# Java & JEE Training

## Day 23 – Examples of File IO & Introduction to JDBC

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# Java File IO Examples Contd…

# FileReader Example

```
import java.io.*;
public class FileRead {

   public static void main(String args[])throws IOException {
      File file = new File("Hello1.txt");

      // creates the file
      file.createNewFile();

      // creates a FileWriter Object
      FileWriter writer = new FileWriter(file);

      // Writes the content to the file
      writer.write("This\n is\n an\n example\n");
      writer.flush();
      writer.close();

      // Creates a FileReader Object
      FileReader fr = new FileReader(file);
      char [] a = new char[50];
      fr.read(a);   // reads the content to the array

      for(char c : a)
         System.out.print(c);   // prints the characters one by one
      fr.close();
   }
}
```

# FileWriter Example

```
import java.io.*;
public class FileRead {

   public static void main(String args[])throws IOException {
      File file = new File("Hello1.txt");

      // creates the file
      file.createNewFile();

      // creates a FileWriter Object
      FileWriter writer = new FileWriter(file);

      // Writes the content to the file
      writer.write("This\n is\n an\n example\n");
      writer.flush();
      writer.close();

      // Creates a FileReader Object
      FileReader fr = new FileReader(file);
      char [] a = new char[50];
      fr.read(a);   // reads the content to the array

      for(char c : a)
         System.out.print(c);   // prints the characters one by one
      fr.close();
   }
}
```

# File Example: Creating Directories

```
import java.io.File;
public class CreateDir {

   public static void main(String args[]) {
      String dirname = "/tmp/user/java/bin";
      File d = new File(dirname);

      // Create directory now.
      d.mkdirs(); //Question: What does mkdirs do?
   }
}
```

# File Example: Listing Directories

```
import java.io.File;
public class ReadDir {

   public static void main(String[] args) {
      File file = null;
      String[] paths;

      try {
         // create new file object
         file = new File("/tmp");

         // array of files and directory
         paths = file.list();

         // for each name in the path array
         for(String path:paths) {
            // prints filename and directory name
            System.out.println(path);
         }
      }catch(Exception e) {
         // if any error occurs
         e.printStackTrace();
      }
   }
}
```

# File Example: Create a file

```
import java.io.File;
import java.io.IOException;

public class CreateFileDemo
{
  public static void main( String[] args )
  {
    try {
                File file = new File("C:\\newfile.txt");
                /*If file gets created then the createNewFile()
                 * method would return true or if the file is
                 * already present it would return false
                 */
          boolean fvar = file.createNewFile();
                if (fvar){
                    System.out.println("File has been created successfully");
                }
                else{
                    System.out.println("File already present at the specified location");
                }
            } catch (IOException e) {
                        System.out.println("Exception Occurred:");
                  e.printStackTrace();
              }
  }
}
```

# How to read file in Java – BufferedInputStream

```
import java.io.*;
public class ReadFileDemo {
   public static void main(String[] args) {
      //Specify the path of the file here
      File file = new File("C://myfile.txt");
      BufferedInputStream bis = null;
      FileInputStream  fis= null;

      try
      {
         //FileInputStream to read the file
         fis = new FileInputStream(file);

         /*Passed the FileInputStream to
BufferedInputStream
          *For Fast read using the buffer array.*/
         bis = new BufferedInputStream(fis);

         /*available() method of BufferedInputStream
          * returns 0 when there are no more bytes
          * present in the file to be read*/
         while( bis.available() > 0 ){
            System.out.print((char)bis.read());
         }

       }
catch(FileNotFoundException fnfe)
      {
         System.out.println("The specified file not found" +
fnfe);
      }
      catch(IOException ioe)
      {
         System.out.println("I/O Exception: " + ioe);
      }
      finally
      {
         try{
            if(bis != null && fis!=null)
            {
                     fis.close();
               bis.close();
            }
          }catch(IOException ioe)
           {
               System.out.println("Error in InputStream close():
" + ioe);
           }
      }
   }
}
```

