Adv.java course
==========

(Before adv.java :: WebSite user /visitor)
(After adv.java :: Website Developer)

Batch code :: NTAJ414
mail email Id :: natarazjavaarena@gmail.com
FB Group:: natarazjavaarena (private group)

pre-requisite :: core java oops + Common sense
duration :: 100 session (Single slot)
60 sessions (two slots)
Main topics :: 1. JDBC + Misc
2. Servlet, Jndi + Misc
3. Jsp +Misc
4. Mini Projects + Misc
5. HTML +java script +Misc

->Depth
->use-cases orientation
-> Interview and system test orientation
-> For freshers and for experienced people
4+/5+

Fresher :: core java + adv.java +oracle +CRT +spring framework
1+ experience :: Fresher Topics + hibernate +DP +Tools (10+)
Design Patterns
2+ experiecne :: 1+ topics + webServices
3+ /4+/5+ :: 2+ topics + spring microservices + angular /angular js /reactJS + devops (optional)

=> Since we can use java to develop different types of Applications like standalone Apps, websistes, mobile Apps ,Dstributed Apps and etc.. So we can call java as programming suite.. instead of just calling it as programming lannguage..

3 important modules of Java Programming suite
==========
1) JSE module (Java Standard Edition)
2) JEE module (Java Enterprie Edition/ Jakarta Enterprise Edition)
3) JME module (Java Micro Edtion)

JSE module
==========
=>It is base module for other modules in java..
=> It is installable s/w as jdk (java development kit)
=> It is standard module to work with java in our computer
I.e we should install this module baded jdk s/w as minimum
s/w in our computer in order to start our with using java..

=> Latest version : java14 / jdk14
=> Stable version :: java8 /jdk 1.8

Maruthi Suzuki
|---> Swift Pertrol
|--->lxi (standard) variant
|--->vxi
|-->zxi

Core Java topics (important)
---
oops
Excpetion handling
Collections
Multi-Threading
String handling
Java8 features

=> This module is mainly given to standalone Apps and Applets .

standalone App (1-tier App)
==========
=> The App that is specific to one computer and only one -user (enduser) at a time to operate the app is called Standalone App..
note:: The person who operates in App is called called enduser like bank employee, bank customer , websote vistor and etc..

examples for standalone Apps
==========
a) Caclualator App b) java calss with main (-) method c) anti-virus s/w ad etc..

Two types of Standalone Apps
==========
(a) CUI /Console Apps CUI:: Character user Interface
--> These are not graphical Apps , So thesre are not user-friendly
-->Generally these Apps run from cmd prompt..

eg: class with main(-) method with out using AWT/Swings..

TestApplication.java
==========

```
public class TestApplication{
  public static void main(String args[]){
    ....
    ...
    ....
  }
}
```

cmd>javac TestApplication.java
cmd>java TestApplication

b) GUI Applications / Deskop Applications (GUI :: Graphical User Interface)

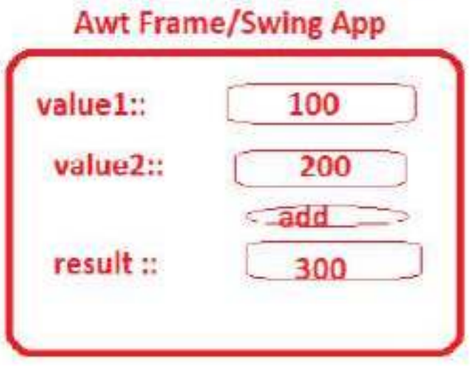
=> These are graphical apps and user-friendly apps
-> Awt/Swing Frame Apps are called stanalone GUI Appliocations
=>these Apps can be executed from Command prompt or from Desktop
eg:: Calculator App , class with main(-) method having Awt/Swing support
Anti-virus s/w and etc..

Awt/Swing based Java Gui App
==========

```
public class ArithmeticApp extends javax.swing.JFrame{
  .....
  ....
  public static void main(String args[]){
    ....
    ...
    ...
  }
}
```

//cmd> javac ArithmeticApp.java
//cmd> java ArithemticApp

Awt Frame/Swing App



JAva Learning is all about
(a) Language Learning (Core Java) (Like raw material)
|-->rice ,wheat granuals
|---> wheat powder,rice powder)
(b) Technologies/APIS Learning (Adv.java) (Like semifinished products)
(c) Frameworks Learning (Spring, hibernate,webServices)
(Like fully finished products)
|---> Maggi noodles, Baba noodles..

Applet
=======

=> Applet is a compiled java class that can sent over the network as java based web page...

=> Applets are GUI .. but they are not desktop Apps/GUI Apps becoz they can be sent over the network as java based webpage..

=> Html based web pages give better performence .. but they give bad security.. where as Applets based web pages give better security but they give bad performence..
=> Becoz of bad performence Applets outdated.. Industry is using html based webpages by improving security standard using other techniques like n/w firewalls and etc..

JSE module is having two parts
(Part1) -> Language (Entire core java concepts)
|--->oops,exception handling, collections ,multithreading,Applets, Awt/Swing , String handling ,I/O Streams, Reflection API, Networking and etc..

(part2) ->Technologies Part (Initial topics of adv.java)
|---->JDBC, JNDI , RMI(outdated) and etc..

JDBC :: Java Database connectivity
JNDI :: Java Naming And Directory Interface
RMI :: Remote Method Invocation

Core Java course
|--->JSE module language part | To develop java based standalone Apps

Adv.java java course
|--->JSE module technologies (JDBC,JNDI)
|--->JEE module Technologies (Servlet,Jsp)
|---->web technologies (html,javascript ,css) | (To develop java based webiste)

*** There are no officially terminologies called core java, adv.java..

Jsp --> java server pages

In resume
========
Programming languages :: c ,Java
Java technologies :: JDBC,Jndi, Servlet,jsp ,...
java frameworks :: Spring ,hibernate, webservices
web technologies:: html ,css, java script and etc..
Databases :: oracle,mysql
...
...
...

=> C#, VB ,PB, D2K and etc.. alternate to JSE module to develop standalone Apps.. but their Apps are Platform(OS) dependent Apps..where as JSE module Apps are platform Independent Apps

VB :: Visual Basic
PB: Power Builder
D2k: Developer 2000(2k)

Why did u choose java to enter into software indurstry?

=> Java is platform/OS Independent
In windows OS ---> max 7 MicroProcessors at atime to imporve speed
In Lin ux OS ---> we can have max of 64 micro processor at a time to improve the the speed

=> JAva is secured
-> we can give only byte code(.class) to clients to hide the source code(.java)
-> We can encrypt .class files to stop decompilation on those files..
-> Applets do not bring virus to our computer...
-> if some tampers .class code while sending over the n/w then that .class will not execute at recieving side..

java compiled gives .class form .java (javac> built in with jdk)
java decompiler gives .java from .class (we need to install seperately)
DJ Decompiler
SJ Decompiler

=> JAva is Open source
->It is not only free, along with the installation we will get the source code..
->We can start using java for Projects development with out any license
-> we read soruce code to understand internals and to even create alternates to existing softwares..

note :: <JAVA_HOME>\src.zip file gives source code jdk apis..

=> Using Java we can develop all types of Applications like standalone Apps, websites, mobile Apps, Distributed Apps and etc..

=> offcourse , java is having more openings and more salary packages..

The App that allows to have mutiple types of Remote Clients is called Distrobuted App..
eg:: SBI App allows to perform banking transactions from Andriod mobile Apps, IOS mobile Apps, web sites , IVR (tele phone), ATM machine

JEE module J2EE (old name)
==========

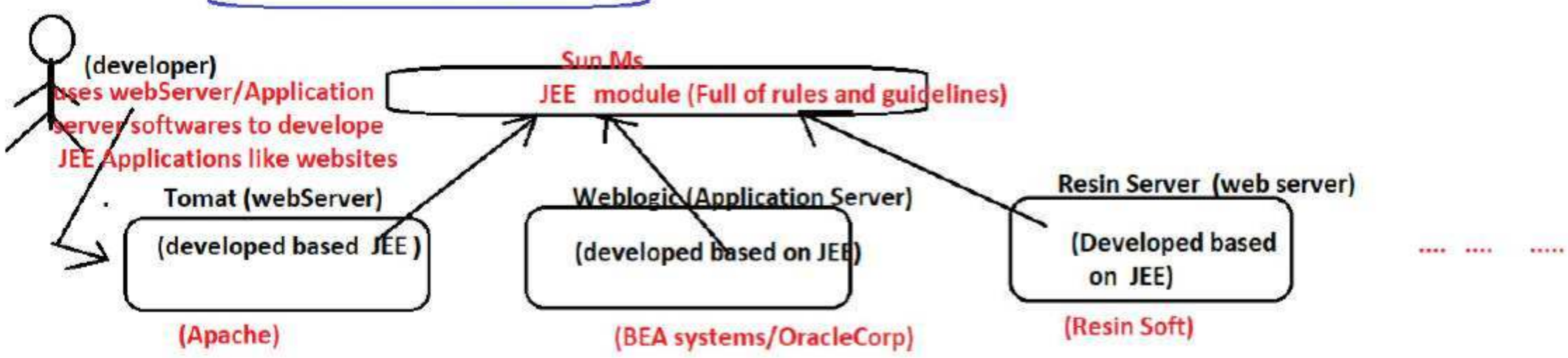
JAva Enterprise Edition (old name)
Jakarta Enerprise Edition (new name)

Latest Version : 7 /8

=> JEE is not a installble software .. It is set of technologies like servlet,jsp,ejb and etc.. acting as s/w specifications providing set of rules and guidelines to develop webServer (like Tomcat) or Applicaiton server (like weblogic) softwares...

=> Working with WebServer or Appllication softwares is nothing but working JEE module..becoz these are developed based on JEE module supplued rules and gudelines...

Application Server = web Server ++



JEE module is giving only Technologies like servlet ,jsp , EJB, JMS , Java Mail ,JPA , JTA, JAAS ane etc...

