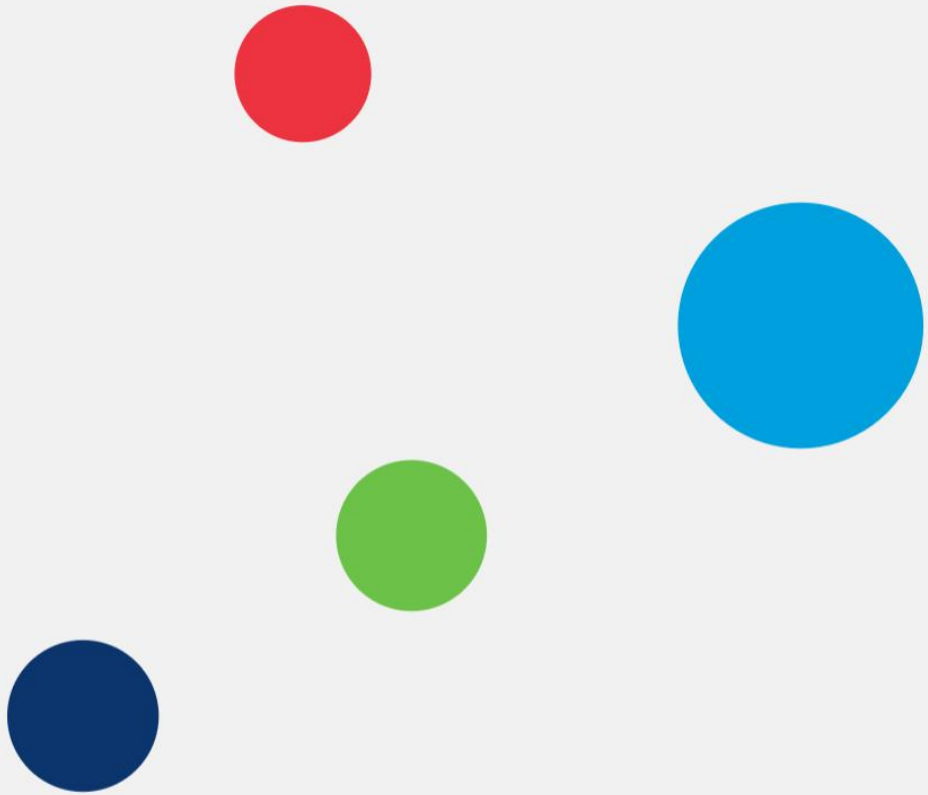
JDBC

MetaData and PreparedStatement

MetaData And PreparedStatement



Objectives

At the end of this module, you will be able to:

- Analyze how to use the Metadata objects to retrieve more information about the database or the result set
- Create and execute a query using PreparedStatement object

The DatabaseMetaData Object

- Metadata is data about data
- DatabaseMetaData is an interface to get comprehensive information about the database as a whole
- The Connection object can be used to get a DatabaseMetaData object
- Use the Connection.getMetaData()method to return a DatabaseMetaData object
- This object provides more than 100 methods to obtain information about the database

The DatabaseMetaData Object

The following are some examples of DatabaseMetaData methods:

- ***getColumnPrivileges():*** Get a description of the access rights for a table's columns.
- ***getColumns():*** Get a description of table columns.
- ***getDatabaseProductName():*** Get the name of this database product.
- ***getDriverName() :*** Get the name of this JDBC driver.
- ***storesLowerCaseIdentifiers():*** Does the database store mixed-case SQL identifiers in lower case?
- ***supportsAlterTableWithAddColumn():*** Is ALTER TABLE with add column supported?
- ***supportsFullOuterJoins():*** Are full nested outer joins supported?

How to obtain Database Metadata?

