are applied.
- For better display results, you might want to clear the **Show grid with alternating colors** check box in the **Result View** options.

**Conditional formatting in various database kinds**

The following are some database-specific examples of SQL statements that use conditional formatting. Note that the examples below illustrate just some of the ways to apply conditional formatting. If supported by the database, it is also possible to achieve the same result with more complex techniques, such as subqueries, stored procedures, and so on.
<table>
<thead>
<tr>
<th>Database Kind</th>
<th>Example</th>
</tr>
</thead>
</table>
| Access | Use the SWITCH function, see [https://support.office.com/en-us/article/Switch-Function-D750C10D-0C8E-444C-9E63-F47504F9E379](https://support.office.com/en-us/article/Switch-Function-D750C10D-0C8E-444C-9E63-F47504F9E379)  

```sql
SELECT [id],
       [name],
       [quantity],
       SWITCH ([quantity] > 200, 'color:blue') AS [DbSpyRowSettings]
FROM  [products];
```


```sql
SELECT [id],
       [name],
       [quantity],
       IIF ([quantity] > 200, 'color:blue', '') AS [DbSpyRowSettings]
FROM  [products];
```

| IBM DB2, IBM DB2 for i | SELECT "id",
| Oracle | "name",
| PostgreSQL | "quantity",
| Progress | CASE WHEN "quantity" > 200 THEN 'color:blue;' END AS "DbSpyRowSettings"
| OpenEdge | FROM "products";
| SQLite | Sybase |
| Teradata | |

| IBM Informix | SELECT id,
| | name,
| | quantity,
| | CASE WHEN quantity > 200 THEN 'color:blue;' END AS "DbSpyRowSettings"
| | FROM "products";

| MariaDB, MySQL | SELECT `id`,
| | `name`,
| | `quantity`,
| | CASE WHEN `quantity` > 200 THEN `color:blue;' END AS `DbSpyRowSettings`
| | FROM `products`;

| SQL Server | SELECT [ProductID],
| | [Name],
| | [Quantity],
| | [DbSpyRowSettings] = CASE WHEN [Quantity] > 200 THEN 'color:blue;' END
| | FROM  [Products];

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Chapter 12

Comparing Database Data
You can compare data from two or more tables or columns side-by-side. The objects to be compared can either belong to the same database, or reside in two different databases. A database comparison is similar to file comparisons; that is, it involves a "left" component and a "right" one. A "component" is just a representation of the database structure from where you can conveniently select the tables or columns that are to be compared.

After comparing database data, you can optionally merge differences either from left to right, or from right to left. It is possible to merge all differences as one batch, or you can display the differences for each table in a data grid, and then review and merge each difference individually at row level. The changes can be either committed directly to the database, or be saved as a merge SQL script for later execution. Optionally, you can generate restore scripts as well. A restore script reverts the effects of a merge script and renders the database to the original state before the merge. For more information, see Displaying Differences in Databases and Merging Database Differences.

If you perform the same data comparison frequently, you can save it to a file (.dbdif) which can later be opened either in DatabaseSpy or in DiffDog, see Database Data Comparison Files.

Prerequisites

- An active connection to a data source must exist in your project (see Connecting to a Database). If you are comparing data from two databases, then you will need a connection to each database (to populate the "left" and "right" components, respectively).
- If you are comparing tables, each table must have a primary key column. DatabaseSpy requires the primary key column to sort the table rows before performing the actual comparison.
12.1 Running a Database Data Comparison

A database data comparison in DatabaseSpy consists of the following steps.

Step 1: Connect to the "left" and "right" databases

1. On the File menu, click New | Data Comparison. (Alternatively, click the Data Comparison toolbar button.) At this stage, you are prompted to add a new data source, if no connected data source already exists in your project. In this case, click Yes and follow the wizard steps to create a new data source (see Connecting to a Database).

2. When prompted to select database objects for comparison, first choose a data source from the Data Source list, and then select the check boxes next to the objects you want to include for comparison. The Data Source list displays any active data sources that you've connected since starting DatabaseSpy.

Note: From the dialog box above, you can optionally group, filter, locate, or navigate database objects using the buttons above the database tree structure. For more information, see Browsing Data Sources.

3. Click either Left Side or Right Side to add the data source to the left or right side of the comparison, respectively, and then click OK. Be patient while DatabaseSpy adds the
selected objects to the comparison; this may take a while for large databases. At this stage, only one of the comparison components has an assigned data source (right or left, depending on what you selected).

4. Click the **Browse** button of the empty component, and choose the second data source from the Data Source list, if one is available. Otherwise, click **Quick Connect** and follow the wizard steps to connect to the second data source.

5. Select the check boxes next to the tables you want to compare.

**Step 2: Map the objects to be compared (if applicable)**

To perform a comparison, the objects on the left and right side of the comparison must be connected by a line (a "mapping"). The mapping instructs DatabaseSpy to compare these two objects specifically. By default, DatabaseSpy will attempt to match automatically the objects to be compared by their name, and thus create the corresponding mappings. The mapping options can be adjusted from **Tools | Options | Data Compare**. When necessary, you can create mappings manually, or adjust the existing ones. For example, you may need to create a mapping manually between two objects if the object names are different in the "left" as opposed to the "right" database. To create a mapping, click the triangle on the left component and, holding the left mouse button pressed, drag it to a target triangle on the right component.

To delete all mappings of a comparison, right-click the title bar of either component and choose **Unmap items** from the context menu. To delete a single mapping, right-click the appropriate object and choose **Unmap selected** from the context menu. Alternatively, click the connection line between two mapped objects and press **Delete**.

**Note:** Unmapping a table will also unmap all columns of that table.
Once the mappings between objects are created, you can run the comparison as follows:

- On the **Data Comparison** menu, click **Compare tables**. (Alternatively, click the **Start Comparison** toolbar button.)

At this stage, you can either explore the comparison results in more detail (see **Displaying Differences in Databases**), or generate the merge script (**Merging Database Differences**).

**Sorting, collapsing, and expanding tables**

To simplify navigation through huge schemas which contain a lot of objects, you can collapse and expand individual tables when you are examining the differences. If you double-click a table in the left component, the same table is also collapsed or expanded in the right component, respectively (provided that a mapping exists between the two tables). To collapse all tables in both components, do one of the following:

- On the **Data Comparison** menu, click **Collapse tables**.
- Right-click the title bar of a component, and select **Collapse tables** from the context menu.

You can also sort tables in ascending or descending order, as follows:

- Right-click the empty area and select **Sort tables | Ascending** or **Sort Tables | Descending** from the context menu. The options **Ascending mapped first** and **Descending mapped first** will give priority to tables that have mappings over those that don’t.
Adding or removing tables from a comparison

To add more tables to the comparison, or remove existing one from the comparison, click the **Browse** button in the upper-right corner of the database component and then select or clear the required check boxes. You can also remove tables directly from the component, as follows:

- Right-click a table, and then select **Remove from Comparison** from the context menu.
12.2 Database Data Comparison Files

After running a database data comparison, you can save it to a file. This will save you time in future, whenever you want to compare the same databases. Database data comparison (.dbdif) files store the connection details of the databases involved in comparison, as well as the database objects selected for comparison. If you defined any configuration options in the "Properties" window, these are also saved in the .dbdif file. (Note that passwords stored in database schema comparison files are encrypted.)

To save a data comparison to a file:

1. Run a comparison, as shown above.
2. On the File menu, click Save As, and select "Altova Database Data Comparison (.dbdif)" as file type.

To open a data comparison file:

- On the File menu, click Open, and browse for the .dbdif file.
12.3 Displaying Differences in Databases

Every time after you run a data comparison (see Running a Database Data Comparison), the high-level results are displayed directly in the Data Comparison window. Namely, the result of a comparison is indicated by the following icons:

- The compared objects are equal in both components
- Differences exist between the objects in the left and right components

Objects that are different are highlighted with green color. A balloon tip with additional information appears if you move the mouse cursor over a comparison icon.

To view a more detailed comparison result, do one of the following:

- Click the comparison result icon for a given table.
- Right-click a table where differences exist, and select Show selected results from the context menu.

This opens a grid where differences between each column are displayed side-by-side, called the "Comparison Result View", as further described below.

**Note:** If a dialog box appears with the following text: "Data is equal, do you want to open content?", this indicates that the command above was run for a selection of tables where there are no differences.

The comparison outcome is also displayed in the Messages window.
From here, you can further explore the comparison results, as follows:

- To view differences between two tables only, click **Show result window**.
- To view only different table pairs, click **Show only results with differences**.
- To view all table pairs side by side (regardless of whether they have differences or not), click **Show all results**. Note that a new tab is created for each table pair, so it's not recommended to click **Show all results** if your database has a large number of tables.

**Comparison Result View**

This view displays differences between a given table pair. As illustrated below, each column is displayed twice (as it stands in the "left" table as opposed to the "right" table). In the example below, the column `quantity` was changed in two occurrences; also, a new row (`id = 11`) exists only in the "right" table.

Use the toolbar buttons to customize which rows should be displayed in this view, or to navigate differences.
<table>
<thead>
<tr>
<th>Icon</th>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="icon" alt="Equal Rows" /></td>
<td>Show/Hide all equal rows</td>
<td>Shows or hides rows that are equal in the left and right component.</td>
</tr>
<tr>
<td><img src="icon" alt="Different Rows" /></td>
<td>Show/Hide all different rows</td>
<td>Shows or hides rows that are different in the left and right component.</td>
</tr>
<tr>
<td><img src="icon" alt="Left Rows" /></td>
<td>Show/Hide rows that are only on the left</td>
<td>Shows or hides rows that exist only in the table that is contained in the left component.</td>
</tr>
<tr>
<td><img src="icon" alt="Right Rows" /></td>
<td>Show/Hide rows that are only on the right</td>
<td>Shows or hides rows that exist only in the table that is contained in the right component.</td>
</tr>
<tr>
<td><img src="icon" alt="Column Differences" /></td>
<td>Show/Hide columns which don't have any differences</td>
<td>Shows or hides columns where no differences exist.</td>
</tr>
<tr>
<td><img src="icon" alt="Next Difference" /></td>
<td>Next difference</td>
<td>Selects the next difference as the current difference. If this command is disabled, click any difference on the grid first.</td>
</tr>
<tr>
<td><img src="icon" alt="Previous Difference" /></td>
<td>Previous difference</td>
<td>Selects the previous difference as the current difference.</td>
</tr>
<tr>
<td><img src="icon" alt="Last Difference" /></td>
<td>Last difference</td>
<td>Selects the last difference in the document as the current difference.</td>
</tr>
<tr>
<td><img src="icon" alt="First Difference" /></td>
<td>First difference</td>
<td>Selects the first difference in the document as the current difference.</td>
</tr>
<tr>
<td><img src="icon" alt="Merge Left" /></td>
<td>Merge data from left to right</td>
<td>Displays a dialog box where you can merge differences from the left to the right database, see also Merging Database Differences.</td>
</tr>
<tr>
<td><img src="icon" alt="Merge Right" /></td>
<td>Merge data from right to left</td>
<td>Displays a dialog box where you can merge differences from the right to the left database.</td>
</tr>
<tr>
<td><img src="icon" alt="Find" /></td>
<td>Find</td>
<td>Searches for a particular string in the Comparison Result View.</td>
</tr>
<tr>
<td><img src="icon" alt="Data Inspector" /></td>
<td>Show the Data Inspector window</td>
<td>Opens a Data Inspector window where you can view the full content of a data cell.</td>
</tr>
<tr>
<td><img src="icon" alt="Go to mapping" /></td>
<td>Go to table mapping</td>
<td>Displays the Data Comparison window (this it typically necessary after you clicked the Maximize button).</td>
</tr>
<tr>
<td><img src="icon" alt="Maximize" /></td>
<td>Maximize the result view</td>
<td>Maximizes the size of the grid so as to show as many rows of the comparison as possible.</td>
</tr>
<tr>
<td><img src="icon" alt="Show Chart" /></td>
<td>Show chart</td>
<td>Displays data differences as a chart.</td>
</tr>
</tbody>
</table>
It is possible to customize the appearance of the Comparison Result View, see Database Data Comparison Options.
12.4 Merging Database Differences

After you run a data comparison (see Running a Database Data Comparison), you can optionally merge any differences either from the left to the right database, or vice versa. Differences can be merged either in batch for the entire database, or individually at table or even row level.

You can execute the merge operation either directly, or through a merge script. The merge script can be generated at database, table, or row level. In addition to the merge script, you can also generate a restore script which can be used to undo the effect of a merge. The restore script can be generated at database or table level.

By default, database transactions as well as rollback on error is enabled on data merging (assuming the database supports this), see Database Data Comparison Options.

Note: It is not possible to merge columns that have incompatible data type (for example, string to numeric type). Also, sometimes a merge is possible only in one direction (for example, a numeric type may be converted to a string type, but not the opposite).

DatabaseSpy will ignore incompatible merges and will notify you, before merging, if such occurrences exist. In the Comparison Result view, merges that are only possible only in one direction are marked with a small red arrow joined with a green arrow. The direction of the green arrow indicates the direction where the merge is possible. For example, in the image below, the description column (of type "text") cannot be mapped to the quantity column because the latter is numeric. However, the quantity column can be mapped to the description column.

<table>
<thead>
<tr>
<th>id</th>
<th>id</th>
<th>name</th>
<th>name</th>
<th>description</th>
<th>quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Flexfan</td>
<td>Flexfan</td>
<td>[NULL]</td>
<td>200</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>Small Epsilon</td>
<td>Small Epsilon</td>
<td>[NULL]</td>
<td>46</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>Arepharm</td>
<td>Arepharm</td>
<td>[NULL]</td>
<td>65</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>Accumax</td>
<td>Accumax</td>
<td>[NULL]</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>Suntough</td>
<td>Suntough</td>
<td>[NULL]</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>Silver-Hold</td>
<td>Silver-Hold</td>
<td>[NULL]</td>
<td>56</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>Quadplus</td>
<td>Quadplus</td>
<td>[NULL]</td>
<td>560</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>Frexthex</td>
<td>Frexthex</td>
<td>[NULL]</td>
<td>10</td>
</tr>
<tr>
<td>9</td>
<td>9</td>
<td>Faxsoft</td>
<td>Faxsoft</td>
<td>[NULL]</td>
<td>23</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>Ornamentis</td>
<td>Ornamentis</td>
<td>[NULL]</td>
<td>2</td>
</tr>
<tr>
<td>11</td>
<td>11</td>
<td>Xilontis</td>
<td>Xilontis</td>
<td>[NULL]</td>
<td>10</td>
</tr>
</tbody>
</table>

Comparison Result View

Generating the merge script
The merge script can be generated for either the "left" or "right" database component, as follows:

1. Run a database data comparison (see Running a Database Data Comparison).
2. Do one of the following:
• To generate the script at database level, right-click an empty area in the Comparison window and select **Merge all Left to Right**.
• To generate the script at table level, right-click the table in the Comparison window and select **Merge Selected Left to Right**.
• To generate the script at row level, right-click the row in the Comparison Result View and select **Merge data from left to right**.

```
Merge Data Left to Right

Selection
- Use all Tables
- Use selected Tables

Affected Tables

<table>
<thead>
<tr>
<th>main (NonNullSource)</th>
<th>main (NonNullTarget)</th>
<th>-</th>
<th>C</th>
<th>Ignored</th>
</tr>
</thead>
<tbody>
<tr>
<td>orderedproducts</td>
<td>orderedproducts</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>products</td>
<td>products</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
```

3. Click **Show merge script**.

**Note:** The commands above assume you want to merge the changes from left to right. Otherwise, use the corresponding reverse (right to left) commands.

**Generating the restore script**

If you would like to be able to undo the effects of the merge script, a restore script must be generated. The restore script can be generated for either the "left" or "right" database component, as follows:

1. Run a database data comparison (see **Running a Database Data Comparison**).
2. Do one of the following:

   • To generate the script at database level, right-click an empty area in the Comparison window and select **SQL and Data | Show restore script** (left or right, as applicable).
• To generate the script at table level, right-click the table in the Comparison window and select **SQL and Data | Show restore script (left or right, as applicable).**

**Executing the merge directly**
1. Run a database data comparison (see Running a Database Data Comparison).
2. Do one of the following:
   • To merge differences at database level, right-click an empty area in the Comparison window and select **Merge Left to Right.**
   • To merge differences at table level, right-click the table in the Comparison window and select **Merge Selected Left to Right.**
   • To merge differences at row level, right-click the row in the Comparison Result View and select **Merge data from left to right.**

![Merge Data Left to Right](image)

3. Click **Yes.**

**Note:** The commands above assume you want to merge the changes from left to right. Otherwise, use the corresponding reverse (right to left) commands.

**Reverting a merge**
To revert a merge, run the restore script against the database (see above for instructions about generating the restore script).
### 12.5 Database Data Comparison Options

There are several groups of options which affect database data comparison, and they can be categorized as follows:

<table>
<thead>
<tr>
<th>Option group</th>
<th>How to access</th>
</tr>
</thead>
<tbody>
<tr>
<td>General database data comparison options, including options for database</td>
<td>You can change these options either at application level, or individually for each comparison.</td>
</tr>
<tr>
<td>transactions, rollback, and memory usage</td>
<td>To change these options application-wide:</td>
</tr>
<tr>
<td></td>
<td>1. On the <strong>Tools</strong> menu, click <strong>Options</strong>.</td>
</tr>
<tr>
<td></td>
<td>2. Click **Data Compare</td>
</tr>
<tr>
<td></td>
<td>To change these options locally, run a new data comparison (see Running a Database Data Comparison) and modify any required options in the Properties window. The local options are the same as the application-wide options; the only difference is that local options apply to the current data comparison window only and will be saved in the .dbdif comparison file if you create one, see Database Data Comparison Files.</td>
</tr>
<tr>
<td></td>
<td>For more information, see <a href="#">Database Data Comparison Options</a>.</td>
</tr>
<tr>
<td>Options for comparing XML fields. These are applicable only if native (not</td>
<td>1. On the <strong>Tools</strong> menu, click <strong>Options</strong>.</td>
</tr>
<tr>
<td>string) comparison is enabled and the database supports and contains XML fields</td>
<td>2. Click **Data Compare</td>
</tr>
<tr>
<td></td>
<td>For more information, see <a href="#">XML Comparison Options</a>.</td>
</tr>
<tr>
<td>Options that control automatic mapping of tables and columns, as well as</td>
<td>1. On the <strong>Tools</strong> menu, click <strong>Options</strong>.</td>
</tr>
<tr>
<td>the appearance of tables in the comparison window</td>
<td>2. Click <strong>Data Compare</strong>.</td>
</tr>
<tr>
<td></td>
<td>For more information, see <a href="#">Data Compare Options</a>.</td>
</tr>
<tr>
<td>Options for configuring the appearance of the Comparison Result View</td>
<td>1. On the <strong>Tools</strong> menu, click <strong>Options</strong>.</td>
</tr>
<tr>
<td></td>
<td>2. Click **Data Compare</td>
</tr>
<tr>
<td></td>
<td>For more information, see <a href="#">Comparison Result View</a>.</td>
</tr>
</tbody>
</table>
Chapter 13

Comparing Database Schemas
13 Comparing Database Schemas

A database schema comparison enables you to compare objects of two different database schemas, in terms of their structure or size. Database objects that can be compared include tables, columns, views, functions, and stored procedures. Comparison works differently for tables, as opposed to views, functions, or stored procedures. Namely, in case of tables, the comparison results report the structural differences (such as different columns, constraints, data types, and so on). In case of views, functions, and stored procedures, the comparison results inform you if the size of the object is the same or different in database A (left-side of comparison) as compared to database B (right-side of comparison).

Note: Line-by-line text comparison of database object definitions is not supported. To compare two object definitions (for example, database views) line-by-line, first save the definitions to files and then open both files in a differencing application such as DiffDog.

To start a database schema comparison, click the Schema Comparison toolbar button. Two database components are displayed side by side (a "left" component and a "right" component). Before running the actual comparison, you need to assign a data source to each of the left and right components. Then you can select for comparison either all objects of a schema, or specific schema objects. To change the objects included in comparison, click the Browse button on the right or left component, and select or clear the required check boxes. For more information, see Running a Database Schema Comparison.

The sample database schema comparison above illustrates the result of comparing a stored procedure, a table, and a view between two SQL Server databases, "ZooDB" and "ZooDBTarget". The table definitions are equal in both the source and target schema (which is indicated by the
sign), while the stored procedure and view definition is different (which is indicated by the sign).

A database schema comparison can be saved as a file. Database schema comparison files have the .dbsdif extension, and can also be opened with DatabaseSpy and added to DatabaseSpy projects. A comparison file stores the connection details of the database(s) involved in comparison, the database objects selected for comparison, as well as any configuration options you have defined in the "Properties" window (see also Database Schema Comparison Files).

