Java Spring & AWS
Sep 7, 2021 - Oct 8, 2021
Monday to Friday
9:30 AM ET - 4:30 PM ET

Java Professional Training
Java Spring AWS Training
SummitWorks
GLOBAL SOLUTION ARCHITECTS
Authorized & published by Summitworks Technologies Inc

Agenda: Day -5

- Java Database Connectivity (JDBC)
  - The steps in implementing a JDBC application
  - The JDBC mechanism-Connecting to a DB
  - Types of statements, Result Sets etc.
  - Statement & Prepared Statement Examples
- Introduction to ORM and Hibernate
- Real-time Examples

Introduction to JDBC

JDBC stands for "Java Database Connectivity". It is an API (Application Programming Interface) which consists of a set of Java classes, interfaces and exceptions and a specification to which both **JDBC driver vendors** and **JDBC developers** (like we) adhere when developing applications.

Database handling using JDBC

- JDBC stands for Java database connectivity.
- a standard API for all Java programs to connect to databases. The JDBC API is available in two packages:
  - Core API *java.sql*.
  - Standard extension to JDBC API *javax.sql* (supports connection pooling, transactions, etc.)
- JDBC defines a few steps to connect to a database and retrieve/insert/update databases.
- The steps are as follows:
  - Load the driver
  - Establish connection
  - Create statements
  - Execute query and obtain result
  - Iterate through the results

Load the Driver

- The driver is loaded with the help of a static method,
  - Class.forName(drivername)
- Every database has its own driver.

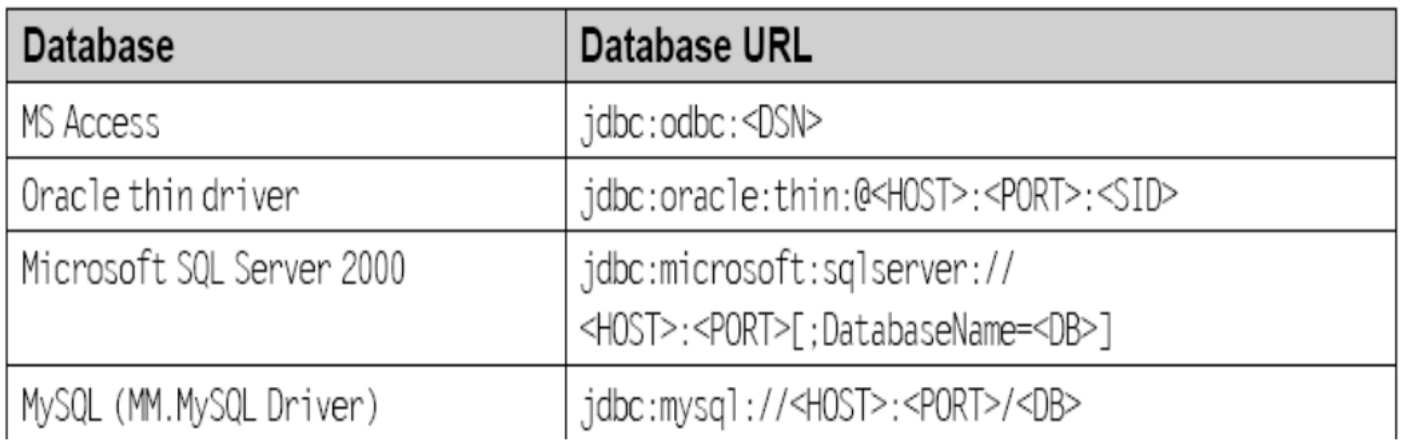
Driver Names

Database name	Driver Name
MS Access	sun.jdbc.odbc.JdbcOdbcDriver
Oracle	oracle.jdbc.driver.OracleDriver
Microsoft SQL Server 2000 (Microsoft Driver)	com.microsoft.sqlserver.jdbc.SQLServerDriver
MySQL (MM.MySQL Driver)	org.gjt.mm.mysql.Driver

Establish a Connection

- A connection to the database is established using the static method *getConnection(databaseUrl)* of the DriverManager class.
- The DriverManager class is class for managing JDBC drivers.
- The database URL takes the following shape *jdbc:subprotocol:subname*.
- If any problem occurs during accessing the database, an SQLException is generated, else a Connection object is returned which refers to a connection to a database.
- Connection is actually an interface in *java.sql* package.
  - Connection con=DriverManager.getConnection(databaseUrl);