1. To get the DatabaseMetaData Object

```
DatabaseMetaData dbmd = conn.getMetaData();
```

2. Use the object's methods to get the metadata

```
DatabaseMetaData dbmd = conn.getMetaData();
String  s1 = dbmd getURL();
String  s2 = dbmd.getSQLKeywords();
boolean b1 = dbmd.supportsTransactions();
boolean b2 = dbmd.supportsSelectForUpdate();
```

Example on DatabaseMetaData object

```
import java.sql.*;
import java.io.*;
class MakeConnection3 {
    Connection conn;
    Statement stmt;
    String s1, s2;
    DatabaseMetaData dbmd;
    MakeConnection3() {
    try {
        Class.forName("oracle.jdbc.driver.OracleDriver");
        conn=DriverManager.getConnection
        ("jdbc:oracle:thin:@localhost:1521:orcl","scott","tiger");
```

contd..

Example on DatabaseMetadata (Contd.).

```
 dbmd = conn.getMetaData();
 s1 = dbmd.getURL();
 s2 = dbmd.getSQLKeywords();
 boolean b1 = dbmd.supportsTransactions();
 boolean b2 = dbmd.supportsSelectForUpdate();
 System.out.println("URL :  "+s1);
 System.out.println("SQL Keywords :"+s2);
 System.out.println("This supports Transactions : "+b1);
 System.out.println("This supports SelectforUpdate : "+b2);
}
```

contd..

Example on DatabaseMetadata (Contd.).

```
            catch(Exception e) {
                e.printStackTrace();
            }
        }
    }
    public class MetaDataExample {
        public static void main(String args[]) {
            new MakeConnection3();
        }
    }
```

The ResultSetMetaData Object

- ResultSetMetaData is an interface which contains methods to get information about the types and properties of the columns in the ResultSet object

- ResultSetMetaData object provides metadata, including:
  - Number of columns in the result set
  - Column type
  - Column name

In JDBC, you use the ResultSet.getMetaData() method to return a ResultSetMetaData object, which describes the data coming back from a database query. This object can be used to find out about the types and properties of the columns in your ResultSet.

How to obtain ResultSetMetadata?

1. To get the ResultSetMetaData object

```
ResultSetMetaData rsmd = rset.getMetaData();
```

2. Use the object's methods to get the metadata

```
ResultSetMetaData rsmd = rset.getMetaData();
for (int i = 1; i <= rsmd.getColumnCount(); i++)
{
  String colname = rsmd.getColumnName(i);
  int coltype = rsmd.getColumnType(i);
  …
}
```

Example on ResultSetMetaData

```
import java.sql.*;
class MakeConnection4{
    Connection conn;
    Statement stmt;
    ResultSet rs;
    ResultSetMetaData rsmd;
    MakeConnection4(){
  try{
      Class.forName("oracle.jdbc.driver.OracleDriver");
      conn=DriverManager.getConnection
      ("jdbc:oracle:thin:@localhost:1521:orcl","scott","tiger");
      stmt=conn.createStatement();
      rs=stmt.executeQuery("Select * from emp");
```

Example on ResultSetMetaData(Contd.).

```
        rsmd = rs.getMetaData();
        int noc = rsmd.getColumnCount();
        System.out.println("Number Of Columns : "+noc);

    for(int i=1;i<=noc;i++)  {
          System.out.print("Column "+i+" ="+rsmd.getColumnName(i)+"; ");
          System.out.print("Column Type ="+rsmd.getColumnType(i)+"; ");
          System.out.println("Column Type Name="+rsmd.getColumnTypeName(i)+";");
          }

     }
        catch(Exception e){
          e.printStackTrace();
        }
    }
}
```

Example on ResultSetMetaData (Contd.).

```
public class RSMetaDataExample {
    public static void main(String args[]) {
        new MakeConnection4();
    }
}
```

- The example shows how to use a ResultSetMetaData object to determine the following information about the ResultSet:
    - The number of columns in the ResultSet.
    - The name of each column
    - The American National Standards Institute (ANSI) SQL type for each column
- **java.sql.Types**

The java.sql.Types class defines constants that are used to identify ANSI SQL types. ResultSetMetaData.getColumnType() returns an integer value that corresponds to one of these constants.

Mapping Database Types to Java Types (Contd.).