Various database comparison options are configurable. For example, you can have DatabaseSpy automatically match the tables or columns to be compared (by name, data type, or both), or perform the mapping manually. The comparison options can be adjusted from Tools | Options | Data Compare.

After running a database schema comparison, you can generate a merge script to update either the left or the right database. You can review and edit the merge script before actually executing it. It is also possible to select specific objects to be included in the merge script (for example, one or several columns of a table). For more information, see Merging Database Schemas.

Note: The merge script synchronizes only differences resulting after comparing structure of tables (this includes changes to columns, keys, or constraints). Merging differences between other object types (such as stored procedures, functions, and views) is not supported.
13.1 Running a Database Schema Comparison

A database schema comparison in DatabaseSpy involves the steps shown below.

Step 1: Connect to the databases that are to be compared

1. On the File menu, click New | Schema Comparison. (Alternatively, click the Schema Comparison toolbar button.) At this stage, you may be prompted to add a new data source, if no connected data source already exists. In this case, click Yes and follow the wizard steps to create a new data source (see Connecting to a Database).

2. When prompted to select database objects for comparison, first choose a data source from the Data Source list, and then select the check boxes next to the objects you want to include for comparison. The Data Source list displays any active data sources that you've connected since starting DatabaseSpy.

3. Click either Left Side or Right Side to add the data source to the left or right side of the comparison, respectively, and then click OK. Be patient while DatabaseSpy adds the selected objects to the comparison. At this stage, only one of the comparison components (right or left, depending on what you selected) has an assigned data source.

4. Click the Browse button of the empty component, and choose the second data source from the Data Source list, if one is available. Otherwise, click Quick Connect.
Comparing Database Schemas

Running a Database Schema Comparison

5. Select the check boxes next to the objects you want to compare, and then click Left Side (or Right Side, depending on the case).

Step 2: Map the objects to be compared (if applicable)

To perform a comparison, the objects on the left and right side of the comparison must be connected by a line (a "mapping"). The mapping instructs DatabaseSpy to compare these two objects specifically. By default, DatabaseSpy will attempt to match automatically the objects to be compared by their name, and thus create the corresponding mappings. The mapping options can be adjusted from Tools | Options | Data Compare. When necessary, you can create mappings manually, or adjust the existing ones. For example, you may need to create a mapping manually between two objects if the object names are different in the "left" as opposed to the "right" database. To create a mapping, click the triangle on the left component and, holding the left mouse button pressed, drag it to a target triangle on the right component.

To delete all mappings of a comparison, right-click the title bar of either component and choose Unmap items from the context menu. To delete a single mapping, right-click the appropriate object and choose Unmap selected from the context menu. Alternatively, click the connection line between two mapped objects and press Delete.

Note: Unmapping a table will also unmap all columns of that table.

Step 3: Run the comparison

Once the mappings between objects are created, you can run the comparison:

- On the Schema Comparison menu, click Compare items. (Alternatively, click the Start Comparison toolbar button.)

The result of a comparison is indicated by the following icons:

- The compared objects are equal in both components
- Differences exist between the objects in the left and right components
- A corresponding item is missing in the opposite component

Schema objects that are different are highlighted with green colour.

To simplify navigation through huge schemas which contain a lot of objects, you can collapse and expand individual objects when you are examining the differences. If you double-click an item in one component, both versions of the item are collapsed or expanded, respectively, simultaneously in both components. To collapse all items in both components, do one of the following:

- On the Schema Comparison menu, click Collapse items.
- Right-click the title bar of a component, and select Collapse items from the context menu.
13.2 Database Schema Comparison Files

After running a database schema comparison, you can save it to a file. This will save you time in future, whenever you want to compare the same database schemas. Database schema comparison (.dbsdif) files store the connection details of the databases involved in comparison, the database objects selected for comparison, as well as any configuration options you have defined in the "Properties" window. (Note that passwords stored in database schema comparison files are encrypted.)

To save a schema comparison to a file:

1. Run a comparison (see Running a Database Schema Comparison).
2. On the File menu, click Save As, and select "Altova Database Schema Comparison (.dbsdif)" as file type.

To open a schema comparison file:

- On the File menu, click Open, and browse for the .dbsdif file.
13.3 Merging Database Schemas

After running a schema comparison between two database schemas (the "left" and the "right" one), table differences can be synchronized (merged) between the two databases. Since the merge operation affects the structure of the database, it is not applied directly. Instead, DatabaseSpy generates a merge script. The generated merge script can apply changes either from the "left" database to "right", or the other way round, from "right" to "left".

**Note:** The merge script synchronizes only differences resulting after comparing structure of tables (this includes changes to columns, keys, or constraints). Merging differences between other object types (such as stored procedures, functions, and views) is not supported.

Once the merge script is generated, you can choose to execute the merge script directly in DatabaseSpy, or save it to a file for later execution.

Before executing the merge script against the database, it is always recommended to review it. If the structural differences between database schemas are numerous, the generated merge script will be equally big. To avoid a potentially dangerous update of multiple items in the target database through a big script, you could generate smaller scripts and apply them progressively. For example, you can select specific items (columns, constraints) that should be included in the merge, and then generate the script only for selected objects.

**To generate and execute a merge script:**

1. Run a database schema comparison (see Running a Database Schema Comparison).
2. Optionally, if you want to merge only specific items, select these items in a component using Ctrl+Click. Note that it has no influence on the direction of the merge whether you select the items in the left or in the right component (for example, you can select items in the right component and still choose to merge from left to right).

**Important:** Child elements of a table or column are not automatically included in the merge if you select just the parent. For this reason, when selecting a parent object (for example, a table), make sure to select also any child items that should be merged (such as columns or constraints). For example, if the column name is equal but the data type is different (as shown in the image below), you must select the data type item to create a valid merge script.

3. Do one of the following:
   - On the Schema Comparison menu, select **Show merge script: Left to Right**.
   - Right-click the component, and select **Show merge script: Left to Right** from the context menu
   - Click the **Merge selected from left to right** toolbar button.
The commands above assume you want to merge the database structure from left to right. Otherwise, use the corresponding reverse (right to left) commands.

4. Review and edit the merge script as required, and click the **Execute** button to actually merge the schemas.
Chapter 14

XML Schema Management
14 XML Schema Management

If the database supports XML as type, you can load XML instance files into database fields, and save them to local files from the database fields (see Editing XML Columns).

XML support is available for the following databases: IBM DB2 9.1 and later, SQL Server, Oracle, PostgreSQL 8.3 and later.

Note: PostgreSQL does not have XML schema management (add schema, drop schema).

If XML schema management is supported by the database, you can register XML schemas with the database. The XML schemas are displayed in the Online Browser in a sub-folder called XML Schemas.

Click the expand button in front of an XML schema name to view dependent/secondary schemas. The properties of the individual XML schemas can be viewed and—where possible—edited in the Properties window.

To view an XML schema in detail, you can open it in XMLSpy. For this purpose, a context menu option in the Online Browser as well as a button in the XML Schema management for databases dialog box are available. You must have XMLSpy installed on your PC to be able to use this...
Viewing XML schemas assigned to a particular column

All the XML schemas that have been assigned to an XML data cell of a table are displayed in the Online Browser in an XML Schemas sub-folder below the respective column. This way, you can see at a glance, which XML schemas are used to validate the content of a particular XML column in the database.

To view an XML schema in XMLSpy:

Do one of the following:

- In the Online Browser, right-click a schema in the XML Schemas folder and select View in XMLSpy from the context menu.
- In the XML Schema management for databases dialog box, select a schema and click the View Schema button, or right-click the schema and choose View Schema from the context menu.
14.1 Assigning XML Schemas

You can assign an XML schema to a database column or, in DB2 databases, field of type XML. This schema is used for data validation when an INSERT or UPDATE action is performed. The Choose XML Schema dialog box lists the XML schema that is currently assigned to an XML column/data cell and allows you to assign an XML schema to the selected column/cell.

You can choose one of the existing XML schemas that are registered with the database. If you want to add an additional XML schema to the database, click the Manage Schemas... button.

After you have assigned an XML schema to an XML column/field, you must commit the changes to the database. At this stage, DatabaseSpy validates the XML file that is contained in the XML column/field against the assigned XML schema and reports any errors to the Message tab. If the validation fails, the XML schema assignment cannot be committed to the database.

To assign an XML schema to a database column or field of type XML:

1. Depending on the database type, do one of the following:

   - In DB2 databases, and provided that the Result window is in the Editing mode, click the Browse button in the XML data cell you want to edit, and choose Assign XML Schema from the menu that appears.
   - In SQL Server databases, right-click the column in the Online Browser and choose Assign XML Schema... from the context menu.

   The Choose XML Schema dialog box opens.

2. Do one of the following:

   - Select the Schema from Database radio button and choose one of the registered XML schemas from the drop-down list. Optionally, click the Manage Schemas... button to...
add a schema to the database.
- To remove any XML schema assignment from the column/data cell, select the None radio button.

3. Click OK.
4. Depending on the database type, do one of the following:
   - In DB2 databases, click the [Commit] button in the Result window.
   - In SQL Server databases, execute the change script.
14.2 Managing XML Schemas

To add, modify, or delete XML schemas, DatabaseSpy provides the XML Schema management for databases dialog box which can be accessed via a menu command or using a toolbar icon. Unless you are connected to a data source supporting XML, the dialog box appears in the Offline state.

The dialog box provides a Connect to a database button which allows you to call the Add a Data Source dialog box and connect to a data source. DatabaseSpy connects to the data source in the background and you can add, delete, or modify XML schemas for this database.

If you are connected to at least one data source, when you open the dialog, you can use the left drop-down list to select a data source connection from the project that is currently open in DatabaseSpy. If you select a connection to a database that does not support XML, or for which XML support is not yet implemented in DatabaseSpy, a corresponding information message is displayed in the list box of the dialog box.

For supported data source connections, DatabaseSpy automatically displays the XML schemas that are registered with the database in the list box of the XML Schema management for databases dialog box. You can then add schemas, change them, drop schemas from the database, or select an XML schema and view it in XMLSpy. Any changes you make are not directly committed to the database. Edited objects are marked new ( ), changed ( ), or deleted ( ) in the list box (see screenshot below). You must actively commit the changes in order for the changes to become effective.
By default, only the Schema and Location columns are displayed in the dialog box. You can, however, activate the Show details check box, which is located at the bottom right of the dialog box, to show also the Schema name (if applicable), Namespace, Decomp. (if applicable), and Description columns. If dependent XML schemas are present, you can view these objects by clicking the expand icon in the list box. The dialog box is resizable so as to allow you to conveniently view all the information if the Show details check box is activated and additional information is displayed.

All the functions in this dialog box are also available in a context menu that opens when you right-click anywhere in the list box.

To open the XML Schema management for databases dialog box:

- Select the menu option **Tools | XML Schema Management for Databases**, or click the **XML Schema Management** icon in the Tools toolbar, or select an XML schema in the Online Browser and choose **Manage XML Schemas** from the context menu.
Alternatively, if the Result window is in the Editing mode:

1. Click the Browse button inside an XML data cell you want to edit and choose Change XML Schema from the popup menu.
2. In the Choose XML Schema dialog box, select the Schema from Database radio button. It is not necessary to select an XML schema from the drop-down list.
3. Click the Manage Schemas... button. The XML Schema management for databases dialog box opens. Please note that the left drop-down list is disabled in this case. Changes can only be made for the active data source.

**To connect to a different database:**

- Click the Connect to a database icon in the upper left part of the XML Schema management for databases dialog box to open the Add a Data Source dialog box. The XML Schema management for databases dialog box remains open in the background.

**To list the available XML schemas of a database connection:**

1. In the XML Schema management for databases dialog box, select a database from the left drop-down list or connect to a different database as described above.
2. If required, select a database schema from the right drop-down list.
3. Optionally, activate the Show details check box to display also namespace, decomposition, and description of the listed XML schemas.
14.3 Adding XML Schemas

You can register additional XML schemas with a database and later assign these schemas to individual XML fields of the database. In the XML Schema management for databases dialog box, these newly added XML schemas are marked new (➕) in the list box, and must be confirmed before they are actually registered with the database’s XSR repository.

Before you commit the changes to the database, you can view the XML schema in XMLSpy or change its description or decomposition properties in the dialog box.

All actions that you perform in the XML Schema management for databases dialog box are reported in the Report tab which works the same way as the Output window in DatabaseSpy.

After an XML schema has been successfully registered with the database, it appears in the XML Schemas sub-folder of the Online Browser.
To register an XML schema with the database:

1. In the XML Schema management for databases dialog box, select a database connection from the left drop-down list if no data source connection is active.
2. Click the Add Schema... button or right-click anywhere into the list box and select Add Schema... from the context menu. The standard Windows Open dialog box appears.
3. Browse to the location of the required XML schema file and click Open. The XML schema appears in the list of available XML schemas and a New icon indicates that this XML schema has not been committed to the database yet.
4. Optionally, double-click the file name of the XML schema and edit the name as desired.
5. Optionally, activate the Show details check box and enter a description for the XML file.
6. Optionally, activate the Decomp. check box or right-click the XML schema and activate the Decomposition option in the context menu to enable the XML schema for decomposition, if applicable.
7. Optionally, change the database schema in the DB schema column, if applicable.
8. Click the Commit changes button.
9. Click Close to exit the dialog box. If any changes have not been committed yet, a prompt appears, asking you whether you would like to commit or discard the changes.
14.4 Modifying XML Schemas

DatabaseSpy allows you to change certain parameters of XML schemas that are registered with the database. You may have to activate the Show details check box in the XML Schema management for databases dialog box to see all the properties.

When you add a new XML schema to the database, you can edit the schema name and the location information in the XML Schema management for databases dialog box before you commit the new schema to the database.

Once an XML schema has been registered with the database, only the schema description and the decomposition property can be changed. This can be done either in the XML Schema management for databases dialog box or in the Properties window.

Although you can edit an XML schema that you have opened for viewing in XMLSpy, you cannot save back a schema to the database. Any changes you make in XMLSpy must be saved in a new XML schema file.

To change XML schema properties:

1. Select the menu option Tools | XML Schema Management for Databases or click the XML Schema Management icon in the Tools toolbar, or right-click an XML schema in the Online Browser and choose Manage XML Schemas... from the context menu.
2. In the XML Schema management for databases dialog box, select an XML schema in the list box.
3. Optionally, activate the Show details check box if the Namespace, Decomp., and Description columns are not displayed.
4. If applicable, change the status of the Decomp. check box as required. The XML schema is enabled for decomposition if the decomposition property is checked.
5. If applicable, change the database schema in the DB schema column as required.
6. Edit the schema description as required.
7. Click the Commit changes button to confirm your changes.
8. Click Close to exit the dialog box. If any changes have not been committed yet, a prompt appears, asking you whether you would like to commit or discard the changes.

Alternatively, do the following:

1. Select an XML schema in the Online Browser and edit the properties in the properties window.
2. Execute the change script to commit your changes to the database.
Deleting XML Schemas

The XML Schema management for databases dialog box can also be used to remove an XML schema from a database. Upon clicking the Drop Schema button, the schema is marked for deletion (✗) in the list box and you have to confirm the deletion before the schema is actually dropped from the database's XSR repository.

The XML Schema management for databases dialog box also provides a Remove Drop Flag button that allows you to undo the deletion, provided that the changes have not been committed yet.

Alternatively, you can also use an option in the context menu of the Online Browser to delete XML schemas from the database. The XML schema is marked for deletion in the Online Browser and a database structure change script is generated which must be executed to commit the deletion to the database.

Note: If you delete an XML schema from the XML Schemas sub-folder of a database column (i.e., from the sub-folder that shows the XML schemas assigned to a certain column of a database table), the XML schema will be deleted from the database's XSR repository and not just removed from the column.

To delete a registered XML schema from the database:

1. In the XML Schema management for databases dialog box, select a database connection from the left drop-down list if no data source connection is active.
2. Select the XML schema you want to delete and click the Drop Schema button. The XML schema is marked for deletion (✗) in the list box. Alternatively, you can also right-click the schema and select Drop Schema from the context menu.
3. Click the Commit changes button.
4. Click the Close button to exit the dialog box. If any changes have not been committed yet, a prompt appears, asking you whether you would like to commit or discard the
changes.

Alternatively, do the following:

1. In the Online Browser, right-click the XML schema you want to delete and select **Delete** from the context menu. Alternatively, you can also select the XML schema and press the **Delete** key. A change script is generated in the Database Structure Change Script window and the XML schema is marked for deletion in the Online Browser.

2. In the Database Structure Change Script window, click the **Execute Change Script** button.

**To undo the deletion of an XML schema:**

1. In the XML Schema management for databases dialog box, select an XML schema that is marked for deletion.
2. Click the **Remove Drop Flag** button or select the option **Remove Drop Flag** from the context menu.
3. Click the **Close** button. A prompt appears, asking you whether you would like to commit or discard the changes.
4. Click **Yes**.
15 Importing Database Data

With DatabaseSpy, you can import data from XML or CSV files to your databases. When you click the Import button in the Tools toolbar or select the menu option Tools | Import data to the database... (Ctrl+I), the "Import data to the database" dialog box opens where you can select the XML or CSV file to be imported and define the import options. The "Import data to the database" dialog box contains two tabs, Selection and Options.

The lower part of the dialog box always shows a preview of the selected data, which can be updated to reflect the selected options.
You can choose to preview the data (screenshot above) or the definition (screenshot below) of the selected element’s table structure.

All fields will be created as Text fields with the length specified in the Options tab. You can change the data type separately for every column in the Preview group box if you select the Show Definition radio button (see screenshot above).

To import database data from a text file:

1. Make sure that a data source is active in the project folder.
2. Select the menu option Tools | Import data to the database, or press Ctrl+I, or click the Import button in the Tools toolbar. The "Import data to the database" dialog opens.
3. In the Source group box, enter the path to the text file you want to import. You can type it in, select it from the drop-down list, or click the Browse button.
4. In the Destination group box, select where you want to import the data to. If you previously selected a data source, the three fields are automatically filled in, if not:
   a) Select the data source, database, and schema from the drop-down lists.
   b) Select Create new table(s), Update/Create if not existing, or Update existing tables, depending on where you want to import the data.
   c) In the Stop after errors drop-down list, specify the number of errors after which the
import process should be stopped.

d) In the Stop action drop-down list, select the action to perform when import is stopped: Commit commits the tables that did not contain errors; rollback does not commit any imported data.

5. In the Import Mode group box, do one or more of the following:

- Activate the Execute radio button if the necessary SQL should be generated and executed in one step.
- Activate the Generate SQL in SQL Editor radio button if the generated SQL file should be placed in the SQL Editor ready for execution.
- Check the Log check box to activate the drop-down list where you can enter the name and path of the SQL log, select a previously used log file, or select an existing log file by clicking on the Browse button.

6. Click the Apply Options button to preview the data and further define the import settings.

7. Click the Show Data or Show Definition radio button to edit the different aspects of the table structure.

8. Double-click a field in the preview window to edit the data type, nullability, or indexing. Define how/whether you want to import each column by clicking the column header to change it.

- Import
- Import as unique key
- Import as primary key
- Do not import

9. Click Import. If the Execute radio button is selected in the Import Mode group box, the text file is imported into the database and a prompt appears asking if you want to view the log.sql file. You may have to execute the generated SQL script first to import the text file into the database.
15.1 Defining XML Import Options

The Options tab of the Import data to the database dialog box allows you to define the options when importing data from files to the database. When the XML icon on the left side of the dialog box is selected, you may change the import options for files of type XML.

Start point of import
You can choose to import the entire XML document or restrict your import to the data hierarchy starting from the currently selected element. The number of sub-levels below the start point that will be imported is specified in the Import Depth option.

Import depth
Specifies the number of sub-levels below the start point that will be imported.

Import fields
Depending on your XML data, you may want to import only elements, attributes, or the textual content of your elements. Note that you can deselect the import of individual elements in the Preview window.

Automatic fields
DatabaseSpy will produce one output file or table for each element type selected. You can choose to automatically create primary/foreign key pairs to link your data in the relational model, or define a primary key for each element.
Other options

The Exclude namespace name radio button, together with the Replace Colon With Underscore radio button, is an either/or choice. Specifies whether namespace prefixes of elements and attributes should be excluded or whether the colon in the namespace prefix should be replaced with an underscore.

Text strings in the XML document that should be treated as NULL values as well as the length of text fields in the database can be specified.
15.2 Defining CSV Import Options

When the CSV icon on the left side of the dialog box is selected, you may change the import options for files of type CSV on the Options tab of the Import data to the database dialog box.