EJB --->Enterprise Java Beans (outdated)
Jsp ---> Java Server Pages
JMS -->Java Messaging Service
JTA ---> Java Transaction API
JAAS -->JAva Authentication and Authorization Service
JPA ---> Java PErsistence API

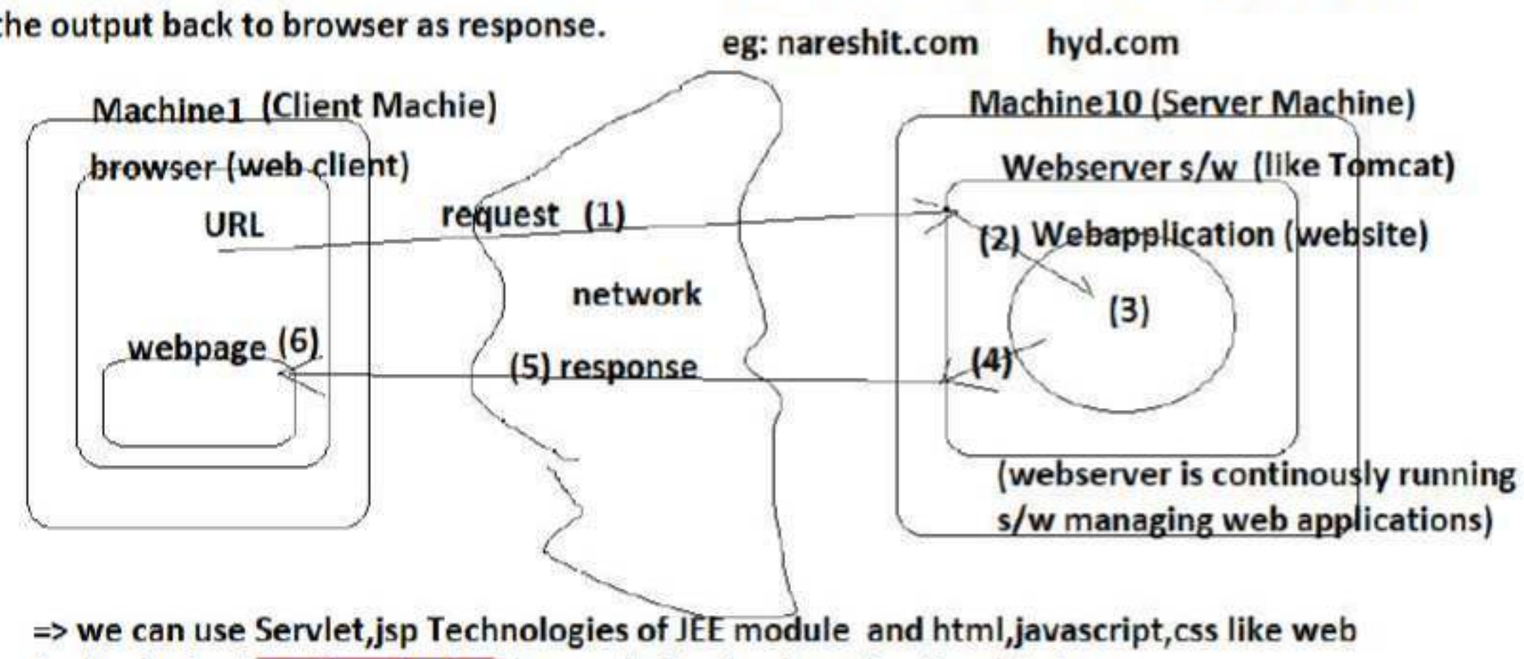
=>Using JEE module and its webServer/Application server s/ws ,we can develop Enterprise Apps like webApplications and Distribued Apps/Remoting Apps

Enterprise Applications
- 1.WebApplications (WebSites)
- 2.Distributed Applications (Remoting Applications)

Struts, Spring ,hiberante and etc.. are frameworks ant not part of Java modules (JSE,JEE,JME).. They need to be arranged seperately.

Web applications/ WebSites

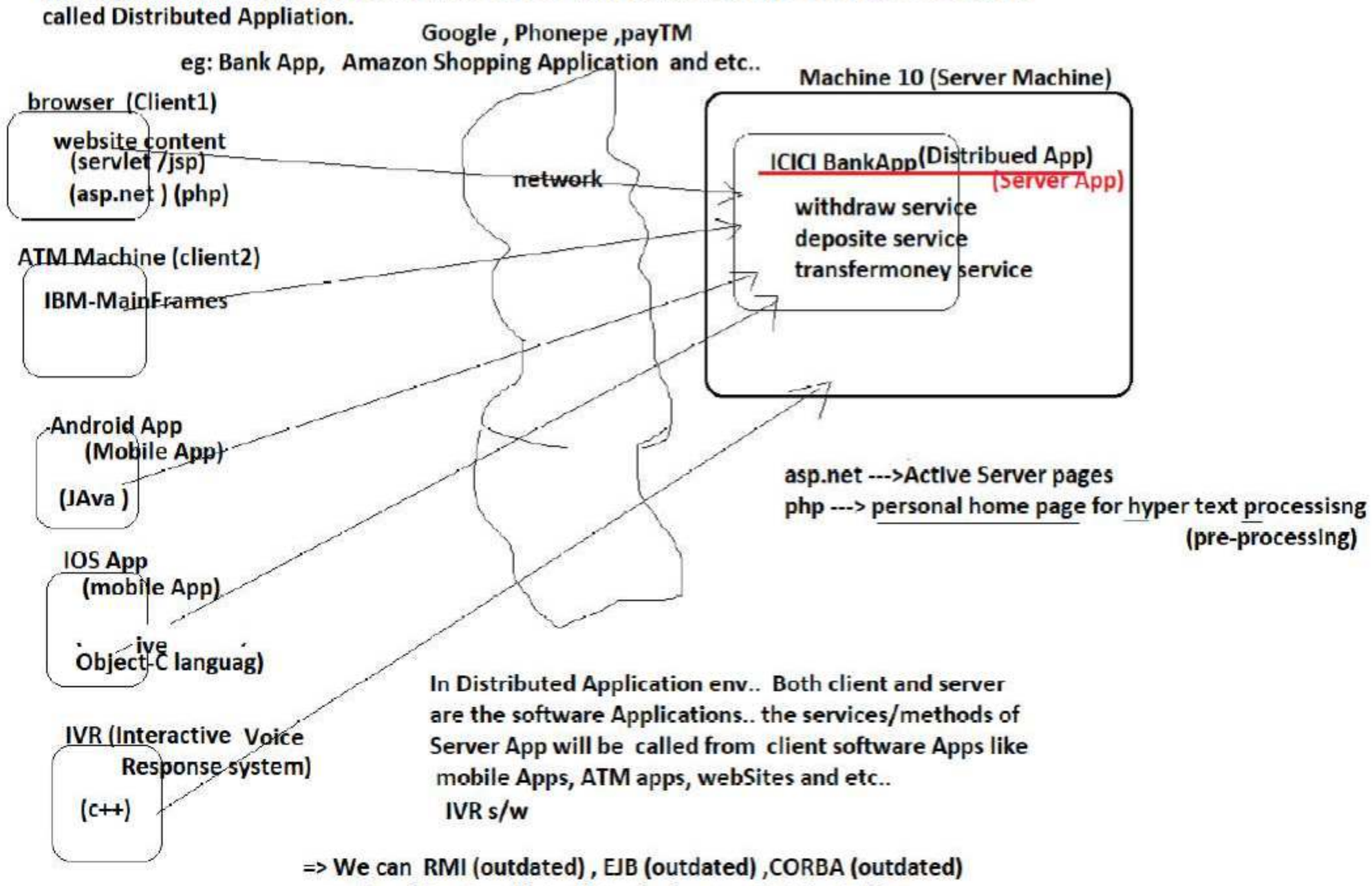
=> It is a client-server app (two-tier App) where client is browser and server is a software App having ability to take browser generated requests, processing the requests and sending the output back to browser as response.



=> we can use Servlet,jsp Technologies of JEE module and html,javascript,css like web technologies to gather to develop websites (web applications) in Java..

Distributed App /Remoting App

The application who logics/services can be accessed from different types of remote clients is called Distributed Appliation.



In Distributed Application env.. Both client and server are the software Applications.. the services/methods of Server App will be called from client software Apps like mobile Apps, ATM apps, webSites and etc..
IVR s/w

=> We can RMI (outdated) , EJB (outdated) ,CORBA (outdated) and webServices (latest) to devleope Distributed Apps ...

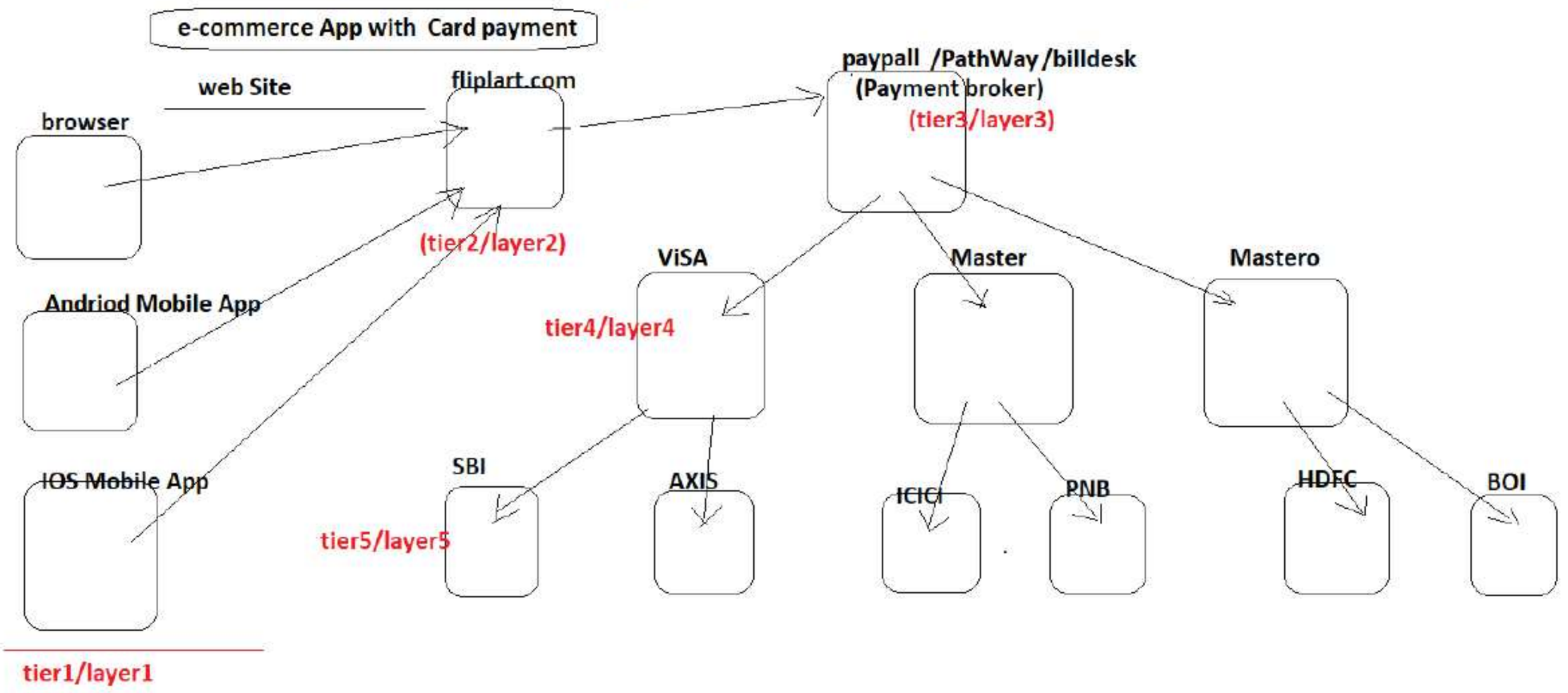
=> We can RMI (outdated) , EJB (outdated) ,CORBA (outdated) and webServices (latest) to devleope Distributed Apps ...

CORBA :: Common ORB Request broker Architecture
ORM :: Object Request broker

what is the difference b/w web application and distributed App?

web application	Distributed App
(a) Here client App is always browser s/w	(a) Here Client app is programmable s/w app developed in diff Languages/Technologies
(b) this app runs based request -repsponse model becoz browser gives the request web application and web aplication sends response to the browser	(b) It runs based on method invocations/calls bcoz Client Apps are programmable s/w Apps calling /invoking the b.methods of Server App.
(c) It is Thin Client (Browser) -Fat Server App (website)	c) It is Fat Client and Fat Server App
(d) we can use servlet,jsp technologies and Struts, JSF, Spring MVC frameworks to develop web applications	(d) We can use RMI,EJB,CORBA (TEchnologies) WebServices (frameworks) to devleope these Distributed Aplications..
(e) eg :: nareshi.com	e) Banking Apps, Google Pay,PhonePe PayTM and Paypal and etc..

An Enterprise App can be a web applicaiton or distributed app or combination of both.. Generally Enterprise Apps are n-tier Applications.. (Multi-tier App)



=>browser giving request flipkart.com is as web application.

