31. Accessing MS-Access with Java

Java

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Outline

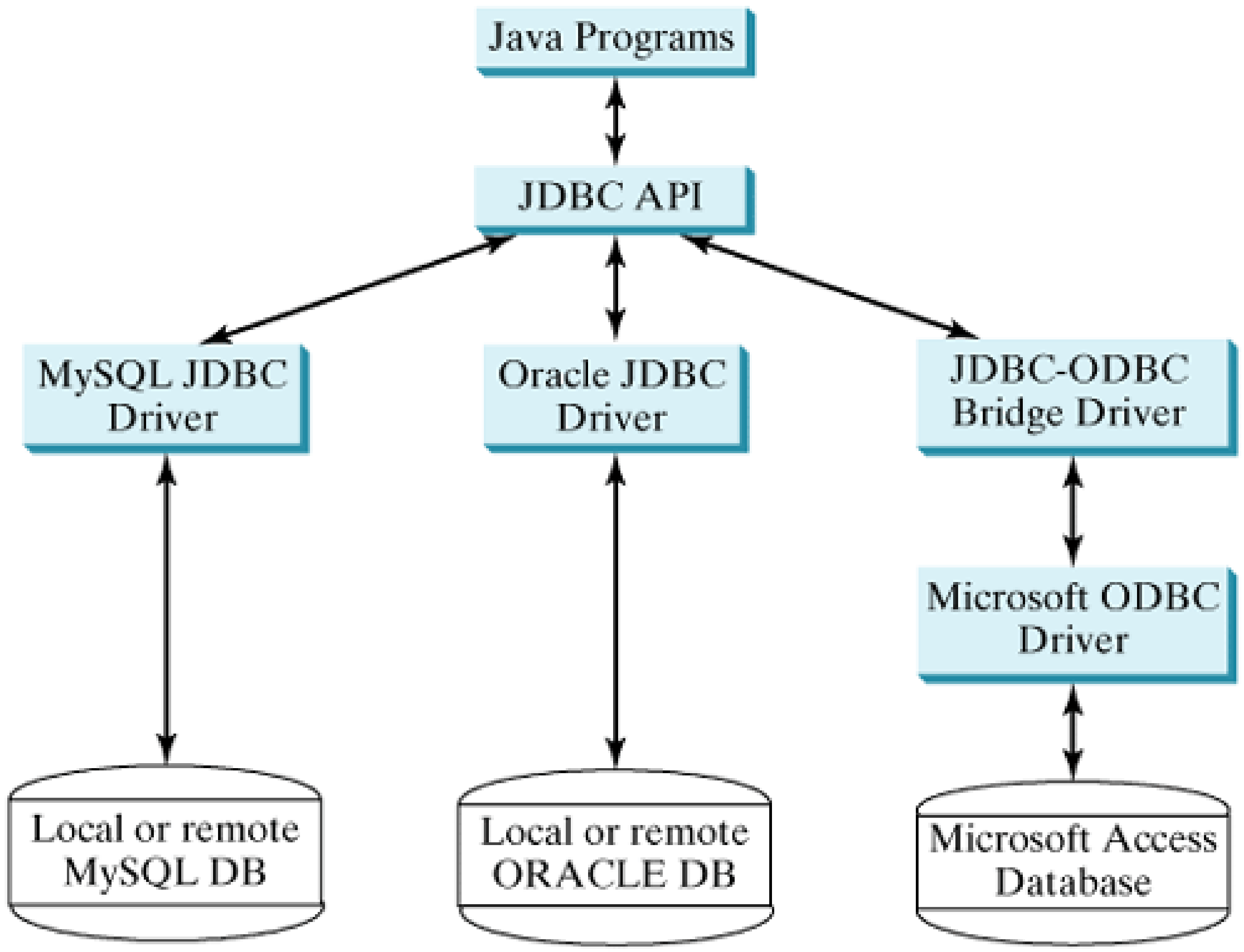
- JDBC-ODBC driver
- Creating an ODBC Data Source
- Connecting to a Database
- Querying a Database
- Retrieving Metadata
- Updating a Database
- References