SQL data type	Java data type	
	Simply mappable	Object mappable
CHARACTER		String
VARCHAR		String
LONGVARCHAR		String
NUMERIC		java.math.BigDecimal
DECIMAL		java.math.BigDecimal
BIT	boolean	Boolean
TINYINT	byte	Integer
SMALLINT	short	Integer
INTEGER	int	Integer
BIGINT	long	Long
REAL	float	Float
FLOAT	double	Double
DOUBLE PRECISION	double	Double
BINARY		byte[]
VARBINARY		byte[]
LONGVARBINARY		byte[]
DATE		java.sql.Date
TIME		java.sql.Time
TIMESTAMP		java.sql.Timestamp

Quiz

1. **Which of the following java type is mapped to the SQL data type *BIT***
   a) String
   b) boolean
   c) Int
   d) byte

2. **What object is returned, when you invoke the getMetaData method on the Connection object**
   a) StatementMetaData
   b) ResultSetMetaData
   c) DatabaseMetaData
   d) ConnectionMetaData

.

Answers :

1 : b
2 : c

The PreparedStatement Object

- Using PreparedStatement in place of Statement interface will improve the performance of a JDBC program
- PreparedStatement is inherited from Statement; the difference is that a PreparedStatement holds precompiled SQL statements.
- If you execute a Statement object many times, its SQL statement is compiled each time. PreparedStatement is more efficient because its SQL statement is compiled only once, when you first prepare the PreparedStatement. After that, each time you execute the SQL statement in the PreparedStatement, the SQL statement does not have to be recompiled.
- Therefore, if you need to execute the same SQL statement several times within an application, it is more efficient to use PreparedStatement than Statement.

The PreparedStatement Object

- A prepared statement can contain variables that you supply each time you execute the statement
- A PreparedStatement does not have to execute exactly the same query each time. You can specify parameters in the PreparedStatement SQL string and supply the actual values for these parameters when the statement is executed.
- The following slide shows how to supply parameters and execute a PreparedStatement.

How to Create a PreparedStatement?

1. Register the driver and create the database connection
2. Create the prepared statement, identifying variables with a question mark (?)

```
PreparedStatement pstmt =
conn.prepareStatement("update STUDENT set SUPERVISOR = ? where ID = ?");
```

```
PreparedStatement pstmt =
conn.prepareStatement("select SUPERVISOR from STUDENT where ID = ?");
```

Once the connection object is obtained, the prepareStatement method is called on it to obtain the PreparedStatement object. However, in this case, while creating it, itself, the SQL statement is provided as a parameter to the method. The variable portions of the SQL statement are provided as a question mark (?) so that the values can be supplied dynamically before execution of the statement.

How to execute PreparedStatement?

1. Supply values for the variables

```
pstmt.setXXX(index, valu);
```

Specifying Values for the Bind Variables

You use the PreparedStatement.set*XXX*() methods to supply values for the variables in a prepared statement. There is one setXXX() method for each Java type: setString(), setInt(), and so on.

You must use the setXXX() method that is compatible with the SQL type of the variable. In the example on the slide, the first variable is updating a VARCHAR column, so we need to use setString() to supply a value for the variable. You can use setObject() with any variable type.

Each variable has an index. The index of the first variable in the prepared statement is 1, the index of the second is 2, and so on. If there is only one variable, its index is one. The index of a variable is passed to the setXXX() method.

How to execute PreparedStatement?

2. Execute the statement

```
pstmt.executeQuery();
pstmt.executeUpdate();
```

```
PreparedStatement pstmt =
conn.prepareStatement("update STUDENT set SUPERVISOR = ? Where ID = ?");
pstmt.setString(1, "Jeetendra");
pstmt.setInt(2, id);
pstmt.executeUpdate();
```

Closing a Prepared Statement

If you close a prepared statement, you will have to prepare it again.