=>flipkart App allowing Browser / IOS Mobile App/ Andriod Mobile App is like Distributed App...

=> E-Commerce Apps talking to Paypall /PathWay/BillDesk App is also a distributed App...

=>Payment broker Apps like pay pall taking to Payment gateway apps like VISA/master/masterio alos comes under distributed App development... Similary Payment gateways Apps talking to Bank Apps also comes under distributed App development...

=> The above E-comerce App with Card Payment setup is an enterprise App where one web application and multiple distributed Apps are invovled .. as n-tier Application...

We need JEE Technologies like servlet,jsp,JMS, javamail and etc.. and also by using java frameworks like spring,hibernate,webservices and etc to develop java based enterprise Applications

JME (Java Micro Edition)
====

==> It is installable s/w as mdk s/w (mdk ---> mobile development kit)
==> Latest version Is 3.x
==> It is given to develop Micro Apps and Mobile Apps

=> The App that is small in size and can be attached with various of types devices like eletrical, mechanical, automobile and etc.. devices to make them thinking and taking decisions are called are micro Apps... These are useful in Artificial Intelligence(AI) and Embedded system programming.

chips added to washing machines , chips added driver less cars, chips added to Robots and etc...

Supports AI , Embedded System programming..

=> The Apps that can run in mobile devices are called Mobile Apps...
eg:: Mobile PhoneBook , Mobile Games , Mobile Music Player and etc...

=>JME is outdated ..becoz of alternates...

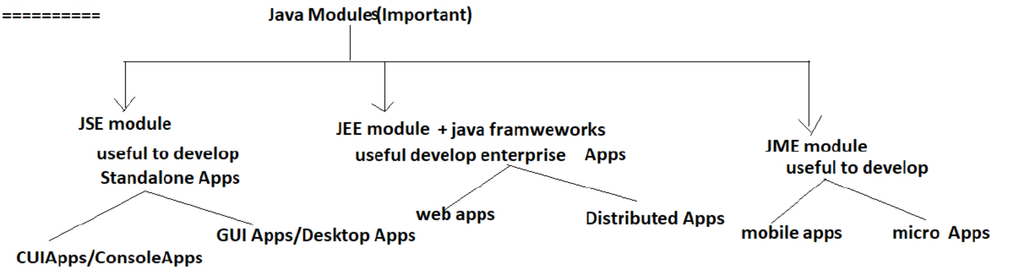
=> JME mobile Apps are outdated becoz of Andriod Apps
=> JME mico Apps are outdated becoz EmbeddedC, RTOS , VxWorks and etc.

RTOS ::Realtime Operating System..

To build career in java
==========
=> learn JSE+ JEE modules and java frameworks
they are in the form of
Core java course
adv.java java course
frameworks courses (spring with spring boot , hiberante , spring micro services , Websevices)
+
Design Patterns
+
Oracle course

+ Java Realtime Tools (10+)
+ HTML +java script +CSS

Conclusion
==========



Every S/w Project will have two Domain names

(a) Functional domain name

--> Will be decided based on the functionalaties of the project

eg:: banking domain, insurance domain , tele communication domain and etc..

(b) Technical domain name

->will be decided based on the technology in which the project is developed

eg: java , php, .net , phyton , c++ and etc..

JSE module useful to develoe desktop gaming , office automation, retail , networking and etc.. domain projects...

JEE module technologies and Java frameworks can be used to develop Banking, Insurance , Financial Services (BFSI), billing, Health Care, Travelling , inventory , e-commece and etc. domain projects e-education, social networking and etc..

JME module was used .. to develop telecommunications, Mobile Gaming, AI and etc.. domain projects..

note:: JDBC, Hibernate are not there to develop complete java apps... different types Apps can use JDBC,Hibernate to make thier Apps talking DB s/w.. and to manipulate DB table records..

Explain what is software vendor , software services company and Client Organization?

software vendor
==========

The company who creates and releases software to the market is called is software vendor company

eg:: IBM,Microsoft , Applet, Oracle corp ,Apache , Google and etc..

Software services Company
==========

=> These companies use the software released by the software vendor companies and develops software projects for client Orgnanizations based their requirements...

eg:: Infosys , wipro, accenture , CTS , Verizon , TCS and etc..

note:: IBM, Google and etc.. companies will act as both Software vendor and software services company.

for example IBM India develops software projects by gathering requirements from client organizations... where IBM-USA acts pure software vendor company

Client Organization
==========

It is the organization who give their requirements to s/w service company to develop software projects ..

eg:: State Govts, central govt, Apsrtc, TSRTC, SBI , AirBus , Indian Railway , CitiBank, Amex and etc...

Some Big Client organizations running their own software companies

eg:: UHG , WellsFergo ,JP Morgan and etc..

What is the difference b/w Software product and software services Project?

=>Software products are projects the are developed by software company and kept on open market for multiple client organizations to test and purchase...

eg:: Tally , Ms-Office , Winzip, Anti-Virus s/w , Adode Photoshop aned etc...

=>Software service Project /software project are developed software service comapanies exclusily for one client organization by gathering requirements from that client organization..

eg:: CitibBank developed by POLARIS
Amex Project developed by CTS
AirBus project developed by Verizon
and etc..

Different types of software companies
==========

(a) Prodcut based Companies

-->Develope release software product to the market

eg:: Druva , Microsoft , UHG, Wellsfargo and etc..

(b) services companies

--> Developes software projects for client organizations by gathering requirement from them..

(c) Vendor Company

-> creates and release softwares...

eg: MicroSoft, google , IBM, Apache ,Oracle corp and etc..

(d) Solution Provider companies

-> Provides hardware or software solutions to improve the exisiting business or to create new domain of business..

eg: RedBus , DropBox , Accenture , facebook and etc...

Zoom Link: https://nareshit.zoom.us/meeting/register/tJUkcuippjMuHNOae5WEul7GX-RX0xs_moJQ
Password: 274140 (Sun Day 11 am)

CaseStudy1 ::

natarazjavaarena@gmail.com

What is the difference b/w staic block and constructor?

Ans) static block class level one time executing block where as constructor is object level one-time executing block ..

When JVM loads the java class.. the static block of the class will be executed only for 1 time.. In the entire App execution the JVM Loads the given class only for 1 time.. So static block executes only for 1 time.. we use static block to intialize static variable... we place one time execution logics in static block .. like established connection with Db s/w only for 1 time irrepspective of no.of objects that are created...

```
static {
   ...
   ..
 }
```

JVM executes constructor for each object creation.. we place logic to initialize non-static variables in the constructor ... if we create multiple objects for java class.. the constructor executes for multiple times... we place object level one time execution logic in the constructor, for example if want to see every object should use seperate connection to interact with Db s/w.. then better to write logic in the constructor..

```
<Acesss modifier>  <class name> (<params>){
   ....
   ...
  }
```

Example
=======

software setup :: jdk any version (1.8+) , editplus / notepad++

In One .java file we can place mulitple class definitation.. when we compile this file multiple .class files will be generated on 1 per each class definitation basis...

=> In One .java file (source file) only one class can be taken as public class .. In this situation public class name and .java file name must match..

E:\Advjava
|---->basics
|--------->TestApp.java

int a; //default is 0
int a=0; //0 is initial value of "a"

note:: Only java compiler generaed 0-param constructor is called default constructor.. but the programmer placed 0-param constructor can not called as default constructor

In one computer we can see multiple jvms execution simultaenously.. and different jvms can have different versions...

Class.forName(".....");

|--->It is static method of predefined class java.lang.Class (class name it selt Class)

|---> This method makes underlying JVM to load the given java class dynamically at runtime.. But does not create the object for the loaded class i.e only static block of loaded class will execute... not the constructor

|---> if the given class is not to load then it throws ClassNotFoundException.. (checked Exception) which should be either catch and handle or should be declared to be thrown using "throws" clause..

eg:: Class.forName("Demo");
Class.forName("java.util.Date");

we should pass fully qualifed class name here .. (class name with package name)

```
//TestApp.java
 //class 1
class  Test
{
        //static block
        static {
                System.out.println("Test: static block");
        }

         //  0-param user-defined constructor  , not the default constructor
        public Test(){
       System.out.println("Test: 0-param block");
        }
} //Test

//class2
class Demo
{
         //static block
        static{
                System.out.println("Demo:: static block");
        }
    // constructor
        public Demo(){
     System.out.println("Demo:: constructor");
        }
}//Demo

 //main class
 public  class TestApp
 {
         static{
                 System.out.println("TestApp:: static block");
         }
         public static void main(String args[]) throws Exception{
                  System.out.println("start of main(-) method ");
                 Test t=new Test();
       Test t1=new Test();
      System.out.println("...................................");

                  Class.forName("Demo");
                   Class.forName("Demo");
                         Class.forName("Demo");
                         Class.forName("Test");

       System.out.println("end of main(-) method ");
        }//main
 }//class
 //cmd> javac  TestApp.java
 //cmd> java TestApp
```

output::
TestApp:: static block
start of main(-) method
Test: static block
Test: 0-param block
Test: 0-param block
.....
Demo:: static block
end of main(-) method

Assignments::
Q) When java does not support pointers why does it throws NullPointerException?
Q)what is the difference b/w System.out.println(-) and System.err.println(-)?

The JVM attempts to load the java class in the following the situations
==========

(a) When we class to "java" tool having main(-) method to begin the execution
cmd> java TestApp

(b) In the Process of instantiation(object creation) JVM loads the class ,if it is not already loaded..
Test t1=new Test();

(c) when we cal static method on the class name

```
String s=String.valueOf(10);
Thread t=Thread.currentThread();
Class.forName("-");
```

(d) When we pass certain class name as the argument value of Class.forName(-) method

```
Class.forName("java.util.Date");
```

(Here we are explicitly asking JVM to load the certain given class-- java.util.Date)

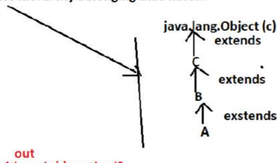
forName(-) makes jvn to load the give "java.util.Date" class dynamically at runtime

(e) if we take class/interface/annotation/enum name as the parameter type or return type method .. then they will be loaded automatically..

```
public String sayHello(StringBuffer username){
    ....
    ...
}
```

and etc..

note:: while loading any class.. the jvm also loads all the classes of inheritence hierarchy belonging that class...



out

Can we develope Java App with main(-) method?

