8. Java Database Connectivity

Outline

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What is JDBC?

- A set of SQL-Level APIs to enable Java applications to access relational database
- Java program will be able to use SQL(Structure Query Language) query statements to access information in relational database systems

An Introduction to SQL

SQL Commands

- SELECT
- INSERT
- UPDATE
- DELETE

CREATE TABLE tableName(
columnName columnType columnModifier,
columnName columnType columnModifier,
…
columnName columnType columnModifier,
)

INSERT INTO tableName(cloumnName, …, columnName)
VALUES(value, value, .., value)

UPDATE tableName
SET columnName = value,
columnName = value,
….
columnName = value,
WHERE columnName = value,

DELETE FROM tableName WHERE columnName = value

SELECT columnName, .. , columnName
FROM tableName
WHERE columnName = value

Some SQL Query Examples

SELEC * FROM Atthors WHERE YearBorn > 1960
SELECT AuthorID, LastName FROM Authors
SELECT * FROM Authors WHERE LastName LIKE 'd*'
SELECT * FROM Authors WHERE LastName LIKE '?*'
SELECT * FROM Authors WHERE LastName LIKE '?[a-l]*'

ORDER BY CLAUSE
SELECT * FROM Authors ORDER BY LastName ASC
SELECT * FROM Authors ORDER BY LastName DESC
SELECT * FROM Authors ORDER BY LastName, FirstName

SELECT * FROM Titles
WHERE Title LIKE '*How to Program'
ORDER BY Title ASC

INNER JOIN

```
SELECT * FROM Tables WHERE JOIN Table2 ON Table1.field = Table2.field

SELECT FirstName, LastName, ISBN
FROM Authors INNER JOIN AuthorISBN
ON Authors.AuthordID = AuthorISBN.AuthorID
ORDER BY LastName, FirstName
```

SQL Examples:

TitleAuthor Query from Books.mbd

```
SELECT Titles.Title, Titles.ISBN, Authors.FirstName,
            Authors.LastName, Titles.YearPublished,
            Publishers.PublisherName
FROM
        (Publishers INNER JOIN Titles
         ON Publishers.PublisherID = Titles.PublisherID)
        INNER JOIN
        (Authors INNER JOIN AuthorISBN ON
         Authors.AuthorID = AuthorISBN.AuthorID)
        ON Titles.ISBN = AuthorISBN.ISBN
ORDER BY Titles.Title
```

Database and Driver Types

Type 1 Driver (**JDBC-ODBC bridge**)

- A bridge technology that provides a gateway to the ODBC API (JDBC-ODBC)
- Comes with JDK for accessing a database
- Requires software installation on client side

Type 2 Driver (**Native API connection driver**)

- Native API connection driver contains Java code that calls native C or C++ methods
- Provided by the individual database vendors
- Require software installation on client side

Type 3 Driver (**Network Connection Driver**)

- JDBC driver on client side
- Uses sockets to call a middleware application on the server
- The middleware translates the client request
- No software installation is required

Type 4 Driver (**Database Protocol Driver**)

- Pure Java solution using network protocols built into the database engine
- Using Java socket to talk directly to the database

JDBC Access Driver API Web site:
http://industry.java.sun.com/products/jdbc/drivers

JDBC Supporting Classes

- The JDBC Classes for Creating a Connection

  java.sql.Driver

  java.sql.DriveManager

  java.sql.Connection

- Database Access

  java.sql.Statement

  // executeQuery() to execute SQL query

  // executeUpdate()

  java.sql.ResultSet

  // one or more rows of data returned from a database query

- Other classes
  - java.sql.SQLException
  - java.sql.SQLWarning
  - java.sql.DataTruncation
  - java.sql.Date
  - java.sql.Time
  - java.sql.Timestamp
  - SQL Datatypes and Java Datatypes Mappings

java.sql.Types	**Java Type**
BIT	boolean
TINYINT	byte
SMALLINT	short
INTEGER	int
BIGINT	long
REAL	float
FLOAT	double
DOUBLE	double

java.sql.Types	Java Type
DECIMAL	java.math.BigDecimal
NUMERIC	java.math.BigDecimal
CHAR	java.lang.String
VARCHAR	java.lang.String
LONGCARCHAR	java.lang.String
DATE	java.sql.Date
TIME	java.sql.Time
TIMESTAMP	java.sql.Timestamp
BINARY	byte[ ]
VARBINARY	byte[ ]
LONGVARBINARY	byte[ ]
BLOB	java.sql.Blob
CLOB	java.sql.Clob
ARRAY	java.sql.Array
REF	java.sql.Ref
STRUCT	java.sql.Struct

Procedures for using JDBC to Access Database

The following steps are necessary to access a database using JDBC:

- Preparation
  - Install Java and JDBC API
  - Install a driver
- Setting up a database
- Establishing a connection with the DBMS
  - Loading a driver and register it with java.sql.DriverManager
    - If using the JDBC-ODBC bridge driver:

      `Class.forName("sun.jdbc.odbc.JdbcOdbcDriver");`
    - If using JDBC driver:

      `Class.forName("jdbc.DriverXYZ");`
  - Open a connection

// ODBC Data source called "ThisDb"

```
String url = "jdbc:odbc:ThisBookTable";
String dbUserName = "anonymous";
String dbPassword = "guest";
connection conDB = DriverManager.getConnection(url,
dbUserName, dbPassword);
```

