CODE Session – JDBC

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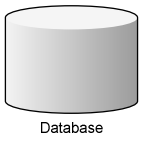
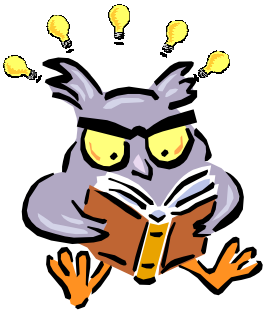
JDBC is used to retrieve database information within Java



Developers struggle with the complexity of the JDBC API

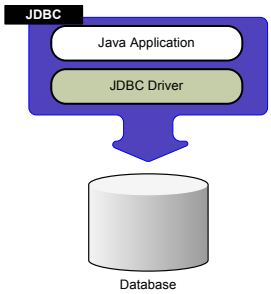
Incorrect use of JDBC can cause application problems

Understanding the JDBC API will help you prevent these problems

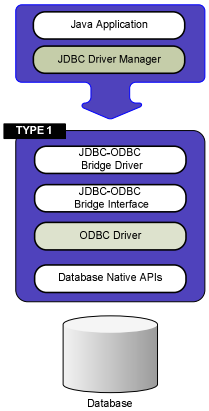


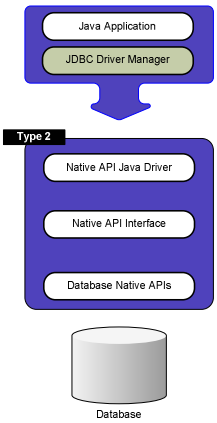
Follow along as we journey into the depths of JDBC

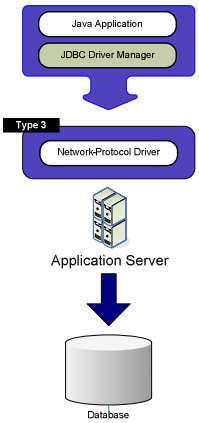
Basic JDBC

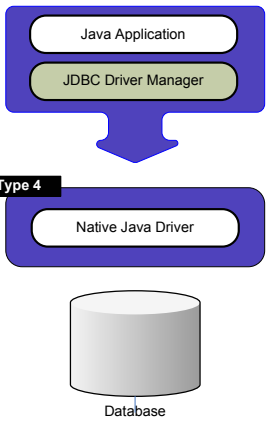


Drivers

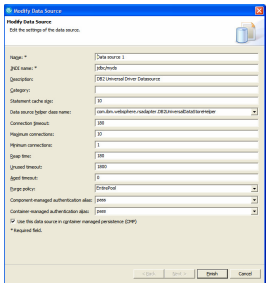






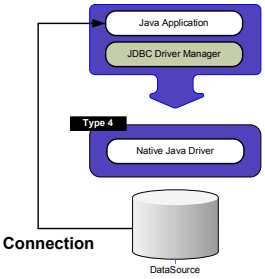


Datasources



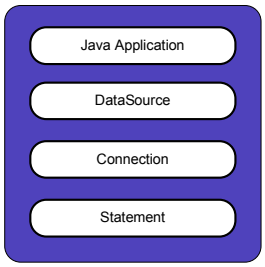
```
public DataSource getDataSource() {
try{
InitialContext ic = new InitialContext();
DataSource ds =
    (DataSource)ic.lookup("jdbc/myds");
}
catch(NamingException ex){
    logger.error("Can't lookup
    datasource jdbc/myds".);
}
}
```

Connection



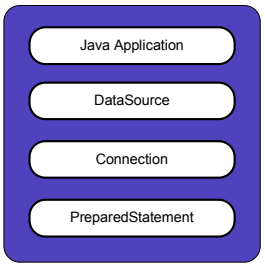

```
public String getName(){
Connection conn = null;
try{
conn = getDataSource().getConnection();
.....
}catch(SQLException sqlExc){
logger.error("Problem getting
     name.",sqlExc);
}
finally{
try{
if(conn != null) { conn.close(); }
} catch(SQLException sqlExc){
logger.error("Problem closing
     connection",sqlExc);
}
}
```