### Options

If the files you are importing contain column names, select the First row contains column names check box to exclude them from the import. In the Treat this as NULL values drop-down list, you can choose the character that should be recognized as a NULL value in the file being imported. The delimiter character and the quotes to be used to identify strings can also be selected from the respective drop-down lists. In the Encoding drop-down list, select the encoding of the files you are importing from the drop-down list. If a two- or four-byte encoding is selected as the default encoding (i.e., UTF-16, UCS-2, or UCS-4), you can choose between little-endian and big-endian byte ordering. A fixed length of the text fields being imported can be defined in the Create text fields with length field.
Chapter 16

Exporting Database Data
16 Exporting Database Data

DatabaseSpy can export database data to a number of file formats such as XML, XML Structure, CSV, HTML, and Excel. When you click the Export button in the Tools toolbar or select the menu option Tools | Export database data... (Ctrl+E), the "Export database data" dialog box opens, where you can select the data to be exported and define the export options for the individual export file types. The "Export database data" dialog box contains two tabs, Selection and Options, where the Selection tab is the same for all export types while each export file type has an Option tab of its own. You can change the export file type by clicking on the respective icon in the left area of the dialog box.

The Source group box basically is a depiction of the Online Browser window with all its features and options. In addition, you can select the individual tables for export here. Please note that the default layout in the Source group box for XML, CSV, HTML, and Excel is Folders while it is Table Dependencies for XML structure. You can, however, change the layout by clicking on the Layouts button in the Source group box.

Exporting structured XML
The structured XML export option exports table data in an hierarchical fashion, for example:

```xml
<import>
  <parentTable>
    <name>...</name>
    ...
    <childTable>
      <childname>...</childname>
      <grandchildTable>
      </grandchildTable>
    </childTable>
  </parentTable>
</import>

<?xml version="1.0" encoding="UTF-8"?>
<Import>
  <tblAnimalTypes>
    <AnimalTypeID>1</AnimalTypeID>
    <EnglishName>Parma wallaby</EnglishName>
    <LatinName>Macropus parma</LatinName>
    <AreaOfOrigin>Australia</AreaOfOrigin>
    <Category>1</Category>
  </tblAnimalTypes>
  <tblAnimalTypes>
    <AnimalTypeID>2</AnimalTypeID>
    <EnglishName>Freshwater Butterflyfish</EnglishName>
    <LatinName>Pantodon buchholzi</LatinName>
    <AreaOfOrigin>Asia</AreaOfOrigin>
    <Category>2</Category>
  </tblAnimalTypes>
</Import>
```
16.1 Selecting Database Data for Export

The Selection tab of the "Export database data" dialog box is the same for all export file types. The option that has been used last is active by default. If you want to export your database data to a different file format, select the respective icon on the left side of the dialog box and change to the Options tab in order to define the export options for XML, XML Structure, CSV, HTML, or Excel.

The Source group box of the "Export database data" dialog box provides a toolbar containing the same icons as the Online Browser (layout, filter, favorites, and Object Locator) as well as the Show checked objects only icon. The latter is useful if you have a large number of tables in your database and want to export data from only a few of them. After you have activated the check boxes of the appropriate tables, clicking the Show checked objects only icon displays only the tables that you have selected for export and hides the tables not concerned.

To export database data:

1. Make sure that a data source is active in the project tab.
2. Select the menu option Tools | Export database data, or press Ctrl+E, or click the Export button in the Tools toolbar. The "Export database data" dialog box opens.
3. Click the desired icon on the left side of the dialog.
4. In the Source database group box, select the data source from the drop-down list.
5. Select the data you want to export in the Source group box. Do one of the following:
• The **Table** radio button is selected by default. The data source you selected above is displayed as it appears in the [Online Browser](#). The [filter](#) and [favorites](#) functions as well as the [object locator](#) are all available in the toolbar.

• Clicking the **SQL** radio button displays SQL commands or allows you to enter them directly.

**Note:** If you have opened the "Export database data" dialog box from the toolbar of the SQL Editor window and not from the Tools toolbar, the SQL radio button is active by default and the contents of the SQL Editor window appear in the text box.

• If you select tables while the **Table** radio button is selected and then click the **SQL** radio button, the SELECT statements for those tables will be generated automatically and appear in this window.

```
1 SELECT [BirthID], [BirthDate], [Mother], [Father], [Veterinarian], [NumberInLitter] FROM [ZooDB].[dbo].[tblAnimalBirths];
2 SELECT [FeedTypeID], [FeedName], [AmountInStock], [Supplier], [AmountOrdered] FROM [ZooDB].[dbo].[tblAnimalFeed];
3 SELECT [AnimalTypeID], [EnglishName], [LatinName], [AreaOfOrigin], [Category] FROM [ZooDB].[dbo].[tblAnimalTypes];
```

6. If required, change the database you want to export the data from by clicking on the arrow to the right of the database name and selecting a database from the drop-down list.

7. Activate the check boxes of the tables you want to export from the database.

8. Specify the **Destination** to which you want to export the data. Do one of the following:

   • Optionally, enter a prefix that will be added to the table name when the table is exported.

   • Select Path and enter a path in the field or use the [Browse](#) button.

   • Select Export to [XMLSpy](#).

9. Select the table you want to preview and click the [Preview](#) button in the Preview group box.
Selecting Database Data for Export

10. For each column, click the icon next to the column name to select whether you want it to be exported to the export file as an element, an attribute, or not appear at all. In order to restore the original setting, click the Reload button.
11. Change the file name of the selected table in the Export Table Name field, if necessary.
12. Click Export. Each of the selected tables is exported to a separate file. A message appears that informs you about the successful export of your database data.

Exporting data from designs

Exporting Database Data

Note: The Preview button is only activated if a table is selected.

The table data now appears in the Preview group box and the Preview button changes to Reload.

Exporting Database Data

Exporting data from designs

If you have a specific design open in a Design Editor window, you can easily export the data that is contained in the tables of this particular design. The Design Editor window provides an additional Export button which is active if at least one table in the Design Editor window is selected. When you click this button, the "Export database data" dialog box opens with the Table radio button activated and the check box(es) of the selected table(s) already checked. You can still add additional tables to the export definition.
**Note:** Clicking the Export button in the Tools toolbar will also open the Export database data dialog box. However, in this case no tables will be preselected for export.

**To export data from a Design Editor window:**

1. Make the Design Editor window whose tables you want to use for export the active window and select at least one table.

2. Press the Export button in the Design Editor window. The Export database data dialog box opens. The tables that are currently selected in the Design Editor are already preselected in the Source group box.

3. Do one of the following:
   - Activate the Path radio button and enter the path you want the destination files to appear in.
   - Activate the Export to XMLSpy radio button if you want your exported data to be displayed in XMLSpy. Note that this option is not available for export to Excel files.

4. In the Source group box, select a table and click the Preview button in the Preview group box.

5. Optionally, change the file name in the Export Table Name field.

6. If required, exclude columns from export or export them as attributes.

7. Optionally click the Options tab to change the options for XML, XML Structure, CSV, HTML, or Excel.

8. Click the Export button when all the settings are correct. A message box appears to inform you about the success of the export.

9. Click OK. The data is exported under the name specified in the Export Table Name field in the desired format and either stored under the path you specified or opened in XMLSpy for further editing.
16.2 Defining XML and XML Structure Export Options

In the Options tab for XML and XML Structure you can define the appearance of the exported files.

To define the extended options for XML and XML Structure export files:

1. Choose one of the following options for the format of number, date, and time values:
   - According to system locale
   - Compatible with Schema data types

2. Choose one of the following options for the default data type:
   - Select **Elements by default** to export the data as elements
   - Select **Attributes by default** to export the data as attributes

**Note:** You can change individual columns in tables to be exported as elements or attributes in the Preview group box of the dialog.

3. If you want to exclude primary and foreign keys from the export file, activate the **Exclude Primary/Foreign Keys** check box.
4. Activate the **Include comments** check box to include an attribute in the exported XML file that shows the SQL query used to select the data, as well as a list of comments containing one item for each column header in the database table.
5. Activate the **Create elements from NULL-fields** check box to include an empty element for each null value in the data being exported.
6. Optionally, select from the **Substitution for NULLs** drop-down list or type in the string
that should appear in the XML file when there is a NULL value in the data being exported. You can also type in a value that is not contained in the drop-down list. This option is only available if the Create elements from NULL-fields check box is activated.

7. Select the desired encoding for the files that are generated during export from the Encoding drop-down list.

8. If a two- or four-byte encoding is selected as the default encoding (i.e., UTF-16, UCS-2, or UCS-4), you can choose between little-endian and big-endian byte ordering.
16.3 Defining CSV Export Options

In the Options tab for CSV files, you can choose from among several options concerning the appearance of the CSV file that is created as a result of the export.

To define the extended options for CSV export files:

1. Activate the Include comments check box to include an attribute in the exported CSV file that shows the SQL query used to select the data, as well as a list of comments containing one item for each column header in the database table.
2. Activate the Remove delimiters check box to remove delimiters that are contained in text values in the exported data. Set the delimiter you want to remove by using the Delimiter drop-down list, the second drop-down list in this tab. For example, if this option is activated and you export a table containing the string "Ba'ker", the string will be "Baker" in the exported text.
3. If the exported tables is to include the database column names, activate the Include column headers check box.
4. Select the Remove newlines check box if you want to remove newlines from exported data.
5. Select from the Substitution for NULL-values drop-down list or type in the string that should appear in the CSV file when there is a NULL value in the data being exported. You can also type in a value that is not contained in the drop-down list.
6. Select from the Delimiter drop-down list the character you would like to use to delimit columns in the text file or enter the desired character string.
7. If you want to put each string into quotes, select the desired character from the String quotes drop-down list. You can also type in a character that is not contained in the drop-down list.
8. Select the desired encoding for the files that are generated during export from the Encoding drop-down list.
9. If a two- or four-byte encoding is selected as the default encoding (i.e., UTF-16, UCS-2, or UCS-4), you can choose between little-endian and big-endian byte ordering.
16.4 Defining HTML Export Options

The Options tab for HTML files provides some settings that apply to exported HTML files.

To define the extended options for HTML export files:

1. Activate the **Include comments** check box to include a comment in the HTML code of the exported HTML file that shows the SQL query used to select the data, as well as a list containing one item for each column header in the database table.
2. If the HTML table generated is to include the database column names, activate the **Include column headers** check box.
3. Select from the **Substitution for NULL-values** drop-down list or type in the string that should appear in the exported HTML file when there is a NULL value in the data being exported. You can also type in a value that is not contained in the drop-down list.
4. Select the desired encoding for the files that are generated during export from the **Encoding** drop-down list.
5. If a two- or four-byte encoding is selected as the default encoding (i.e., UTF-16, UCS-2, or UCS-4), you can choose between little-endian and big-endian byte ordering.
16.5 Defining Excel Export Options

For Excel export files, you can only define whether comments and column headers are to exported and specify a substitution for NULL values.

<table>
<thead>
<tr>
<th>Selection</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Options</td>
<td></td>
</tr>
<tr>
<td></td>
<td>✓ Include comments</td>
</tr>
<tr>
<td>Substitution for NULL-values:</td>
<td>▼</td>
</tr>
</tbody>
</table>

To define the extended options for Excel export files:

1. Activate the **Include comments** check box to include a comment in the Excel code of the exported Excel file that shows the SQL query used to select the data, as well as a list containing one item for each column header in the database table.
2. If the Excel table generated is to include the database column names, activate the **Include column headers** check box.
3. Select from the **Substitution for NULL-values** drop-down list or type in the string that should appear in the exported Excel file when there is a NULL value in the data being exported. You can also type in a value that is not contained in the drop-down list.
Chapter 17

DatabaseSpy Settings
17 DatabaseSpy Settings

The Tools | Options command enables you to define global application settings. These settings are specified in a dialog box with a navigation pane and saved in the registry. They apply to all current and future document windows. The Apply button in the Options dialog displays the changes in the currently open documents and fixes the current settings. The changes are seen immediately in the background windows. Each dialog page provides also a Reset to Page Defaults button which sets all changes you made on this page back to the default settings.

Each page of the Options dialog is described in detail in this section.

To change DatabaseSpy settings:

1. Select Tools | Options... or press Ctrl+Alt+O. The Options dialog box appears.
2. In the navigation pane, select the dialog pages for the following options:
   - General
   - SQL Editor
   - Design Editor
   - Data Compare
3. Make the desired changes and click OK.
17.1 General Options

The main page of the General options defines the general appearance of DatabaseSpy as well as general options when working with the application. Related settings are defined in the Online Browser, Change Script, File Types, and Encoding options.

Application Startup
You can choose to automatically open the project file that was open when you last closed DatabaseSpy or to have the Add a Data Source dialog box displayed when DatabaseSpy is started. If you do not choose any of the options in this group box, you must open files or projects in DatabaseSpy via the File menu.

Program Logo
Choose whether you want the DatabaseSpy logo displayed when the application is started and whether it should appear on top of a print-out you make.

Line Breaks
When you open a file, the character coding for line breaks in it is preserved if Preserve old is selected. Alternatively, you can choose to code line breaks in any of three codings: CR&LF (for PC), CR (for MacOS), or LF (for Unix).

Frame Title
The frame title in DatabaseSpy shows the project name and the name of the object that is currently active in the SQL Editor or the Design Editor, respectively. You can choose whether you want to see just the file name or the entire path of the object in the frame title of the application.
Automatic reload of files
If you are working in a multi-user environment, or if you are working on files that are dynamically generated on a server, you can watch for changes to files that are currently open in the interface. Each time DatabaseSpy detects a change in an open document, it will prompt you about whether you want to reload the changed file.

Connection Wizard
If you activate the **Skip Configuration Step in Connection Wizard** check box, the Configure page in the Add a Data Source dialog box is skipped and clicking **Next** in the first dialog page of the Add a Data Source dialog box will bring you directly to the Data Link Properties dialog box.

 Newly saved files
You can automatically add files to your project when you save them to the file system or suppress the display of the respective dialog box.

17.1.1 Online Browser

The Online Browser section of the Options dialog box lets you configure layout and behaviour aspects of the Online Browser.

**Context Menu Action for SQL Editor**
Specify the default action taken when an object is dragged and dropped from the Online Browser to the SQL Editor. You can specify a different default action for each database object type.
Display Labels
You can have DatabaseSpy display labels that are displayed as a prefix in front of the names in the Online Browser or the Project window. For example, table names are prefixed with the word “Table” and columns with the word “Column” in the Online Browser, or data sources are prefixed with the word "Data Source" in the Project window. To hide the connection method for data sources in the Online Browser and Project windows, deactivate the respective check box.

Show connection method in Project window:  
Hide connection method in Online Browser:

Please note that you can show or hide the connection method only for both the Project window and the Online Browser; this option cannot be set individually for the two of them.

Appearance
When the **Enable full row selection** check box is activated, in the Online Browser the row in which the cursor is currently positioned is highlighted and you can click to select the row without having to move the cursor exactly over the text of the row. From the drop-down list, you can choose a color to be used for selecting.

If you prefer a wider display of your database data, you can deactivate the **Reduce vertical spacing** check box. This option applies to both Project window and Online Browser. The **Optional display of Table and View row counts** check box is activated by default, allowing you to show the number of data rows of a table or view without having to retrieve data first.

Case Sensitivity for Object Locator
When searching and filtering database objects, you can decide whether or not this should be case sensitive.

17.1.2 Change Script

The Change Script section of the Options dialog box lets you configure the script generation and execution of the Database Structure Change Script.
Database Structure Change Script
The Database Structure Change Script can be generated either instantly when a change occurs, or on demand. In the latter case, you must generate the change script manually by clicking on the Update Change Script icon. In this group box, you can also define the time delay during execution of the change script. Choosing Slow, for example, increases the time delay and gives you the opportunity to cancel the execution of the change script at a certain stage.

Confirmation Messages
DatabaseSpy can display a popup alarming you that a change script has been generated when a database object is edited for the first time. You can turn off this message by deactivating the Show hint on the first database edit operation or by activating the Don't show this dialog again! check box in the dialog box.
If you want DatabaseSpy to inform you when a change script is created, but do not want to have the details displayed, click the **Hide Details** button and the dialog will appear in a minimized form next time.

### 17.1.3 File Types

The File Types section of the Options dialog box allows you to customize the behavior of DatabaseSpy on a per-file-type basis.

**Windows Explorer settings**

You can define the file type description and MIME-compliant content type used by Windows Explorer and whether DatabaseSpy is to be the default editor for documents of this file type.

**Conformance**

DatabaseSpy provides specific editing and other features for various file types. The features for a file type are set by specifying the conformance in this option. DatabaseSpy lets you set file type to conform with SQL and other (text) grammars. A large number of file types is defined with a default conformance that is appropriate for the file type. We recommend that you do not modify these settings unless you are adding a new file type or deliberately wish to set a file type to another kind of conformance.

**Add new file extension**

Adds a new file type to the File types list. You must then define the settings for this new file type using the other options in this section.

**Delete selected file extension**

Deletes the currently selected file type and all its associated settings.
17.1.4 Encoding

In the Encoding section of the Options dialog box, you can specify several options for file encodings.

Default encoding for new SQL files
Define the default encoding for new files so that each new document includes the encoding specification that you specify here. If a two- or four-byte encoding is selected as the default encoding (i.e., UTF-16, UCS-2, or UCS-4), you can also choose between little-endian and big-endian byte ordering for the SQL files. The encoding for existing files will, of course, always be retained.

Open SQL files with unknown encoding as
You can select the encoding with which to open an SQL file with no encoding specification or where the encoding cannot be detected.

Note: SQL files which have no encoding specification are correctly saved with a UTF-8 encoding.

BOM (Byte Order Mark)
When a document with two-byte or four-byte character encoding is saved, the document can be saved either with (i) little-endian byte-ordering and a little-endian BOM (Always create BOM if not UTF-8); or (ii) the detected byte-ordering and the detected BOM (Preserve detected BOM on saving).

17.1.5 Java

On the Java tab, you can optionally enter the path to a Java VM (Virtual Machine) on your file system. Note that adding a custom Java VM path is not always necessary. By default, DatabaseSpy attempts to detect the Java VM path automatically by reading (in this order) the Windows registry and the JAVA_HOME environment variable. The custom path added on this dialog box will take priority over any other Java VM path detected automatically.
You may need to add a custom Java VM path, for example, if you are using a Java virtual machine which does not have an installer and does not create registry entries (for example, Oracle's OpenJDK). You might also want to set this path if you need to override, for whatever reason, any Java VM path detected automatically by DatabaseSpy.

```
Java

Java VM library location

Path to jvm.dll:

E.g., C:\Program Files (x86)\Java\jdk-11.0.9\bin\server\jvm.dll

Leave the field empty for auto-detection of the JVM.

Important: The Java bit-version must be the same as that of the Altova application (64-bit).

Note: If JVM has been started within the current instance of the Altova application, a change of the JVM location will take effect only after the application is restarted.
```

Note the following:

- The Java VM path is shared between Altova desktop (not server) applications. Consequently, if you change it in one application, it will automatically apply to all other Altova applications.
- The path must point to the jvm.dll file from the \bin\server or \bin\client directory, relative to the directory where the JDK was installed.
- The DatabaseSpy platform (32-bit, 64-bit) must be the same as that of the JDK.
- After changing the Java VM path, you may need to restart DatabaseSpy for the new settings to take effect.

Changing the Java VM path affects database connectivity via JDBC.
17.2 SQL Editor Options

The main page of the SQL Editor options defines the visual appearance of the editor. Additional SQL Editor-related settings are defined in the SQL Generation, SQL Formatting, Autoinsertion, Result View, and Fonts, options.

General
Syntax coloring emphasizes different elements of SQL syntax using different colors. By activating the Connect data source on execute check box, you can have DatabaseSpy connect to the corresponding data source automatically whenever an SQL file is executed and its data source is not connected.

Retrieval
You can have DatabaseSpy display a dialog box asking you whether you want to change the time out settings when the permissible execution period is exceeded. Specify the maximum amount of time that is permissible for the execution of retrievals. The number n you enter into the Buffered Amount (Rows) field will appear in the context menu of the Online Browser if you select the Retrieve data | First n rows option.

Entry Helpers
To enable auto-completion suggestions as you start typing in SQL Editor, select the Automatically open check box.

The entry helper buffer for auto-completion and auto-insertion can be filled either when you connect to a data source or when it is used for the first time. Note that filling the buffer may take
some time. Use the **Clear Buffer** button to reset the buffer.

If you are running DatabaseSpy as part of Altova MissionKit or alongside other Altova products, note that this setting is preserved across multiple Altova products that have an SQL editor.