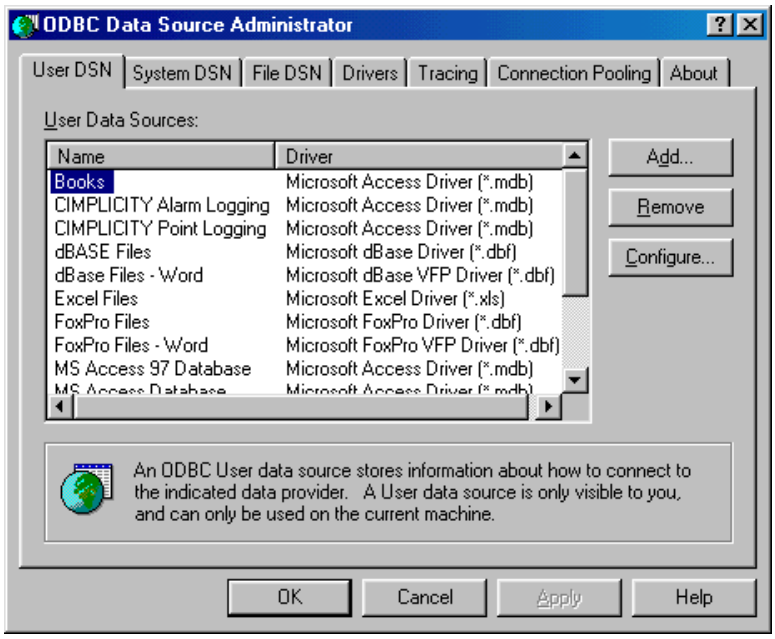
- Using JDBC Statements
  - Using a **Statement** object to send SQL statements to the DBMS

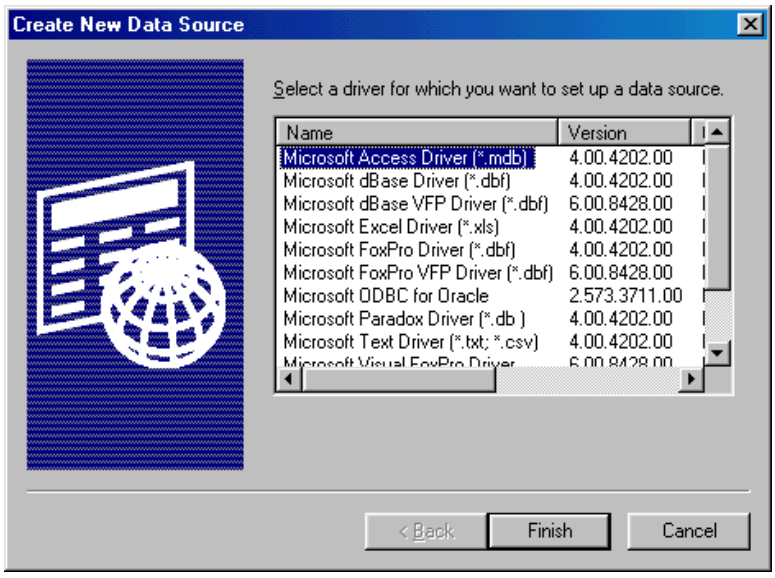
`Statement dbStmExec = conDB.createsStatement();`

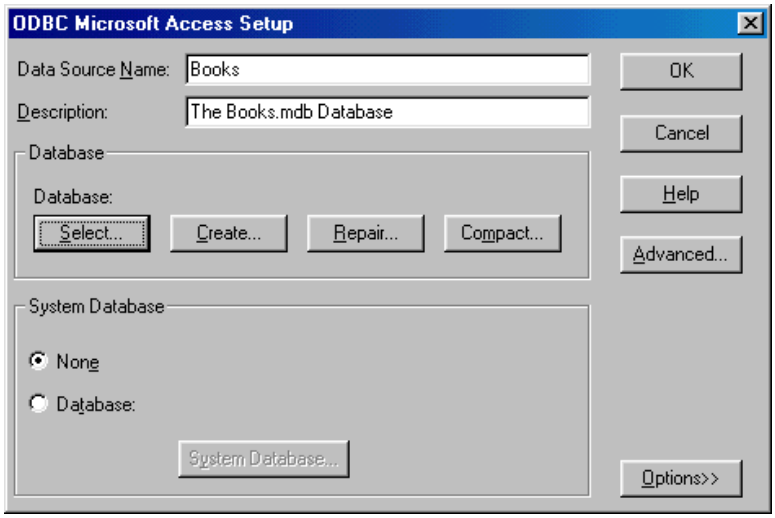
`dbStmExec.executeUpdate(sqlQueryString);`

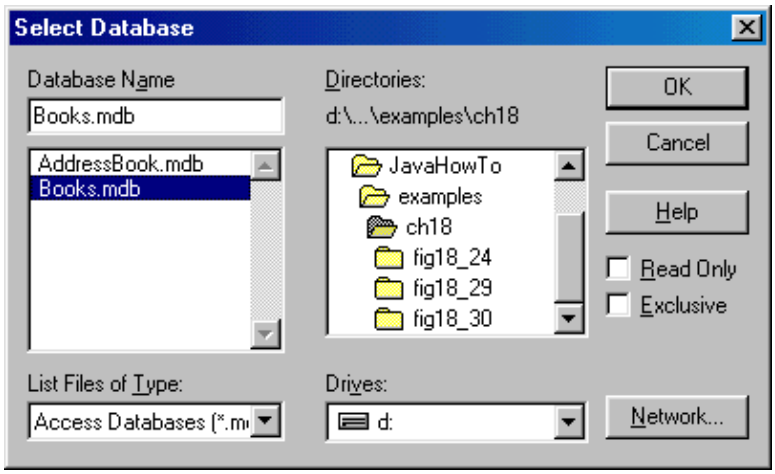
Data Source Administrator

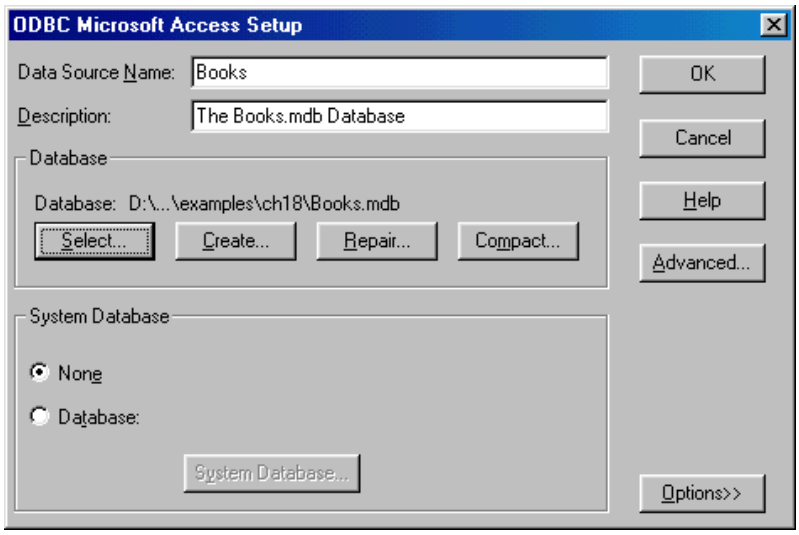
Configuring ODBC Data Source (Window's control panel)