JDBC-ODBC driver

JDBC-ODBC driver

- To use the JDBC-ODBC driver to access databases in Java, two drivers must be installed on the computer:
  - a universal JDBC-ODBC bridge driver
  - a vendor-specific ODBC driver

JDBC-ODBC driver



JDBC-ODBC bridge driver

- The JDBC-ODBC driver comes with Java 2 SDK 1.3 or higher
- The JDBC-to-ODBC Bridge allows any Java program to access any ODBC data source.
- The driver is class JdbcOdbcDriver in package sun.jdbc.odbc.

ODBC driver

- On the Microsoft Windows platform, most databases support access via Open Database Connectivity (ODBC).
- ODBC is a technology developed by Microsoft to allow generic access to disparate database systems on the Windows platform.

ODBC driver

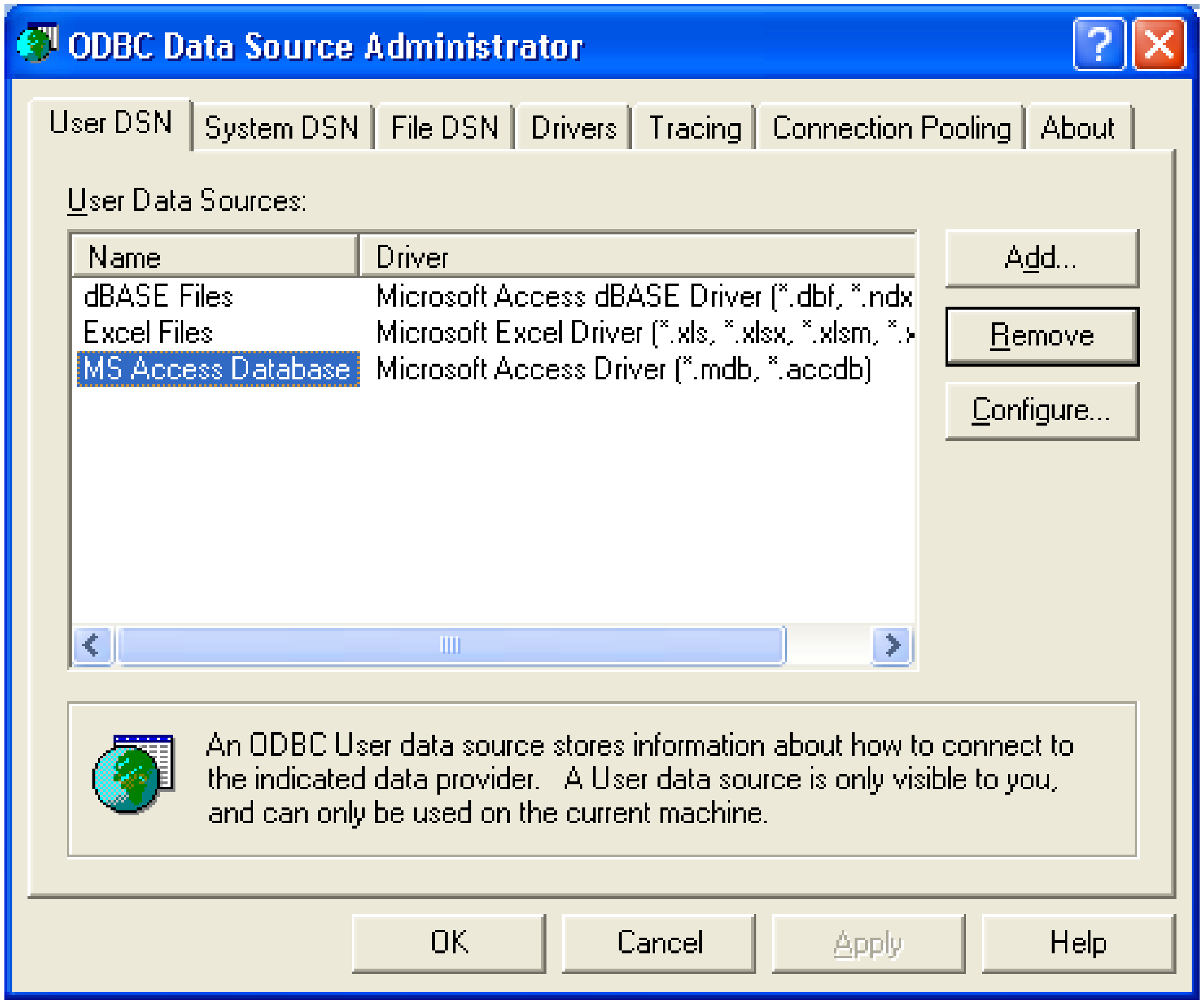
- By default the ODBC driver is installed on Windows 98, NT, 2000, XP, and Vista.
- If not, install MS Access to get the proper ODBC driver on your system.
- Upon successful installation, you should see the icon Data Sources (ODBC) in the Administrative Tools window under the Control Panel