# How to read file in Java using BufferedReader

```
import java.io.BufferedReader;
import java.io.FileReader;
import java.io.IOException;

public class ReadFileDemo {
  public static void main(String[] args) {

    BufferedReader br = null;
    BufferedReader br2 = null;
    try{
      br = new BufferedReader(new FileReader("B:\\myfile.txt"));


      //One way of reading the file
                System.out.println("Reading the file using readLine()
method:");
                String contentLine = br.readLine();
                while (contentLine != null) {
                  System.out.println(contentLine);
                  contentLine = br.readLine();
                }

                br2 = new BufferedReader(new
FileReader("B:\\myfile2.txt"));

                //Second way of reading the file
                System.out.println("Reading the file using read()
method:");
 int num=0;
                char ch;
                while((num=br2.read()) != -1)
                {
          ch=(char)num;
                   System.out.print(ch);
                }

    }
catch (IOException ioe)
    {
                ioe.printStackTrace();
    }
    finally
    {
                try {
                  if (br != null)
                                br.close();
                  if (br2 != null)
                                br2.close();
                }
                catch (IOException ioe)
       {
                                System.out.println("Error in
closing the BufferedReader");
                }
              }
  }
}
```

# How to write to file in Java using BufferedWriter

```
import java.io.BufferedWriter;
import java.io.File;
import java.io.FileWriter;
import java.io.IOException;

public class WriteFileDemo {
   public static void main(String[] args) {
      BufferedWriter bw = null;
      try {
                String mycontent = "This String would be
written" +
                  " to the specified File";
        //Specify the file name and path here
                File file = new File("C:/myfile.txt");

                /* This logic will make sure that the file
                 * gets created if it is not present at the
                 * specified location*/
                 if (!file.exists()) {
                    file.createNewFile();
                 }
                    FileWriter fw = new FileWriter(file);
                    bw = new BufferedWriter(fw);
                    bw.write(mycontent);
          System.out.println("File written Successfully");

       } catch (IOException ioe) {
                    ioe.printStackTrace();
                }
                finally
                {
                   try{
                      if(bw!=null)
                                bw.close();
                   }catch(Exception ex){
                       System.out.println("Error in closing the
BufferedWriter"+ex);
                    }
                }
   }
}
```

# Append content to File using FileWriter and BufferedWriter

```
import java.io.File;
import java.io.FileWriter;
import java.io.BufferedWriter;
import java.io.IOException;

class AppendFileDemo
{
  public static void main( String[] args )
  {
    try{
            String content = "This is my content which would be appended " +
            "at the end of the specified file";
      //Specify the file name and path here
            File file =new File("C://myfile.txt");

            /* This logic is to create the file if the
             * file is not already present
             */
            if(!file.exists()){
              file.createNewFile();
            }
            //Here true is to append the content to file
            FileWriter fw = new FileWriter(file,true);
            //BufferedWriter writer give better performance
            BufferedWriter bw = new BufferedWriter(fw);
            bw.write(content);
            //Closing BufferedWriter Stream
            bw.close();

            System.out.println("Data successfully appended at the end of file");

    }catch(IOException ioe){
      System.out.println("Exception occurred:");
            ioe.printStackTrace();
    }
  }
}
```

# Append content to File using PrintWriter

```
import java.io.File;
import java.io.FileWriter;
import java.io.PrintWriter;
import java.io.BufferedWriter;
import java.io.IOException;

class AppendFileDemo2
{
  public static void main( String[] args )
  {
    try{
       File file =new File("C://myfile.txt");
              if(!file.exists()){
                     file.createNewFile();
              }
              FileWriter fw = new FileWriter(file,true);
              BufferedWriter bw = new
BufferedWriter(fw);
              PrintWriter pw = new PrintWriter(bw);
       //This will add a new line to the file content
              pw.println("");
/* Below three statements would add three
       * mentioned Strings to the file in new lines.
       */
              pw.println("This is first line");
              pw.println("This is the second line");
              pw.println("This is third line");
              pw.close();

              System.out.println("Data successfully
appended at the end of file");

     }catch(IOException ioe){
              System.out.println("Exception
occurred:");
              ioe.printStackTrace();
    }
  }
}
```