Example 1 on PreparedStatement(Contd..)

```
import java.sql.*;
class ConnectionClass {
    Connection con;
    Connection connectionFactory() {
    try {
       Class.forName("oracle.jdbc.driver.OracleDriver");
       con=DriverManager.getConnection
      ("jdbc:oracle:thin:@localhost:1521:orcl","scott","tiger");
    }
    catch(Exception e) {
        System.out.println(e);
   }
   return con;
  }
}
```

Example 1 on PreparedStatement (Contd..)

```
class JdbcCalls {
  Connection con;
  JdbcCalls() {
    ConnectionClass x = new ConnectionClass();
    con=x.connectionFactory();
  }
  void create(String[] args) throws SQLException {
    String tablename = args[0];
    PreparedStatement pst = con.prepareStatement
    ("Create table "+tablename+" (empid number(4), empname varchar(20),
    dept varchar2(10), joindate date, salary number(10,2))");
    pst.executeUpdate();
    System.out.println("Table created successfully");
  }
}
```

Example 2 on PreparedStatement

```
/* This class is executed in the following manner :
If you want to insert a row within the table, you will execute as java JInsert
jdbcdemotable 1001 anish admin 23-dec-2008 50000.00 */
import java.sql.*;
class JInsert {
  public static void main(String args[]){
    try {
        JdbcCalls e = new JdbcCalls();
        e.insert(args);
    }
    catch(SQLException e) {
        System.out.println(e.toString());
    }
  }
}
```

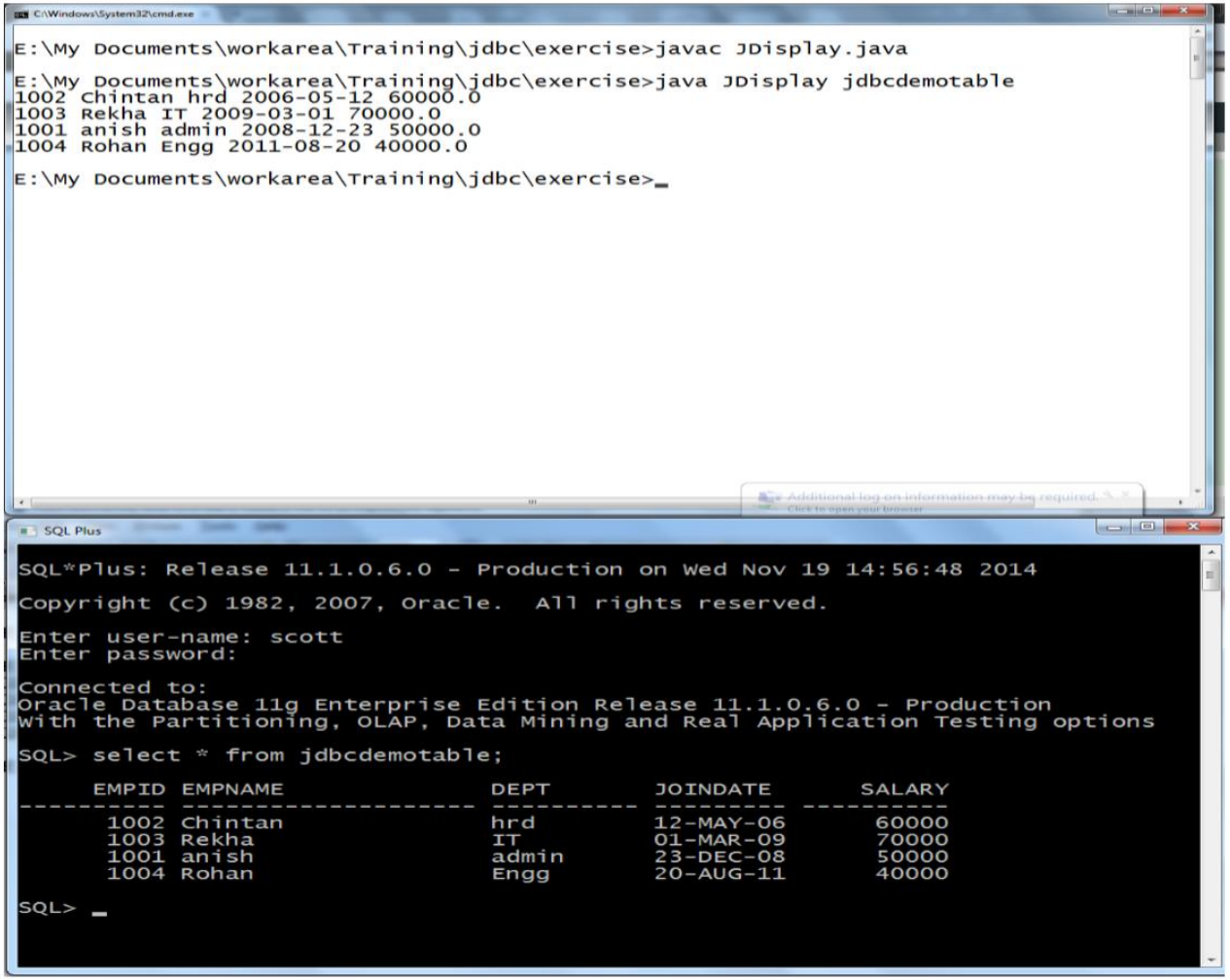
Example 2 on PreparedStatement (Contd..)

```
class JdbcCalls {
  Connection con;
  JdbcCalls() {
    ConnectionClass x = new ConnectionClass();
    con=x.connectionFactory();
  }
  void insert(String[] args) throws SQLException {
    String tablename = args[0];
    int empid = Integer.parseInt(args[1]);
    String empname = args[2];
    String dept = args[3];
    String dat=args[4];
    Float salary = Float.parseFloat(args[5]);
```