**Text View Settings**

Text view settings are defined in a separate dialog box, which can be accessed via the **Text View Settings** button. See [SQL Editor Features](#).

### 17.2.1 Generation

The Generation section of the Options dialog box lets you configure how the statements are generated.

#### Statement generation options

Use the **Select a database** field list to select a database kind and set the statement generation options individually for the different database kinds you are working with. Activating the **Apply to all databases** check box sets the options that are currently selected for all databases.

When the **Append semicolons to statement end** check box is activated, a semicolon is appended when you generate an SQL statement in the SQL Editor. Note that editing of data in Oracle databases and IBM iSeries and DB2 databases via a JDBC connection is possible only if this check box is unchecked.

By default, identifiers in SQL statements are enclosed in database-specific escape characters. You can deactivate the **Surround identifiers with escape characters** check box if you do not want to display these characters.

The **Generate SELECT statements with full column list** check box is also activated by default.
If you prefer `SELECT * FROM ...` when retrieving all columns of a table, deactivate it.

**Confirmation Messages**

When you have deactivated the **Append semicolons to statement end** check box and activated the **Show warning when editor enforces semicolons and SQL generation does not** check box, DatabaseSpy will display a message box when a statement is generated (see Generating SQL Statements).

---

### 17.2.2 Formatting

The Formatting section of the Options dialog box lets you switch off SQL formatting for the SQL Editor and Change Script windows and configure the behavior of open SQL Editor windows.

When you have deactivated the **Append semicolons to statement end** check box and activated the **Show warning when editor enforces semicolons and SQL generation does not** check box, DatabaseSpy will display a message box when a statement is generated (see Generating SQL Statements).

---

**SQL Formatting**

You can disable the SQL formatting options for the Change Script window and/or the SQL Editor by deactivating the respective check boxes. Note that in the Change Script window, SQL formatting is applied automatically when the next change is recorded, and that you cannot apply
formatting without changing the database structure.

**Update behavior after changing Formatting Configurations**

This group box allows you to specify whether or not open SQL Editor windows should be automatically updated after formatting configurations have changed or if a prompt should be displayed, where you can choose to update the windows or to keep the existing formatting.

**SQL Formatting Configurations**

The SQL Formatting Configurations... button opens the SQL Formatting Configuration dialog box, where you can define the configurations for the different database types or disable formatting on database or even statement type level.

### 17.2.3 Autoinsertion

The Autoinsertion section of the Options dialog box lets you configure the options that apply for text that is inserted automatically into the SQL Editor. Autoinsertion occurs, for example, when you type an opening bracket "(" and DatabaseSpy automatically inserts the closing bracket ")".

![SQL Editor: Autoinsertion](image)

**Closing Characters**

You can disable the autoinsertion of closing characters completely by deactivating the Autoinsert closing characters check box. If you only want to exclude some of the characters from being inserted automatically, activate the Autoinsert closing characters check box and deactivate the corresponding check box for the respective character. If you insert an opening character for which autoinsertion is enabled, the corresponding closing character is automatically inserted and the cursor is placed between the two characters.
When inserting comment marks, please note that you have to highlight a text section before entering a "/" or "-" in order to comment out this text. DatabaseSpy will then automatically insert a "**" after the "/" in front of the text as well as "*/" after the text if you enter a "/", or add a second "-" if you enter a "-" while the text to be commented out is selected.

**Autoindent**

The **Match previous line** option helps you preserve text indentation after you press the **Enter** key in SQL Editor. For example, if line 1 is indented by a tab character, you may want the next line to have the same indentation as line 1 after you press **Enter**. To enable this behaviour, select the **Match previous line** check box.

**Behaviour**

When the corresponding option is activated, the closing character is deleted automatically when the opening character is deleted in the SQL Editor.

To place selected text inside a pair of autoinserted characters, activate the **Wrap selected text when autoinserting** check box and then type the opening character. The opening and closing characters are inserted automatically before and after the text.

**Star Expansion**

DatabaseSpy can automatically replace the "**" in a **SELECT * FROM ...** statement with all of the columns of the respective table if the **Expand columns with tab** option is checked. Please note that the statement has to be valid and that you must place the cursor behind the "**" in the statement and then press the **Tab** key to achieve this.

**17.2.4  Result View**

The Result View section of the Options dialog box lets you configure aspects of the appearance of the Result window in the SQL Editor.

### SQL Editor: Result View

- **Colors**
  - Check **Show grid with alternating colors**

- **Display Options**
  - Check **Show horizontal lines**
  - Check **Show line numbers**
  - Check **Show sorting arrows**
  - Check **Show vertical lines**
  - Check **Show result toolbar**

- **Data Editing**
  - Check **Use transactions to save changes**
  - **Initialize cells with default values**
  - Check **Rollback transactions on failure**
  - Check **Show hint when data editing is limited**

---

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Colors
You can have rows in Result tabs displayed as simple grid or with alternating white and colored rows. The color can be changed using the color chooser below the check box.

Display Options
By default, horizontal and vertical grid lines as well as line numbers and the Result toolbar are displayed. You can switch any of these options off by deactivating the respective check box.

DatabaseSpy allows you to sort data contained in the result grid either ascending or descending by repeatedly clicking the column headers. To enable this option, activate the Show sorting arrows check box.

Data Editing
When the default setting is applied, DatabaseSpy uses transactions to save changes in the result grid and rolls back these changes if a failure occurs during committing the changes to the database. Any editing is then written into a transaction which is executed as a whole. If the Rollback transactions on failure check box is activated, all changes contained are undone upon failure of a single update statement in the transaction.

Note: Transactions are not supported by MS Access databases.

If default values are defined for the individual database fields, DatabaseSpy can automatically insert these values when creating a new line in the result grid. Deactivate the Initialize cells with default values check box if you want to create empty lines.

When data editing is not possible to the full extent, DatabaseSpy shows a warning message before the data is displayed in the Result window. You can suppress this hint by deactivating the Show hint when data editing is limited check box.

17.2.5 Fonts
The Fonts section of the Options dialog box lets you configure color and font settings of different parts of SQL statements. Use the drop-down list below the heading of the dialog page to switch between Text Editor and Result View settings.
Text Editor Font

The types listed in the left hand pane are elements of SQL statements. You can choose the common font face, style, and size of all text that appears in SQL Editor. Note that the same font and size is used for all text types. Only the style can be changed for individual text types. This enables the syntax coloring feature.

Click the **Reset to Page Defaults** button to restore the original settings.

Result View Font
In the left hand pane, you can choose either the result grid header or the data rows. You can choose the common font face, style, and size of all text that appears in the result grid. Note that you can apply the same font and/or size to all text types by activating the respective *Use the same for all* check box.

Click the **Reset to Page Defaults** button to restore the original settings.
17.3 Design Editor Options

The main page of the Design Editor options defines the visual appearance and general behaviour of the editor. Additional Design Editor-related settings are defined in the Element Colors and Fonts options.

**General Behavior**

If you have several data sources defined in your project but not all are active, you can automatically connect to the related data source when you open a design file in Design Editor. A prompt asking you if you want to connect will appear if this option is not activated.

DatabaseSpy can display tooltips when database objects are dragged from the Online Browser or from different table designs into the Columns or Keys section of a table design. When creating new database objects, you can automatically display the properties box in the Design Editor so as to fine-tune the definition of the objects without having to change to the properties window. For this purpose, activate the **Automatically expand newly created objects** check box.

**Tables**

When new tables are created in the Design Editor, DatabaseSpy can automatically create primary keys for them. The first column of a new table is then renamed to "id" and a primary key constraint is added to the Keys section.

You can have the schema name displayed in parentheses in the title bar of a table.
Relations
By default, all connection lines between related tables are labeled in Design Editor. You can, however, hide the labels of unselected lines by deactivating the respective check box. Highlighting active relations objects will gray out tables that do not form part of a relation when you click on the line that connects related tables.

Default options on insertion
The default table layout can be set to compact and/or expanded. In the compact layout only the column names of a table are visible (check the Insert with compact layout (single column) check box to switch to compact layout). If the Expand table object when inserted check box is not checked, only the title bar of a table will be displayed.

Grid Settings
Adjust the grid size according to your needs and specify whether or not database objects in the Design Editor should snap to grid.

17.3.1 Element Colors

The Colors section of the Options dialog box lets you configure colors for objects in the Design Editor.

Element Colors
Specify the color that is used for displaying each element in the Properties windows. Select an element from the list and choose a color for it from the drop-down list. Click the Reset All button.
to restore the original settings.

**Selection Colors**
Define the colors for selected elements and text. Click the **Reset All** button to restore the original settings.

**Background Coloring**
Defines the appearance of Design Editor's background. Choose between solid and gradient background and specify the colors and the way they are used in the gradient.

### 17.3.2 Fonts

The Fonts section of the Options dialog box lets you configure fonts for objects in the Design Editor.

![Design Editor: Fonts](image)

**Font settings**
You can choose the font face, size, and style for the individual elements displayed in the Design Editor. Note that, unlike in the Text Font section, it is possible to specify different font faces for header and data rows. To apply the same font and/or size to all text types, activate the respective **Use the same for all** check box.

The element names in the list box are defined as follows:

- **Title**: The name of a table in its title bar
- **Data**: The content of the table, i.e., the column names
- **Compartment**: The sub-titles in a table, i.e., Column Name, Indexes, Keys, Check Constraints
- **Label**: The designation of the connection line which links related tables in the Design Editor
- **Note**: The content of sticky notes that you add to the design view
17.4 Data Compare Options

The main page of the Data Compare Options defines how the compared tables in data and schema comparisons are displayed in the comparison components and whether tables and/or columns should be mapped automatically when added to a comparison. Additional settings related to database data comparison are defined on the Comparison Options, XML Compare, and Result View pages.

### Display Options

In order to be able to open a comparison window without having to specify data source and tables to be compared, deactivate the **Show table selection for new documents** check box. If you prefer that all tables be shown with the columns not expanded, deactivate the **Show tables initially expanded** check box. You can deactivate the display of the schema name for tables in components, and show the data source name in the component header.

### Automatic table and column mapping

This group of options is applicable when you perform database data and schema comparisons. By default, when tables are added to a comparison, they are automatically mapped. To disable automatic mapping of tables or columns, clear the **Map tables automatically** or **Map columns automatically** check box, respectively.

If automatic mapping is enabled for columns, you can further specify how DatabaseSpy should create the mapping:

- **Find mapping by name**: DatabaseSpy checks for matching column names in both tables. By default, matching is case insensitive (for example, "Expenses" will match to
"expenses"). To perform a case sensitive matching, clear the **Ignore case when mapping by name** check box.

- **Find mapping by type**: DatabaseSpy maps columns that have a different name but share the same data type. It is recommended to use this option only in small databases, provided that each column of the same table has a different type; otherwise, unwanted mappings are likely to occur.

- **Find mapping by name and type**: DatabaseSpy considers first the column name and then its data type when mapping.

- **Find mapping based on column position**: Columns will only be mapped if the ordinal position at the time of table creation is identical in both tables. This way you can compare tables that are equally designed but use different column names.

In addition, you can specify whether or not binary data columns, XML columns, identity columns, calculated columns, or the case of a column name should be ignored. If you want to map item names that match to a large extent but are not exactly equal (e.g. "expenses2008" and "expenses_09"), clear the **Exact match when mapping by name** check box.

### Schema comparison

If you activate the **Try to map unconnected items during comparison** check box, DatabaseSpy will try to find corresponding items for unmapped items in the opposite component when a comparison is started.

### 17.4.1 Comparison Options

The Comparison Options section of the Options dialog box displays the options that are used for string-based comparison.

<table>
<thead>
<tr>
<th>Comparison Options</th>
<th>Numeric Options</th>
<th>Optimization Options</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Comparison Mode</strong></td>
<td><strong>Ignore case in comparison</strong></td>
<td><strong>Append trailing zeros to floating point numbers</strong></td>
</tr>
<tr>
<td>○ Use native type for comparison</td>
<td>○ Ignore whitespaces in comparison</td>
<td>○ Keep only different rows in memory</td>
</tr>
<tr>
<td>○ Use string-representation for comparison</td>
<td>○ Treat [NULL] as empty string</td>
<td></td>
</tr>
<tr>
<td><strong>Execution Options</strong></td>
<td><strong>Use transaction when committing</strong></td>
<td><strong>Rollback on error</strong></td>
</tr>
<tr>
<td>○ Process comparison sequentially</td>
<td>○ Process comparison in parallel</td>
<td></td>
</tr>
</tbody>
</table>
Comparison Mode
You can choose from among two comparison modes: native type or as string. The native type considers the data type of the column that is compared, whereas everything will be converted into strings before comparison if you use the string representation type.

Comparison Options
Clear the Ignore case in comparison check box if upper and lower casing should not be ignored when checking for differences. Select the Ignore whitespaces in comparison option if you do not want to consider whitespaces when comparing database data. Whitespace characters are space, tab, carriage return, and line feed. If you do not want to make a difference between an empty field and a field containing the NULL value, select the Treat [NULL] as empty string check box.

Numeric Options
Floating point numbers can be filled up with trailing zeros by selecting the Append trailing zeros to floating point numbers check box.

Optimization Options
If you do not care to see rows that are equal in both tables of a comparison, select the Keep only different rows in memory check box. In this case, only different rows are retrieved and displayed in the Result window.

Execution Options
You can define whether you want to process comparison of multiple tables sequentially or parallel. Changes can be committed with or without the use of transactions and you can decide whether or not you want to rollback on errors.

17.4.2 XML Compare
The XML section of the Options dialog box displays the options that are used for XML-based comparison.
### Data Compare: XML Compare

#### Whitespace
- Compare as is
- Normalize
- Strip all

#### Case sensitivity
- Ignore case
- Do not ignore case in node names

#### Namespace/Prefix
- Ignore namespace
- Ignore prefixes

#### Order
- Ignore order of child nodes
- Ignore order of attributes

#### Entities
- Resolve entities

#### Text
- Ignore text

#### Depth
- Ignore node depth

### Whitespace
Whitespace characters are space, tab, carriage return, and line feed. The three options here compare files with whitespace unchanged; with whitespace normalized (i.e., all consecutive whitespace characters are reduced to one whitespace character); and with all whitespace stripped (i.e., not considered for comparison).

### Case sensitivity
If the **Ignore case** check box is checked, then case is ignored, and you have the option of ignoring or not ignoring case in node names.

### Namespace/Prefix
These are options for ignoring namespaces and prefixes when searching for differences.

### Ignore node types
Check the node types that will **not** be compared in the Compare session. Node types that may be ignored are Attributes, CDATA, Comments, Processing Instructions, DOCTYPE statements, and XML declarations.

### Order
If **Ignore order of child nodes** is selected, then the relative position of the child nodes of an element is ignored. As long as an element node with the same name exists in each of the two sets of sibling nodes, the two sets are considered to be equal. Note, however, that if an element node has an attribute, it will always be considered unequal to an element with the same name in the compared sibling set—even if the **Ignore order of child nodes** is selected. The option of ignoring the order of attributes is also available, and applies to the order of attributes of a single
element.

**Entities**

If **Resolve entities** is selected, then all entities in the document are resolved. Otherwise the files are compared with the entities as is.

**Text**

If **Ignore text** is selected, then differences in corresponding text nodes are not reported.

**Depth**

If **Ignore node depth** is selected, then the additional depth of any element (i.e., more levels of descendants) relative to the depth of the corresponding element in the compared file is ignored. This option must be unselected to enable merging and exporting differences.

### 17.4.3 Result View

The Compare Result View section of the Options dialog box provides options for customizing the display of the comparison results.

<table>
<thead>
<tr>
<th><img src="image" alt="Data Compare: Result View" /></th>
<th>Reset to Page Defaults</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Display Options</strong></td>
<td></td>
</tr>
<tr>
<td>☑ Show horizontal lines</td>
<td>Default gutter width: 2</td>
</tr>
<tr>
<td>☑ Show vertical lines</td>
<td></td>
</tr>
<tr>
<td>☑ Show line numbers</td>
<td></td>
</tr>
</tbody>
</table>

**Display Options**

Activate the relevant check boxes if you want to display horizontal or vertical lines, or line numbers in the Compare Result View. You can also adapt the default gutter width if you want to separate the compared columns from each other more clearly.

**Advanced Selection Options**

When checked, the **Don’t auto-select relevant cells** check box allows you to select a single cell containing a difference in the result grid without automatically selecting the corresponding cell in the compared table. Leaving the check box unchecked (default setting) the two different cells are always selected as a pair so as to show you exactly which cells will be affected by a merge.
18 Altova Global Resources

Altova Global Resources is a collection of aliases for file, folder, and database resources. Each alias can have multiple configurations, and each configuration maps to a single resource (see screenshot below). Therefore, when a global resource is used as an input, the global resource can be switched among its configurations. This is done easily via controls in the GUI that let you select the active configuration. For example, an SQL file or data source connection can be changed with a couple of mouse-clicks, and a query can be executed without having to change the data source or SQL statement.

Using Altova Global Resources involves two processes:

- **Defining Global Resources**: Resources are defined and the definitions are stored in an XML file. These resources can be shared across multiple Altova applications.
- **Using Global Resources**: Within DatabaseSpy, files can be located via a global resource instead of via a file path. The advantage is that the resource can be switched by changing the active configuration in DatabaseSpy.

**Global resources in other Altova products**

Currently, global resources can be defined and used in the following individual Altova products: XMLSpy, StyleVision, MapForce, Authentic Desktop, MobileTogether Designer, and DatabaseSpy.
18.1 Defining Global Resources

Altova Global Resources are defined in the Manage Global Resources dialog, which can be accessed in two ways:

- Click the menu command **Tools | Global Resources**.
- Click the **Manage Global Resources** icon in the Global Resources toolbar (screenshot below).

The Global Resources Definitions file

Information about global resources is stored in an XML file called the Global Resources Definitions file. This file is created when the first global resource is defined in the Manage Global Resources dialog (screenshot below) and saved.

When you open the Manage Global Resources dialog for the first time, the default location and name of the Global Resources Definitions file is specified in the **Definitions File** text box (see screenshot above):

```
C:\Users\<username>\My Documents\Altova\GlobalResources.xml
```

This file is set as the default Global Resources Definitions file for all Altova applications. So a global resource can be saved from any Altova application to this file and will be immediately available to all other Altova applications as a global resource. To define and save a global resource to the Global Resources Definitions file, add the global resource in the Manage Global Resources dialog and click **OK** to save.

To select an already existing Global Resources Definitions file to be the active definitions file of a
particular Altova application, browse for it via the Browse button of the Definitions File text box (see screenshot above).

**Note:** You can name the Global Resources Definitions file anything you like and save it to any location accessible to your Altova applications. All you need to do in each application, is specify this file as the Global Resources Definitions file for that application (in the Definitions File text box). The resources become global across Altova products when you use a single definitions file across all Altova products.

**Note:** You can also create multiple Global Resources Definitions files. However, only one of these can be active at any time in a given Altova application, and only the definitions contained in this file will be available to the application. The availability of resources can therefore be restricted or made to overlap across products as required.

### Managing global resources: adding, editing, deleting, saving

In the Manage Global Resources dialog (screenshot above), you can add a global resource to the selected Global Resources Definitions file, or edit or delete a selected global resource. The Global Resources Definitions file organizes the global resources you add into groups: of files, folders, and databases (see screenshot above).

To **add a global resource**, click the Add button and define the global resource in the appropriate Global Resource dialog that pops up (see the descriptions of files, folders, and databases in the sub-sections of this section). After you define a global resource and save it (by clicking OK in the Manage Global Resources dialog), the global resource is added to the library of global definitions in the selected Global Resources Definitions file. The global resource will be identified by an alias.

To **edit a global resource**, select it and click Edit. This pops up the relevant Global Resource dialog, in which you can make the necessary changes (see the descriptions of files, folders, and databases in the sub-sections of this section).

To **delete a global resource**, select it and click Delete. If the global resource you delete has been added as a data source to the project that is currently open in DatabaseSpy, a message box appears and you can decide whether the data source should be deleted also in the project or whether it should be converted into a local data source.

After you finish adding, editing, or deleting, make sure to click OK in the Manage Global Resources dialog to **save your modifications** to the Global Resources Definitions file.

### Relating global resources to alias names via configurations

Defining a global resource involves mapping an alias name to a resource (file, folder, or database). A single alias name can be mapped to multiple resources. Each mapping is called a configuration. A single alias name can therefore be associated with several resources via different configurations (screenshot below).
In an Altova application, you can then assign aliases instead of files. For each alias you can switch between the resources mapped to that alias simply by changing the application's active Global Resource configuration (active configuration). For example, in Altova's XMLSpy application, if you wish to run an XSLT transformation on the XML document *MyXML.xml*, you can assign the alias *MyXSLT* to it as the global resource to be used for XSLT transformations. In XMLSpy you can then change the active configuration to use different XSLT files. If Configuration-1 maps *First.xslt* to *MyXSLT* and Configuration-1 is selected as the active configuration, then *First.xslt* will be used for the transformation. In this way multiple configurations can be used to access multiple resources via a single alias. This mechanism can be useful when testing and comparing resources. Furthermore, since global resources can be used across Altova products, resources can be tested and compared across multiple Altova products as well.