# How to delete file in Java – delete() Method

```
import java.io.File;
public class DeleteFileJavaDemo
{
  public static void main(String[] args)
  {
    try{
      //Specify the file name and path
            File file = new File("C:\\myfile.txt");
      /*the delete() method returns true if the file is
       * deleted successfully else it returns false
       */
            if(file.delete()){
              System.out.println(file.getName() + " is deleted!");
      }else{
              System.out.println("Delete failed: File didn't delete");
            }
     }catch(Exception e){
        System.out.println("Exception occurred");
            e.printStackTrace();
          }
   }
}
```

# How to rename file in Java – renameTo() method

```
import java.io.File;
public class RenameFileJavaDemo
{
   public static void main(String[] args)
   {
      //Old File
            File oldfile =new File("C:\\myfile.txt");
            //New File
            File newfile =new File("C:\\mynewfile.txt");
            /*renameTo() return boolean value
             * It return true if rename operation is
             * successful
             */
      boolean flag = oldfile.renameTo(newfile);
            if(flag){
              System.out.println("File renamed successfully");
            }else{
              System.out.println("Rename operation failed");
             }
   }
}
```

# How to Compress a File in GZIP Format

```
import java.io.FileInputStream;
import java.io.FileOutputStream;
import java.io.IOException;
import java.util.zip.GZIPOutputStream;

public class GZipExample
{
  public static void main( String[] args )
  {
    GZipExample zipObj = new GZipExample();
    zipObj.gzipMyFile();
  }

  public void gzipMyFile(){
    byte[] buffer = new byte[1024];
    try{
      //Specify Name and Path of Output GZip file here
      GZIPOutputStream gos =
       new GZIPOutputStream(new
FileOutputStream("B://Java/Myfile.gz"));

      //Specify location of Input file here
      FileInputStream fis =
       new FileInputStream("B://Java/Myfile.txt");

      //Reading from input file and writing to output GZip file
      int length;
while ((length = fis.read(buffer)) > 0) {

        /* public void write(byte[] buf, int off, int len):
         * Writes array of bytes to the compressed output stream.
         * This method will block until all the bytes are written.
         * Parameters:
         * buf - the data to be written
         * off - the start offset of the data
         * len - the length of the data
         */
        gos.write(buffer, 0, length);
      }

      fis.close();

      /* public void finish(): Finishes writing compressed
       * data to the output stream without closing the
       * underlying stream.
       */
      gos.finish();
      gos.close();

      System.out.println("File Compressed!!");

    }catch(IOException ioe){
       ioe.printStackTrace();
     }
  }
}
```

# How to Copy a File to another File in Java

```
import java.io.File;
import java.io.FileInputStream;
import java.io.FileOutputStream;
import java.io.IOException;

public class CopyExample
{
   public static void main(String[] args)
   {
            FileInputStream instream = null;
            FileOutputStream outstream = null;

            try{
               File infile =new File("C:\\MyInputFile.txt");
               File outfile =new
File("C:\\MyOutputFile.txt");

               instream = new FileInputStream(infile);
               outstream = new FileOutputStream(outfile);

               byte[] buffer = new byte[1024];

               int length;

                        /*copying the contents from input
stream to
                         * output stream using read and write
methods
                         */
 while ((length = instream.read(buffer)) > 0){
                                 outstream.write(buffer, 0,
length);
                        }

                        //Closing the input/output file streams
                        instream.close();
                        outstream.close();

                        System.out.println("File copied
successfully!!");

                  }catch(IOException ioe){
                                 ioe.printStackTrace();
                  }
   }
}
```