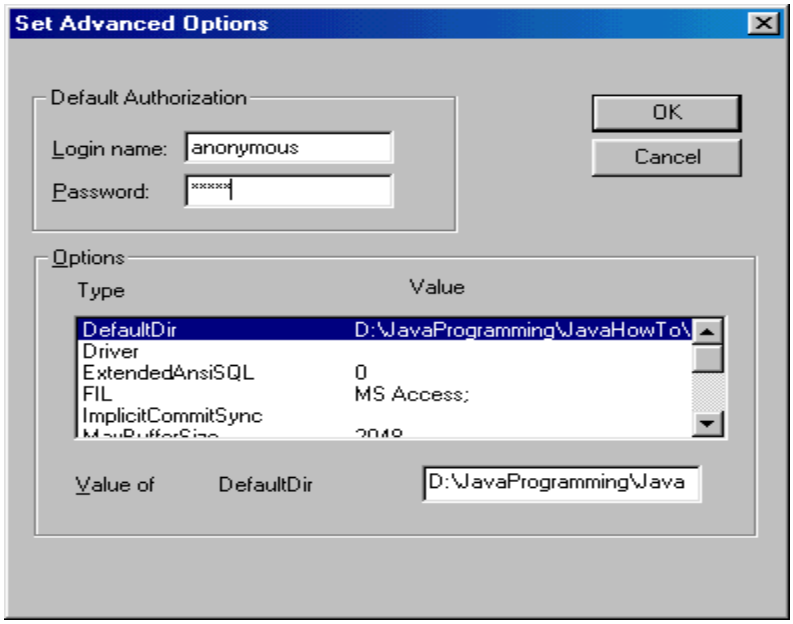





ODBC Microsoft Access Setup
Data Source Name: Books
Description: The Books.mdb Database
Database
Database:
Select...
Create...
Repair...
Compact...
System Database
None
Database:
System Database...
OK
Cancel
Help
Advanced...
Options>>


Select Database
Database Name
Books.mdb
AddressBook.mdb
Books.mdb
Directories:
d:\...\examples\ch18
JavaHowTo
examples
ch18
fig18_24
fig18_29
fig18_30
List Files of Type:
Access Databases (*.m
Drives:
d:
OK
Cancel
Help
Read Only
Exclusive
Network...


ODBC Microsoft Access Setup
Data Source Name: Books
Description: The Books.mdb Database
Database
Database: D:\...\examples\ch18\Books.mdb
Select...
Create...
Repair...
Compact...
System Database
None
Database:
System Database...
OK
Cancel
Help
Advanced...
Options>>



Java Classes Used in the JDBC Examples

java.lang.Class
public final class Class extends Object implements Serializable

- Instances of the class `Class` represent classes and interfaces in a running Java application.
- Every array also belongs to a class that is reflected as a `Class` object that is shared by all arrays with the same element type and number of dimensions.
- The primitive Java types (`boolean`, `byte`, `char`, `short`, `int`, `long`, `float`, and `double`), and the keyword `void` are also represented as `Class` objects.

Static Class forName(String className)

- Create a new `Class` object associated with the class or interface with the given string name.

java.sql
public interface connection

- An interface for creating a connection (session) with a specific database
- Within the context of a Connection, SQL statements are executed and results are returned.

A Connection's database is able to provide information describing its tables, its supported SQL grammar, its stored procedures, the capabilities of this connection, and so on. This information is obtained with the `getMetaData` method.

java.sql
public interface Statement

- The object used for executing a static SQL statement and obtaining the results produced by it.
- Only one `ResultSet` object per `Statement` object can be open at any point in time.
- If the reading of one `ResultSet` object is interleaved with the reading of another, each must have been generated by different `Statement` objects. All statement `execute` methods implicitly close a statment's current `ResultSet` object if an open one exists.

java.sql
public interface ResultSet

The ResultSet object references to a table of data representing a database result set. The ResultSet object is usually generated by executing a statement that queries the database. A ResultSet object maintains a cursor pointing to its current row of data. Initially the cursor is positioned before the first row. The next method moves the cursor to the next row, and because it returns false when there are no more rows in the ResultSet object, it can be used in a while loop to iterate through the result set.

Fields and Methods of ResultSet

```
// Fields
static int CONCUR_READ_ONLY
static int CONCUR_UPDATABLE
static int FETCH_FORWARD
static int FETCH_REVERSE
static int FETCH_UNKNOWN
static int TYPE_FORWARD_ONLY
static int TYPE_SCROLL_INSENTIVE
static int TYPE_SCROLL_SENSITIVE
//Methods
boolean     absolute(int row)
void        afterLast()
void        beforeFirst()
void        cancelRowUpdates()
void        clearWarnings()
void        close()
void        deleteRow()
int         findColumn(String columName)
boolean     first()
Array       getArray(int I)
Array       getArray(String colName)
InputStream getAsciiStream(int columnIndex)
InputStream getAsciiStream(String columnName)
BigDecimal  getBigDecimal(int columnIndex)
BigDecimal  getBigDecimal(int columnIndex, int scale)
BigDecimal  getBigDecimal(String columnName)
BigDecimal  getBigDecimal(String columnName, int scale)
InputStream getBinaryStream(int columnIndex)
InputStream getBinatyStream(String columnName)
Blob        getBlob(int I)
```