### 18.1.1 Files

The Global Resource dialog for Files *(screenshot below)* is accessed via the Add | Files command in the Manage Global Resources dialog. In this dialog, you can define configurations of the alias that is named in the Resource Alias text box. After specifying the properties of the configurations as explained below, save the alias definition by clicking OK.

After saving an alias definition, you can add another alias by repeating the steps given above (starting with the Add | Files command in the Manage Global Resources dialog).

**Global Resource dialog**

An alias is defined in the Global Resource dialog *(screenshot below)*.
Global Resource dialog icons

- **Add Configuration**: Pops up the Add Configuration dialog in which you enter the name of the configuration to be added.
- **Add Configuration as Copy**: Pops up the Add Configuration dialog in which you can enter the name of the configuration to be created as a copy of the selected configuration.
- **Delete**: Deletes the selected configuration.
- **Open**: Browse for the file to be created as the global resource.

Defining the alias

Define the alias (its name and configurations) as follows:

1. **Give the alias a name**: Enter the alias name in the Resource Alias text box.
2. **Add configurations**: The Configurations pane will have, by default, a configuration named
Default (see screenshot above), which cannot be deleted or renamed. You can add as many additional configurations as you like by: (i) clicking the Add Configuration or Add Configuration as Copy icons, and (ii) giving the configuration a name in the dialog that pops up. Each added configuration will be shown in the Configurations list. In the screenshot above, two additional configurations, named Long and Short, have been added to the Configurations list. The Add Configuration as Copy command enables you to copy the selected configuration and then modify it.

3. Select a resource type for each configuration: Select a configuration from the Configurations list, and, in the Settings for Configuration pane, specify a resource for the configuration: (i) File, (ii) Output of an Altova MapForce transformation, or (iii) Output of an Altova StyleVision transformation. Select the appropriate radio button. If a MapForce or StyleVision transformation option is selected, then a transformation is carried out by MapForce or StyleVision using, respectively, the .mfd or .sps file and the respective input file. The result of the transformation will be the resource.

4. Select a file for the resource type: If the resource is a directly selected file, browse for the file in the Resource File Selection text box. If the resource is the result of a transformation, in the File Selection text box, browse for the .mfd file (for MapForce transformations) or the .sps file (for StyleVision transformations). Where multiple inputs or outputs for the transformation are possible, a selection of the options will be presented. For example, the output options of a StyleVision transformation are displayed according to what edition of StyleVision is installed (the screenshot below shows the outputs for Enterprise Edition).

5. Define multiple configurations if required: You can add more configurations and specify a resource for each. Do this by repeating Steps 3 and 4 above for each configuration. You can add a new configuration to the alias definition at any time.

6. Save the alias definition: Click OK to save the alias and all its configurations as a global resource. The global resource will be listed under Files in the Manage Global Resources dialog.

Result of MapForce transformation

Altova MapForce maps one or more (existing) input document schemas to one or more (new) output document schemas. This mapping, which is created by a MapForce user, is known as a MapForce Design (MFD). XML files, text files, databases, etc, that correspond to the input schema/s can be used as data sources. MapForce generates output data files that correspond to
the output document schema. This output document is the *Result of MapForce Transformation* file that will become a global resource.

If you wish to set a MapForce-generated data file as a global resource, the following must be specified in the Global Resource dialog (*see screenshot below*):

- **A .mfd (MapForce Design) file.** You must specify this file in the *Resource will point to generated output of text box* (*see screenshot above*).
- **One or more input data files.** After the MFD file has been specified, it is analyzed and, based on the input schema information in it, default data file/s are entered in the *Inputs* pane (*see screenshot above*). You can modify the default file selection for each input schema by specifying another file.
- **An output file.** If the MFD document has multiple output schemas, all these are listed in the *Outputs* pane (*see screenshot above*) and you must select one of them. If the output file location of an individual output schema is specified in the MFD document, then this file location is entered for that output schema in the *Outputs* pane. From the screenshot above we can see that the MFD document specifies that the *Customers* output schema has a default XML data file (*CustomersOut.xml*), while the *Text file* output schema does not have a file association in the MFD file. You can use the default file location in the *Outputs* pane or specify one yourself. The result of the MapForce transformation will be saved to the file location of the selected output schema. This is the file that will be used as the global resource.

**Note:** The advantage of this option (Result of MapForce transformation) is that the transformation is carried out at the time the global resource is invoked. This means that the global resource will contain the most up-to-date data (from the input file/s).
Note: Since MapForce is used to run the transformation, you must have Altova MapForce installed for this functionality to work.

Result of StyleVision transformation

Altova StyleVision is used to create StyleVision Power Stylesheet (SPS) files. These SPS files generate XSLT stylesheets that are used to transform XML documents into output documents in various formats (HTML, PDF, RTF, Word 2007+, etc). If you select the option Result of StyleVision Transformation, the output document created by StyleVision will be the global resource associated with the selected configuration.

For the StyleVision Transformation option in the Global Resource dialog (see screenshot below), the following files must be specified.

- **A .sps (SPS) file.** You must specify this file in the Resource will point to generated output of text box (see screenshot above).
- **Input file/s.** The input file might already be specified in the SPS file. If it is, it will appear automatically in the Inputs pane once the SPS file is selected. You can change this entry. If there is no entry, you must add one.
- **Output file/s.** Select the output format in the Outputs pane, and specify an output file location for that format.
18.1.2 Folders

In the Global Resource dialog for Folders *(screenshot below)*, add a folder resource as described below.

**Global Resource dialog icons**

- **Add Configuration**: Pops up the Add Configuration dialog in which you enter the name of the configuration to be added.
- **Add Configuration as Copy**: Pops up the Add Configuration dialog in which you can enter the name of the configuration to be created as a copy of the selected configuration.
- **Delete**: Deletes the selected configuration.
- **Open**: Browse for the folder to be created as the global resource.

Note: The advantage of this option (Result of StyleVision transformation) is that the transformation is carried out when the global resource is invoked. This means that the global resource will contain the most up-to-date data (from the input file/s).

Note: Since StyleVision is used to run the transformation, you must have Altova StyleVision installed for this functionality to work.
Defining the alias
Define the alias (its name and configurations) as follows:

1. *Give the alias a name:* Enter the alias name in the Resource Alias text box.
2. *Add configurations:* The Configurations pane will have a configuration named Default (see screenshot above). This Default configuration cannot be deleted nor have its name changed. You can enter as many additional configurations for the selected alias as you like. Add a configuration by clicking the **Add Configuration** or **Add Configuration as Copy** icons. In the dialog which pops up, enter the configuration name. Click **OK.** The new configuration will be listed in the Configurations pane. Repeat for as many configurations as you want.
3. *Select a folder as the resource of a configuration:* Select one of the configurations in the Configurations pane and browse for the folder you wish to create as a global resource. If security credentials are required to access a folder, then specify these in the **Username** and **Password** fields.
4. *Define multiple configurations if required:* Specify a folder resource for each configuration you have created (that is, repeat Step 3 above for the various configurations you have created). You can add a new configuration to the alias definition at any time.
5. *Save the alias definition:* Click **OK** in the Global Resource dialog to save the alias and all its configurations as a global resource. The global resource will be listed under Folders in the [Manage Global Resources dialog](#).

### 18.1.3 Databases

In the Global Resource dialog for Databases (*screenshot below*), you can add a database resource as follows:
Global Resource dialog icons

- **Add Configuration**: Pops up the Add Configuration dialog in which you enter the name of the configuration to be added.
- **Add Configuration as Copy**: Pops up the Add Configuration dialog in which you can enter the name of the configuration to be created as a copy of the selected configuration.
- **Delete**: Deletes the selected configuration.

Defining the alias
Define the alias (its name and configurations) as follows:

1. **Give the alias a name**: Enter the alias name in the Resource Alias text box.
2. **Add configurations**: The Configurations pane will have a configuration named Default (see
screenshot above). This Default configuration cannot be deleted nor have its name changed. You can enter as many additional configurations for the selected alias as you like. Add a configuration by clicking the Add Configuration or Add Configuration as Copy icons. In the dialog which pops up, enter the configuration name. Click OK. The new configuration will be listed in the Configurations pane. Repeat for as many configurations as you want.

3. **Start selection of a database as the resource of a configuration:** Select one of the configurations in the Configurations pane and click the Choose Database icon. This pops up the Create Global Resources Connection dialog.

4. **Connect to the database:** Select whether you wish to create a connection to the database using the Connection Wizard, an ADO Connection, an ODBC Connection, or JDBC Connection. Complete the definition of the connection method as described in the section Connecting to a Database. You can use either the Connection Wizard, ADO Connections, or ODBC Connections.

5. **Select the root object:** If you connect to a database server where a root object can be selected, you will be prompted, in the Choose Root Object dialog (screenshot below), to select a root object on the server. Select the root object and click Set Root Object. The root object you select will be the root object that is loaded when this configuration is used.

If you choose not to select a root object (by clicking the Skip button), then you can select the root object at the time the global resource is loaded.

6. **Define multiple configurations if required:** Specify a database resource for any other configuration you have created (that is, repeat Steps 3 to 5 above for the various configurations you have created). You can add a new configuration to the alias definition at any time.

7. **Save the alias definition:** Click OK in the Global Resource dialog to save the alias and all its configurations as a global resource. The global resource will be listed under databases in the Manage Global Resources dialog.
18.2 Using Global Resources

There are several types of global resources (file-type, folder-type, and database-type). Some scenarios in which you can use global resources in DatabaseSpy are listed here: Global SQL Statements and Data Sources in DatabaseSpy Projects.

Selections that determine which resource is used

There are two application-wide selections that determine what global resources can be used and which global resources are actually used at any given time:

- The active Global Resources XML File is selected in the Global Resource dialog. The global-resource definitions that are present in the active Global Resources XML File are available in the application. Only the definitions in the active Global Resources XML File are available. The active Global Resources XML File can be changed at any time, and the global-resource definitions in the new active file will immediately replace those of the previously active file. The active Global Resources XML File therefore determines: (i) what global resources can be assigned, and (ii) what global resources are available for look-up (for example, if a global resource in one Global Resource XML File is assigned but there is no global resource of that name in the currently active Global Resources XML File, then the assigned global resource (alias) cannot be looked up).

- The active configuration is selected via the menu item Tools | Active Configuration or via the Global Resources toolbar. Clicking this command (or drop-down list in the toolbar) pops up a list of configurations across all aliases. Selecting a configuration makes that configuration active application-wide. This means that wherever a global resource (or alias) is used, the resource corresponding to the active configuration of each used alias will be loaded. The active configuration is applied to all used aliases. If an alias does not have a configuration with the name of the active configuration, then the default configuration of that alias will be used.

18.2.1 Global SQL Statements

SQL statements that have been saved as *.SQL files can be used as file-type global resources in DatabaseSpy. For example, if you use a development and a production database with different names and/or location, you would need two different SQL statements to query the currently active database. By defining these SQL statements as global resources, you can not only switch between the two databases with a mouse click, but also have the corresponding SQL query displayed in the SQL Editor. All you have to do, is to synchronize the SQL Editor with the data source and execute the query.

Displaying file-type global resources in the SQL Editor

File-type global resources can be viewed, edited, and executed like any other SQL in the SQL Editor. When clicking the View button in the Manage Global Resources dialog, the file is displayed in the SQL Editor in the background and the Manage Global Resources dialog remains open so that you can edit or delete the global resource, if required.
Alternatively you can also use the **File** menu to open a global resource.

**To display a file-type global resource in the SQL Editor:**

1. Select the menu option **File | Open Global Resource...** to display the **Choose Global Resource** dialog box.
2. Select a file-type global resource under the Files directory and click **OK**. The file is displayed under its Alias name in a new SQL Editor window.

Alternatively, do the following:

1. Select the menu option **Tools | Global Resources...** or click the **Manage Global Resources** toolbar button to open the **Manage Global Resources** dialog.
2. In the Files folder, select the Alias name of the SQL file you want to display and click the **View** button.
3. Click **Cancel** to close the **Manage Global Resources** dialog.

### 18.2.2 Data Sources in DatabaseSpy Projects

When working with DatabaseSpy, you can make use of database-type global resources in several ways:

- Add a global resource to a project as a data source
- Convert an existing data source connection to a global resource
- Copy a global resource into a project (and thus make it a local data source connection)
Adding a data source connection from a global resource
You can add a data source from a global resource either via the File | Create a Database Connection... menu or by right-clicking the Data Sources folder in the Project window and choosing Add a New Data source from the context menu. Both options bring up the Create a Database Connection dialog, where you can choose a global resource from the Global Resources page.

Note that a balloon help pops up when you hover over the individual entries, showing information about the different configurations in the global resource.

Converting an existing data source connection to a global resource
Any data source connection that appears in a DatabaseSpy project can be converted to a global resource with a single mouse click.
The data source is added to the Global Resources XML file and hence available in all Altova applications. Note that the icon in the Project window changes to indicate that the data source connection is now a global resource.

When you right-click the Data Sources folder in the Project window, you also have the option to convert all data sources in the project to global resources.

Copying a global resource into a project
If you want to use only a certain configuration of a global resource, you can add the global resource to your project, then copy it to the project as a local data source connection and remove the global resource from the project again. Make sure that you have selected the appropriate configuration before copying the global resource into the project. Only the active configuration will be available once the data source is local.

To copy a global resource into a project:

1. In the Project window, right-click a data source that has been added to the project as global resource and select **Copy Global Resource into Project** from the context menu.
2. Enter a name in the **Set a Data Source Name** dialog and click **OK**.
3. Optionally, remove the global resource from the project.

### 18.2.3 Changing the Active Configuration

One configuration of a global resource can be active at any time. This configuration is called the active configuration, and it is active application-wide. This means that the active configuration is active for all global resources aliases in all currently open files and data source connections. If an alias does not have a configuration with the name of the active configuration, then the default configuration of that alias will be used. As an example of how to change configurations, consider the case in which a file has been assigned via a global resource with multiple configurations. Each configuration maps to a different file. So, which file is selected depends on which configuration is selected as the application's active configuration.
Switching the active configuration can be done in the following ways:

- Via the menu command **Tools | Active Configuration**. Select the configuration from the command's submenu.
- In the combo box of the Global Resources toolbar (screenshot below), select the required configuration.

DatabaseSpy displays a dialog where you can choose whether or not the files and/or data source connections should be reloaded.

In this way, by changing the active configuration, you can change source files that are assigned via a global resource.
19 User Reference

19.1 Menus

The Menus section contains a complete description of all DatabaseSpy menu commands. We've tried to make this user manual as comprehensive as possible. If, however, you have questions which are not covered in the User Reference or other parts of this documentation, please look up the FAQs and Discussion Forums on the Altova website. If you are still not able to have your problem satisfactorily addressed, please do not hesitate to contact us through the Support Center on the Altova website.

Note that in the File and Edit menus, all standard Windows commands are supported, as well as additional database-related commands.

19.1.1 File Menu

The File menu contains all commands relevant to manipulating files, in the order common to most Windows software products.

<table>
<thead>
<tr>
<th>Command</th>
<th>Shortcut</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create a Database Connection…</td>
<td>Ctrl+Q</td>
</tr>
<tr>
<td>New</td>
<td></td>
</tr>
<tr>
<td>Open</td>
<td></td>
</tr>
<tr>
<td>Reload</td>
<td></td>
</tr>
<tr>
<td>Close</td>
<td></td>
</tr>
<tr>
<td>Close All</td>
<td></td>
</tr>
<tr>
<td>Save</td>
<td>Ctrl+S</td>
</tr>
<tr>
<td>Save As…</td>
<td></td>
</tr>
<tr>
<td>Save Project As…</td>
<td></td>
</tr>
<tr>
<td>Save All</td>
<td>Ctrl+Shift+S</td>
</tr>
<tr>
<td>Print…</td>
<td>Ctrl+P</td>
</tr>
<tr>
<td>Print Preview</td>
<td></td>
</tr>
<tr>
<td>Print Setup…</td>
<td></td>
</tr>
<tr>
<td>Recent Files</td>
<td></td>
</tr>
<tr>
<td>Recent Projects</td>
<td></td>
</tr>
<tr>
<td>Exit</td>
<td></td>
</tr>
</tbody>
</table>

In addition to the standard Open, Save, Print, Print Setup, and Exit commands, DatabaseSpy
offers a range of application-specific commands.

19.1.1  Create a Database Connection...

| Ctrl+Q |

The Create Database Connection... command opens the Add a Data Source dialog box allowing you to choose between the generic Connection Wizard, creating ADO or ODBC connections, and Global Resources.

In the General Options, you can specify whether or not the Add a Data Source dialog box should be displayed upon startup of the application.

19.1.1.2  New

The New sub-menu contains options for opening new projects, SQL Editor and Design Editor windows, data comparisons, and schema comparisons.

| Ctrl+Shift+N |

19.1.1.2.1  Project

| Ctrl+Shift+N |

The Project command creates a new project in DatabaseSpy. If you are currently working with another project, a prompt appears, asking if you want to close all documents belonging to the current project.

19.1.1.2.2  SQL Editor

| Ctrl+N |

The SQL Editor command opens a new SQL Editor window.
19.1.2.3  **Design Editor**

[Ctrl+D]

The **Design Editor** command opens a new **Design Editor window**. Please note that you need an active database connection in order to open a Design Editor window.

19.1.2.4  **Data Comparison**

[Ctrl+D]

The **Data Comparison** command opens a new Data Comparison window and the Select Database Objects for Comparison dialog box, where you can select tables from two databases that you want to compare. Note that you can disable the display of the selection dialog box in the Data Compare options.

When no data source exists in your project, DatabaseSpy displays a warning message which allows you to add a data source immediately.

Click **Yes** in the message box to open the Create a Database Connection dialog box.

Also make sure that at least one data source is connected before you select the command to avoid the following message.
19.1.1.2.5  Schema Comparison

The **Schema Comparison** command opens a new Schema Comparison window and the Select Database Objects for Comparison dialog box, where you can select tables from two database schemas that you want to compare. Note that you can disable the display of the selection dialog box in the Data Compare options.

When no data source exists in your project, DatabaseSpy displays a warning message which allows you to add a data source immediately.

Click **Yes** in the message box to open the Create a Database Connection dialog box.

Also make sure that at least one data source is connected before you select the command to avoid the following message.

**Open**

The **Open** sub-menu provides options for opening **projects**, **files**, and **Altova Global Resources**.

<table>
<thead>
<tr>
<th>Option</th>
<th>Key</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open Project</td>
<td>Ctrl+Shift+O</td>
</tr>
<tr>
<td>Open File...</td>
<td>Ctrl+O</td>
</tr>
<tr>
<td>Open Global Resource...</td>
<td></td>
</tr>
</tbody>
</table>
### 19.1.1.3.1 Open Project...

Press **Ctrl+Shift+O**

The Open Project... command opens an existing project in DatabaseSpy. The standard Windows Open dialog box appears where you can choose a project file (*.qprj). If you are currently working with another project, the previous project is closed first.

### 19.1.1.3.2 Open File...

Press **Ctrl+O**

The Open... command pops up the familiar Windows Open dialog box and allows you to open any project file (*.qprj), SQL file (*.sql), design file (*.qdes), database data comparison file (*.dbdif), or database schema comparison file (*.dbsdif). In the Open dialog box, you can select more than one file to open. Use the Files of Type combo box to restrict the kind of files displayed in the dialog box.

### 19.1.1.3.3 Open Global Resource...

The Open Global Resource... command opens the Choose Global Resource dialog box where you can select a file or folder and display it in the SQL Editor. The Open Global Resources dialog... button allows you to display the Manage Global Resources dialog box where you can make changes to a resource prior to opening it.

If you select a folder that has been defined as a global resource, then the standard Windows Open dialog box appears and displays the content of the directory that is defined for the active configuration.
19.1.1.4  **Reload**

The **Reload** command reloads the version of the active file that is saved in your file system. Any changes that you made in DatabaseSpy will be lost. You can still keep the updated version by clicking No in the message box that pops up.

19.1.1.5  **Close**

The **Close** command closes the active window. If the file was modified (indicated by an asterisk * after the file name in the title bar), you will be asked if you wish to save the file first.

19.1.1.6  **Close All**

The **Close All** command closes all open windows. If any document has been modified (indicated by an asterisk * after the file name in the title bar), you will be asked if you wish to save the file first.