Statement



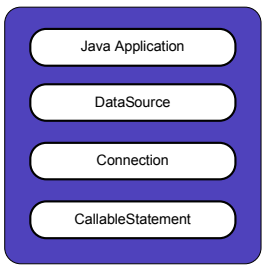

```
public void callDatabase(){
Connection conn = null;
Statement stmt = null;
try{
....
stmt = conn.createStatement();
.....
}catch(SQLException sqlExc){
logger.error("Problem getting name.",sqlExc);
}
finally{
try{
if(stmt != null) { stmt.close(); }
} catch(SQLException sqlExc){
logger.error("Problem closing
     statement",sqlExc);
}
//conn close code goes here
}
```

PreparedStatement



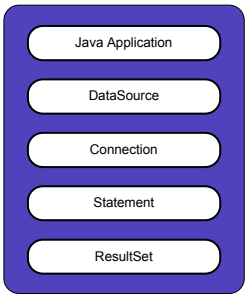

```
public void callDatabase(){
Connection conn = null;
PreparedStatement stmt = null;
try{
....
String sql = "Select name from table where id=?";
stmt = conn.prepareStatement(sql);
stmt.setString(1,"00002321");
.....
}catch(SQLException sqlExc){
logger.error("Problem getting name.",sqlExc);
}
finally{
try{
if(stmt != null) { stmt.close(); }
} catch(SQLException sqlExc){
logger.error("Problem closing
     statement",sqlExc);
}
//conn close code goes here
}
```

CallableStatement



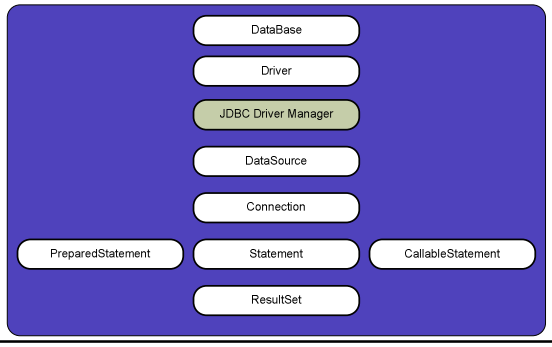

```
public void callDatabase(){
Connection conn = null;
CallableStatement stmt = null;
try{
....
String sql = "{? = CALL MYSP(?)}";
stmt = conn.prepareCall(sql);
stmt.registerOutParameter(1,Types.String);
stmt.setString("00002321");
.....
}catch(SQLException sqlExc){
logger.error("Problem getting name.",sqlExc);
}
finally{
try{
if(stmt != null) { stmt.close(); }
} catch(SQLException sqlExc){
logger.error("Problem closing statement",sqlExc);
}
//conn close code goes here
}
```

ResultSet

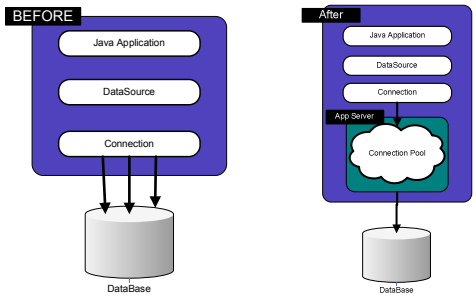



```
public void callDatabase(){
Connection conn = null;
PreparedStatement stmt = null;
ResultSet rs = null;
try{
....
String sql = "Select name from table where id=?";
.....
logger.debug("Executing statement [" + sql +"]");
rs = stmt.executeQuery();
while(rs.next()) {
      name = rs.getString("name");
}
}catch(SQLException sqlExc){
logger.error("Problem getting name.",sqlExc);
}
finally{
try{
if(rs != null) { rs.close(); }
} catch(SQLException sqlExc){
logger.error("Problem closing resultSet",sqlExc);
}
//stmt close code goes here
//conn close code goes here
}
```