Ans) => Upto java6 possible using static block
=> In java7 not possible
=> In Java 8/9/10 possible using static block but our App should be develop as javafx application.
=> Not possible from Java11 onwords..

note:: developing java app with out main(-) is bad pratice.. Not recomanded to do.. We learning only as the FAQ.

upto java 6 java App with out main(-) method
==========

DemoApp.java

```
public class DemoApp{
  static{
    int a=10;
    System.out.println("square value::"+a*a);
    System.exit(0);
  }
}
```

TErminates the current the process/App

```
cmd> set path=C:\Program Files\Java\jdk1.6.0_80\bin;
cmd> java -version
cmd> javac DemoApp.java
cmd> java DemoApp
```

(Success)

Java app with out main(-) method in java7
==========

DemoApp.java

```
public class DemoApp{
  static{
    int a=10;
    System.out.println("square value::"+a*a);
    System.exit(0);
  }
}
```

TErminates the current the process/App

```
cmd>set path=C:\Program Files\Java\jdk1.7.0_80\bin
cmd>java -version
cmd>javac DemoApp.java (success)
cmd>java DemoApp (error)
```

Error: Main method not found in class DemoApp, please define the main method as:
public static void main(String[] args)

Developing java app with out main(-) as javafx App in java8/9/10 version
==========

```
//DemoApp.java
public abstract class DemoApp extends javafx.application.Application
{
    static{
        int a=10;
        System.out.println("square :"+a*a);
        System.exit(0);
    }//static block
}//class
```

pre-defined abstract class having abstract methods

```
cmd>set path=C:\Program Files\Java\jdk1.8.0_31\bin
cmd>java -version
cmd> javac DemoApp.java (success)
cmd> java DemoApp (sucesss)
```

(it can java9/10 also)

There is no javafx in jdk before java8 version..

output::
square vlaue :: 100

Developing java App with out main(-) from java 11 onwords
==========

Not possible .. becoz javafx is removed from jdk from java11 onwords...

```
//DemoApp.java
public abstract class DemoApp extends javafx.application.Application
{
    static{
        int a=10;
        System.out.println("square :"+a*a);
        System.exit(0);
    }//static block
}//class
```

pre-defined abstract class having abstract methods

```
cmd>set path=C:\Program Files\Java\jdk-11.0.3\bin
cmd>java -version
cmd >javac DempApp.java
DemoApp.java:3: error: package javafx.application does not exist
public abstract class DemoApp extends javafx.application.Application
                                      ^
1 error
```

(u can also use java12/13/14 /..)

Assigment :: how to find out java version of given .class file?

Stable Java versions :::
java8 , java 11

What is the difference between System.out.println(-) and System.err.println(-)?

S.o.p(-) supports output redirection where as S.e.p(-) does not support output redirection.... by default..

```
//SysDemo.java
public class SysDemo
{
    public static void main(String args[]){
      System.out.println("corona");
        System.err.println("virus");
    }//main
}//class
//cmd>javac SysDemo.java
//cmd> java SysDemo > output.txt
```

output::
virus

output.txt
---
corona

=>use S.o.p(-) for normal debugging /output messages
=>use S.e.p(-) for catch(-) blocks related Exception messages..

API (Application Programming Interface)
====

It is no way related to java meaning, it is used having english meaning like base, platform and etc..

=> API is base the programmers to develop software Apps ... every programming language, s/w technology and framework provides API.

=> In "C" language API means set of functions that comes in the form of "header files" (.h files)
=> In "C++" langugae API means set of functions and classes that comes in the form "header files"
=> In "Java" language API means set of classes, interfaces ,enums, annotations which comes in the form of packages..

3 types of APIs
==========

a) Pre-defined APIs /Built-in APIS
-->Will come along with software
b) user-defined APIS
--->Developed by the Programmers
c) Third party APIS
-->Given by Third party vendors like java zoom , softwareTree, Apache and etc
(Here party1 ---> Programmer/Developer)
part2 ---> The s/w vendor company who is giving software language/technology/ framework

Examples java pre-defined apis
==========
utility api ---> java.util and its sub pkgs
relfection api --> java.lang.reflect and its sub pkgs
networking api ---> java.net and its sub pkgs
jdbc api (technology) --> java.sql, javax.sql and their sub pkgs
servlet api (technology) --> javax.servlet and its sub pkgs
hibernate api (framework) ---> org.hibernate and its sub pkgs
and etc..

=>In Application development we can use all 3 types of apis...

=> set of apis togather is called Library ... and these libraries in java will come as jar files...

jar files = libraries= apis = set of packages = classes+interfaces+enums +annotations

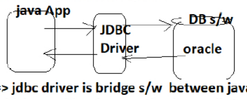
jar file
======

java archieve (java based zip /rar file)
compressed / zip/rar content

In java jar files will be used in different angles, they are

=> as zip file or rar file (To combine multiple files into single file)
=> To represent pre-defined/user-defined/thrid party apis/libraries
=> Entire java language pre-defined api comes in the form of rt.jar file

=> represents jdbc driver s/ws..



=> jdbc driver is bridge s/w between java App and DB s/w..
which capable of converting java calls to DB calls and vice-versa.
eg:: ojdbc6/7/8.jar (oracle jdbc driver s/w)

java is having
(a) Langauge :: Core java
(b) technologies:: adv.java
(jdbc,jndi, servlet,jsp ,java mail ,....)
(c) frameworks ::
spring , hibernate, webservices and etc..

=> Represents ready to release stanalone Project (will release App/Project as executable jar file)
eg:: lombok-<ver>.jar

=> Represents ready to deploy/host java web application (website)
here we work war file (a flavor of jar file)
War is a jar files representing java based website..
war --> web applicaiton archieve

=> represents EJB Comps (Distributed Apps)

and etc...

note:: Everyy Api/library comes in the form jar file.. but we can not say every jar file is an api/library becoz jar files even represent jdbc driver s/w, standaline projects , web sites and etc...

=>To create our own jar file . we can use the jdk supplied tool called "jar"
(avaialbe in <java_home>\bin directory.)

To create jar file
==========

E:\advjava
|---->jarDemo
|--->a.txt ,b.txt

"." -->current directory
".." --> parent directory

E:\advjava\jarDemo>jar cf nit.jar .

all the content (both files and subfolders) will be added nit.jar file having compressed sizes)

c--> create archive file
f-->specify archive file name

E:\AdvJava\JarDemo>jar cvf nit.jar .
added manifest
adding: a.txt(in = 39) (out= 33)(deflated 15%)
adding: b.txt(in = 52) (out= 32)(deflated 38%)

v---> verbose mode (detailed info)

Every jar file creation automatically gets manifest.mf in META-INF folder having description about current jar file..

note: by default every jar file is not executable file.. we need to make it executable files.. with extra content added to jar files and manifest.mf file..

note:: we can see the content and extract jar files using winzip or winrar

To see the content jar file (use winzip or winrar)
==========

E:\AdvJava\JarDemo>jar tf nit.jar
META-INF/
META-INF/MANIFEST.MF
a.txt
b.txt

E:\AdvJava\JarDemo>jar tvf nit.jar
0 Wed Jul 15 17:19:38 IST 2020 META-INF/
68 Wed Jul 15 17:19:38 IST 2020 META-INF/MANIFEST.MF
39 Wed Jul 15 17:17:26 IST 2020 a.txt
52 Wed Jul 15 17:17:38 IST 2020 b.txt

t--->table of content...

To add new file to the existing jar file (Updating the jar file)
==========

E:\AdvJava\JarDemo>jar uvf nit.jar 123.txt
adding: 123.txt(in = 452) (out= 411)(deflated 9%)

u--->update the archive file..

E:\AdvJava\JarDemo>jar tf nit.jar
META-INF/
META-INF/MANIFEST.MF
a.txt
b.txt
123.txt

To extract specific file from jar file
==========

E:\AdvJava\JarDemo>jar xvf nit.jar 123.txt
inflated: 123.txt

x ---> Extract from archieve

To extract all the content form jar file
==========

E:\AdvJava\JarDemo>jar xvf nit.jar
created: META-INF/
inflated: META-INF/MANIFEST.MF
inflated: a.txt
inflated: b.txt
inflated: 123.txt

note:: we can not delete specific file or files or all files from jar file.. but we can delete total jar file

what is the difference between PATH and CLASSPATH?

PATH
=====

=> It is DOS /Windows command .. So it can be used while working all softwares that are running in windows/DOS computer... This command is not java specific command.
=> In order execute .exe , .bat , .cmd files certain location from any location of that computer with out copying files.. , we need to add the orginal location of those files to PATH env.. variable...

exe file --->executable file
bat file --> batch file
cmd file ---> command file (same as batch file windows)

batch (.bat) file is useful to create single command by combining multiple commands..

```
run.bat
--------
 date
 time
 ver
 dir
```

```
cmd> run
cmd> run.bat
```

here "run" ,"run.bat" acts as single command having multiple commands execution internally..

Problem:
========

```
E:\advjava
      |---->PATHDemo
                |--------->run.bat
```

```
run.bat
--------
 date
 time
 ver
 dir
```

```
E:\Advjava\PATHdemo>run   (success)
                    >run.bat  (sucess)
```

E:\> run (error)
=> Bad command or file name (old) (or)
=>run is not an internal or external command or operable program or batch file (new)

E:\Advjava> run (error)

C:\> run (error)

note:: we able execute run.bat file only from its oginal location... not from locations...

Solution1:: (Not Recomanded)
==========

copy run.bat file other locations .. where u want to execute... this is not recomanded.. becoz when copy file to other locations.. memory will be wasted for the same file..

Solution2:: (Recomanded)
==========

Add the orginal location of run.bat file (E:\advjava\PATHDemo) to PATH env.. variable...

This pc ---> properties ---> adv sys settings ---> env.. variables ---> user/sys variables

variable name :: PATH
value :: E:/advjava/PATHDemo;<old vlaues>;.
-->ok -->ok -->ok.

c:\>run (success)
d:\>run (success)
e:\advjava>run (success)
e:\advjava\PATHDemo>run (success)

user env.. variables are specific to currently logged in windows user.. where as system env.. variables visiable to all the windows user of computer...

All java tools like javac ,java , javap and etc.. are .exe files of <java_home>\bin directory.In order to use them from location of computer toward compilation and exection of java code... we need add <JAVa_home>\bin directory PATH env.. variable...

variable name ::PATH
value :: C:\Program Files\Java\jdk1.8.0_31\bin;<old value>;.

Explain diff ways of reading inputs from enduser?

CLASSPATH
==========

=>It is purely java based env.. variable.. i.e it can be used only in java env.. not in all other places
=> if Java App uses user-defined apis or third party apis (other than jdk apis) then those apis related jar files or directories must be added to CLASSPATH env.. variable.. in order to make java tools like javac ,java and etc.. recognizing and using those apis..

Problem::
=========

User-defined Api (WishAPI)

```
F:\CPATHDemo
        |------>WishMessageGenertor.java
        |----->com.nt.basics
                |---->WishMessageGenerator.class
```

WishMessageGenerator.java

```
package com.nt.basics;
public   class WishMessageGenerator{

  public String sayHello(String user){
      return "Good Morning ::"+user;
    }
}
```

F:\CPATHDemo>javac -d . WishMessageGenerator.java

Main Application(Which wants to use WishApi)

```
E:\advjava
    |---->MainApplication.java   (Application)
```

MainApplication.java

```
import com.nt.basics.WishMessageGenerator;
public class  MainApplication{

  public static void  main(String args[]){
      WishMessageGenrator generator=new WishMessageGenrator();
       String  result=generator.sayHello("raja");
        S.o.p(result);
  }
}
```

E:\advjava>javac MainApplication.java (error)

=>Can not find symbols "com.nt.basics", "WishMessageGenerator", "sayHello()"

Soultion:: Add the location of "com.nt.basics" pkg that is (f:\CPATHDemo) to CLASSPATH env.. variable to make java tools like javac,java and etc.. recognizing and using package and its content (com.nt.basics and its classes) from that location..

This PC ----->properties ------> adv sys settings ---> env. variables ---> user/sys variables--->

variable name:: CLASSPATH
value :: F:/CPATHDemo;<old values>;.
-->ok ->ok -->ok..

E:\advjava> javac MainApplication.java (sucess)
E:\advjava> java MainApplication (success)

Conclusion:: To use Java In our computer we need add <java_home>\bin directory to PATH env.. variable... Similarly to make java Apps working with user-defined ,thrid party apis then we need to add their locations to CLASSPATH Env.. variable...

note:: we can not add java packages ,apis location to PATH ...env.. variable.. becoz java tools like javac,java always looks in CLASSPATH env. varaiable .. not in PATH env.. variable..