# How to make a File Read Only in Java

```
import java.io.File;
import java.io.IOException;

public class ReadOnlyChangeExample
{

   public static void main(String[] args) throws IOException
   {
            File myfile = new File("C://Myfile.txt");
            //making the file read only
            boolean flag = myfile.setReadOnly();
            if (flag==true)
            {
              System.out.println("File successfully converted to Read only mode!!");
            }
            else
            {
              System.out.println("Unsuccessful Operation!!");
            }
   }
}
```

# How to check if a File is hidden in Java

```
import java.io.File;
import java.io.IOException;

public class HiddenPropertyCheck
{

   public static void main(String[] args) throws IOException, SecurityException
   {
            // Provide the complete file path here
            File file = new File("c:/myfile.txt");

            if(file.isHidden()){
                     System.out.println("The specified file is hidden");
            }else{
                     System.out.println("The specified file is not hidden");
            }
   }
}
```

# Java & JEE Training

## JDBC – Java Database Connectivity

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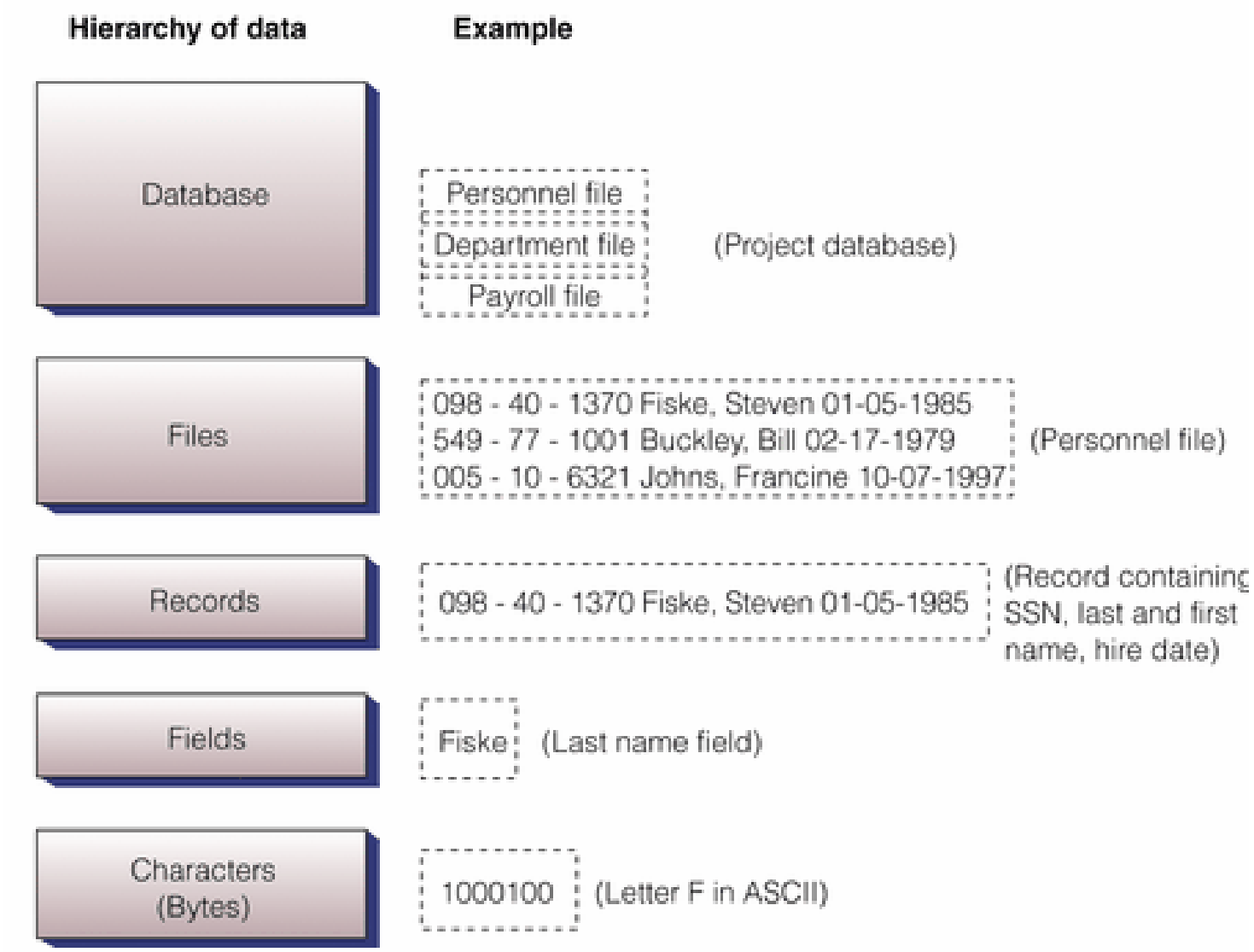
# Introduction