Creating an ODBC Data Source

Creating an ODBC Data Source

- From the Windows Start button, choose Setting, Control Panel to bring up the Control Panel dialog box.
- Double-click Administrative Tools, and then double-click Data Sources (ODBC) to display the ODBC Data Source Administrator dialog box, as shown in the Figure.

Creating an ODBC Data Source



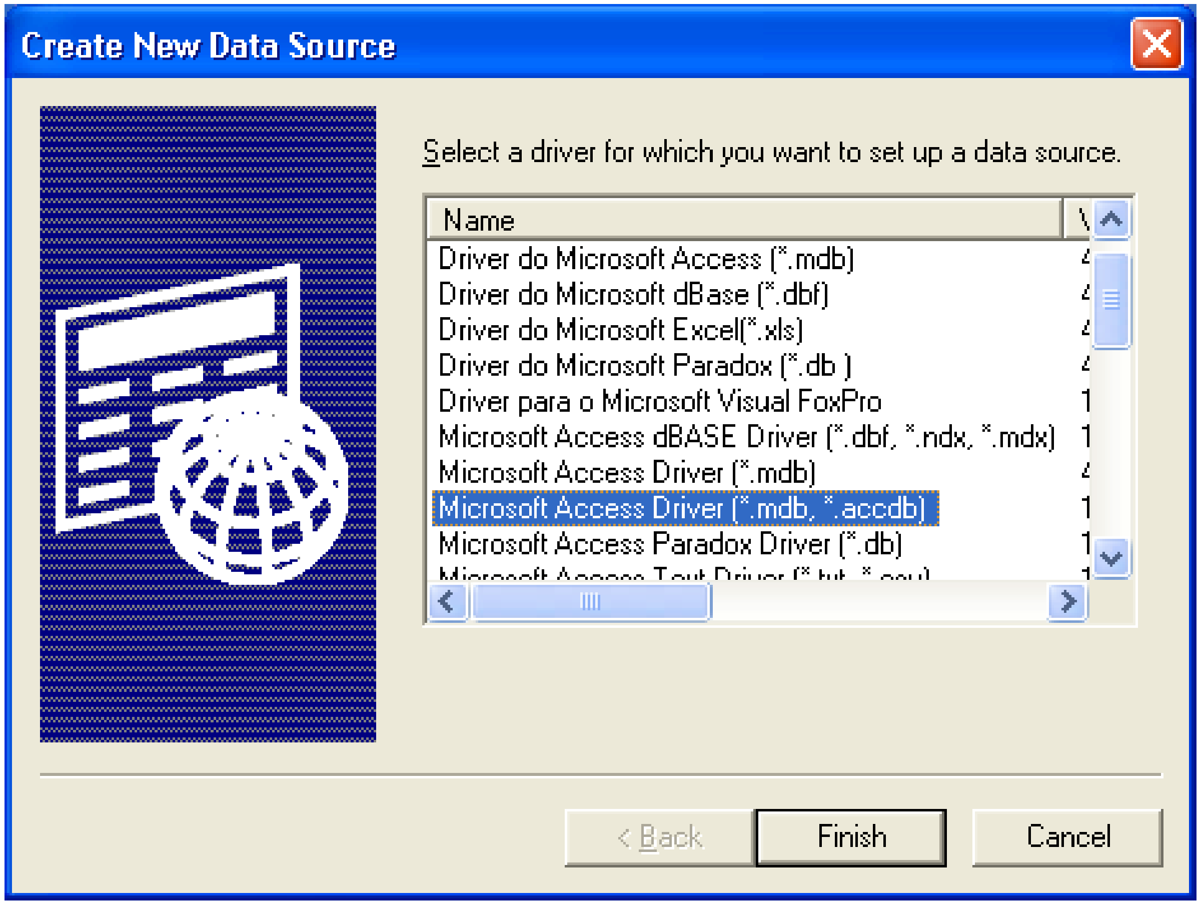
User Data Sources:

Name	Driver
dBASE Files	Microsoft Access dBASE Driver (*.dbf, *.ndx
Excel Files	Microsoft Excel Driver (*.xls, *.xlsx, *.xlsm, *.x
MS Access Database	Microsoft Access Driver (*.mdb, *.accdb)

An ODBC User data source stores information about how to connect to the indicated data provider. A User data source is only visible to you, and can only be used on the current machine.

Creating an ODBC Data Source

- Click Add to bring up the Create New Data Source dialog box, as shown in the Figure.

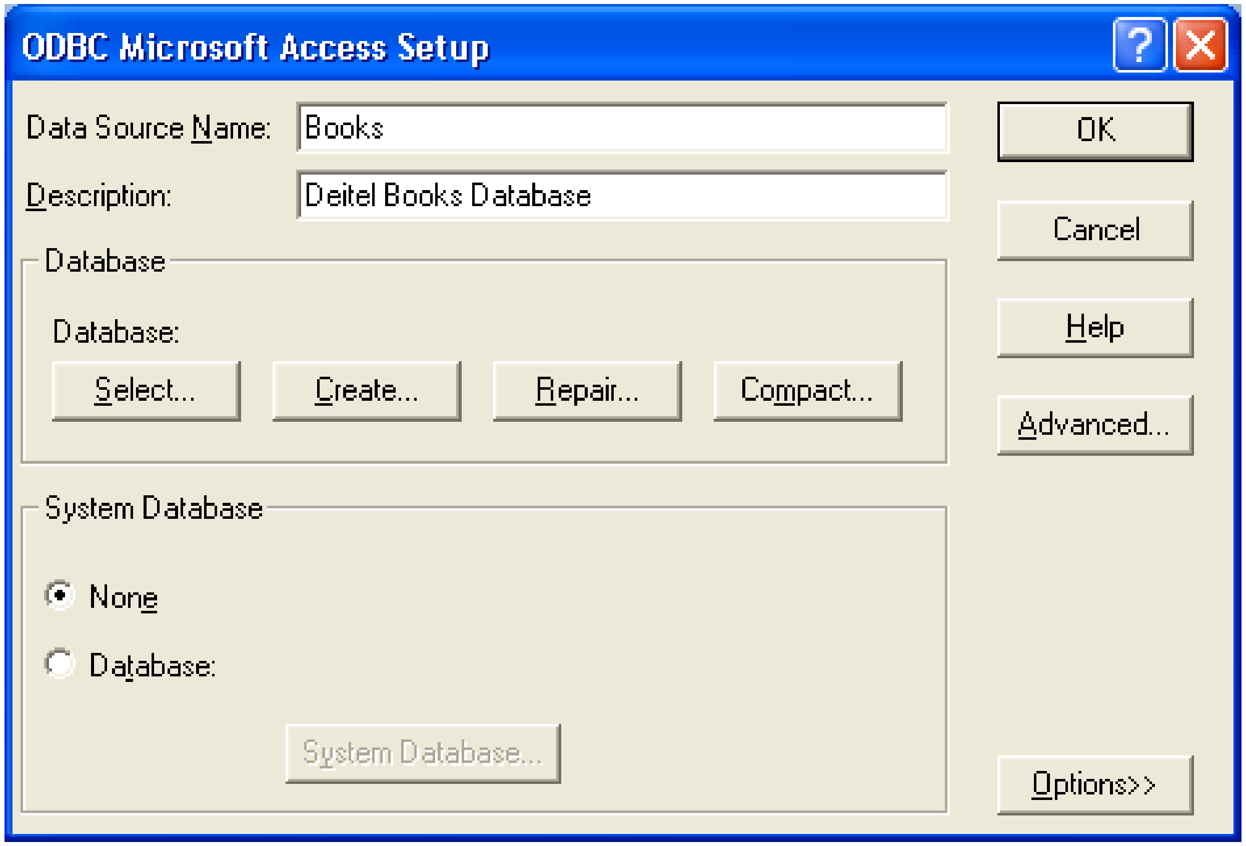


Select a driver for which you want to set up a data source.

Name	V
Driver do Microsoft Access (*.mdb)	4
Driver do Microsoft dBase (*.dbf)	4