Please note that the project will not be closed by the **Close All** command. A project can only be closed by opening a new project or by exiting DatabaseSpy.

19.1.1.7  **Save**

The **Save** command saves the contents of the active window to the file from which it has been opened. If the active window contains a new file, the **Save As...** dialog box is opened automatically.

19.1.1.8  **Save As...**

The **Save As...** command pops up the familiar Windows **Save As** dialog box, in which you enter the name and location of the file you wish to save the active file as.
19.1.1.9  **Save Project As...**

The **Save Project As...** command saves the project that is currently open under a new name or at a different path. The standard Windows **Save As** dialog box appears where you can enter the desired file name and path.

19.1.1.10 **Save All**

Ctrl+Shift+S

The **Save All** command saves all modifications that have been made to any open documents. The command is useful if you edit multiple documents simultaneously. If a document has not been saved before (for example, after being newly created), the **Save As...** dialog box is presented for that document.

19.1.1.11 **Print...**

![Printer Icon] Ctrl+P

The **Print...** command opens the Print dialog box, in which you can select printer options and print the active file.

Please note that the **Print...** command behaves differently depending on whether it is called from an SQL Editor window or Design Editor window:

- Choosing the **Print...** command from an SQL Editor window brings up the standard windows Print dialog box.
- If you select the **Print...** command for a design file in the Design Editor, DatabaseSpy presents a Print dialog box where you can choose which part of the design file is to be printed and adapt the zoom. Clicking the **Print** button brings up the standard Windows Print dialog box. Click the **Preview** button to open the preview window and check the layout before printing or change the printer setup by clicking the **Print Setup** button.
19.1.1.12  **Print Preview**

The **Print Preview** command opens a preview window where you can check the layout of your active window before printing.

Please note that the **Print Preview** command behaves differently depending on whether it is called from an SQL Editor window or Design Editor window:

- If you select **File | Print Preview** from an active SQL Editor window, a preview window opens immediately where you can browse the pages and zoom in or zoom out using the appropriate buttons.

- When called from an active Design Editor window, the **Print Preview** command will first open the Print dialog box for design files. Click the **Preview** button to open the preview window where you can browse the pages and zoom in or zoom out using the appropriate buttons. If you click the **Close** button, the Print dialog box reappears and you can either print the file or cancel the operation.
19.1.1.13  **Print Setup...**

The **Print Setup...** command displays the printer-specific Print Setup dialog box, in which you specify such printer settings as paper format and page orientation. These settings are applied to all subsequent print jobs.

19.1.1.14  **Recent Files**

The **Recent Files** command in the **File** menu opens a sub-menu displaying a list of the four most recently used files, with the most recently opened file shown at the top of the list. You can open any of these files by clicking its name. To open a file in the list using the keyboard, press **Alt+F** to open the **File** menu, and then press the number of the file you want to open.

19.1.1.15  **Recent Projects**

The **Recent Projects** command opens a submenu displaying the file name for the four most recently used projects, allowing quick access to these files.

Also note, that DatabaseSpy can automatically open the last project that you used, whenever you start DatabaseSpy. (**Tools** | **Options** | **General** | **Open last project on startup**).

19.1.1.16  **Exit**

The **Exit** command is used to quit DatabaseSpy. If you have any open files with unsaved changes, you are prompted to save these changes. DatabaseSpy also saves modifications to program settings and information about the most recently used files.

19.1.2  **Edit Menu**

The **Edit** menu contains commands for editing text in the SQL Editor window.
Different options are provided if the active window is a Design Editor.

19.1.2.1  Undo

Alt+Backspace

The Undo command contains support for unlimited levels of Undo. Every action can be undone and it is possible to undo one command after another. The Undo history is retained after using the Save command, enabling you to go back to the state the document was in before you saved your changes.

19.1.2.2  Redo

Ctrl+Y

The Redo command allows you to redo previously undone commands, thereby giving you a complete history of work completed. You can step back and forward through this history using the Undo and Redo commands.
19.1.2.3 Cut

Shift+Delete

The Cut command copies the selected text to the clipboard and deletes it from its present location.

19.1.2.4 Copy

Ctrl+C

The Copy command copies the selected text to the clipboard. This can be used to duplicate data within DatabaseSpy or to move data to another application.

19.1.2.5 Paste

Ctrl+V

The Paste command inserts the contents of the clipboard at the current cursor position.

19.1.2.6 Select User Tables

Alt+T

The Select User Tables command selects all user tables that are contained in the active Design Editor window.

19.1.2.7 Select System Tables

Alt+S

The Select System Tables command selects all system tables that are contained in the active Design Editor window.

19.1.2.8 Select All

Ctrl+A

The Select All command selects (i) any text in the currently active SQL Editor window or (ii) all tables in the currently active Design Editor window.
19.1.2.9  **Find...**

**Ctrl+F**

The **Find** command pops up the **Find** dialog, in which you can specify the string you want to find and other options for the search.

19.1.2.10  **Find Next**

**F3**

The **Find next** command repeats the last **Find...** command to search for the next occurrence of the requested text.

19.1.2.11  **Replace...**

**Ctrl+H**

The **Replace** command enables you to find and replace one text string with another text string. It features the same options as the **Find...** command. You can replace each item individually or you can use the **Replace All** button to perform a global search-and-replace operation.

19.1.3  **View Menu**

The **View** menu contains commands for switching the various windows on or off.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Online Browser</td>
<td></td>
</tr>
<tr>
<td>Project Window</td>
<td></td>
</tr>
<tr>
<td>Property Window</td>
<td>Alt+Enter</td>
</tr>
<tr>
<td>Overview Window</td>
<td></td>
</tr>
<tr>
<td>Data Inspector Window</td>
<td></td>
</tr>
<tr>
<td>Charts Window</td>
<td></td>
</tr>
<tr>
<td>Output Window</td>
<td></td>
</tr>
<tr>
<td>Database Structure Change Script</td>
<td></td>
</tr>
<tr>
<td>Status</td>
<td></td>
</tr>
<tr>
<td>Toggle All Side Windows</td>
<td></td>
</tr>
<tr>
<td>Toggle Output and Change Script Windows</td>
<td></td>
</tr>
</tbody>
</table>
19.1.3.1 Online Browser

This command lets you switch the Online Browser on or off.

This is a dockable window. Dragging on its title bar detaches it from its current position and makes it a floating window. Click right on the title bar to allow docking or hide the window.

19.1.3.2 Project Window

This command lets you switch the Project window on or off.

This is a dockable window. Dragging on its title bar detaches it from its current position and makes it a floating window. Click right on the title bar to allow docking or hide the window.

19.1.3.3 Property Window

This command lets you switch the Property window on or off.

This is a dockable window. Dragging on its title bar detaches it from its current position and makes it a floating window. Click right on the title bar to allow docking or hide the window.

19.1.3.4 Overview Window

This command lets you switch the Overview window on or off.

This is a dockable window. Dragging on its title bar detaches it from its current position and makes it a floating window. Click right on the title bar to allow docking or hide the window.

19.1.3.5 Data Inspector Window

This command lets you switch the Data Inspector window on or off.

This is a dockable window. Dragging on its title bar detaches it from its current position and makes it a floating window. Click right on the title bar to allow docking or hide the window.
19.1.3.6  Charts Window

This command lets you switch the Chart window on or off.

This is a dockable window. Dragging on its title bar detaches it from its current position and makes it a floating window. Click right on the title bar to allow docking or hide the window.

19.1.3.7  Output Window

This command lets you switch the Output window on or off.

This is a dockable window. Dragging on its title bar detaches it from its current position and makes it a floating window. Click right on the title bar to allow docking or hide the window.

19.1.3.8  Database Structure Change Script

This command lets you switch the Database Structure Change Script window on or off.

This is a dockable window. Dragging on its title bar detaches it from its current position and makes it a floating window. Click right on the title bar to allow docking or hide the window.

19.1.3.9  Status

The Status command toggles on and off the Status bar.

19.1.3.10  Toggle All Side Windows

This command toggles on and off the display of the Online Browser and the Project, Properties, and Overview windows as well as any other window that has been docked to the side of the application. Note that this command applies also to windows that are docked on the right side of DatabaseSpy.

19.1.3.11  Toggle Output and Change Script Windows
This command toggles the display of the Output and Change Script windows on and off.

19.1.4 SQL Editor Menu

The SQL Editor menu contains commands for selecting, editing, and executing SQL statements.

<table>
<thead>
<tr>
<th>Command</th>
<th>Key</th>
</tr>
</thead>
<tbody>
<tr>
<td>Execute</td>
<td>F5</td>
</tr>
<tr>
<td>Execute for Data Editing</td>
<td></td>
</tr>
<tr>
<td>Navigation</td>
<td></td>
</tr>
<tr>
<td>Insert</td>
<td></td>
</tr>
<tr>
<td>Bookmarks</td>
<td></td>
</tr>
<tr>
<td>Result view</td>
<td></td>
</tr>
<tr>
<td>Message view</td>
<td></td>
</tr>
<tr>
<td>Stack Result Windows</td>
<td></td>
</tr>
<tr>
<td>Word Wrap</td>
<td></td>
</tr>
<tr>
<td>Text View Settings</td>
<td></td>
</tr>
</tbody>
</table>

The SQL Editor menu is only visible if the active window contains an SQL file.

19.1.4.1 Execute

The Execute command executes all the SQL statements that are currently in the active window of the SQL Editor. You can customize the behaviour of the Execute command in Properties window of the active SQL Editor options.

The Stop Retrieval command stops the retrieval of database data. The data that has been retrieved so far is displayed in the Result tab. Use the Retrieve next n rows button or the Retrieve outstanding rows button, respectively, or the context menu in the Result view to resume retrieval. This button replaces the Execute button while data is being retrieved.

19.1.4.2 Execute for Data Editing

The Execute for Data Editing command executes a SELECT statement in the Online Browser and switches the Result window into the Editing Mode so that you are able to update or even add new data directly in the result grid. This command is only available if data editing from within the
SQL Editor is supported for the data source connection you are currently working with.

**Note:** This command is supported only for SELECT statements in the SQL Editor.

### 19.1.4.3 Navigation

The **Navigation** sub-menu contains options for selecting statements in the active SQL Editor window.

<table>
<thead>
<tr>
<th>Command</th>
<th>Shortcut</th>
</tr>
</thead>
<tbody>
<tr>
<td>Next Statement</td>
<td>Alt+Down</td>
</tr>
<tr>
<td>Previous Statement</td>
<td>Alt+Up</td>
</tr>
<tr>
<td>Last Statement</td>
<td>Alt+End</td>
</tr>
<tr>
<td>First Statement</td>
<td>Alt+Home</td>
</tr>
<tr>
<td>Select entire Statement</td>
<td>Shift+Alt+Enter</td>
</tr>
</tbody>
</table>

#### 19.1.4.3.1 Next Statement

Alt+Down

The **Next Statement** command selects the statement following the statement in which the cursor is currently located.

#### 19.1.4.3.2 Previous Statement

Alt+Up

The **Previous Statement** command selects the statement preceding the statement in which the cursor is currently located.

#### 19.1.4.3.3 Last Statement

Alt+End

The **Last Statement** command selects the last statement in active window of the SQL Editor.

#### 19.1.4.3.4 First Statement

Alt+Home

The **First Statement** command selects the first statement in the active window of the SQL Editor.
19.1.4.3.5  Select Entire Statement

Shift+Alt+Enter

The Select Entire Statement command selects the SQL statement in which the cursor is currently located.

19.1.4.4  Insert

The Insert sub-menu contains options for inserting block and line comments, targets, and regions into the active SQL Editor window.

19.1.4.4.1  Insert/Remove Block Comment

The Insert/Remove Block Comment inserts or removes a block comment around the currently selected text block in the active window of the SQL Editor.

19.1.4.4.2  Insert/Remove Line Comment

The Insert/Remove Line Comment command inserts line comment from the current position of the cursor to the end of the line or removes a selected line comment.

19.1.4.4.3  Insert Target

The Insert Target command inserts --Target: Result before the currently marked SELECT statement. Executing the statement places the result in a tab named “Result”. The text “Result” can be edited, allowing you to create your own named tabs, see Naming Result Tabs.
19.1.4.4  Insert Region

The Insert Region command creates a region for the currently selected block of text. Regions can be folded or expanded by clicking the + icon.

19.1.4.5  Bookmarks

The Bookmarks sub-menu provides commands for inserting and removing bookmarks, and allows you to navigate between the bookmarks in an SQL Editor window.

19.1.4.5.1  Insert/Remove Bookmark

The Insert/Remove Bookmark command inserts a bookmark at the line of the current cursor position, or removes the bookmark if the cursor is in a line that has been bookmarked previously.

Bookmarked lines are displayed in one of the following ways:

- If the bookmarks margin has been enabled, then a solid cyan ellipse appears to the left of the text in the bookmark margin.
- If the bookmarks margin has not been enabled, then the complete line containing the cursor is highlighted.

19.1.4.5.2  Go to Next Bookmark

The Go to Next Bookmark command places the text cursor at the beginning of the next bookmarked line.

19.1.4.5.3  Go to Previous Bookmark
The Go to Previous Bookmark command places the text cursor at the beginning of the previous bookmarked line.

19.1.4.5.4 Remove All Bookmarks

The Remove All Bookmarks command removes all the defined bookmarks from the SQL Editor window that is currently active.

Note: The Undo command does not undo the effects of this command.

19.1.4.6 Result View

The Result view command toggles all Result tabs in SQL Editor windows on and off.

19.1.4.7 Message View

The Message view command toggles the Message tab in SQL Editor windows on and off.

19.1.4.8 Stack Result Windows

If the Stack Result Windows option is deactivated, results of queries are displayed in separate, sequentially numbered tabs of the Result window (Result1, Result2, etc.). If the option is activated, all results are displayed in a single result tab with multiple panes for the individual queries.

19.1.4.9 Show Groupings For Execution

The Show groupings for execution command toggles the display of execution groups for SQL statements on and off.

19.1.4.10 Word Wrap
The **Word Wrap** command enables or disables word wrapping in the SQL Editor.

### 19.1.4.11 Text View Settings

The **Text View Settings** command opens the Text View Settings dialog box where you can define settings for the display of line number, bookmark, and source folding margins, specify the tab size, and define which visual aids are available in the SQL Editor.

### 19.1.5 SQL Refactoring Menu

The **SQL Refactoring** menu contains commands for changing the layout of SQL code in the SQL Editor.

<table>
<thead>
<tr>
<th>Format SQL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add Semicolons</td>
</tr>
<tr>
<td>Remove Semicolons</td>
</tr>
<tr>
<td>Add quotation to identifiers</td>
</tr>
<tr>
<td>Remove quotation from identifiers</td>
</tr>
<tr>
<td>Create View As</td>
</tr>
<tr>
<td>Uppercase Keywords</td>
</tr>
<tr>
<td>Expand columns for star expressions</td>
</tr>
<tr>
<td>Remove Comments</td>
</tr>
<tr>
<td>Remove Comments and Formatting</td>
</tr>
</tbody>
</table>

The **SQL Refactoring** menu is only visible if the active window contains an SQL file.

### 19.1.5.1 Format SQL

The **Format SQL** command applies SQL formatting as currently defined for the respective database kind to the active SQL Editor Window.

A message is displayed in the **Message** tab, after the formatting has been completed.

![Formatting was performed with the following configuration: MS SQL Server 2005](image)
19.1.5.2  Add Semicolons

The Add Semicolons command appends a semicolon to the end of each statement. No semicolon will be added however if it already exists in a statement.

19.1.5.3  Remove Semicolons

The Remove Semicolons command removes all semicolons from the end of statements. It makes no difference whether the semicolons have been entered manually or using the Add Semicolons command.

19.1.5.4  Add Quotations to Identifiers

This command adds database-specific quotations (e.g., ", '', [], etc.) to the table and column identifiers in the SQL Editor.

19.1.5.5  Remove Quotations from Identifiers

This command removes database-specific quotations (e.g., ", '', [], etc.) from the table and column identifiers in the SQL Editor. It makes no difference whether the identifiers have been entered manually or using the Add Quotations to Identifiers command.

19.1.5.6  Create View As

The Create View As command creates a view from a SELECT statement in the active SQL Editor window. A view is a stored query.

19.1.5.7  Uppercase Keywords

The Uppercase Keywords converts all keywords in the active SQL Editor into uppercase.

19.1.5.8  Expand Columns for Star Expressions

The Expand columns for star expressions command inserts the full column list of a table if the cursor is placed after the asterisk in a SELECT statement and the command is executed.

Note that the SQL statement must be complete and valid. If, for example, the SQL Editor should require semicolons option is checked, the terminating semicolon must indeed be present in the SQL Editor.
19.1.5.9  Remove Comments

This command removes all text that is enclosed in comment marks ("/*...*/" and --).

The Remove Comments command removes the text that has been comment out and not the command marks. To remove the comment marks, use the Insert/Remove Block Comment and Insert/Remove Line Comment commands.

19.1.5.10  Remove Comments and Formatting

The Remove Comments and Formatting command reverts all formatting that has been added by the Format SQL command, that is, any additional line feed or whitespace is removed and the SQL is displayed in one line. In addition, this command removes all text that has been commented out.

19.1.6  Design Editor Menu

The Design Editor menu contains commands for maintaining database objects in a graphical manner.

<table>
<thead>
<tr>
<th>Command</th>
<th>Shortcut</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create New Table</td>
<td>Ctrl+T</td>
</tr>
<tr>
<td>Create New Column</td>
<td>Alt+C</td>
</tr>
<tr>
<td>Add Sticky Note</td>
<td>Alt+N</td>
</tr>
<tr>
<td>Add related tables</td>
<td></td>
</tr>
<tr>
<td>SQL and Data</td>
<td></td>
</tr>
<tr>
<td>Zoom In</td>
<td>Ctrl+Num +</td>
</tr>
<tr>
<td>Zoom Out</td>
<td>Ctrl+Num -</td>
</tr>
<tr>
<td>Zoom to fit</td>
<td></td>
</tr>
<tr>
<td>Auto Layout whole Diagram</td>
<td></td>
</tr>
<tr>
<td>Auto Layout selected Tables</td>
<td></td>
</tr>
<tr>
<td>Remove From Design</td>
<td>Ctrl+Delete</td>
</tr>
<tr>
<td>Delete selected Objects</td>
<td>Delete</td>
</tr>
<tr>
<td>Export database data</td>
<td></td>
</tr>
<tr>
<td>Save Diagram as Image</td>
<td></td>
</tr>
<tr>
<td>Generate Database Structure Change Script</td>
<td></td>
</tr>
<tr>
<td>Show Design Options</td>
<td></td>
</tr>
</tbody>
</table>
The Design Editor menu is only visible if the active window contains a design file.

19.1.6.1  Create New Table

CTRL+T

The Create New Table command creates a new table in the currently active Design Editor window and automatically assigns it to the active data source. A Database Structure Change Script is generated and has to be executed to add the newly created table to the database.

19.1.6.2  Create New Column

ALT+C

The Create New Column command adds a new column to the selected table. If you have selected more than one table, the column will be added to the table that was selected last.

19.1.6.3  Add Sticky Note

ALT+N

The Add Sticky Note command adds a Sticky Note to the Design Editor window. Double-click the note to enter text and drag it to the desired position.

19.1.6.4  Add Related Tables

The Add Related Tables command opens a sub-menu which adds tables that are either referenced by or are referencing the selected table.

Referenced Tables
Referencing Tables
All Relations

19.1.6.4.1  Referenced Tables

The Referenced Tables command adds tables that are referenced by the selected table to the active Design Editor window.
19.1.6.4.2   Referencing Tables

The Referencing Tables command adds tables which include a reference to the selected table to the active Design Editor window.

19.1.6.4.3   All Relations

The All Relations command adds both referenced and referencing tables to the active Design Editor window.

19.1.6.5   SQL and Data

The SQL and Data command opens a sub-menu which provides options for generating SQL scripts, retrieving, and editing data from within the design view.

- Show in new SQL Editor
- Retrieve data
- Edit Data

19.1.6.5.1   Show in new SQL Editor

The Show in new SQL Editor command opens a sub-menu which enables you to create SQL statements from the selected tables in the Design Editor.

If more than one table is selected, a statement is created for each of the selected tables. Please note that different statements are created depending on what you have selected:

- If you have selected the entire table, one statement is created for all of the columns in the
If you have selected a single column, the statement is created for this particular column only.

```
SELECT [EnglishName] FROM [ZooDB].[dbo].[tblAnimalTypes];
```

If you have selected some but not all of the columns, one statement is created for the selected columns.

```
SELECT [EnglishName], [AreaOfOrigin] FROM [ZooDB].[dbo].[tblAnimalTypes];
```

19.1.6.5.2 Retrieve Data

The Retrieve Data command opens a sub-menu which enables you to perform a query on the selected table in the Design Editor.