- Data stored in variables and arrays is temporary
  - It's lost when a local variable goes out of scope or when the program terminates
- For long-term retention of  data, computers use **files.**
- Computers store files on **secondary storage devices**
  - hard disks, optical disks, flash drives and magnetic tapes.
- Data maintained in files is **persistent data** because it exists beyond the duration of program execution.

# Data Hierarchy

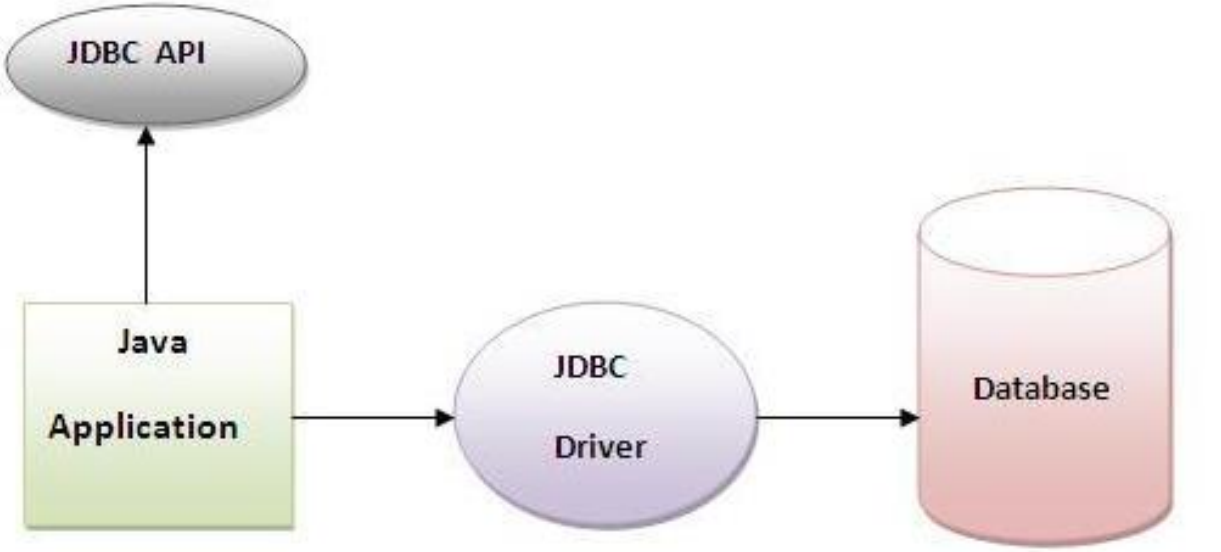


# Databases

- There are many ways to organize records in a file. The most common is called a **sequential file**, in which records are stored in order by the record-key field.
- A group of related files is called a **database.**
- A collection of programs designed to create and manage databases is called a **database management system (DBMS).**

# JDBC – Java Database Connectivity

- Java JDBC is a Java API to connect and execute query with the database. JDBC API uses JDBC drivers to connect with the database.
- Before JDBC, **ODBC API** was the database API to connect and execute query with the database. But, ODBC API uses ODBC driver which is written in C language (i.e. platform dependent and unsecured). That is why Java has defined its own API (JDBC API) that uses JDBC drivers (written in Java language).