Driver do Microsoft Excel(*.xls)	4
Driver do Microsoft Paradox (*.db)	4
Driver para o Microsoft Visual FoxPro	1
Microsoft Access dBASE Driver (*.dbf, *.ndx, *.mdx)	1
Microsoft Access Driver (*.mdb)	4
Microsoft Access Driver (*.mdb, *.accdb)	1
Microsoft Access Paradox Driver (*.db)	1
Microsoft Access Text Driver (*.txt, *.csv)	1

Creating an ODBC Data Source

- Select Microsoft Access Driver (*.mdb, *.accdb) and press Finish to bring the ODBC Microsoft Access Setup dialog window, as shown in the Figure.


ODBC Microsoft Access Setup

Data Source Name: Books

Description: Deitel Books Database

Database

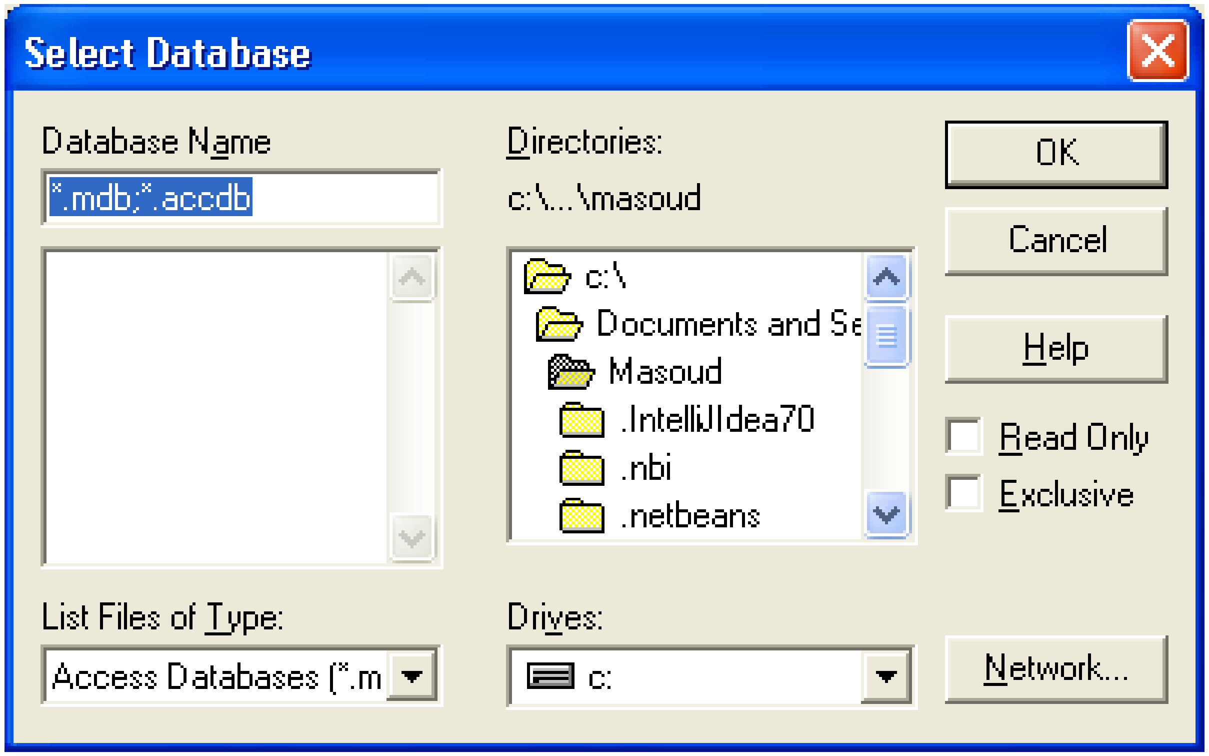
Database:

System Database

(● None) ○ Database:

Creating an ODBC Data Source

- Type Books in the Data Source Name field, and type Deitel Books Database in the Description filed.
- Click Select to bring up the Select Database dialog window, as shown in the Figure.



Creating an ODBC Data Source

- Select Books.accdb from the appropriative directory.
- Press OK to close the Select Database dialog window
- Click OK to close the ODBC Microsoft Access Setup window
- Click OK to close the ODBC Data Source Administrator window

Accessing Database Using Java

- The JDBC driver for MS Access is sun.jdbc.odbc.JdbcOdbcDriver contained in JDK.
- The database URL for Access is jdbc:odbc:dataSource.
- For example, if the ODBC data source is named Books, the URL is jdbc:odbc:Books.

Connecting to a Database

Connecting to and Querying a Database

- This section illustrates:
  - Connecting to a database
  - Querying the database
  - Display the results of the query in `Jtable`
- The following discussion presents the key JDBC aspects of the program.

Accessing a database

- A typical Java program takes the steps outlined below to access the database:

1. Loading drivers
   - An appropriate driver must be loaded using the statement shown below before connecting to a database.
     Class.forName("JDBCDriverClass");
   - A driver is a concrete class.
   - For MS-Access we will use:

     Class.forName(“sun.jdbc.odbc.JdbcOdbcDriver ");

Accessing a database

2. Establishing connections
   - To connect to a database, use the static method getConnection(databaseURL) in the DriverManager class, as follows:
     Connection connection = DriverManager.getConnection(databaseURL);
   - The URLs for the Access database:

     jdbc:odbc:dataSource
   - Suppose a data source named Books has been created for an Access database. The following statement creates a Connection object:
     Connection connection = DriverManager.getConnection(jdbc:odbc:Books);

Accessing a database

3. Creating statements
   - If a Connection object can be envisioned as a cable linking your program to a database, an object of Statement or its subclass can be viewed as a cart that delivers SQL statements for execution by the database and brings the result back to the program.
   - Once a Connection object is created, you can create statements for executing SQL statements as follows:

     ```
     Statement statement =
     connection.createStatement();
     ```

Accessing a database

4. Executing statements
   - An SQL update statement can be executed using executeUpdate(String sql), Example:

     statement.executeUpdate("INSERT INTO authors (firstName, lastName) VALUES ('Sue', 'Smith')");

   - An SQL query statement can be executed using executeQuery(String sql). The result of the query is returned in ResultSet, Example:

     ResultSet resultSet = statement.executeQuery("SELECT authorID, firstName, lastName FROM authors");