Few Database URLs



Database	Database URL
MS Access	jdbc:odbc:<DSN>
Oracle thin driver	jdbc:oracle:thin:@<HOST>:<PORT>:<SID>
Microsoft SQL Server 2000	jdbc:microsoft:sqlserver://<HOST>:<PORT>[;DatabaseName=<DB>]
MySQL (MM.MySQL Driver)	jdbc:mysql://<HOST>:<PORT>/<DB>

Create Statement

- The connection is used to send SQL statements to the database.
- three interfaces are used for sending SQL statements to databases
  - Statement and its two sub-interfaces,
  - PreparedStatement and Callable Statement.
- Three methods of the Connection object are used to return objects of these three statements.
- A Statement object is used to send a simple SQL statement to the database with no parameters.
  - Statement stmt = con.createStatement();

Create Statement (contd.)

- A PreparedStatement object sends precompiled statements to the databases with or without IN parameters.
- If n rows need to be inserted, then the same statement gets compiled n number of times.
- So to increase efficiency, we use precompiled PreparedStatement.
- only the values that have to be inserted are sent to the database again and again.
  - PreparedStatement ps = con.prepareStatement(String query);
- A CallableStatement object is used to call stored procedures.
  - CallableStatement cs = con.prepareCall(String query);

Execute Query

- Three methods are used
  - ResultSet executeQuery(String sqlQuery) throws SQLException
  - int executeUpdate(String sqlQuery) throws SQLException
- executeQuery is used for executing SQL statements that return a single ResultSet, e.g. a select statement.
  - The rows fetched from database are returned as a single ResultSet object. For example,
  - ResultSet rs=stmt.executeQuery(“select * from emp”);
- executeUpdate is used for DDL and DML SQL statements like insert,update, delete, and create.
  - returns an integer value for DML to indicate the number of rows affected and 0 for DDL statements which do not return anything.

Execute Query (contd.)

  - PreparedStatement ps = con.prepareStatement(“update emp set salary=? where empid=?”);
- The statement is sent to database and is prepared for execution, only the value of the IN (?) parameters need to be sent.
  - ps.setInt(1,100000);
  - ps.setString(2,”Emp001”);
  - ps.executeUpdate();
- The execute method is used when the statement may return more than one ResultSet or update counts or a combination of both.
- This happens when stored procedures are executed.

Iterate ResultSet

```
while (rs.next())
{
System.out.println(rs.getString(1));
System.out.println(rs.getInt(2));
……..
}
```

Result Set Meta Data

```
ResultSetMetaData rsmd=rs.getMetaData();
    System.out.println("Column in ResultSet:"+rsmd.getColumnCount());
    for(int i=1;i<=rsmd.getColumnCount();i++)
    {
    System.out.println("Column Name :"+rsmd.getColumnName(i));
    System.out.println("Column Type :"+rsmd.getColumnTypeName (i));
    }
```

Example

```
import java.sql.*;
    class DatabaseConnection{
    public static void main(String args[]) throws Exception{
    Class.forName("sun.jdbc.odbc.JdbcOdbcDriver");
    Connection con=DriverManager.getConnection("jdbc:odbc:sac");
    PreparedStatement ps=con.prepareStatement("insert into emp values (?,?,?)");
    ps.setString(1,"Emp001");
    ps.setString(2,"Peter");
    ps.setInt(3,10000);
    System.out.println("Row inserted : "+ps.execute Update());
    Statement stmt=con.createStatement();
    ResultSet rs=stmt.executeQuery("select * from emp");
```

Example (contd.)