Blob getBlob(String colName)
boolean getBoolean(int columnIndex)
boolean getBoolean(String columnName)
byte getByte(int columnIndex)
byte[ ] getByte(String columnName)
byte[ ] getBytes(int columnIndex)
byte[ ] getByte(String columnName)
Reader getCharacterStream(int columnIndex)
Reader getCharacterStream(String columnName)
Clob getClob(int i)
Clob getClob(String colName)
int getConcurrency()
String getCursorName()
Date getDate(int columnIndex)
Date getDate(int columnIndex, Calendar cal)
Date getDate(String columnName)
Date getDate(String columnName, Calendar cal)
double getDouble(int columnIndex)
double getDouble(String columnName)
int getFethcDirection()
int getFetchSize()
float getFloat(int columnIndex)
float getFloat(Sting columnName)
int getInt(int columnIndex)
int getInt(String columnName)
long getLong(int columnIndex)
long getLong(String columnName)
ResultSetMetaData getMetaData()
Object getObject()
Object getObject(int i, Map map)
Object getObject(String columnName)

Object	getObject(String colName, Map map)
Ref	getRef(int i)
Ref	getRef(String colName)
int	getRow()
short	getShort(int columnIndex)
short	getShort(String columnName)
Statement	getStatement()
String	getString(int columnIndex)
String	getString(String columnName)
Time	getTIme(int columnIndex)
Time	getTime(int columnIndex, Calendar cal)
Time	getTime(String columnName)
Time	getTime(String columnName, Calendar cal)
Timestamp	getTimestamp(int columnIndex)
Timestamp	getTimestamp(int columnIndex, Calendar cal)
Timestamp	getTimestamp(String columnName)
Timestamp	getTimestamp(String columnName, Calendar cal)
int	getType()
InputStream	getUnicodeStream(int columnIndex)
InputStream	getUnicodeStream(String columnName)
SQLQarning	getWarnings()
void	insertRow()
boolean	isAfterLast()
boolean	isBeforeFirst()
boolean	isFirst()
boolean	isLast()
boolean	last()
void	moveToCurrentRow()
void	moveToInsertRow()
boolean	next()
boolean	previous()

void	refreshRow()
boolean	relative(int rows)
boolean	rowDeleted()
boolean	rowInserted()
boolean	rowUpdate()
void	setFetchDirection(int direction)
void	setFetchSize(int rows)
void	updateAsciiStream(int columnIndex, InputStream x, int length)
void	updateAsciiStream(String columnName, InputStream x, int length)
void	updateBigDecimal(int columnIndex, BigDecimal x)
void	updateBigDecimal(String columnName, BigDecimal x)
void	updateBinaryStream(int columnIndex, InputStream x, int length)
void	updateBinaryStream(String columnName, InputStream x, int length)
void	updateBoolean(int columnIndex, boolean x)
void	updateBinaryStream(String columnName, boolean x)
void	updateByte(int columnIndex, byte x)
void	updateByte(String columnName, byte x)
void	updateByte(String columnName, byte [ ] x)
void	updateBytes(String columnName, byte [ ] x)
void	updateCharacterStream(int columnIndex, Reader x, int length)
void	updateCharacterStream(String columnName, Reader x, int length)
void	updateDate(int columnIndex, Date x)
void	updateDate(String columnName, Date x)
void	updateDouble(int columnIndex, double x)
void	updateDouble(Sting columnName, double x)
void	updateFloat(int columnIndex, Float x)
void	updateFloat(Sting columnName, Float x)
void	updateInt(int columnIndex, int x)
void	updateInt(Sting columnName, int x)
void	updateLong(int columnIndex, long x)
void	updateLong(Sting columnName, long x)

void updateNull(int columnIndex)
void updateNull(Sting columnName)
void updateObject(int columnIndex, Objec x)
void updateObject(int columnIndex, Object x, int scale)
void updateObject(Sting columnName, Object x)
void updateObject(Sting columnName, Object x, int scale)
void updateRow()
void updateShort(int columnIndex, Short x)
void updateShort(Sting columnName, Short x)
void updateString(int columnIndex, String x)
void updateString(Sting columnName, String x)
void updateTime(int columnName, Time x)
void updateTime(String columnName, Time x)
void updateTimestamp(int columnName, Timestamp x)
void updateTimestamp(String columnName, Timestamp x)
boolean wasNull()

Other Classes referenced by ResultSet

public **class Date** extends Object implements Serializable, Cloneable, Comparable

```
// Give the information on Year, Month, Day, Hour, Minute, and Second
// value
```

public **class Time** extends Date

```
// A thins wrapper class extends java.util.Date
// Allows the JDBC API to identify this as an SQL TIME values
```

public **class Timestamp** extends Date

```
// A thins wrapper class extends java.util.Date
// Allows the JDBC API to identify this as an SQL TIMESAMP value
```

public abstract **class Calendar** extends Object implements Serializable, Clonable

// A base class for converting between a Date object and a set of

// integer fields: YEAR, MONTH, DAY, HOUR, etc

public **interface Ref**

// The Ref is a reference to a SQL structured type value in the database

public **interface Map**

// Support mapping mechanism from key to value

public **interface Clob**

// A SQL Clob type mapping support

// A SQL CLOB is a built-in type that stores a Character Large Object as

// column value in a row of a database table

public **interface Blob**

// A SQL Blob type mapping support

// A SQL BLOB is a built-in type that stores a Binary Large Object as

// column value in a row of a database table

public **class BigDecimal** extends Number implements Comparable

// Arbitrary-precision signed decimal numbers

public **abstract class Reader** extends Object

// An abstract class for reading character streams

public **abstract class Writer** extends Object

// An abstract class for writing character streams

java.sql
public interface ResultSetMetaData

This interface is designed with fields and methods for retrieving and determining information about columns of database data being placed in ResltSet object through an execution of execQuery() method.