PReparing jar file representing user-defined api
==========

F:\CPATHDemo>jar cvf wishapi.jar . wishapi.jar (representing user-defined api)

```
added manifest
adding: com/(in = 0) (out= 0)(stored 0%)
adding: com/nt/(in = 0) (out= 0)(stored 0%)
adding: com/nt/basics/(in = 0) (out= 0)(stored 0%)
adding: com/nt/basics/WishMessageGenerator.class(in = 504) (out= 317)(deflated 37%)
adding: WishMessageGenerator.java(in = 182) (out= 136)(deflated 25%)
```

if the user-defined or third party apis are there in the form of jar files...then we need add jar files names and locations to CLASPATH env.. variable.. inorder make java tools using them..

variable name ::: CLASSPATH
value :: F:\CPATHDemo\wishapi.jar;<old value>;.

E:\Advjava>javac MainApplicaiton.java (success)
e:\advjava>java MainApplication (sucess)

note: Upto Java8 we can also copy jar files that representing user-defined or third party apis to <java_home>\jre\lib\ext folder... (we can not place directories here)

eg:: copy F:/CPATHDemo/wishapi.jar file to <java_home>\jre\lib\ext folder ..

note:: The content "ext" folder will be used by "ExtensionClassLoader" ... But ExtesionClassLoader is removed from "java9" onwords.. So there is no "ext" folder in the jdk installation from java9...

Q) What the difference b/w adding values to CLASSPATH and adding values to ext folder ?

important points on env.. variables
==========

a) Env.. variables are not case-sensitive
b) multiple values added to env.. variables must be seperated with ";"
c) "." ,".." symbols added to Env.. variables represent "current directory", "parent directory" respectively..
d) It is recomanded to add new values to "env.. variables" at the begining...
e) values set to env variables from cmd prompt will remain temporary.. i.e we will loose them once cmd prompt closed.. where as the values kept in "This PC" env.. variables will remain perminent..
f) Modifications done in env.. variables will not reflect in old cmd prompts.. so we must open new cmd prompts..
and etc.

JDBC (Java Database Connectivity)
(old days)

JDBC --> No abbrivation , It is a trademark
(as on today)
TIME Inistitute
T.I.M.E

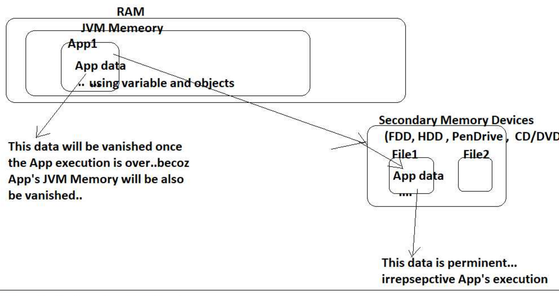
What is persistence?

It is the process stroring and managing data for long time is called Persistence.. for this we need to use Files , DB s/w and etc..

Need of Persistence

--> The Data stored in Variables , objects , collections, arrays and etc.. use stack,heap memory of JVM memory which is part of RAM .. Once the Application execution is over.. the JVM memory of the App will be vanished becoz RAM is a temporary memory.. i.e we can not use App data across the multiple executions of same App or diff Apps...

To overcome this problem .. we need to write (persist) App Data to Secondary Memory Devices like FloppyDisk, CD, DVD, HardDisk,pen drive and etc..... by taking the support files and Db s/w..



Imp terminologies related to Persistence

(a) Persistence
(b) Persistence Store
(c) Persistent Data
(d) Persistence operations
(e) Persitence Logic
(f) Persisttence Technologies/frameworks
(Data Access TEchnologies /Frameworks)

PErsistence
==========
=>It is the process of saving and managing data for long time..

Persistence store

==> The place/ software where the data can be saved and managed for long time
==>It is also Data Storage Unit / Data storage software.

eg:: Files , DB s/w , Google drive , One Drive , Cloud , DropBox and etc..
(Core) Extensions

Persistent Data
==========
=>The data of Persistence store is called Persistent data...
eg: file content , Db table Records..

persistence operations
==========
insert,update, delete and select operations performed on the persistent data are called Persitence operations.. These are called as CURD/CRUD/SCUD operations..

CURD/CRUD

C---->create (insert)
U--->Update (modify)
R--->Read (select)
D---->Delete (removed)

SCUD

S ----->Select (Read)
C----->Create
U---->Update
D---->Delete

Every Service sector project like Banking App, TicketBooking , E-Commerce and etc.. should deal with CURD Operations..

Persistence logic
==========
==>It is the logic /code using which we perform persistence operations on persistent data..

eg:: jdbc code, hibernate code , I/O streams code and etc...

Persistence Technology/framework
==========
=>It is the technology or framework using which we develop Persitence logic.. These also called DataAccess technologies/ frameworks..

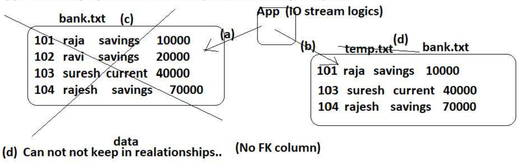
eg: JDBC (Technology), hibernate (framework), Spring JDBC(framework), Spring ORM(framework) , Spring Data (framework)
IOStream (part of java language)

=>Persistence Technology/framework is given for devleoping persistence logic to perform persistence operations on the persistent data of Persistence store..

Java App ----------I/o Streams----------> Files (Flat files)
The files that software and hardware independent are called flat files like txt files , csv files ,xml files and etc..
.c, .exe, .doc,.class ,.dll and etc.. are not flat files...

Java App ----------JDBC----------> RDBMS DB s/w (oracle,mysql,postgresql and etc..)

Limitations with files as Persistence stores
==========
(a) No Security..
(b) Can not store huge amount data ..
(c) No SQL Support
(d) It is very complex to retrieve data by applying multiple conditions..
(e) No Constraints Support , So data redundency (duplications) problem may occur
(f) Performing update and delete operations is very complex..



(d) Can not not keep data in realationships.. (No FK column)

(e) Comparing and merging of data is very complex..

and etc...

To overcome these Problems use DB s/w as the Persistence stores..

Conclusion
==========
if the App is small size App and generating little amount of data to persist then go for files as the Persistence stores
eg:: Mobile Apps, mobile games, Desktop games and etc..

if the App is medium scale or larget scale App generating huge amoutn of data to persist then go for DB s/w as Persistence store..
eg:: Banking Apps, E-Commerce Apps, Financial SErvices Apps and etc..

No SQL Dbs/w
==========
1-->employee with 20 details
2-->employee with 30 details
3---> empplloyee with 4 details
4---> employee with 10 details

DB s/w

Employee having 30 cols..

(DB s/ws are not good unstructured Data dyamic Data)

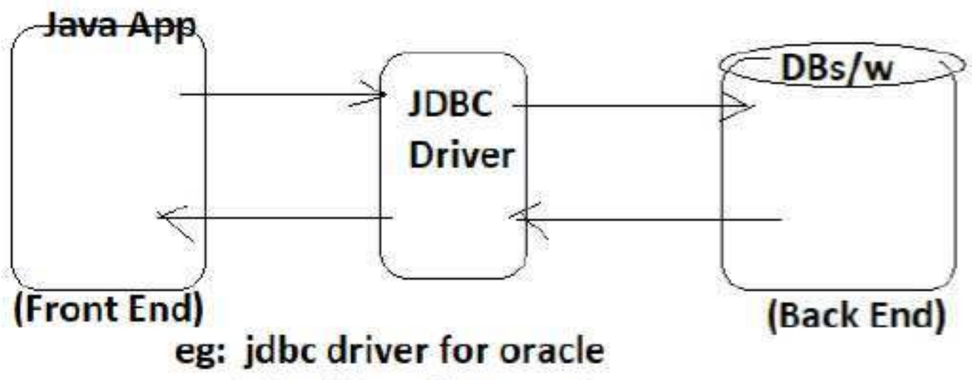
To overcome these problems we got NoSQL DB s/w... which allows to store data in different formats like docs ,graphs and etc.. but not as rows and cols..
eg:: MongonDB , Neo4j and etc...

Java App ----------NoSQL API----------> NO SQL Db s/w
(MongoDB API
Neo4j API
and etc..)
(MongoDB
Neo4J
ande tc.)

note::: JDBC or IO Streams are not given to talk NOSQL Db s/w.... they need seperate their own apis...

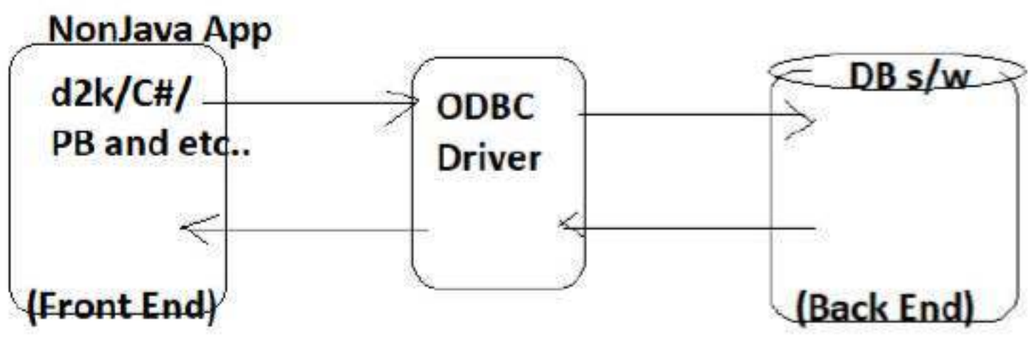
JDBC driver
==========

JDBC driver s/w is bridge between Java App and DB s/w converting java calls (instructions) to DB calls and DB calls to java calls ..



eg: jdbc driver for oracle
jdbc driver for mysql
jdbc driver for postgresql

Device drivers act as bridge b/w
Operating System and physical Devices
eg:: Printer drivers , Sound Drivers
and etc...



ODBC means
Open Database connectivity

=>ODBC driver s/w act as bridge b/w Non-Java App and DB s/w.

eg:: odbc driver for mysql
odbc driver for oracle
odbc driver for postgresql

note:: Java Apps, Non-Java Apps from where we interact with Db s/w are called front end Apps.. and DB s/w is called BackEnd..

note:: In any App/project what an end user can see and operate is called front end.. what an enduser can not see and can not operate but it is part of App/project and responds to the instructions given by front end is called BackEnd

When all non-java Apps are using ODBC Driver to interact with DB s/ws. why Java Apps are looking for seperate JDBC drivers?

a) ODBC drivers are given in "C" language taking the support of pointers.. but java does not support pointers
b) Converting Pointer notation logic to non-pointer notation logics and using ODBC drviers in Java Apps degrades the performence..
c) ODBC drivers are developed in "C" language which is Platform dependent.. So pairing ODBC driver with Platform Independent Java Apps kills Java Apps Portability i.e Platform independent behaviour..

To overcome all these problems.. Java Apps are using Java Based JDBC driver s/ws...

we can get ODBC drivers from diff vendords
==========
a) ODBC group (32+ companies like microsoft , IBM ,Oracle corp and etc..) (Best)
b) MicroSoft
c) DB vendors
d) Third party Vendors

We can JDBC Drivers from diff vendors
---
a) Sun Ms (Initial few days)
b) DB vendors (Best)
c) Third party vendors

natarazjavaarena@gmail.com

note:: Most of ODBC drivers and JDBC drivers are free...

What is the diff b/w Programming language and S/w Technology?

Progamming language
==========
=>It is directly installable s/w acting as raw material by providing basic features that are required in Application development..

=>It defines syntaxes(rules) and semantics(structure) of the programming by supplying compilers and interpeters.