Accessing a database

5. Processing ResultSet
   - The ResultSet maintains a table whose current row can be retrieved.
   - The initial row position is null.
   - You can use the next method to move to the next row and the various get methods to retrieve values from a current row.
   - For example, the code given below displays all the results from the preceding SQL query:

```
while (resultSet.next())
  System.out.println(resultSet.getString(1) + " " +
resultSet.getString(2) + " " + resultSet.getString(3));
```

Accessing a database

5. Processing ResultSet (cont.)
   - Alternatively, you can use getString("firstName"), getString("mi"), and getString("lastName") to retrieve the same three column values.
   - The first execution of the next() method sets the current row to the first row in the result set, and subsequent invocations of the next() method set the current row to the second row, third row, and so on, to the last row.

Querying a Database

Querying a Database

- DisplayAuthors.java performs a simple query on the books database that retrieves the entire authors table and displays the data.
- This program retrieves the entire `authors` table and displays the data in the standard output stream
- The Program:
  - DisplayAuthors.java

Querying a Database

- Lines 3
  - import the JDBC classes from package java.sql used in this program.
- Line 12
  - uses static method forName of class Class to load the class for the database driver.
  - This line throws a checked exception of type java.lang.ClassNotFoundException if the class loader cannot locate the driver class.

Querying a Database

- Lines 15
  - creates a Connection object (package java.sql) referenced by connection.
  - An object that implements interface Connection manages the connection between the Java program and the database.
  - Connection objects enable programs to create SQL statements that access databases.
  - The program initializes Connection with the result of a call to static method getConnection of class DriverManager (package java.sql), which attempts to connect to the database specified by its URL.

Querying a Database

- Lines 15 (cont.)
  - The URL locates the database (possibly on a network or in the local file system of the computer).
  - If the DriverManager cannot connect to the database, method getConnection tHRows a SQLException (package java.sql).
- Line 18
  - invokes Connection method createStatement to obtain an object that implements interface Statement (package java.sql).
  - The program uses the Statement object to submit SQL to the database.

Querying a Database

- Lines 21-22
  - use the Statement object's executeQuery method to submit a query that selects all the author information from table authors.
  - This method returns an object that implements interface ResultSet and contains the result of the query.
  - The ResultSet methods enable the program to manipulate the query result.

Querying a Database

- Lines 30-35
  - display the data in each ResultSet row.
  - Before processing the ResultSet, the program positions the ResultSet cursor to the first row in the ResultSet with method next (line 45).
  - The cursor points to the current row.
  - Method next returns boolean value true if it is able to position to the next row; otherwise the method returns false (end of table).
  - Initially, a ResultSet cursor is positioned before the first row. Attempting to access a ResultSet's contents before positioning the ResultSet cursor to the first row with method next causes a SQLException.

Querying a Database

- Lines 30-35 (cont.)
  - Specifying column number 0 when obtaining values from a ResultSet causes a SQLException.

Retrieving Metadata

Retrieving Metadata

- JDBC provides the DatabaseMetaData interface for obtaining database-wide information and the ResultSetMetaData interface for obtaining information on the specific ResultSet, such as column count and column names.
- The program:
  - DisplayAuthors2.java

Retrieving Metadata

- Line 25
  - obtains the metadata for the ResultSet as a ResultSetMetaData (package java.sql) object.
  - The metadata describes the ResultSet's contents.
  - Programs can use metadata programmatically to obtain information about the ResultSet's column names and types.
- Line 26
  - uses ResultSetMetaData method getColumnCount to retrieve the number of columns in the ResultSet.
- Lines 29-31
  - display the column names.

Updating a Database

Updating a Database

- The program:
  - UpdatingDatabase.java

References

References

- H. M. Deitel and P. J. Deitel, **Java™ How to Program**, Sixth Edition, Prentice Hall, 2005. (Chapter 25)
- Y. Daniel Liang, **Introduction to Java Programming**, Sixth Edition, Pearson Education, 2007. (Chapter 32)

The End