Introduction to JDBC

Mark Allen Weiss

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Outline of Topics

- **Basic principles**
- **Making your database visible**
- **Java code**

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Basic Ideas

- **Two layers**
  - **The JDBC API**
  - **JDBC Manager Driver API**
- **JDBC API communicates with manager using SQL statements.**
- **Manager communicates with various database drivers to translate the SQL to into database queries for the appropriate database.**
- **Database vendors should supply drivers; as a database user, you are only concerned with JDBC API.**

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SQL

- The standard database query language.
- JDBC requires support for SQL-92.
- If you know SQL, it is trivial to construct Java code to access a database.

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Basic SQL Commands

- SELECT
- UPDATE
- DELETE
- INSERT INTO
- CREATE TABLE

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SELECT Statements

- Basic Query Components
  - SELECT columns
  - FROM table
  - WHERE criteria
  - ORDER BY how to order
  - LIMIT number of rows
- FROM is required; others are optional
- columns can be * to list all columns, or comma-separated list of a subset of columns

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Examples

SELECT * FROM hockey

SELECT name, goals, assists, points FROM hockey ORDER BY points DESC

SELECT name, goals, assists, points FROM hockey ORDER BY points DESC LIMIT 40

SELECT * FROM hockey WHERE goals > 20 AND assists > 20 AND points > 50 ORDER BY points

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Database URLs

- **A database URL looks like**

```
jdbc:subprotocol name:data base url
```

- **Example:**

```
jdbc:odbc:data.csv
jdbc:odbc://data.ticketmaster.com:8888/db1;PWD=secret
```

- **odbc subprotocol is always available.**

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Connecting

- **Need a driver manager to be loaded.**
- **Use `Class.forName` to load the driver manager class.**
- **For odbc, use**

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

- **Once class is loaded, use static method `DriverManager.getConnection`. Provide a database URL, and optionally a name and password. This returns a `Connection` object.**

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`Connection` Interface

- **Allows you to**
  - **create queries**
  - **get database meta-data**
  - **commit or rollback transactions**
- **Connection not made until later request.**
- **Important methods:**

```
Statement createStatement( );
PreparedStatement prepareStatement( String sql );
void setAutoCommit( boolean autoCommit );
DatabaseMetaData getMetaData( );
void rollback( );
```

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Statements and ResultSets

- **Statement is a query that can be sent to the database.**
- **Important methods:**

```
ResultSet exectueQuery( String sql );
int executeUpdate( String sql );
```

- **The `ResultSet` contains an enumation-type pattern; each item in the enumeration is a row in the result.**
- **Can get elements in the current row of the enumeration using `getXXX(int column)`. Note: columns begin at 1.**

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Typical Code

```
...
try {
  Class.forName( "sun.jdbc.odbc.JdbcOdbcDriver" );

  String url = "jdbc:odbc:somedb";
  Connection con = DriverManager.getConnection( url );
  Statement stmt = con.createStatement( );
  String sql = "SELECT Name FROM directory.csv";
  ResultSet r = stmt.executeQuery( sql );

  while( r.next( ) )
    System.out.println( r.getString( 1 ) );
  stmt.close(); // Also closes ResultSet
} catch(Exception e) {
  e.printStackTrace();
}
```

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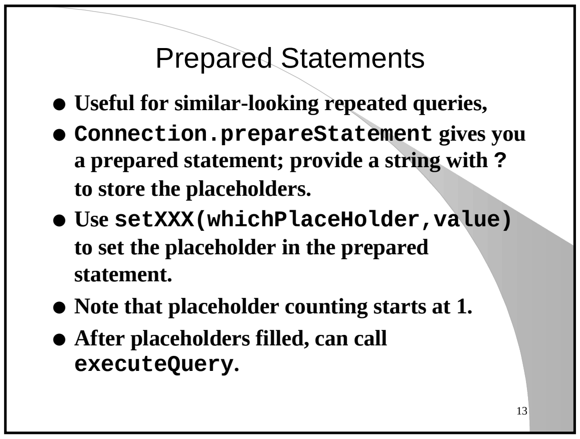

Prepared Statements

- Useful for similar-looking repeated queries,
- `Connection.prepareStatement` gives you a prepared statement; provide a string with `?` to store the placeholders.
- Use `setXXX(whichPlaceHolder,value)` to set the placeholder in the prepared statement.
- Note that placeholder counting starts at 1.
- After placeholders filled, can call `executeQuery`.

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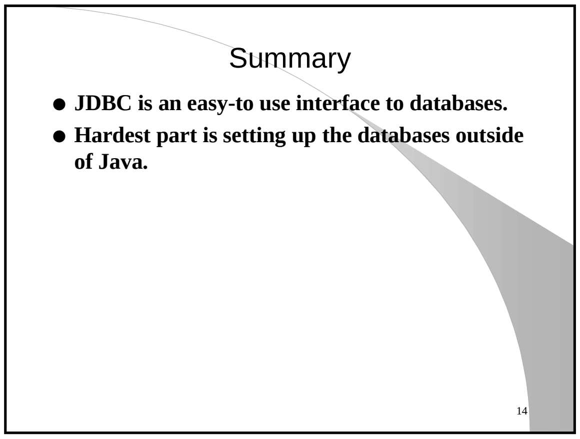

Summary

- JDBC is an easy-to use interface to databases.
- Hardest part is setting up the databases outside of Java.

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