=> Programming languages are bsse create s/w technologies , DB s/w , Operating systems, Device Drivers , Tools , frameworks and etc..

c,c++,java, c# , ada, scals , groovy and etc..

JVM based Languages
java ,scala, groovy , kotlin , go and etc..

All these languages gives .class files after using their compilers.. but those .class files can be executed using same jvm..

Software technology
==========
It is a software specification that gives bunch of rules and guidelines in the form of apis to develope implementation software by using one or another programming language..

=>S/w technologies are not installable , but the s/w technology based implementation s/ws are installable or arrangable .. Working with these implementation s/ws is nothing but working with s/w technologies..
eg:: JDBC is s/w specification that providing bunch rules and guidlines in the form of jdbc apis (java.sql ,javax.sql and their pkgs) to develope JDBC driver s/ws .. by using java language .. JDBC is not installable ,but JDBC based JDBC driver s/ws are arrangable (like jars) .. Working JDBC drivers is nothing but working JDBC Techonology...

eg:: JDBC, Servlet , JSP, EJB, Java mail,JTA ,JAAS and tc...

eg:: JDBC, Servlet , JSP, EJB, Java mail,JTA ,JAAS and tc...

JTA : Java Transaction API
JAAS :: Java Authentication and Authorization service
EJB:: Enterprise Java Beans..

Upto java 7
==========
Java Technologies give interfaces representing rules, concreate classes representing guidlines and abstract classes representing both rules and guidelines..

=>Interfaces contains only method declarations (rules)
=>concrete classes contain only method concrete method definitations (guidelines)
=>abstract classes contain both abstract methods (rules) and concreate methods (guidelines)

Form Java8 onwords
==========
Java Tehnology gives interfaces ,abstract classes representing both rules and guidlines, also gives classes representing only guidlines...

note:: java8 onwords interfaces can have default, static method definitations along with method declarations (abstract methods)...

Every Technology will give api in the form packages .. having the above saided classes, interfaces and absttract classes representing rules , guidlines...

Two types of S/w technologies

Open Technologies | Propritietary Technologies

Open technologies
==========
Here the rules and guidlines of technology are open to all s/w vendor companies to develop implementation s/ws...

eg:: All Java Technologies like JDBC, Servlet , JTA and etc....

note:: Based on JDBC Technology rules and guidlines there are 100+ jdbc driver s/ws for various Db s/ws given by different s/w venedors...

Propritietary Technologies

Here the rules and guidelines of s/w technology are specific to vendor company and only that vendor company is allowed to develope implementing s/ws...
eg:: All microsoft technologies like asp.net and etc...

Sun Ms
[JDBC Technology javing JDBC API] (Open Technology)
-->Gives rules and guidlines to develop jdbc driver s/ws..

Vendor1 (Oracle corp)
=>Created and released jdbc driver s/w for oracle

Vendor2 (Devx)
=>created and released JDBC driver s/w for mysql

Vendor3 (Nataraj soft)
=>created and realesed JDBC driver s/w for oracle, mysql

MicroSoft
Asp.net (Proprietary Technology)
[Gives rules and guidlines to develop WebServer]

Vendor1 (MicroSoft) (No others are allowed)
=>Created and released IIS (Internet Information server) as WEbSErver s/w.

note:: Since multiple Vendors of open Technology are giving their implementing s/ws .. based on the common rules and guidlines open technology..So the way we work with multiple implementing s/ws given by multiple vendors will be the same..

=>Since All jdbc driver s/ws are given based on the common rules and guidelines jdbc technology.. So the way we work with all jdbc driver s/ws will remain same.. i.e if we know how to work with one jdbc driver s/w.. we can use that knowledge work with other jdbc driver s/w...

What is JDBC?
It is a open java based Technology/specification given by Sun Ms in JSE module providing bunch of rules and guidlines in the form of jdbc api to create JDBC driver s/ws for different DB s/ws..

JSE :: JAva Standard Edition..

jdbc api packages (latest 4.x)
- java.sql pkg
- javax.sql pkg ,
- javax.sql.rowset pkg,
- javax.sql.rowset.serial pkg

Core pkgs | extended pkgs

java.sql pkg
- classes
  - DriverManager
  - Types
  - Date
  - TimeStamp
  - .
  - .
- interfaces
  - Connection
  - Driver
  - ResultSet
  - Statement
  - PreparedStatement
  - CallableStatement
  - DatabaseMetaData
  - ResultSetMetData
  - .
  - .
  - .

extended..

javax.sql pkg
- Classes
  - StatementEvent
  - ConnectionEvent
  - RowSetEvent
  - .
  - .
- interfaces
  - RowSet
  - DataSource
  - PooledConnection
  - .
  - .
  - .

note:: Programmers/ developers are not resposible to implement the interfaces given by jdbc api pkgs.. It is the responsibility of the vendor companies who actually creates the JDBC driver s/ws based JDBC Technology...

What is JDBC driver s/w?

=>It is bride between Java App and Db s/w..
=> It is collection classes given vendor company implementing jdbc api interfaces(rules) and using jdbc api guidelines (classes) having logic to establish the connection with ceratain Db s/w and to send and execute SQL queries in that Db s/w..
=> At the end the Vendor companies packs all these implementation classes into single jar file and they release the jar file to the market as jdbc driver s/w...

sun Ms/Oracle corp
jdbc api
|--->100 interfaces
|--->30 classes
(rules and guidelines) (rt.jar)

Vendor1 (oracle corp) (for oracle)
Giving 100 clases implementing 100 interfaces of jdbc api.. having logic to establish connection with Oracle Db s/w and having logic to send and execute SQL queries in oracle DB s/w
⇩
pack all these classes into jar file (ojdbc6/7/8.jar) and releases to the market as jdbc driver s/w for oracle

Vendor2 (Devx) (for mysql)
==========
Giving 100 clases implementing 100 interfaces of jdbc api.. having logic to establish connection with mysql Db s/w and having logic to send and execute SQL queries in mysql DB s/w
⇩
pack all these classes into jar file mysql-connector-java.jar and releases to the market as jdbc driver s/w for mysql

Developer1 (Working for Wipro)
App1.java (Wants to interact oracle DB s/w)
==========
=>downloads ojdbc6.jar file from internet and adds classpath
=> Activates and uses jdbc driver s/w for oracle
=> writes persistence logic to perform CURD Operations on oracle Db s/w..

Developer2 (Working Infosys)
==========
App2.java (wants to interact with MySQL DB s/w)
=> downloads mysql-connector-java.jar file from internet and adds to the classpath
=> activates and uses jdbc driver for mysql
=>writer persistence logic to pefrom CURD operations on mysql DB s/w..

Different Phase s of Software/Project Development (With respect to developers)
==========

(a) Development (Coding) | (Mysql DB s/w)
(b) Testing (Checking the code)
(c) releasae & Production (Giving to project to client organization and client using that project) | ORacle/ Mysql Db s/w
(d) Maintenance/Support (Fixing the bugs and issues)

JDBC driver s/w
|--->Collection of classes implementing various interfaces jdbc api pkgs and released to the market as jar file..

=> Every JDBC driver s/w is identified with its jdbc driver class name i.e even though there 100+ class names in jdbc driver s/w .. we can activate and use jdbc driver s/w in our Java Apps by just using its jdbc driver class name..

=> The java class given by jdbc driver s/w implementing java.sql.Driver (I) directly or indirectly is called jdbc driver class name

In ojdbc6.jar (jdbc driver s/w for oracle)
⇩
oracle.jdbc.driver.OracleDriver (c) ---> jdbc driver class name
pkg name — jdbc driver class implementing java.sql.Driver (I) directly or indirectly..

In mysql-connector-java-<ver>.jar (jdbc driver for mysql)
⇩
com.mysql.cj.jdbc.Driver ----> jdbc driver class name
pkg name — jdbc driver class implementing java.sql. Driver(I)

=>In any Java App we can activate any jdbc driver s/w either by loading jdbc driver class or by creating object for jdbc driver class..

App1.java (wants to interact with Oracle Db s/w)

=>download ojdbc6/7/8.jar file from internet and add classpath
=> Activate jdbc driver s/w
Class.forName("oracle.jdbc.driver.OracleDriver"); (loading of jdbc driver class)
(or)
oracle.jdbc.driver.OracleDriver obj=new oracle.jdbc.driver.OracleDriver(); (object creation)
=> use jdbc driver s/w to devleop the persistence logic (CURD operations)

For every Db s/w seperate jdbc driver s/w is avaiable.. and Every jdbc driver s/w is identified with unique jdbc driver class name..

10 vendors
|-->10 jdbc drivers s/ws
|-->for same oracle DB s/w

we will be having 10 unique jdbc driver class names here..

App2.java (wants to interact with mysql Db s/w)

=>download mysql-connector-java-<ver>.jar file from internet and add classpath
=> Activate jdbc driver s/w
Class.forName(" com.mysql.cj.jdbc.Driver "); (loading of jdbc driver class)
(or)
com.mysql.cj.jdbc.Driver obj=new com.mysql.cj.jdbc.Driver(); (object creation)
=> use jdbc driver s/w to devleop the persistence logic (CURD operations)

(mysql-connector-java-8.0.2.jar)
https://mvnrepository.com/artifact/mysql/mysql-connector-java/8.0.21 --> for mysql jdbc driver s/w

C:\oraclexe\app\oracle\product\11.2.0\server\jdbc\lib ---> gives ojdbc6.jar file
(from oracle 11g installation)

oracle10g ---> ojdbc14.jar
oracle11g ---> ojdbc6.jar
oracle12c ---> ojdbc7.jar
oracle13c++ ---> ojdbc8.jar

=>JAva compiler is given (javac) to generate byte code(.class) from soruce code (.java)
(Built-in with jdk)
=>Java Decompilers are given to get source code (.java) from byte code (.class) .. we need to arrange decompilers seperately or use online decompilers...

To use java decompiler ---> go to decompiler.com ---> choose and upload either .class file or jar file having .class files and get the source code...

java.sql.Driver (I)	java.sql.Driver (I)
↑ implements	↑ implements
oracle.jdbc.driver.OracleDriver(c)	com.mysql.cj.jdbc.Driver(C)
(in ojdbc6/7/8.jar)	(In mysql-connector-java-<ver>.jar)

=>JDBC driver s/w is bridge b/w java App and Db s/w
=> Every JDBC driver s/w comes in the form jar files having bunch of classes implementing the interfaces of jdbc api pkgs (java.sql , javax.sql and thier pkgs)
eg: ojdbc6/7/8.jar (jdbc driver s/w oracle)
eg: mysql-connector-java-<ver>.jar (jdbc driver s/w mysql)

=> Every JDBC driver s/w is identified with its jdbc driver class name .. by using this class name in our app we can activate and use jdbc driver s/w..

=> The java class that implements java.sql.Driver(I) is called jdbc driver class and it is unique class name for every jdbc driver s/w...