- **All rows**
  - The All rows command generates a SELECT statement for all rows in a new SQL Editor window and executes the query immediately. The result of the query is displayed in the Result tab below the SQL Editor window.

- **First n rows**
  - The First n rows command generates a SELECT statement for the first n rows in a new SQL Editor window and executes the query immediately. The result of the query is displayed in the Result tab below the SQL Editor window.

  You can customize the number of rows to be retrieved in the SQL Editor options.

19.1.6.5.3 Edit Data

`Ctrl+Alt+E`

The Edit Data command retrieves data from the selected table or columns and switches the result grid into the editing mode (if supported for the respective data source).
19.1.6.6  **Zoom In**

![Zoom In](image)

**Ctrl+Num +**

The Zoom In command increases the zoom factor of the Design Editor window by 10 percent. You can also zoom in by scrolling (with the scroll-wheel of the mouse) while keeping the **Ctrl** key pressed.

19.1.6.7  **Zoom Out**

![Zoom Out](image)

**Ctrl+Num -**

The Zoom Out command decreases the zoom factor of the Design Editor window by 10 percent. You can also zoom out by scrolling (with the scroll-wheel of the mouse) while keeping the **Ctrl** key pressed.

19.1.6.8  **Zoom to Fit**

![Zoom to Fit](image)

The Zoom to Fit command sizes the working area to include all tables in the current Design Editor window.

19.1.6.9  **Auto Layout Whole Diagram**

![Auto Layout Whole Diagram](image)

The Auto Layout Whole Diagram command arranges all tables in the active Design Editor window in a way that considers relations between the individual tables as well as proper layouting.

19.1.6.10  **Auto Layout Selected Tables**

![Auto Layout Selected Tables](image)

The Auto Layout Selected Tables command arranges the selected tables in the active Design Editor window in a way that considers relations between the individual tables as well as a proper layouting.

19.1.6.11  **Remove from Design**

**Ctrl+Del**

The Remove from Design command removes the selected table from the Design Editor window.
Please note that the table is not deleted from the database in this case. To drop a table from the database, use the Delete Selected Objects command instead.

19.1.6.12  Delete Selected Objects

Del

The Delete Selected Objects command generates a Database Structure Change Script and marks the selected objects for deletion. You must execute the change script in order to actually delete the objects from the database.

You can select multiple objects for deletion. If you select one or more database objects of a table as well as the table itself and press the Delete key, DatabaseSpy prompts you to choose whether you want to delete the entire table or only its objects.

19.1.6.13  Export Database Data

The Export Database Data command opens the Export database data dialog box where you can define the export settings. If you have tables selected in the Design Editor window, the check boxes of these tables will already be activated in the Source group box of the Export database data dialog box and thus selected for export.

19.1.6.14  Save Diagram As Image

The Save Diagram As Image command opens the standard Windows Save As dialog box where you can specify a name and location for the design image. The designs can be stored as Portable Network Graphics (*.png) or Enhanced Meta Files (*.emf).

19.1.6.15  Generate Database Structure Change Script

The Generate Database Structure Change Script command starts the generation of a change
script or updates it after changes occurred to the database structure. Please note that this menu option is not available if in the General options you have activated the Instantly radio button in the Database Structure Change Script group box.

19.1.6.16   Show Design Options

The Show Design Options command opens the Design Editor page of the Options dialog box where you can customize the settings for the Design Editor.

19.1.7   Data Comparison Menu

The Data Comparison menu contains all the commands that are related to the comparison of database data.

The Data Comparison menu is only visible if the active window contains a data comparison file.

19.1.7.1   Compare Tables

The Compare Tables command starts a comparison of the tables that you have selected in the Data Comparison window.
19.1.7.2  **Merge Left to Right**

The **Merge Left to Right** command updates the tables in the right comparison component with the data contained in the tables in the left component. Missing table rows are added and obsolete rows are deleted. The required SQL script is generated and executed in the background. DatabaseSpy displays a warning message which has to be confirmed before the changes are actually committed to the database.

19.1.7.3  **Merge Right to Left**

The **Merge Right to Left** command updates the tables in the left comparison component with the data contained in the tables in the right component. Missing table rows are added and obsolete rows are deleted. The required SQL script is generated and executed in the background. DatabaseSpy displays a warning message which has to be confirmed before the changes are actually committed to the database.

19.1.7.4  **Show Results**

The **Show Results** command displays the Comparison Result window for the selected table(s) or for all mapped tables in the active Data Comparison window, if no table is selected.

19.1.7.5  **SQL and Data**

The **SQL and Data** sub-menu of the Data Comparison menu provides options for showing the merge and restore scripts for both sides of a comparison.

<table>
<thead>
<tr>
<th>Show merge script: Left to Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Show merge script: Right to Left</td>
</tr>
<tr>
<td>Show restore script: Left</td>
</tr>
<tr>
<td>Show restore script: Right</td>
</tr>
</tbody>
</table>

The commands of the **SQL and Data** sub-menu are only available after a comparison has been started.
19.1.7.5.1  Show merge script: Left to Right

The Show merge script: Left to Right command opens a new SQL Editor window and displays an SQL change script that overwrites the data in the table(s) contained in the right component with the values of the mapped table(s) of the left component.

19.1.7.5.2  Show merge script: Right to Left

The Show merge script: Right to Left command opens a new SQL Editor window and displays an SQL change script that overwrites the data in the table(s) contained in the left component with the values of the mapped table(s) of the right component.

19.1.7.5.3  Show restore script: Left

The Show restore script: Left command reverts the changes that have been made to the left table and restores the condition the left table had before the merge script was executed.

19.1.7.5.4  Show restore script: Right

The Show restore script: Right command reverts the changes that have been made to the right table and restores the condition the right table had before the merge script was executed.

19.1.7.6  Sort Tables

The Sort Tables sub-menu of the Data Comparison menu provides options for sorting the tables that are included in the components of a database data comparison.

<table>
<thead>
<tr>
<th>Ascending</th>
</tr>
</thead>
<tbody>
<tr>
<td>Descending</td>
</tr>
<tr>
<td>Ascending mapped first</td>
</tr>
<tr>
<td>Descending mapped first</td>
</tr>
</tbody>
</table>

Please note that the commands always affect both sides of the comparison (i.e., you cannot sort just one component).

19.1.7.6.1  Ascending

The Ascending command sorts all tables in a comparison window in ascending order.
19.1.7.6.2 **Descending**

The **Descending** command sorts all tables in a comparison window in descending order.

19.1.7.6.3 **Ascending mapped first**

The **Ascending mapped first** command sorts all tables in a Data Comparison window and displays the mapped tables in ascending order first (see screenshot).

19.1.7.6.4 **Descending mapped first**

The **Descending mapped first** command sorts all tables in a Data Comparison window and displays the mapped tables in descending order first (see screenshot).

19.1.7.7 **Map items**

The **Map items** command tries to map all tables in the Data Comparison window using the settings defined in the **Data Compare** section of the Options dialog box.
19.1.7.8 **Unmap items**

The **Unmap items** command deletes all mappings in the active comparison window. If one or more tables are selected in the components, only the mapping of the selected tables will be deleted.

19.1.7.9 **Expand tables**

The **Expand tables** command expands all tables in both components of the active comparison window.

19.1.7.10 **Collapse tables**

The **Collapse tables** command collapses all tables in both components of the active comparison window.

19.1.7.11 **Autolayout**

The **Autolayout** command fits the components into the visible part of the comparison window, tries to avoid horizontal scrollbars in the components, and aligns the top and bottom borders of the components.

19.1.7.12 **Show Comparison Options**

The **Show Comparison Options** command opens the **Data Compare** section of the **Options** dialog page.

19.1.8 **Schema Comparison Menu**

The **Schema Comparison** menu contains all the commands that are related to the comparison of database schemas.
The Schema Comparison menu is only visible if the active window contains a schema comparison file.

19.1.8.1 Compare items

The Compare items command starts a comparison of the tables that you have selected in the Schema Comparison window.

19.1.8.2 Show merge script: Left to Right

The Show merge script: Left to Right command opens a new SQL Editor window and displays an SQL change script that overwrites the table structure(s) contained in the right component with those of the mapped table(s) of the left component.

Please note that only selected items are included in the merge script and that child items are not automatically considered in the merge script when their parents are selected. If you want to merge both parent and children you must select all items.

Consider the following example: Two versions of a database are compared where one column is misspelled and the data type of that column has been changed on purpose between the two versions. If child entries would be automatically merged if a parent entry is selected for merging, you would not be able to correct the type in the column name without setting the data type back to its old setting.

19.1.8.3 Show merge script: Right to Left

The Show merge script: Right to Left command opens a new SQL Editor window and displays an SQL change script that overwrites the table structure(s) contained in the left component with
those of the mapped table(s) of the right component.

Please note that only selected items are included in the merge script and that child items are not automatically considered in the merge script when their parents are selected. If you want to merge both parent and children you must select all items.

Consider the following example: Two versions of a database are compared where one column is misspelled and the data type of that column has been changed on purpose between the two versions. If child entries would be automatically merged if a parent entry is selected for merging, you would not be able to correct the type in the column name without setting the data type back to its old setting.

19.1.8.4  Sort Items

The Sort items sub-menu of the Schema Comparison menu provides options for sorting the tables that are included in the components of a database schema comparison.

<table>
<thead>
<tr>
<th>Ascending</th>
</tr>
</thead>
<tbody>
<tr>
<td>Descending</td>
</tr>
<tr>
<td>Ascending mapped first</td>
</tr>
<tr>
<td>Descending mapped first</td>
</tr>
</tbody>
</table>

Please note that the commands always affect both sides of the comparison (i.e., you cannot sort just one component).

19.1.8.4.1  Ascending

The Ascending command sorts all tables in a comparison window in ascending order.

19.1.8.4.2  Descending

The Descending command sorts all tables in a comparison window in descending order.

19.1.8.4.3  Ascending mapped first

The Ascending mapped first command sorts all tables in a Schema Comparison window and displays the mapped tables in ascending order first (see screenshot).
19.1.8.4.4  Descending mapped first

The *Descending mapped first* command sorts all tables in a Schema Comparison window and displays the mapped tables in descending order first (see screenshot).

19.1.8.5  Map items

The *Map items* command tries to map all tables in the Schema Comparison window using the settings defined in the *Data Compare* section of the Options dialog box.

19.1.8.6  Unmap Items

The *Unmap Items* command deletes all mappings in the active comparison window. If one or more tables are selected in the components, only the mapping of the selected tables will be deleted.

19.1.8.7  Expand items

The *Expand items* command expands all items in both components of the active comparison window.
19.1.8.8  **Collapse items**

The **Collapse items** command collapses all items in both components of the active comparison window.

19.1.8.9  **Autolayout**

The **Autolayout** command fits the components into the visible part of the comparison window, tries to avoid horizontal scrollbars in the components, and aligns the top and bottom borders of the components.

19.1.8.10  **Show Comparison Options**

The **Show Comparison Options** command opens the [Data Compare](#) section of the [Options](#) dialog page.

19.1.9  **Tools Menu**

The **Tools** menu allows you to:

- **Export** and **import** database data
- Generate **SQL change scripts**
- **Manage XML schemas** for databases
- Access **user-defined tools**
- Manage **Global Resources** and **configurations**
- **Customize** menus, toolbars, etc.
- Restore toolbars and windows to their default state
- Define the global program **settings**
19.1.9.1  **Export Database Data...**

![Ctrl+E]

The **Export Database Data...** command opens the Export Database Data dialog box where you can define your export options.

19.1.9.2  **Import Data to the Database...**

![Ctrl+I]

The **Import Data to Database...** command opens the Import data to database dialog box where you can define your import options.

19.1.9.3  **Generate Change Script**

![Generate Change Script]

The **Generate Change Script** command starts the generation of a change script or updates it after changes occurred to the database structure. Please note that this menu option is not available if in the General options you have activated the **Instantly** radio button in the Database Structure Change Script group box.

19.1.9.4  **XML Schema Management for Databases...**

![XML Schema Management for Databases]

The **XML Schema Management for Databases** command opens the XML Schema management for databases dialog box which allows you to select a data source connection and add, drop, modify, or view XML schemas for the active data source.

19.1.9.5  **User-defined Tools**

The **User-defined Tools** command opens a sub-menu where you can add your personal menu items, e.g., links to other applications.

To add a user-defined tool, select the menu option **Tools | Customize** or right-click into the toolbar and select **Customize** from the context menu. Change to the **Tools tab** and add name of and path to the EXE file of the application you want to start from within DatabaseSpy. The name you entered in the **Menu contents** box appears in the **Tools | User-defined Tools** sub-menu.
19.1.9.6  Global Resources...

The **Global Resources...** command opens the **Manage Global Resources** dialog box, where you can add, edit, or delete global resources.

19.1.9.7  Active Configurations

The **Active configurations** command opens a sub-menu, where all available configurations are listed and the active configuration is indicated. Selecting a configuration in the sub-menu will make it the active configuration.

19.1.9.8  Customize...

The **Customize...** command lets you customize DatabaseSpy to suit your personal needs.

19.1.9.8.1  Commands

The **Commands** tab allows you customize your menus or toolbars.

To add a command to a toolbar or menu:

1. Select the menu option Tools | Customize. The Customize dialog box appears.
2. Select the All Commands category in the Categories list box. The available commands appear in the Commands list box.

3. Click on a command in the Commands list box and drag it to an existing menu or toolbar. An I-beam appears when you place the cursor over a valid position to drop the command.

4. Release the mouse button at the position you want to insert the command.

- A small button appears at the tip of mouse pointer when you drag a command. The "x" below the pointer means that the command cannot be dropped at the current cursor position.
- The "x" disappears whenever you can drop the command (over a tool bar or menu).
- Placing the cursor over a menu when dragging opens it, allowing you to insert the command anywhere in the menu.
- Commands can be placed in menus or toolbars. If you created you own toolbar you can populate it with your own commands/icons.

**Note:** You can also edit the commands in the context menus (right-click anywhere to open the context menu), using the same method. Click the **Menu** tab and then select the specific context menu available in the **Context Menus** combo box.

### 19.1.9.8.2 Toolbars

The **Toolbars** tab allows you to activate or deactivate specific toolbars, as well as create your own specialized ones.

DatabaseSpy toolbars contain symbols for the most frequently used menu commands. For each symbol you get a brief "tool tip" explanation when the mouse cursor is directly over the item and the status bar shows a more detailed description of the command.

You can drag the toolbars from their standard position to any location on the screen, where they appear as a floating window. Alternatively, you can also dock them to the left or right edge of the main window.
The **Show text labels** option displays explanatory text below toolbar icons when activated. You can activate or deactivate this option for each toolbar individually.

**To activate or deactivate a toolbar:**

- Click the check box to activate (or deactivate) the specific toolbar.

**To create a new toolbar:**

1. Click the New... button, and give the toolbar a name in the Toolbar Name dialog box that appears.
2. Drag commands to the toolbar in the **Commands** tab of the Customize dialog box.

**To reset the Menu Bar:**

1. Click the Menu Bar entry.
2. Click the **Reset** button, to reset the menu commands to the state they were in when DatabaseSpy was installed.

**To reset all toolbar and menu commands:**

1. Click the **Reset All** button to reset all the toolbar commands to the state they were when the program was installed. A prompt appears stating that all toolbars and menus will be reset.
2. Click **Yes** to confirm the reset.
To change a toolbar name:

- Click the **Rename...** button to edit the name of the toolbar.

This option is available only for user-defined toolbars.

To delete a toolbar:

1. Select the toolbar you want to delete in the **Toolbars** list box.
2. Click the **Delete** button. A prompt appears, asking if you really want to delete the toolbar.
3. Click **Yes** to confirm the deletion.

This option is available only for user-defined toolbars.

19.1.9.8.3  Tools

The **Tools** tab allows you to add your personal menu items, e.g., links to other applications, to the Tools menu.

Any user-defined entries will appear in the User-defined tools sub-menu.
To add a user-defined tool:

1. Click the New icon in the Menu contents title bar or press the Insert key.
2. In the text field that appears, enter the string that is to appear as menu entry in the Tools menu.
3. In the Command field enter the path to the EXE file of the application or use the browse button to select the path.
4. If applicable, enter arguments needed to start the application in the Arguments field.
5. Enter the path to the initial directory, if required.

To change the sequence of user-defined tools:

- Select an entry and use the Move Item Up and Move Item Down buttons to move the menu item. Alternatively, you can also use the shortcut keys Alt+Up and Alt+Down to move the entry.

To rename a user-defined menu item:

- Double-click an item in the Menu contents field and edit the entry.

To remove a user-defined tool:

- Select the entry you want to remove from the Tools menu and click the Delete icon in the Menu contents title bar or press the Delete key.

19.1.9.8.4 Keyboard

The Keyboard tab allows you to define (or change) keyboard shortcuts for any DatabaseSpy command.
In the **Set accelerator for** drop-down list, you can differentiate between shortcuts that are valid in the Default menu or in the DatabaseSpy Design menu.

**To assign a new Shortcut to a command:**

1. Select the **All Commands** category using the **Category** combo box.
2. Select the command you want to assign a new shortcut to, in the **Commands** list box.
3. Click in the **Press New Shortcut Key** text box, and press the shortcut keys that are to activate the command. The shortcuts appear immediately in the text box. If the shortcut was assigned previously, then that function is displayed below the text box.
4. Click the **Assign** button to assign the shortcut.

The shortcut now appears in the **Current Keys** list box. (To clear this text box, press any of the control keys, **Ctrl**, **Alt** or **Shift**).

**To de-assign or delete a shortcut:**

1. Click the shortcut you want to delete in the **Current Keys** list box.
2. Click the **Remove** button.
3. Click the **Close** button to confirm.

**To reset all shortcut keys:**

1. Click the **Reset All** button to reset all the shortcut keys to the state they were when the program was installed. A prompt appears stating that all toolbars and menus will be reset.
2. Click **Yes** to confirm the reset.

The following tables list the currently assigned keyboard shortcuts by key and by function, respectively.