- This interface enables an object to get information about the types and properties of the columns in a ResultSet object.
- An example:
  - **ResultSet object rs** is created
  - Execute query method **ResultSet rs** to receive the database information
  - The **ResultSetMetaData rsmd** object can be created
  - Find out how many columns rs has

```
String query = "SELECT * FROM Authors";
ResultSet rs = stmt.executeQuery(query");
ResultSetMetaData rsmd = rs.getMetaData();
int numberOfColumns = rsmd.getColumnCount();
```

  - Determine if the 1st column can be used in a WHERE clause

```
String query = "SELECT * FROM Authors";
ResultSet rs = stmt.executeQuery(query");
ResultSetMetaData rsmd = rs.getMetaData();
int numberOfColumns = rsmd.getColumnCount();
boolean b = rsmd.isSearchable(1);
```

Fields and Methods of ResultSetMetaData

//Fields
static int columnNoNulls // A column does not allow NULL values
static int columnNullable // A column doe allow NULL values
static int columnNullableUnknown // Column nullability is unknown

//Methods

```
String   getCatalogName(int column) throws SQLException
         // Gets the designated column's table's catalog name
String   getColumnClassname(int column) throws SQLException
         // Returns the fully qualified name of the Java class whose instances are
int      getColumnCount()          throws SQLException
         // Returns the numbers of column in ResultSet Object
         // throws SQLException If a database access error occur
int      getColumnDisplaySize(int column) throws SQLException
         // Determines the max width in characters for the selected
         // column
String   getColumnLabel(int column) throws SQLException
         // Retrieve TITLE from selected column for display or pritining
String   getColumnName(int column) throws SQLException
         // Retrieve the selected column name
int      getColumnType(int column) throws SQLException
         // Retrieve the designated column's SQL type
int      getColumnTypeName(int column) throws SQLException
         // Retrieve the selected column type name
int      getPrecision(int column) throws SQLException
         // Get information about the number of decimal digits for the
         // selected column
int      getScale(int column) throws SQLException
         // Get the designated column's number of digits to right of decimal points
String   getSchemaName(int column) throws SQLException
         // Get the designated column table schema
String   getTableName(int column) throws SQLException
         // Get the designated column's table name
boolean isAutoIncreament(int column) throws SQLException
         // Indicated if the designated column is automatically numbered
         // First column = 1, second column = 2, etc
boolean isCaseSensitive(int column) throws SQLException
```

```
boolean isCurrency(int column) throws SQLException
        // Determine if the column is currency value
boolean isDefinitelyWritable(int column) throws SQLException
        // Determine if the column is definitely writable
int     isNullable(int column) throws SQLException
boolean isReadOnly(int column) throws SQLException
        // Determine if the column is read only
boolean isSearchable(int column) throws SQLException
        // Indicates whether the designated columns can be used in
        // a SQL WHERE cluase
boolean isSigned(int column) throws SQLException
        // Determine if the values in the designated columns are signed numbers
boolean isWriteable(int column) throws SQLException
        // Determine if the column is writable
```

java.sql
public interface SQLData

- The interface used for the custom mapping of SQL user-defined types
- This interface must be implemented by any Java class that is registered in a type mapping.
- It is expected that this interface will normally be implemented by a tool.
- The methods in this interface are called by the driver and are never called by a programmer directly.

java.sql
public interface SQLInput

- An input stream that contains a stream of values representing an instance of an SQL structured or distinct type.
- This interface, used only for custom mapping, is used by the driver behind the scenes, and a programmer never directly invokes SQLInput methods. The readXXX methods provide a way to read the values in an SQLInput object. The method wasNull is used to determine whether the the last value read was SQL NULL.
- When the method getObject is called with an object of a class implementing the interface SQLData, the JDBC driver calls the method SQLData.getSQLType to determine the SQL type of the user-defined type (UDT) being custom mapped.
- The driver creates an instance of SQLInput, populating it with the attributes of the UDT. The driver then passes the input stream to the method SQLData.readSQL, which in turn calls the SQLInput.readXXX methods in its implementation for reading the attributes from the input stream.

public interface SQLOutput

- The output stream for writing the attributes of a user-defined type back to the database. This interface, used only for custom mapping, is used by the driver, and its methods are never directly invoked by a programmer.
- When an object of a class implementing the interface SQLData is passed as an argument to an SQL statement, the JDBC driver calls the method SQLData.getSQLType to determine the kind of SQL datum being passed to the database. The driver then creates an instance of SQLOutput and passes it to the method SQLData.writeSQL. The method writeSQL in turn calls the appropriate SQLOutput.writeXXX methods to write data from the SQLData object to the SQLOutput output stream as the representation of an SQL user-defined type.

public class SQLException
extends Exception

An exception that provides information on a database access error or other errors.

Each SQLException provides several kinds of information:

- a string describing the error. This is used as the Java Exception message, available via the method getMesage.
- a "SQLstate" string, which follows the XOPEN SQLstate conventions. The values of the SQLState string are described in the XOPEN SQL spec.
- an integer error code that is specific to each vendor. Normally this will be the actual error code returned by the underlying database.
- a chain to a next Exception. This can be used to provide additional error information

java.sql
public class DriveManager extends Object

- This class provides basic service for managing a set of JDBC drivers
- During the initialization through the method getConnection, the DriverManager class attempts to load the driver classes referenced in the "jdbc.drivers" system property
- A program can also explicitly load JDBC drivers at any time. For example, the my.sql.Driver is loaded with the following statement

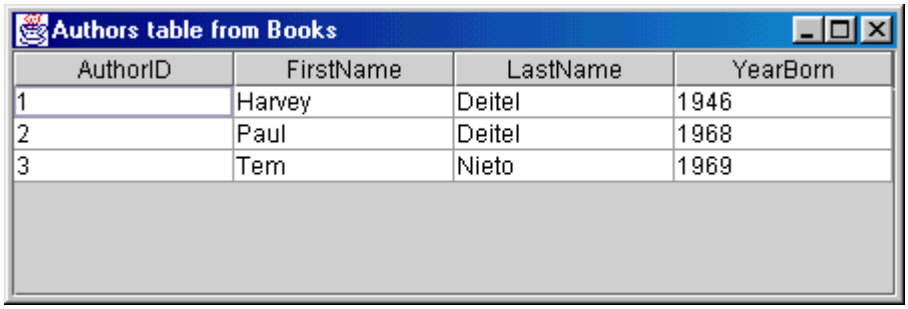
NOTE: The DataSource interface, new in the JDBC 2.0 API, provides another way to connect to a data source. The use of a DataSource object is the preferred means of connecting to a data source.

public class JTable
extends JComponent
implements TableModelListener, Scrollable, TableColumnModelListener, ListSelectionListener, CellEditorListener, Accessible

2D table user-interface component

Example 1: Connect to database and make a simple query.