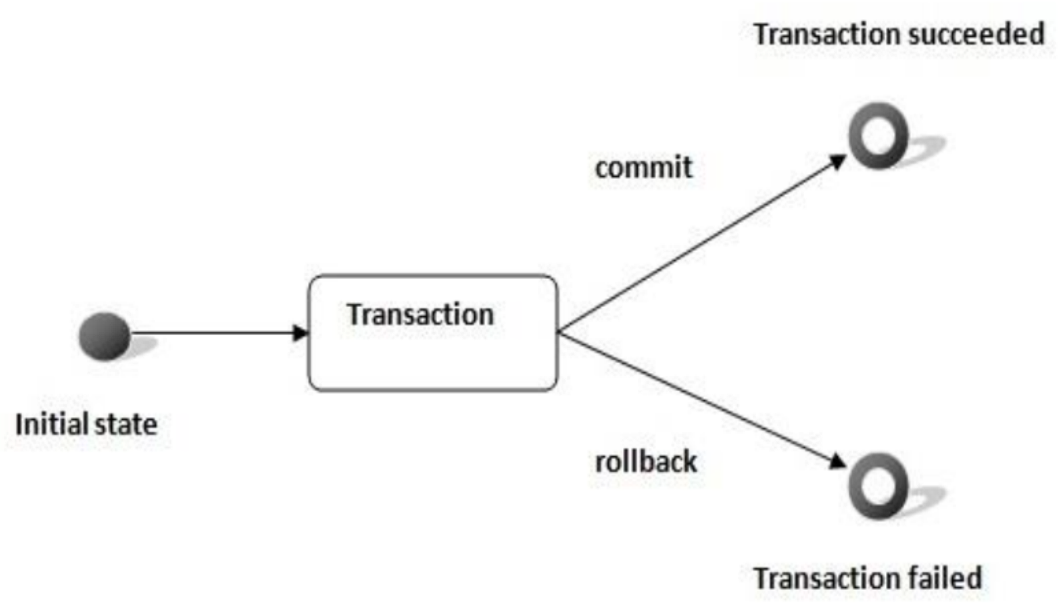
```
ResultSetMetaData rsmd=rs.getMetaData();
    int cc=rsmd.getColumnCount();
    System.out.println("Number of columns in result set: "+cc);
    for(int i=1;i<=cc;i++)
    System.out.print(rsmd.getColumnName(i)+"\t");
    System.out.println();
    while(rs.next()){
    System.out.print(rs.getString(1)+"\t");
    System.out.print(rs.getString(2)+"\t");
    System.out.print(rs.getString(3)+"\n");} } }
```

Transaction Management in JDBC

- Transaction represents **a single unit of work**.
- The ACID properties describes the transaction management well. ACID stands for Atomicity, Consistency, isolation and durability.
- **Atomicity** means either all successful or none.
- **Consistency** ensures bringing the database from one consistent state to another consistent state.
- **Isolation** ensures that transaction is isolated from other transaction.
- **Durability** means once a transaction has been committed, it will remain so, even in the event of errors, power loss etc.

Advantage of Transaction Management

- **fast performance** It makes the performance fast because database is hit at the time of commit.



	Description
void setAutoCommit(boolean status)	It is true by default means each transaction is committed by default.
void commit()	commits the transaction.
void rollback()	cancels the transaction.

Batch Processing in JDBC

- Instead of executing a single query, we can execute a batch (group) of queries. It makes the performance fast.
- The java.sql.Statement and java.sql.PreparedStatement interfaces provide methods for batch processing.
- **Advantage of Batch Processing**
- Fast Performance

Example of batch processing using PreparedStatement

into user420 values(191,'umesh',50000)");

- stmt.executeBatch();//executing the batch
- con.commit();
- con.close();
- }}

Example to store image in Oracle database

You can store images in the database in java by the help of **PreparedStatement** interface.

The **setBinaryStream()** method of PreparedStatement is used to set Binary information into the parameterIndex.

The syntax of setBinaryStream() method is given below:

1) **public void** setBinaryStream(**int** paramIndex,InputStream stream)**throws** SQLException.

```
Query: CREATE TABLE  "IMGTABLE"
  (    "NAME" VARCHAR2(4000),
   "PHOTO" BLOB
 )
```

Example to retrieve image from Oracle database

of getBlob() method of PreparedStatement

public Blob getBlob()**throws** SQLException

- Signature of getBytes() method of Blob interface

public **byte**[] getBytes(**long** pos, **int** length)**throws** SQLException

Java CallableStatement Interface

output.

Oracle Example

```
CREATE OR REPLACE PROCEDURE getEmpName
   (EMP_ID IN NUMBER, EMP_FIRST OUT VARCHAR) AS
BEGIN
   SELECT name INTO EMP_FIRST
  FROM Employees
   WHERE ID = EMP_ID;
END;
```

Mysql

```
DELIMITER $$

DROP PROCEDURE IF EXISTS `EMP`.`getEmpName` $$
CREATE PROCEDURE `EMP`.`getEmpName`
   (IN EMP_ID INT, OUT EMP_FIRST VARCHAR(255))
BEGIN
   SELECT first INTO EMP_FIRST
   FROM Employees
   WHERE ID = EMP_ID;
END $$

DELIMITER ;
```

Sample function code

- create or replace function sum4
- (n1 in number,n2 in number)
- **return** number
- is
- temp number(8);
- begin
- temp :=n1+n2;
- **return** temp;
- end;
- /

Queries?