JDBC Summary



Connection Pooling



JDBC "Best" Practices

- Close resources in the same place you created them.
- Batch insert/update.
- try/catch/finally
- Use a connection pool
- Don't use SELECT *
- Use PreparedStatements
- Use get*() instead of getObject()

Close your resources!

```
finally
    {
        try {
            if(rs != null) {rs.close();}
        } catch (SQLException e3) {
            logger.error("Problem closing ResultSet",e3);}
        try {
            if(ps != null) {ps.close();}
        } catch (SQLException e1) {
            logger.error("Problem closing Statement",e3);}
        try {
            if(conn != null) {conn.close();}
        } catch (SQLException e2) {
            logger.error("Problem closing Connection",e3); }
    }
```

Don't Repeat Yourself (D.R.Y)

```
public class DBUtil {
public static void close(Connection conn) {
 try {
            if(conn != null) {conn.close();}
    } catch (SQLException e2) {
            logger.error("Problem closing Connection",e3);} }
public static void close(Statement stmt) {
    try {
            if(ps != null) {ps.close();}
    } catch (SQLException e1) {
            logger.error("Problem closing Statement",e3);}}
public static void close(ResultSet rs) {
    try {
            if(rs != null) {rs.close();}
    } catch (SQLException e3) {
            logger.error("Problem closing ResultSet",e3);}}
}

Now your code becomes....
finally {
    DBUtil.close(resultSet);
    DBUtil.close(statement);
    DBUtil.close(connection);
}
```

Batch Insert/Update Example

```
PreparedStatement stmt = con.prepareStatement( "INSERT INTO
    employees VALUES (?, ?)");

stmt.setInt(1, 2000);
 stmt.setString(2, "Kelly Kaufmann");
 stmt.addBatch();

 stmt.setInt(1, 3000);
 stmt.setString(2, "Bill Barnes");
 stmt.addBatch();

 // submit the batch for execution
 int[] updateCounts = stmt.executeBatch();
```

Advanced Tip for Generated Keys

```
String SQL = "INSERT INTO……";
pstmt = conn.prepareStatement(SQL,
Statement.RETURN_GENERATE_KEYS);
……
ps.execute();
ResultSet keys = ps.getGeneratedKeys();
while(keys.next())
   logger.info(keys.getBigDecimal(1));
…..
```

BONUS Material

Phantom Reads

Id	Name	Age
1	Joe	20
2	Jill	25

```
/* Transaction 1 */

/* Query 1 */
SELECT * FROM users WHERE
age BETWEEN 10 AND 30;

/* Query 1 */
SELECT * FROM users WHERE
age BETWEEN 10 AND 30;
```

```
/* Transaction 2*/

/* Query 2 */
INSERT INTO users VALUES
( 3, 'Bob', 27 );
COMMIT;
```

Non-Repeatable Read

Id	Name	Age
1	Joe	20
2	Jill	25

```
/* Transaction 1 */

 /* Query 1 */
SELECT * FROM users WHERE
    id = 1;

/* Query 1 */
SELECT * FROM users WHERE
    id = 1;
```

```
/* Transaction 2 */

/* Query 2 */
UPDATE users SET age = 21
    WHERE id = 1;
COMMIT;
```

Dirty Read

Id	Name	Age
1	Joe	20
2	Jill	25

```
/* Transaction 1 */

 /* Query 1 */
SELECT * FROM users WHERE
    id = 1;

/* Query 1 */
SELECT * FROM users WHERE
    id = 1;
```

```
/* Transaction 2 */

/* Query 2 */
UPDATE users SET age = 21
    WHERE id = 1;
```

ANSI Isolation Levels

Isolation Level	**Dirty Read**	**Non-repeatable Read**	**Phantom Read**
READ UNCOMMITTED	Permitted	Permitted	Permitted
READ COMMITTED	--	Permitted	Permitted
REPEATABLE READ	--	--	Permitted
SERIALIZABLE	--	--	--

Setting the Isolation Level