# JDBC Driver

- JDBC Driver is a software component that enables java application to interact with the database.

# 5 Steps to connect to the database in java

1. Register the driver class
2. Creating connection
3. Creating statement
4. Executing queries
5. Closing connection

# 5 Steps to connect to the database in java

1. Register the driver class

```
Class.forName("oracle.jdbc.driver.OracleDriver")
```

(throws ClassNotFoundException)

2. Creating connection –

```
Connection con=DriverManager.getConnection(
"jdbc:oracle:thin:@localhost:1521:xe","system","password");
Connection con=DriverManager.getConnection(
"jdbc:oracle:thin:@localhost:1521:xe");
```

(throws SQLException)

3. Creating statement:

```
Statement stmt=con.createStatement();
```

(throws SQLException)

4. Executing queries

```
ResultSet rs=stmt.executeQuery("select * from emp");
while(rs.next()){
  System.out.println(rs.getInt(1)+" "+rs.getString(2));
}
```

(throws SQLException)

5. Closing connection

```
con.close();  // (throws SQLException)
```

# Working with Databases… Instruction.

- In our class, we will work with Oracle 11g XE (Express Edition).
- It is available for download for free from Oracle site:

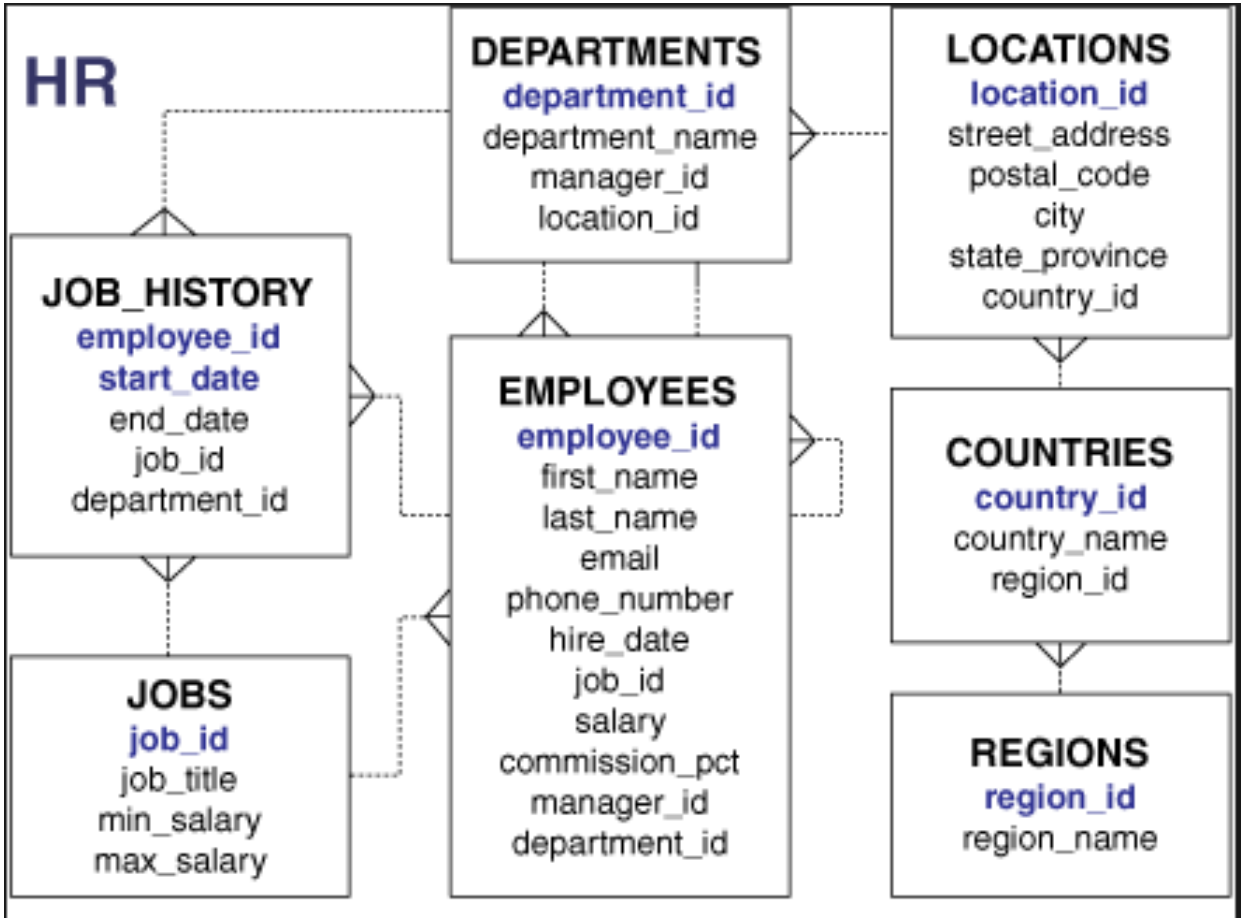
  http://www.oracle.com/technetwork/database/database-technologies/express-edition/downloads/index.html
- Download the zip file, extract it, and run the setup file for installing Oracle database.
- Oracle database will get installed and use default port 1521.
- Then follow instructions here to complete the initial setup.