Fig.18.24: TableDisplay.java




```
// Fig. 18.24: TableDisplay.java
// This program displays the contents of the Authors table
// in the Books database.
import java.sql.*;
import javax.swing.*;
import java.awt.*;
import java.awt.event.*;
import java.util.*;

public class TableDisplay extends JFrame {
   private Connection connection;
   private JTable table;

   public TableDisplay()
   {
      // The URL specifying the Books database to which
      // this program connects using JDBC to connect to a
      // Microsoft ODBC database.
      String url = "jdbc:odbc:Books";
      String username = "anonymous";
      String password = "guest";
```

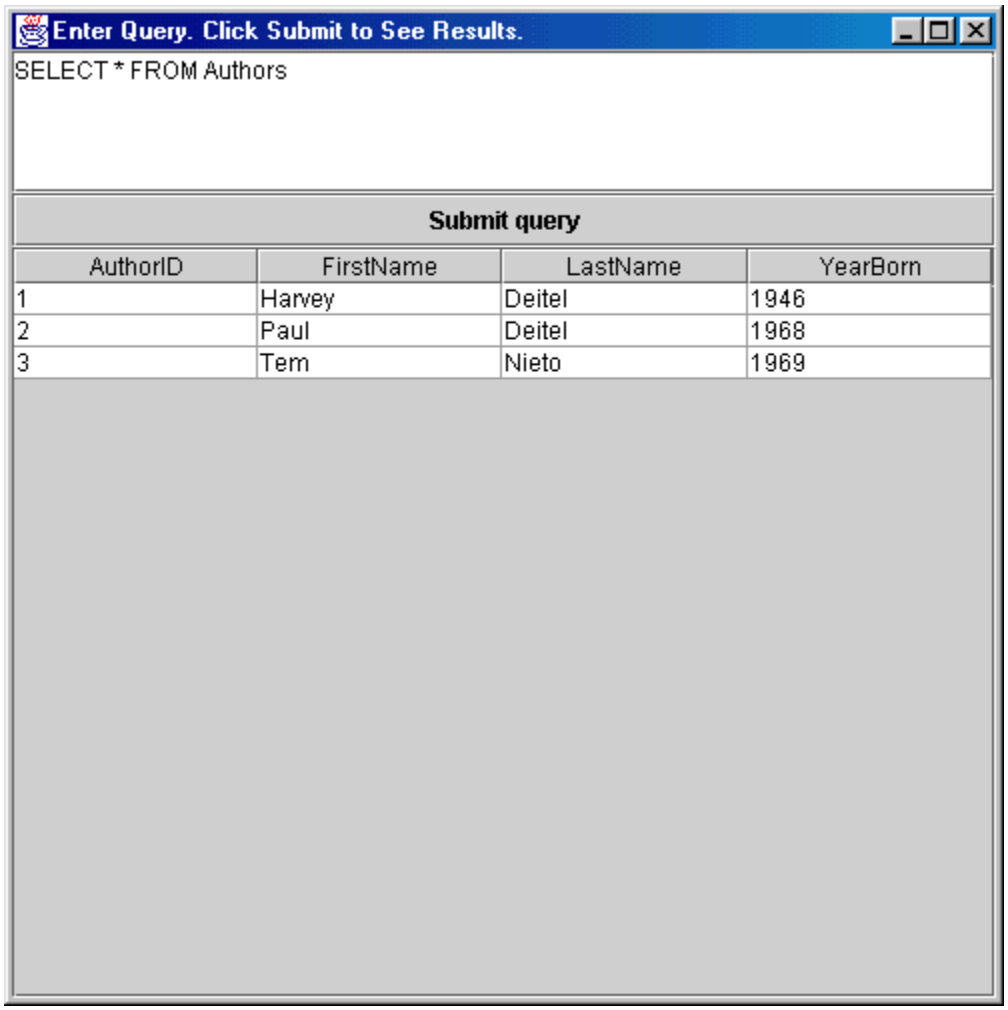
```
      // Load the driver to allow connection to the database
      try {
         Class.forName( "sun.jdbc.odbc.JdbcOdbcDriver" );

         connection = DriverManager.getConnection(
            url, username, password );
      }
      catch ( ClassNotFoundException cnfex ) {
         System.err.println(
            "Failed to load JDBC/ODBC driver." );
         cnfex.printStackTrace();
         System.exit( 1 );  // terminate program
      }
      catch ( SQLException sqlex ) {
         System.err.println( "Unable to connect" );
         sqlex.printStackTrace();
      }

      getTable();

      setSize( 450, 150 );
      show();
   }

   private void getTable()
   {
      Statement statement;    // Sql Interafce
      ResultSet resultSet;    // Sql Interface

      try {
         String query = "SELECT * FROM Authors";

         statement = connection.createStatement();
         resultSet = statement.executeQuery( query );
         displayResultSet( resultSet );
         statement.close();
      }
      catch ( SQLException sqlex ) {
         sqlex.printStackTrace();
      }
   }

   private void displayResultSet( ResultSet rs )
      throws SQLException
   {
      // position to first record
      boolean moreRecords = rs.next();

      // If there are no records, display a message
      if ( ! moreRecords ) {
         JOptionPane.showMessageDialog( this,
            "ResultSet contained no records" );
         setTitle( "No records to display" );
         return;
      }

      setTitle( "Authors table from Books" );
```