In ojdbc6/7/8.jar (jdbc driver s/w for oracle)
|----> jdbc driver class name:: oracle.jdbc.driver.OracleDriver
pkg name class name implementing java.sql.Driver (I)

In mysql-connector-java-<ver>.jar (jdbc driver s/w for mysql)
|---->jdbc driver class name :: com.mysql.cj.jdbc.Driver
pkg name class name implementing java.sql.Driver(I)

java.sql.Driver (I)
↑ implements
oracle.jdbc.driver.OracleDriver(c)

java.sql.Driver(I)
↑ implements..
com.mysql.cj.jdbc.Driver(c)

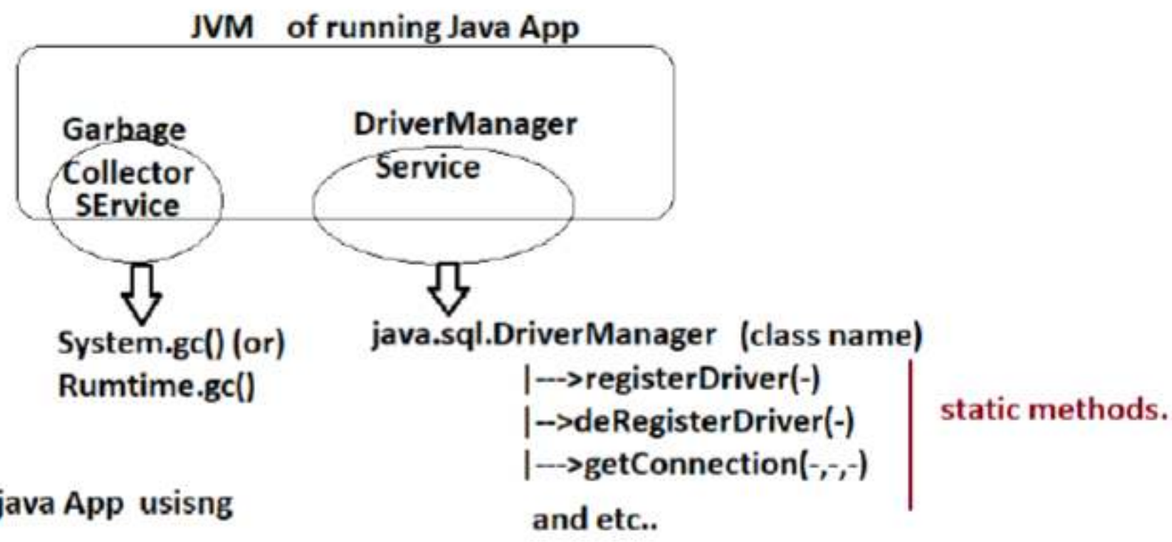
What the difference b/w Driver (I) , driver class and driver s/w in jdbc?

Ans) => jdbc driver s/w is bridge b/w java App and DB s/w .. and comes in the form of jar file
=>Every Driver s/w is identified , can be activated and used by using jdbc driver class name
=> The java class that implements java.sql.Driver(I) is called jdbc driver class..

DriverManagerService
==========

=> In the execution of every Java App lots of service will be starteed internally.. like GarbageCollector service and DriverManager service....

=> Garbage Collector service is useful to destroy the objects in java App
=> DriverManager Service is useful to manage set of jdbc driver s/ws...
=> we can access Gargbage collector service in our java App usisng System.gc () , Runtime.gc() methods
=> we can access DriverManager service in java App using various method java.sql.DriverManager class...



note:: In order to use jdbc driver s/w in our Java App , it must be placed/registered with DriverManager service .. with the support of java.sql.DriverManager class...
Registering JDBC driver s/w with DriverManagerService is nothing keeping JDBC drvier class object in DriverManager service...

eg1 (Registering oracle jdbc driver s/w with DriverManagerService)
==========

```
//create jdbc driver class object
oracle.jdbc.driver.OracleDriver driver=new oracle.jdbc.driver.OracleDriver();
//register jdbc driver s/w with DriverManager service..
DriverManager.registerDriver(driver);
```

static method

eg2: (Registering mysql jdbc driver s/w with DriverManager service)
==========

```
// create jdbc driver class object
com.mysql.cj.jdbc.Driver obj=new com.mysql.cj.jdbc.Driver();
//register jdbc driver s/w
DriverManager.registerDriver(obj);
```

note: if java App wants to talk with only one DB s/w then we need to register only one JDBC driver s/w. with DriverManager service. (eg: transfering money b/w two accounts of same bank)
note: if java App wants to talk with more than one DB s/w then we need to register multiple JDBC driver s/ws with DriverManager service. (eg: transfering money b/w two accounts of two different banks)

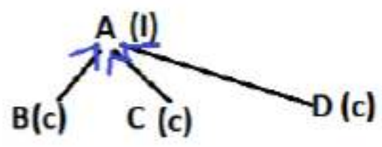
Signature of registerDriver(-) method of DriverManager class

```
public static void registerDriver(java.sql.Driver driver) throws SQLException
```

(Interface)

Since all jdbc driver s/w are given their jdbc driver class names by implementing java.sql.Driver(I) directlry or indirectly.. So we can pass any jdbc driver class object as the argument value here..

alterts caller to handle the exception while calling the method



3 imp points on method parameter types

(a) if java method parameter type is an interface , then we can call that method having any one implementation class obj of that interface as an argument value..

(b) if java method parameter type is an abstract class, the we can call method having any one sub class object of that abstract class..

(c) if the java method parameter type is concrete class, then we can call method eitther with concrete class object or with one sub class obj of that concrete class..

```
public void m1( B b){
..
}
```

m1(new B()) ; valid
m1(new C()); invalid
m1(new D()) ; invalid
Tight coupling with class B

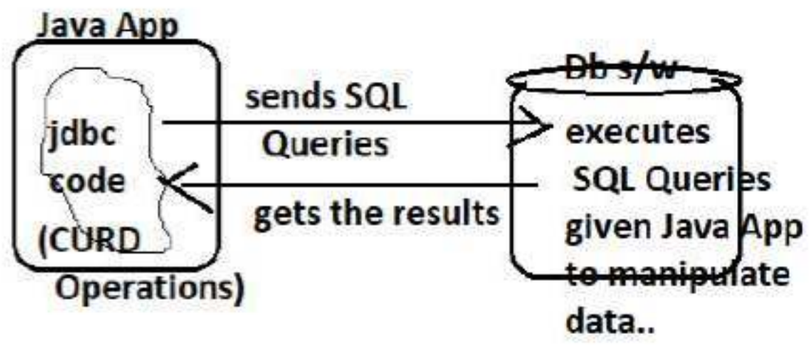
```
public void m1 (C c){
..
}
```

m1(new B()) ; invalid
m1(new C()); valid
m1(new D()); /invalid
Tight coupling with class C

```
publc void m1(A a){
...
..
}
```

m1(new B()) ; valid
m1(new C()); valid
m1(new D()); valid
(Loose coupling)

Standard steps to develop to JDBC App (java App with JDBC Persistence logic)



step1) Register JDBC driver s/w with DriverManager service..
(To activate and use JDBC driver s/w)

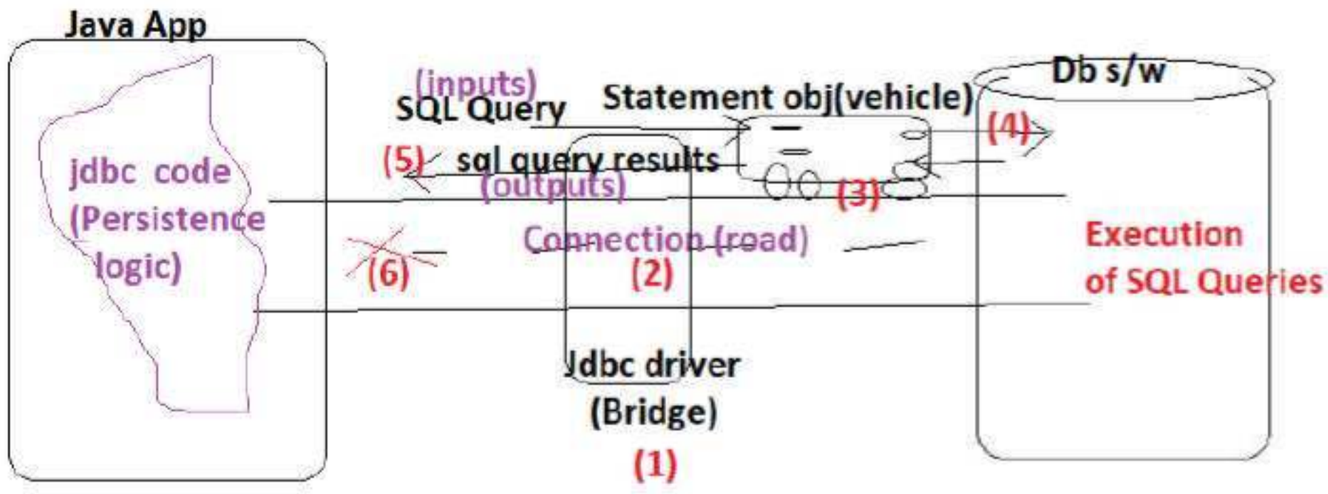
step2) Establish the connection with DB s/w from Java App by using the jdbc driver s/w that is there with DriverManager service
(It is like road b/w Java App and Db s/w)

step3) Create STatement object
(It acts vehicle to send inputs (SQL queries) to Db s/w from Java App and to gather SQL Query Results (outputs) from DB s/w to java App)

step4) Send and execute SQL Queriues in DB s/w using Statement object

step5) Use the Statement to gather SQL Query results and to process the results..

step6) Close Connection with Db s/w..



The vendor companies can use 4+1 (5) architectures/mechanisms/methodologies to create jdbc driver s/ws for diff Db s/ws based the rules and guidelines JDBC Technology/ JDBC specification given by Sun Ms (now part of Oracle Corp)

=>Type1 JDBC driver ARchitecture (JDBC-ODBC Bridge Driver)
=>Type2 JDBC driver ARchitecture (Native API/Partly Java driver)
=>Type3 JDBC driver ARchitecture (Net Protocol/All Java driver)
(Best) =>Type4 JDBC driver ARchitecture (Native Protocol/All Java driver)
=>Type5 JDBC driver ARchitecture (No Technical name)

offical and given by Sun Ms

Not official)

from Java 8 onwords type1 jdbc driver s/ws are not coming

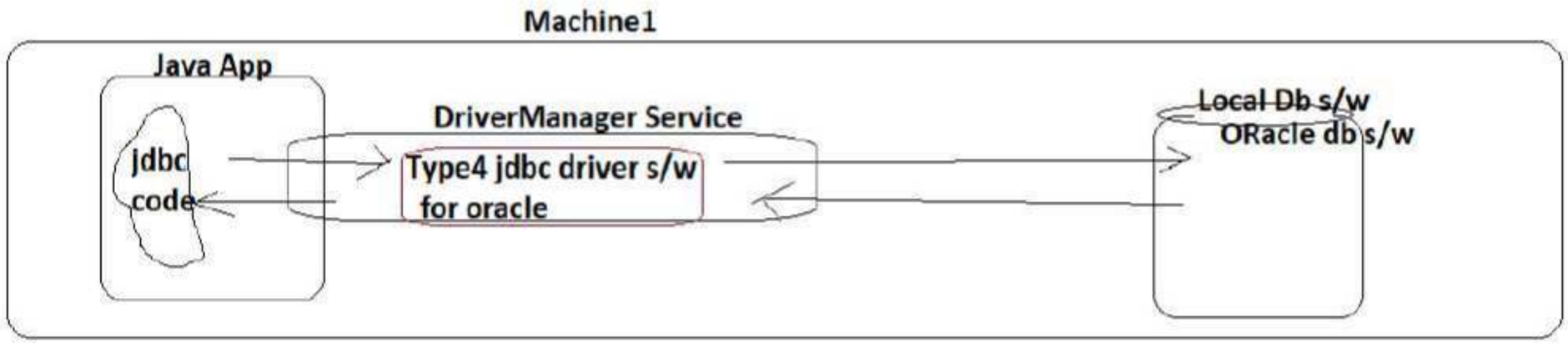
Four Wheeler Architectures
|---> Car
|--->Van
|--->MiniBus
|--->Mini Lorry
and etc...