  https://docs.oracle.com/cd/E17781_01/admin.112/e18585/toc.htm

- We will be working with the HR user/schema in all our examples.
  - Unlock HR schema: ALTER USER HR ACCOUNT UNLOCK
  - Specify a password for HR: ALTER USER HR IDENTIFIED BY <PASSWORD>

# HR USER / SCHEMA

- In Oracle, User and Schema mean the same.



# Demo of HR Schema

- Let us look at the Employees and Departments Tables.
- Basic CRUD operations syntax reference for SQL:
  http://www.orafaq.com/wiki/CRUD

# Ojdbc6.jar

- Copy ojdbc6.jar from C:\oraclexe\app\oracle\product\11.2.0\server\jdbc\lib to your JRE\lib\ext folder.

- This has the JDBC driver you will need.

- Other way of doing is by adding the path to the jar file to your classpath
  - Temporarily: Set classpath in commandline.
  - Permanent: Add path of jar file to classpath environment variable.

# JDBC Example... Connecting to the database.

```
import java.sql.*;
class OracleCon{
public static void main(String args[]){
try{
//step1 load the driver class
Class.forName("oracle.jdbc.driver.OracleDriver");

//step2 create  the connection object
Connection con=DriverManager.getConnection(
"jdbc:oracle:thin:@localhost:1521:xe","system","oracle");

//step3 create the statement object
Statement stmt=con.createStatement();

//step4 execute query
ResultSet rs=stmt.executeQuery("select * from emp");
while(rs.next())
System.out.println(rs.getInt(1)+"  "+rs.getString(2)+"  "+rs.getString(3));

//step5 close the connection object
con.close();

}catch(Exception e){ System.out.println(e);}

}
}
```

# DriverManager class

- The DriverManager class acts as an interface between user and drivers. It keeps track of the drivers that are available and handles establishing a connection between a database and the appropriate driver. The DriverManager class maintains a list of Driver classes that have registered themselves by calling the method DriverManager.registerDriver().

| | |
|---|---|
| public static Connection getConnection(String url): | is used to establish the connection with the specified url. |
| public static Connection getConnection(String url,String userName,String password): | is used to establish the connection with the specified url, username and password. |

# Connection interface

- A Connection is the session between java application and database. The Connection interface is a factory of Statement, PreparedStatement, and DatabaseMetaData i.e. object of Connection can be used to get the object of Statement and DatabaseMetaData.
- The Connection interface provide many methods for transaction management like commit(), rollback() etc.
- ***By default, connection commits the changes after executing queries.***
- Commonly used methods:

| |
|---|
| **1) public Statement createStatement():** creates a statement object that can be used to execute SQL queries. |
| **2) public Statement createStatement(int resultSetType,int resultSetConcurrency):** Creates a Statement object that will generate ResultSet objects with the given type and concurrency. |
| **3) public void setAutoCommit(boolean status):** is used to set the commit status.By default it is true. |
| **4) public void commit():** saves the changes made since the previous commit/rollback permanent. |
| **5) public void rollback():** Drops all changes made since the previous commit/rollback. |
| **6) public void close():** closes the connection and Releases a JDBC resources immediately. |

# Statement interface

The **Statement interface** provides methods to execute queries with the database. The statement interface is a factory of ResultSet i.e. it provides factory method to get the object of ResultSet.