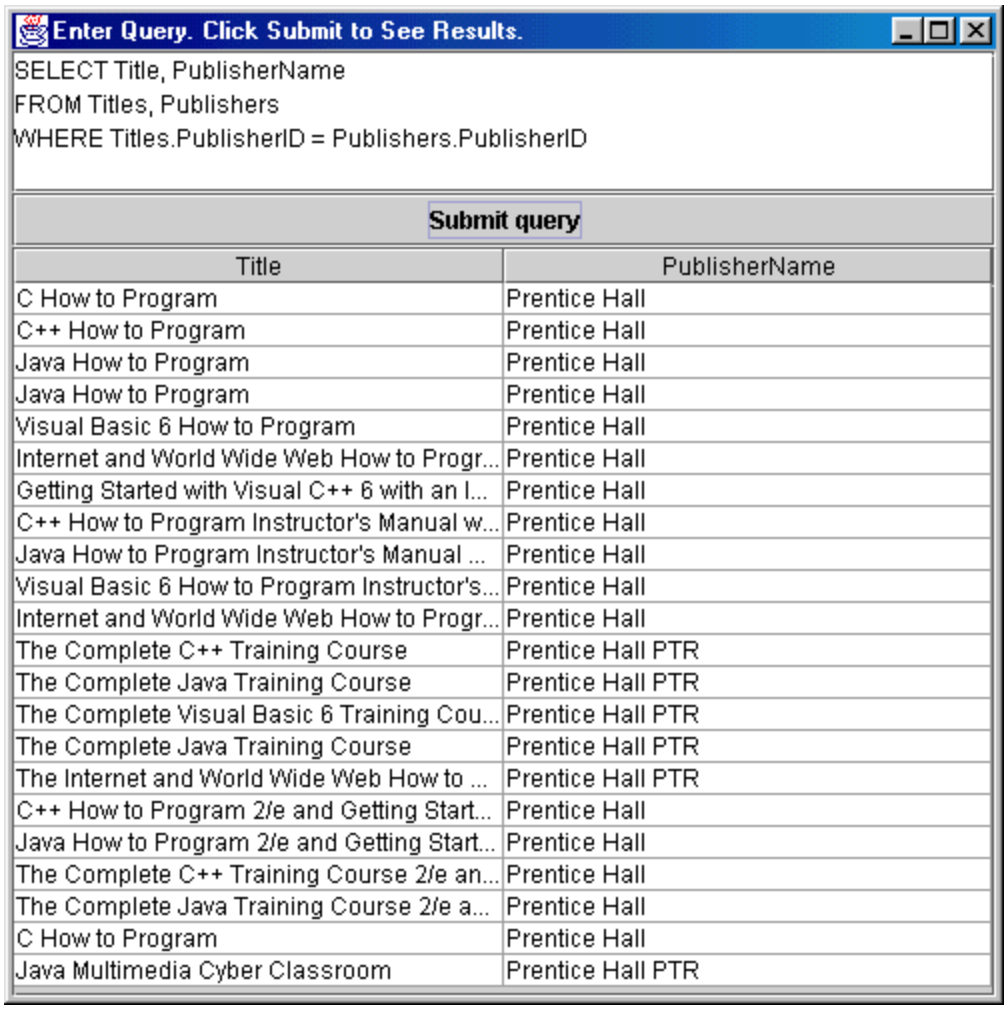
```
      Vector columnHeads = new Vector();
      Vector rows = new Vector();

      try {
         // get column heads
         ResultSetMetaData rsmd = rs.getMetaData();

         for ( int i = 1; i <= rsmd.getColumnCount(); ++i )
            columnHeads.addElement( rsmd.getColumnName( i ) );

         // get row data
         do {
            rows.addElement( getNextRow( rs, rsmd ) );
         } while ( rs.next() );

         // display table with ResultSet contents
         table = new JTable( rows, columnHeads );
         JScrollPane scroller = new JScrollPane( table );
         getContentPane().add(
            scroller, BorderLayout.CENTER );
         validate();
      }
      catch ( SQLException sqlex ) {
         sqlex.printStackTrace();
      }
   }

   private Vector getNextRow( ResultSet rs,
                              ResultSetMetaData rsmd )
       throws SQLException
   {
      Vector currentRow = new Vector();

      for ( int i = 1; i <= rsmd.getColumnCount(); ++i )
         switch( rsmd.getColumnType( i ) ) {
            case Types.VARCHAR:
                  currentRow.addElement( rs.getString( i ) );
               break;
            case Types.INTEGER:
                  currentRow.addElement(
                     new Long( rs.getLong( i ) ) );
               break;
            default:
               System.out.println( "Type was: " +
                  rsmd.getColumnTypeName( i ) );
         }

      return currentRow;
   }

   public void shutDown()
   {
      try {
         connection.close();
      }
      catch ( SQLException sqlex ) {
```

```
            System.err.println( "Unable to disconnect" );
            sqlex.printStackTrace();
         }
      }

      public static void main( String args[] )
      {
         final TableDisplay app = new TableDisplay();

         app.addWindowListener(
            new WindowAdapter() {
               public void windowClosing( WindowEvent e )
               {
                  app.shutDown();
                  System.exit( 0 );
               }
            }
         );
      }
}
```