### Hotkeys by key

<table>
<thead>
<tr>
<th>Shortcut</th>
<th>Command name</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>Table of Contents</td>
</tr>
<tr>
<td>F3</td>
<td>Find next</td>
</tr>
<tr>
<td>F5</td>
<td>Execute</td>
</tr>
<tr>
<td>Alt</td>
<td>Show Paths</td>
</tr>
<tr>
<td>Alt+Enter</td>
<td>Property Window</td>
</tr>
<tr>
<td>Shift+Alt+Enter</td>
<td>Select entire Statement</td>
</tr>
<tr>
<td>Shift+Delete</td>
<td>Cut</td>
</tr>
<tr>
<td>Alt+Backspace</td>
<td>Undo</td>
</tr>
<tr>
<td>Ctrl+Insert</td>
<td>Copy</td>
</tr>
<tr>
<td>Shift+Insert</td>
<td>Paste</td>
</tr>
<tr>
<td>Alt+Down</td>
<td>Next Statement</td>
</tr>
<tr>
<td>Alt+Up</td>
<td>Previous Statement</td>
</tr>
<tr>
<td>Alt+Home</td>
<td>First Statement</td>
</tr>
<tr>
<td>Alt+End</td>
<td>Last Statement</td>
</tr>
<tr>
<td>Alt+Insert</td>
<td>Append new row</td>
</tr>
<tr>
<td>Ctrl+C</td>
<td>Copy/Copy selected cells</td>
</tr>
<tr>
<td>Ctrl+D</td>
<td>New Design Editor</td>
</tr>
<tr>
<td>Ctrl+E</td>
<td>Export database data...</td>
</tr>
<tr>
<td>Ctrl+F</td>
<td>Find...</td>
</tr>
<tr>
<td>Ctrl+H</td>
<td>Replace...</td>
</tr>
<tr>
<td>Ctrl+I</td>
<td>Import data to the database...</td>
</tr>
</tbody>
</table>
# User Reference Menus

<table>
<thead>
<tr>
<th>Shortcut</th>
<th>Command name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ctrl+N</td>
<td>New SQL Editor</td>
</tr>
<tr>
<td>Ctrl+O</td>
<td>Open...</td>
</tr>
<tr>
<td>Ctrl+P</td>
<td>Print...</td>
</tr>
<tr>
<td>Ctrl+Q</td>
<td>Create a database connection...</td>
</tr>
<tr>
<td>Ctrl+S</td>
<td>Save</td>
</tr>
<tr>
<td>Ctrl+S</td>
<td>Save Project</td>
</tr>
<tr>
<td>Ctrl+V</td>
<td>Paste</td>
</tr>
<tr>
<td>Ctrl+X</td>
<td>Cut</td>
</tr>
<tr>
<td>Ctrl+Y</td>
<td>Redo</td>
</tr>
<tr>
<td>Ctrl+Z</td>
<td>Undo</td>
</tr>
<tr>
<td>Ctrl+Alt+E</td>
<td>Edit data</td>
</tr>
<tr>
<td>Ctrl+Alt+O</td>
<td>Options...</td>
</tr>
<tr>
<td>Ctrl+Alt+R</td>
<td>Retrieve all rows</td>
</tr>
<tr>
<td>Ctrl+Alt+T</td>
<td>Retrieve first n rows</td>
</tr>
<tr>
<td>Ctrl+Shift+N</td>
<td>New Project</td>
</tr>
<tr>
<td>Ctrl+Shift+O</td>
<td>Open Project</td>
</tr>
<tr>
<td>Ctrl+Shift+S</td>
<td>Save All</td>
</tr>
<tr>
<td>Ctrl+Shift+V</td>
<td>Paste as new row</td>
</tr>
</tbody>
</table>

## Hotkeys by function

<table>
<thead>
<tr>
<th>Command name</th>
<th>Shortcut</th>
<th>Alternative shortcut</th>
</tr>
</thead>
<tbody>
<tr>
<td>Append new row</td>
<td>Alt+Insert</td>
<td></td>
</tr>
<tr>
<td>Copy</td>
<td>Ctrl+C</td>
<td>Ctrl+Insert</td>
</tr>
<tr>
<td>Copy selected cells</td>
<td>Ctrl+C</td>
<td></td>
</tr>
<tr>
<td>Cut</td>
<td>Ctrl+X</td>
<td>Shift+Delete</td>
</tr>
<tr>
<td>Edit data</td>
<td>Ctrl+Alt+E</td>
<td></td>
</tr>
<tr>
<td>Execute</td>
<td>F5</td>
<td></td>
</tr>
<tr>
<td>Command name</td>
<td>Shortcut</td>
<td>Alternative shortcut</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>--------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>Export database data...</td>
<td>Ctrl+E</td>
<td></td>
</tr>
<tr>
<td>Find next</td>
<td>F3</td>
<td></td>
</tr>
<tr>
<td>Find...</td>
<td>Ctrl+F</td>
<td></td>
</tr>
<tr>
<td>First Statement</td>
<td>Alt+Home</td>
<td></td>
</tr>
<tr>
<td>Import data to the database</td>
<td>Ctrl+I</td>
<td></td>
</tr>
<tr>
<td>Last Statement</td>
<td>Alt+End</td>
<td></td>
</tr>
<tr>
<td>New Design Editor</td>
<td>Ctrl+D</td>
<td></td>
</tr>
<tr>
<td>New Project</td>
<td>Ctrl+Shift+N</td>
<td></td>
</tr>
<tr>
<td>New SQL Editor</td>
<td>Ctrl+N</td>
<td></td>
</tr>
<tr>
<td>Next Statement</td>
<td>Alt+Down</td>
<td></td>
</tr>
<tr>
<td>Open...</td>
<td>Ctrl+O</td>
<td></td>
</tr>
<tr>
<td>Open Project</td>
<td>Ctrl+Shift+O</td>
<td></td>
</tr>
<tr>
<td>Options...</td>
<td>Ctrl+Alt+O</td>
<td></td>
</tr>
<tr>
<td>Paste</td>
<td>Ctrl+V</td>
<td>Shift+Insert</td>
</tr>
<tr>
<td>Paste as new row</td>
<td>Ctrl+Shift+V</td>
<td></td>
</tr>
<tr>
<td>Previous Statement</td>
<td>Alt+Up</td>
<td></td>
</tr>
<tr>
<td>Print...</td>
<td>Ctrl+P</td>
<td></td>
</tr>
<tr>
<td>Property Window</td>
<td>Alt+Enter</td>
<td></td>
</tr>
<tr>
<td>Create a database connection</td>
<td>Ctrl+Q</td>
<td></td>
</tr>
<tr>
<td>Redo</td>
<td>Ctrl+Y</td>
<td></td>
</tr>
<tr>
<td>Replace...</td>
<td>Ctrl+H</td>
<td></td>
</tr>
<tr>
<td>Retrieve all rows</td>
<td>Ctrl+Alt+R</td>
<td></td>
</tr>
<tr>
<td>Retrieve first n rows</td>
<td>Ctrl+Alt+T</td>
<td></td>
</tr>
<tr>
<td>Save</td>
<td>Ctrl+S</td>
<td></td>
</tr>
<tr>
<td>Save All</td>
<td>Ctrl+Shift+S</td>
<td></td>
</tr>
<tr>
<td>Save Project</td>
<td>Ctrl+S</td>
<td></td>
</tr>
<tr>
<td>Select entire Statement</td>
<td>Shift+Alt+Enter</td>
<td></td>
</tr>
<tr>
<td>Show Paths</td>
<td>Alt</td>
<td></td>
</tr>
<tr>
<td>Table of Contents</td>
<td>F1</td>
<td></td>
</tr>
</tbody>
</table>
The **Menu** tab allows you to customize the main menu bars as well as the context menus.

You can customize the Default, the SQL, the Design, the Database Data Comparison, and the Database Schema Comparison menu bars.

The **Default** menu is the one visible when no SQL Editor or Design Editor or Data Comparison windows are open in DatabaseSpy.

The **SQL** menu is the menu bar that is displayed when at least one SQL Editor window has been opened.

The **Design** menu is the menu bar visible when at least one Design Editor window has been opened.
The **Database Data Comparison** menu bar is visible when at least one Data Comparison window has been opened.

The **Database Schema Comparison** menu bar is visible when at least one Schema Comparison window has been opened.

**Menu animations and menu shadows**

You can choose from among several menu animations if you prefer animated menus. The **Menu animations** drop-down box provides the following options:

- None (default)
- Unfold
- Slide
- Fade

The **Menu shadows** check box, which is checked by default, can be deactivated if you do not want all your menus to have shadows.

**To customize a menu:**

1. Select the menu bar you want to customize from the **Show Menus for** combo box.
2. Click the **Commands** tab, and drag the commands to the menu bar of your choice.

**To delete commands from a menu:**

1. Select the menu option **Tools | Customize** to open the Customize dialog box.
2. Do one of the following:
   - Right-click the command or icon representing the command and select the **Delete** option from the context menu.
   - Drag the command away from the menu, and drop it as soon as the check mark icon appears below the mouse pointer.

**To reset either of the menu bars:**

1. Select either the Default, the SQL, the Design, or the Database Data Comparison entry in the **Show Menus for** combo box.
2. Click the **Reset** button just below the menu name. A prompt appears asking if you are sure you want to reset the menu bar.
3. Click **Yes**.
To customize any of the context menus (right-click menus):

1. Select the context menu from the Select context menu combo box. The context menu you selected appears.
2. Click the Commands tab, and drag the commands to the context menu.

To delete commands from a context menu:

1. Select the menu option Tools | Customize to open the Customize dialog box.
2. Do one of the following:
   - Right-click on the command or icon representing the command and select the Delete option from the context menu.
   - Drag the command away from the context menu, and drop it as soon as the check mark icon appears below the mouse pointer.

To reset any of the context menus:

1. Select the context menu from the combo box.
2. Click the Reset button just below the context menu name. A prompt appears asking if you are sure you want to reset the context menu.

To close a context menu window:

Do one of the following:

- Click the Close icon at the top right of the title bar.
- Click the Close button of the Customize dialog box.

To change the appearance of menus:

1. If you want animated menus, select the appropriate option from the Menu animations drop-down box.
2. If required, deactivate the Menu shadows check box.
19.1.9.8.6  Options

The Options tab allows you to set general environment settings.

When active, the Show ScreenTips on toolbars check box displays a popup when the mouse pointer is placed over an icon in any of the icon bars. The popup contains a short description of the icon function, as well as the associated keyboard shortcut, if one has been assigned.

The Show shortcut keys in ScreenTips check box allows you to decide whether or not you want to have the shortcut displayed in the tooltip.

When active, the Large icons check box switches between the standard size icons, and larger versions of the icons.

19.1.9.9  Options...

CTRL+ALT+O

The Options command opens the Options dialog box where you can set the General options as well as specific settings for SQL or Design Editor or Data Comparison windows.

19.1.10  Window Menu

To organize the individual windows in an DatabaseSpy session, the Window menu contains standard commands common to most Windows applications. You can also or switch to an open document window directly from the menu.
You can cascade the open windows, tile them, or arrange document icons once you have minimized them.

### 19.1.10.1 Cascade

The **Cascade** command rearranges all open document windows so that they are all cascaded (i.e., staggered) on top of each other.

### 19.1.10.2 Tile horizontally

The **Tile horizontally** command rearranges all open document windows as horizontal tiles, making them all visible at the same time.

### 19.1.10.3 Tile vertically

The **Tile vertically** command rearranges all open document windows as vertical tiles, making them all visible at the same time.

### 19.1.10.4 Currently open window list

This list shows all currently open windows and lets you quickly switch between them.

You can also use the **Ctrl+Tab** or **Ctrl+F6** keyboard shortcuts to cycle through the open windows.

### 19.1.10.5 Windows...

At the bottom of the list of open windows is the **Windows...** command. Clicking this entry opens the Windows dialog box, which displays a list of all open windows and provides commands that can be applied to the selected window(s). A window is selected by clicking on its name.
**Note:** To exit the Windows dialog box, click **OK**; do not click the **Close Window(s)** button in the dialog box. The **Close Window(s)** button closes the window(s) currently selected in the Windows dialog box.

### 19.1.11 Help Menu

#### Table of Contents
- **Description**
  
  Opens the onscreen help manual of DatabaseSpy with the Table of Contents displayed in the left-hand-side pane of the Help window. The Table of Contents provides an overview of the entire Help document. Clicking an entry in the Table of Contents takes you to that topic.

#### Index
- **Description**
  
  Opens the onscreen help manual of DatabaseSpy with the Keyword Index displayed in the left-hand-side pane of the Help window. The index lists keywords and lets you navigate to a topic by double-clicking the keyword. If a keyword is linked to more than one topic, a list of these topics is displayed.

#### Search
- **Description**
  
  Opens the onscreen help manual of DatabaseSpy with the Search dialog displayed in the left-hand-side pane of the Help window. To search for a term, enter the term in the input field, and press **Return**. The Help system performs a full-text search on the entire Help documentation and returns a list of hits. Double-click any item to display that item.

#### Software Activation
- **Description**
  
  After you download your Altova product software, you can license—or activate—it using either a free evaluation key or a purchased permanent license key.

  - **Free evaluation key.** When you first start the software after downloading and installing it, the Software Activation dialog will pop up. In it is a button to request a free evaluation key-code. Enter your name, company, and e-mail address in the dialog that appears, and click **Request Now!** The evaluation key is sent to the e-mail address you entered and should reach you in a few minutes. Now enter the key in the key-code field of the Software Activation dialog box and click **OK** to start working with your Altova product. The software will be unlocked for a period of 30 days.
  
  - **Permanent license key.** The Software Activation dialog contains a button to purchase a permanent license key. Clicking this button takes you to Altova's
online shop, where you can purchase a permanent license key for your product. There are two types of permanent license: single-user and multi-user. Both will be sent to you by e-mail. A single-user license contains your license-data and includes your name, company, e-mail, and key-code. A multi-user license contains your license-data and includes your company name and key-code. Note that your license agreement does not allow you to install more than the licensed number of copies of your Altova software on the computers in your organization (per-seat license). Please make sure that you enter the data required in the registration dialog exactly as given in your license e-mail.

**Note:** When you enter your license information in the Software Activation dialog, ensure that you enter the data exactly as given in your license e-mail. For multi-user licenses, each user should enter his or her own name in the Name field.

**Your license email and the different ways to license (activate) your Altova product**

The license email that you receive from Altova will contain:

- Your license details (name, company, email, key-code)
- As an attachment, a license file with a `.altova_licenses` file extension

To activate your Altova product, you can do one of the following:

- Enter the email-supplied license details in the Altova product's Software Activation dialog, and click **OK**.
- Save the license file (`.altova_licenses`) to a suitable location, double-click the license file, enter any requested details in the dialog that appears, and finish by clicking **Apply Keys**.
- Save the license file (`.altova_licenses`) to any suitable location, and upload it from this location to the license pool of your Altova LicenseServer. You can then either: (i) acquire the license from your Altova product via the product’s Software Activation dialog, or (ii) assign the license to the product from Altova LicenseServer. *For more information about licensing via LicenseServer, read the rest of this topic.*

The Software Activation dialog (**screenshot below**) can be accessed at any time by clicking the **Help | Software Activation** command.

You can activate the software by either:

- Entering the license key information (click **Enter a New Key Code**), or
- Acquiring a license via an Altova LicenseServer on your network (click **Use Altova LicenseServer**, located at the bottom of the Software Activation dialog). Select the machine on which the LicenseServer you want to use has been installed. Note that the auto-discovery of License Servers works by means
of a broadcast sent out on the LAN. As these broadcasts are limited to a subnet, License Server must be on the same subnet as the client machine for auto-discovery to work. If auto-discovery does not work, then type in the name of the server. The Altova LicenseServer must have a license for your Altova product in its license pool. If a license is available in the LicenseServer pool, this is indicated in the Software Activation dialog (screenshot below), and you can click Save to acquire the license.

![Altova LicenseServer License Pool](image)

After a machine-specific (aka installed) license has been acquired from a LicenseServer, it cannot be returned to the LicenseServer for a period of seven days. After that time, you can return the machine license to LicenseServer (click Return License) so that this license can be acquired from LicenseServer by another client. (A LicenseServer administrator, however, can unassign an acquired license at any time via the administrator's Web UI of LicenseServer.) Note that the returning of licenses applies only to machine-specific licenses, not to concurrent licenses.

**Check out license**

You can check out a license from the license pool for a period of up to 30 days so that the license is stored on the product machine. This enables you to work offline, which is useful, for example, if you wish to work in an environment where there is no access to your Altova LicenseServer (such as when your Altova product is installed on a laptop and you are traveling). While the license is checked out, LicenseServer displays the license as being in use, and the license cannot be used by any other machine. The license automatically reverts to the checked-in state when the check-out period ends. Alternatively, a checked-out license can be checked in at any time via the Check in button of the Software Activation dialog.

To check out a license, do the following: (i) In the Software Activation dialog, click Check out License (see screenshot above); (ii) In the License Check-out dialog that appears, select the check-out period you want and click Check out.
The license will be checked out. The Software Activation dialog will display the check-out information, including the time when the check-out period ends. The **Check out License** button in the dialog changes to a **Check In** button. You can check the license in again at any time by clicking **Check In**. Because the license automatically reverts to the checked-in status, make sure that the check-out period you select adequately covers the period during which you will be working offline.

**Note:** For license check-outs to be possible, it must be enabled on the LicenseServer. If this functionality has not been enabled, you will get an error message to this effect. In this event, contact your LicenseServer administrator.

**Copy Support Code**
Click **Copy Support Code** to copy license details to the clipboard. This is the data that you will need to provide when requesting support via the online support form.

Altova LicenseServer provides IT administrators with a real-time overview of all Altova licenses on a network, together with the details of each license, as well as client assignments and client usage of licenses. The advantage of using LicenseServer therefore lies in administrative features it offers for large-volume Altova license management. Altova LicenseServer is available free of cost from the Altova website. For more information about Altova LicenseServer and licensing via Altova LicenseServer, see the Altova LicenseServer documentation.

**Order Form**
- **Description**
  When you are ready to order a licensed version of the software product, you can use either the **Order license key** button in the Software Activation dialog (see previous section) or the **Help | Order Form** command to proceed to the secure Altova Online Shop.

**Registration**
- **Description**
  Opens the Altova Product Registration page in a tab of your browser. Registering your Altova software will help ensure that you are always kept up to date with the latest product information.

**Check for Updates**
- **Description**
  Checks with the Altova server whether a newer version than yours is currently available and displays a message accordingly.
Description
A link to the Altova Support Center on the Internet. The Support Center provides FAQs, discussion forums where problems are discussed, and access to Altova’s technical support staff.

FAQ on the Web
Description
A link to Altova’s FAQ database on the Internet. The FAQ database is constantly updated as Altova support staff encounter new issues raised by customers.

Download Components and Free Tools
Description
A link to Altova’s Component Download Center on the Internet. From here you can download a variety of companion software to use with Altova products. Such software ranges from XSLT and XSL-FO processors to Application Server Platforms. The software available at the Component Download Center is typically free of charge.

DatabaseSpy on the Internet
Description
A link to the Altova website on the Internet. You can learn more about DatabaseSpy and related technologies and products at the Altova website.

About DatabaseSpy
Description
Displays the splash window and version number of your product. If you are using the 64-bit version of DatabaseSpy, this is indicated with the suffix (x64) after the application name. There is no suffix for the 32-bit version.
Chapter 20

License Information
20 License Information

This section contains information about:

- the distribution of this software product
- software activation and license metering
- the license agreement governing the use of this product

Please read this information carefully. It is binding upon you since you agreed to these terms when you installed this software product.

To view the terms of any Altova license, go to the Altova Legal Information page at the Altova website.
20.1 Electronic Software Distribution

This product is available through electronic software distribution, a distribution method that provides the following unique benefits:

- You can evaluate the software free-of-charge for 30 days before making a purchasing decision. *(Note: Altova MobileTogether Designer is licensed free of charge.)*
- Once you decide to buy the software, you can place your order online at the Altova website and get a fully licensed product within minutes.
- When you place an online order, you always get the latest version of our software.
- The product package includes an onscreen help system that can be accessed from within the application interface. The latest version of the user manual is available at www.altova.com in (i) HTML format for online browsing, and (ii) PDF format for download (and to print if you prefer to have the documentation on paper).

30-day evaluation period

After downloading this product, you can evaluate it for a period of up to 30 days free of charge. About 20 days into the evaluation period, the software will start to remind you that it has not yet been licensed. The reminder message will be displayed once each time you start the application. If you would like to continue using the program after the 30-day evaluation period, you must purchase a product license, which is delivered in the form of a license file containing a key code. Unlock the product by entering this key code in the Software Activation dialog of your product.

You can purchase product licenses at the Altova online shop.

Helping Others within Your Organization to Evaluate the Software

If you wish to distribute the evaluation version within your company network, or if you plan to use it on a PC that is not connected to the Internet, you may distribute only the installer file, provided that this file is not modified in any way. Any person who accesses the software installer that you have provided must request their own 30-day evaluation license key code and after expiration of their evaluation period, must also purchase a license in order to be able to continue using the product.
20.2 Software Activation and License Metering

As part of Altova’s Software Activation, the software may use your internal network and Internet connection for the purpose of transmitting license-related data at the time of installation, registration, use, or update to an Altova-operated license server and validating the authenticity of the license-related data in order to protect Altova against unlicensed or illegal use of the software and to improve customer service. Activation is based on the exchange of license-related data such as operating system, IP address, date/time, software version, and computer name, along with other information between your computer and an Altova license server.

Your Altova product has a built-in license metering module that further helps you avoid any unintentional violation of the End User License Agreement. Your product is licensed either as a single-user or multi-user installation, and the license-metering module makes sure that no more than the licensed number of users use the application concurrently.

This license-metering technology uses your local area network (LAN) to communicate between instances of the application running on different computers.

**Single license**

When the application starts up, as part of the license metering process, the software sends a short broadcast datagram to find any other instance of the product running on another computer in the same network segment. If it doesn't get any response, it will open a port for listening to other instances of the application.

**Multi-user license**

If more than one instance of the application is used within the same LAN, these instances will briefly communicate with each other on startup. These instances exchange key-codes in order to help you to better determine that the number of concurrent licenses purchased is not accidentally violated. This is the same kind of license metering technology that is common in the Unix world and with a number of database development tools. It allows Altova customers to purchase reasonably-priced concurrent-use multi-user licenses.

We have also designed the applications so that they send few and small network packets so as to not put a burden on your network. The TCP/IP ports (2799) used by your Altova product are officially registered with the IANA (see the IANA Service Name Registry for details) and our license-metering module is tested and proven technology.

If you are using a firewall, you may notice communications on port 2799 between the computers that are running Altova products. You are, of course, free to block such traffic between different groups in your organization, as long as you can ensure by other means, that your license agreement is not violated.

If you are online, you will also notice that your Altova software provides many useful functions. These are unrelated to the license-metering technology.
20.3 Altova End-User License Agreement

- The Altova End-User License Agreement is available here: https://www.altova.com/legal/eula
- Altova's Privacy Policy is available here: https://www.altova.com/privacy
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