Example 3 on PreparedStatement (Contd..)

```
class JdbcCalls {
  Connection con;
  JdbcCalls() {
    ConnectionClass x = new ConnectionClass();
    con=x.connectionFactory();
  }
void display(String[] args) throws SQLException {
    String tablename = args[0];
    PreparedStatement pst = con.prepareStatement("select * from "+tablename);
    ResultSet rs= pst.executeQuery();
    while(rs.next()) {
  System.out.println(rs.getInt(1)+" "+rs.getString(2)+" "+rs.getString(3)+"
  "+rs.getDate(4)+" "+rs.getFloat(5)); }
  con.close();
  } }
```

Example 3 on PreparedStatement (Contd..)



Example on Modifying the row

```
/* This class is executed in the following manner :
If you want to modify a row, you will execute as Java JModify  table1 1001
60000.00 where modifying a row will allow you to change the salary
*/
import java.sql.*;
class JModify {
  public static void main(String args[]) {
    try {
        JdbcCalls e = new JdbcCalls();
        e.modify(args);
    }
    catch(SQLException e) {
        System.out.println(e);
    }
  } }
```

Example on Modifying the row (Contd..)

```
class JdbcCalls {
Connection con;
JdbcCalls() {
  ConnectionClass x = new ConnectionClass();
  con=x.connectionFactory();
}
void modify(String[] args) throws SQLException{
  String tablename = args[0];
  int empid = Integer.parseInt(args[1]);
  Float sal = Float.parseFloat(args[2]);
  PreparedStatement pst = con.prepareStatement("update "+tablename+" set
salary="+sal+" where empid="+empid);
  int i= pst.executeUpdate();
  con.close();
}
}
```

Example on Deleting a row

```
/* This class is executed in the following manner : If you want to delete a
   row, you will execute as java JDelete table1 1001
*/
import java.sql.*;
class JDelete{
    public static void main(String args[]) {
    try {
        JdbcCalls e = new JdbcCalls();
        e.delete(args);
    }
    catch(SQLException e) {
        System.out.println(e);
    }
  }
}
```

Example on Deleting a row (Contd.).

```
class JdbcCalls {
Connection con;
JdbcCalls() {
  ConnectionClass x = new ConnectionClass();
  con=x.connectionFactory();
}
void delete(String[] args) throws SQLException {
  String tablename = args[0];
  int empid = Integer.parseInt(args[1]);
  PreparedStatement pst = con.prepareStatement("delete from "+tablename+"
where empid="+empid);
  int i= pst.executeUpdate();
  con.close();
}
}
```

Summary

In this module, you were able to:

- Analyze how to use the Metadata objects to retrieve more information about the database or the result set
- Create and execute a query using PreparedStatement object

Thank You