Example 2 Querying Books.mdb Database

Fig. 18.29: Querying the Books.mdb Database





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C++ How to Program	Prentice Hall
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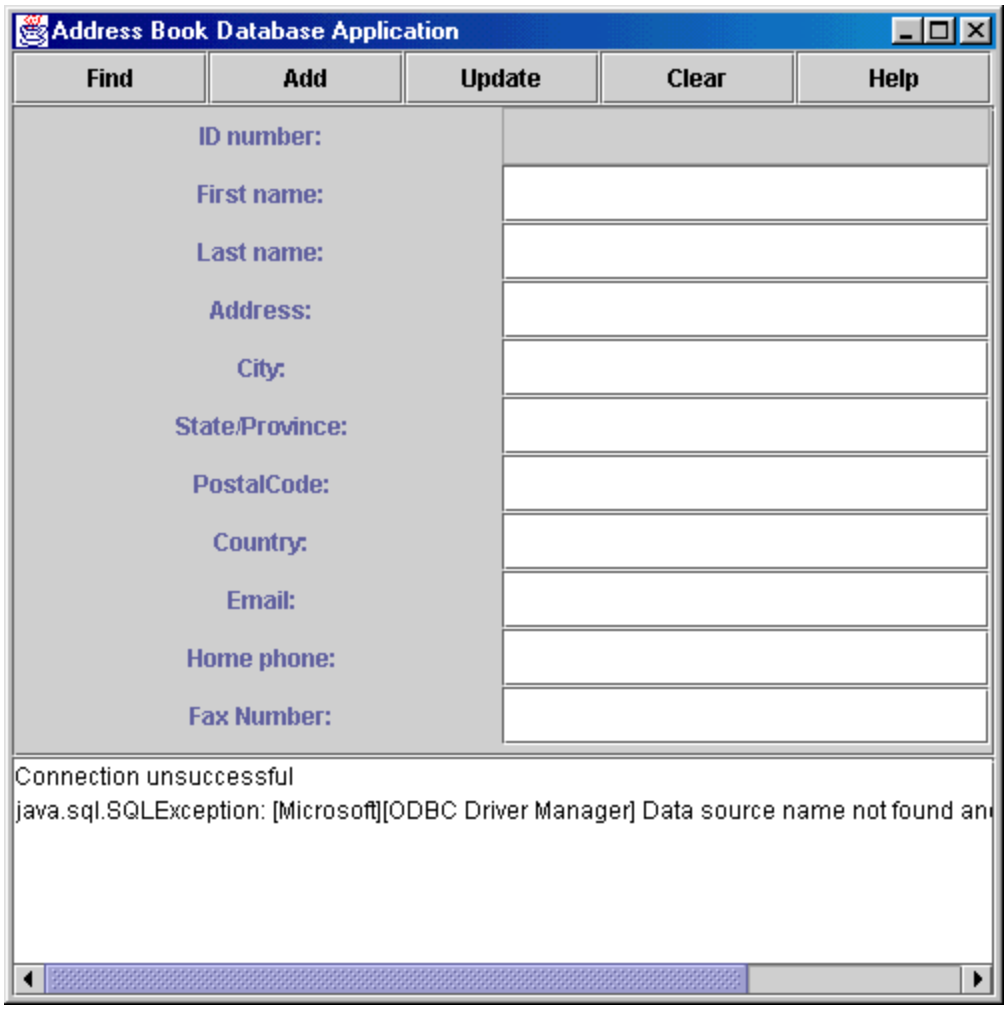
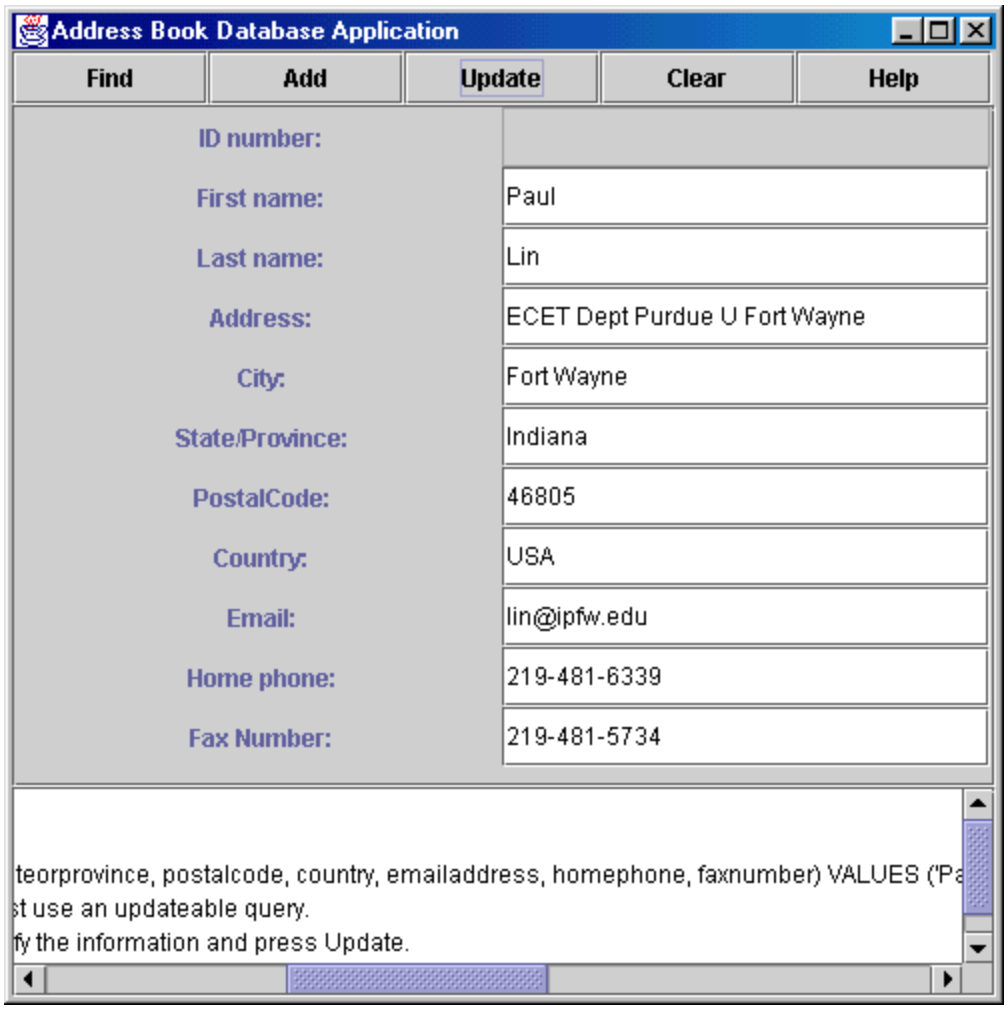
Java Multimedia Cyber Classroom	Prentice Hall PTR

Example 3: Database Reading, Inserting and Updating

Fig. 18.30: Reading, Inserting, and Updating an One Table Microsoft Access Database




Address Book Database Application
Find
Add
Update
Clear
Help
ID number:
First name:
Paul
Last name:
Lin
Address:
ECET Dept Purdue U Fort Wayne
City:
Fort Wayne
State/Province:
Indiana
PostalCode:
46805
Country:
USA
Email:
lin@ipfw.edu
Home phone:
219-481-6339
Fax Number:
219-481-5734
teorprovince, postalcode, country, emailaddress, homephone, faxnumber) VALUES ('Pa
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