**1) public ResultSet executeQuery(String sql):** is used to execute SELECT query. It returns the object of ResultSet.

**2) public int executeUpdate(String sql):** is used to execute specified query, it may be create, drop, insert, update, delete etc.

**3) public boolean execute(String sql):** is used to execute queries that may return multiple results.

**4) public int[] executeBatch():** is used to execute batch of commands.

# Example: Insert, Update and Delete using Statement.

```
import java.sql.*;
class FetchRecord{
public static void main(String args[])throws Exception{
Class.forName("oracle.jdbc.driver.OracleDriver");
Connection
con=DriverManager.getConnection("jdbc:oracle:thin:@localhost:1521:xe"
,"system","oracle");
Statement stmt=con.createStatement();

//stmt.executeUpdate("insert into emp765 values(33,'Irfan',50000)");
//int result=stmt.executeUpdate("update emp765 set
name='Vimal',salary=10000 where id=33");
int result=stmt.executeUpdate("delete from emp765 where id=33");
System.out.println(result+" records affected");
con.close();
}}
```

# ResultSet interface

- The object of ResultSet maintains a cursor pointing to a row of a table. Initially, cursor points to before the first row.
- **By default, ResultSet object can be moved forward only and it is not updatable.**
- But we can make this object to move forward and backward direction by passing either TYPE_SCROLL_INSENSITIVE or TYPE_SCROLL_SENSITIVE in createStatement(int,int) method as well as we can make this object as updatable by:

```
Statement stmt = con.createStatement(ResultSet.TYPE_SCROLL_INSENSITIVE,
 ResultSet.CONCUR_UPDATABLE);
```

# Commonly used methods of ResultSet interface

| | |
|---|---|
| **1) public boolean next():** | is used to move the cursor to the one row next from the current position. |
| **2) public boolean previous():** | is used to move the cursor to the one row previous from the current position. |
| **3) public boolean first():** | is used to move the cursor to the first row in result set object. |
| **4) public boolean last():** | is used to move the cursor to the last row in result set object. |
| **5) public boolean absolute(int row):** | is used to move the cursor to the specified row number in the ResultSet object. |
| **6) public boolean relative(int row):** | is used to move the cursor to the relative row number in the ResultSet object, it may be positive or negative. |
| **7) public int getInt(int columnIndex):** | is used to return the data of specified column index of the current row as int. |
| **8) public int getInt(String columnName):** | is used to return the data of specified column name of the current row as int. |
| **9) public String getString(int columnIndex):** | is used to return the data of specified column index of the current row as String. |
| **10) public String getString(String columnName):** | is used to return the data of specified column name of the current row as String. |

# Example of Scrollable ResultSet (retrieve data of 3rd row)

```
import java.sql.*;
class FetchRecord{
public static void main(String args[])throws Exception{

Class.forName("oracle.jdbc.driver.OracleDriver");
Connection
con=DriverManager.getConnection("jdbc:oracle:thin:@localhost:1521:xe","sy
stem","oracle");
Statement
stmt=con.createStatement(ResultSet.TYPE_SCROLL_SENSITIVE,ResultSet.CO
NCUR_UPDATABLE);
ResultSet rs=stmt.executeQuery("select * from emp765");

//getting the record of 3rd row
rs.absolute(3);
System.out.println(rs.getString(1)+" "+rs.getString(2)+" "+rs.getString(3));

con.close();
}}
```