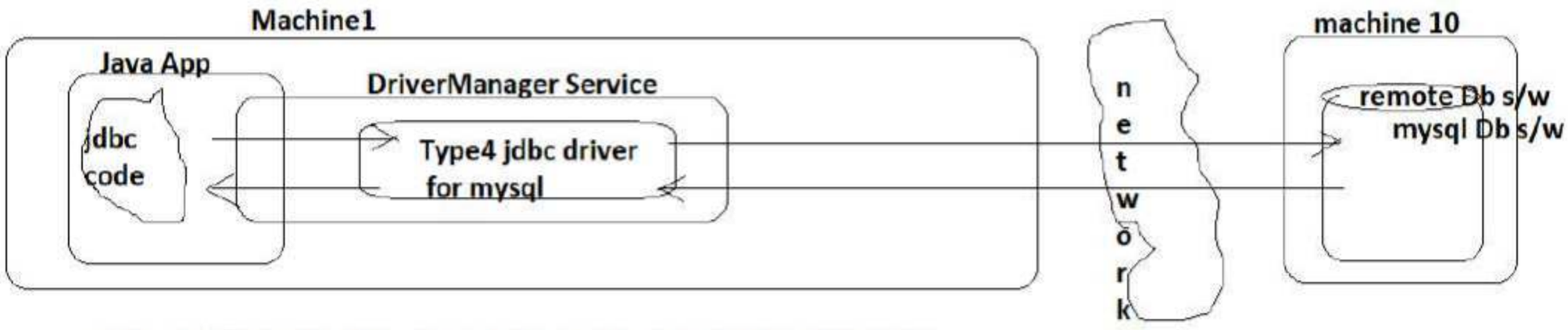
note:: Most of vendor companies give their JDBC driver s/ws based on Type4 Mechanism .... becoz it is best...

note:: Type4 JDBC driver archiecture is designed to locate and interact with Local or remote DB s/ws Directly with out taking support of other comps..

note:: ojdbc6/7/8.jar , mysql-connector-java-<ver>.jar based jdbc driver s/ws are given using Type JDBC driver archiecture..

Type4 jdbc driver Architecture



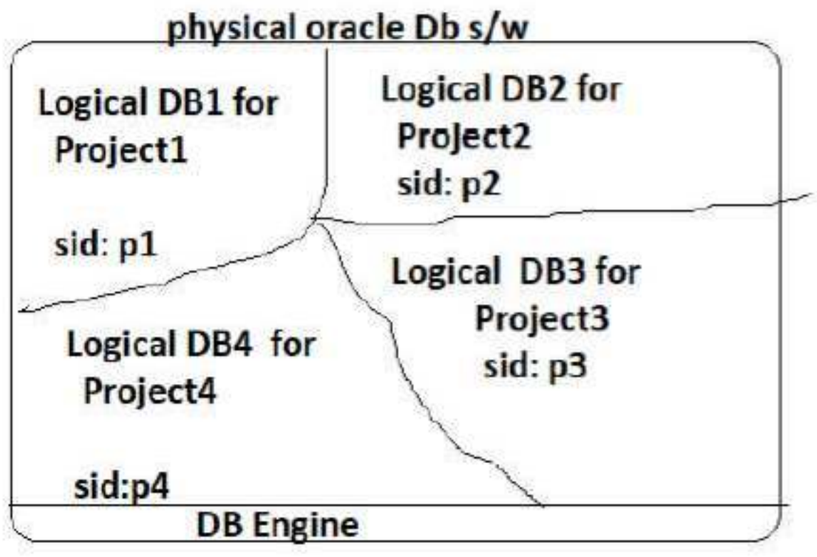


note:: for Every Db s/w , we need seperate type4 JDBC driver s/w..
=> Type4 jdbc driver oracle (eg:: ojdbc6/7/8.jar)
=> Type4 jdbc driver mysql (eg:: mysql-connector-java-<ver>.jar)

Logical DB vs Physical DB s/w

DBA -->DB Administrator

=>Every Logical DB is a logical partiation of a physical Db s/w (which is installed physically)..
=>In Phyiscal Db s/w , multiple Logical Dbs will be created on 1 per Project basis (DBA creates).
=> every logical Db maintain its project related dB table, PL/SQL procedures/functuions, sequences and etc...



sid :: service id

=> Along oracle Db s/w installation, we will get One default logic DB.. generally whose SID is XE (trail version) /ORCL (enterprise Edition)

To know defualt logical DB's SID after installing oracle

a) launch sql prompt
search run sql command line
b) connect to oracle Db s/w
cmd> connect system/manager
connected
c) get SID
SQL>Select * from global_name;
XE (sid) (or)
ORCL (sid) (or)
XE.ABC.XXX.YYY (XE is SID) (or)
ORCL .ABC.XXX.YYYY (ORCL is SID)

Port number vs Socket number
==========

=> In our computer hard ports (physical ports) are given to connect hardware devices to our computer
eg:: keyboard port , usb port , printer port , mouse port ,hdmi port and etc..

=> Operating system gives software ports (logical) to maintain /executes various software services
note:: In windows OS computer total 65,535 (1 to 65,535) software ports are available...
In that 1 to 1024 ports reserved for OS related services (windows Services) and the remaning software ports are given for extenally installed s/ws (1025 to 65,535) like oracle, mysql, tomcat and etc...

external s/w	default portnumber
oracle	1521
mysql	3306
postgresql	5432
tomcat	8080
and etc..	

what is port number clash?
web based SQL Prompt (oracle) default port no:: 8080
tomcat server default port :: ~~8080~~ 3030 (change)
(any number u can choose b/w 1025 to 65,535)

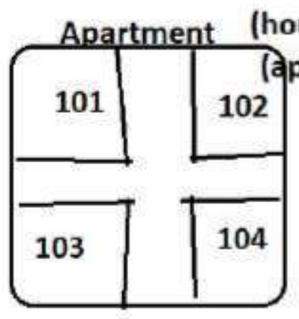
cmd>netstat -a
(run windows admin)

Socket number (It is extension of port number)

socket numer :: <IPaddress>/<host name> + <port no>

oracle port number:: 1521
oracle socket number :: 192.55.77.5+1521 (or)
machine30+1521

socket number is called communication end point.. becoz using socket number we can connect to any service running on any computer..



(house no: 123/55/a)
(apartment name:: ASR Enclave)

house number or housename is like IP address or host name

flat number is like port number..

scoket number is like both details togather house number/name + flat number:

note:: To refer a computer being from that computer we can use "locahost" or "127.0.0.1".

oracle port no::: 1521
current computer oracle socket number :: localhost+1521
127.0.0.1+1521

=>Oracle corp supplied Type4 mechanism based jdbc driver s/w for oracle is called "oracle thin" jdbc drvier
It is comming in the form jar file along with Oracle installation.. like ojdbc<n>.jar
like ojdbc6/7/8.jar

Oracle thin jdbc driver details are

-> jdbc driver class name ::: oracle.jdbc.driver.OracleDriver (or)
oracle.jdbc.OracleDriver

https://www.facebook.com/groups/388095825162910/

-> jdbc url :: jdbc:oracle:thin:@<hostname>/<ipaddress>:<portno>:<sid>

(protocol fixed for oracle thin driver)	subname (fixed for oracle thin driver)	host name or ip address of local or remote computer where oracle s/w is running	oracle Db s/w port no	Logical DB name (or) (service Id)

examle url::

1) jdbc:oracle:thin:@localhost:1521:xe (for local XE oracle)
or
jdbc:oracle:thin:@127.0.0.1:1521:xe (for local XE oracle)
(Practice env..)

2) jdbc:oracle:thin:@187.56.77.122:1521:xe (for rmeote XE oracle)
(or)
jdbc:oracle:thin:@Machine50:1521:xe (for rmeote XE oracle)
(Company env...)

jar file :: classes111.jar (oracle 8i) ojdbc6.jar (oracle11g) * ---> IP address or hostname
classes12.jar (oracle 9i) ojdbc7.jar (oracle12c) of Remote computer in the network
ojdbc14.jar (oracle 10g) ojdbc8.jar (oracle 13c++) where remote oracle DB s/w is running

---

protocol
=======

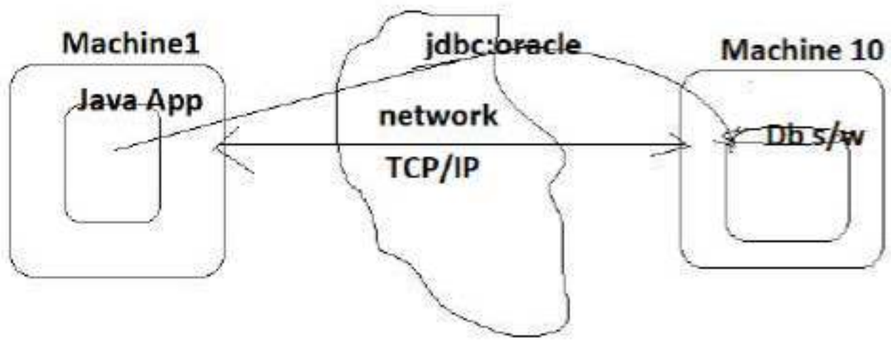
=>Protocol is bunch of rules followed by two parties .. who want participate in communication..

=>There are two types of protocols
a) network protocols
-->Gives set of rules to get communication b/w two physical computers ..
eg:: TCP/IP , UDP and etc..

b) Application protocols
Gives set of rules to get commnucation b/w two sofwares or software applications..
eg:: http or https (to get communication b/w browser s/w and WebServer s/w (where the website executes))
jdbc:oracle (To get communication b/w Java App and oracle Db s/w using jdbc driver s/w support)
jdbc:mysql (To get communication b/w Java App and mysql Db s/w using jdbc driver s/w support)
and etc..

in jdbc:oracle protocl
jdbc is main protocol
oracle is sub protocl
in TCP/IP
TCP is main protocol
IP is sub protocl

note:: Application Protocols run over (runs on the top of) network protocols



Write a JDBC App (java App with DB s/w) to establish the connection with oracle DB s/w using oracle thin driver

step1) keep the following s/w setup ready
=>oracle DB s/w any version (10+) (oracle 11g)
=>Jdk any version (8+) (jdk 8/11)
=>Editplus /notepad++

step2) make sure that Oracle DB s/w related services are running properly..
Go to search --> services.msc --->services ----> search for
OracleServiceXE/ORCL,
ORacleXETNSListener --> make sure they are in running ... it not start them to run.

step3) Gather SID of Oracle's logical DB to which u want to connect.
SQL> select * from global_name
XE (sid) (or) ORCL (sid)

step4) Gather jdbc driver class s/w details (oracle thin driver details)
refer previous details...

step5) add jdbc driver s/w reatled jar file to classpath or copy to <Java_home>\jre\lib\ext folder based on active java version.. (works for all versions java)
(only upto java8 version)

note:: if java App uses any jar file content (like packages,classes) then that jar file must be added classpath.. or should be copied to <java_home>\jre\lib\ext folder..

This PC ---> propertes ----> adv.. system settings ---> env..varibles---> system variables --->

variable name :: CLASSPATH
value :: C:\oraclexe\app\oracle\product\11.2.0\server\jdbc\lib\ojdbc6.jar;<old values>;.

ok -->ok -->ok .

step6) Develop the The Application..

All the methods in System class and DriverManager class are static methods.

G:\workspaces
|--->advava
|---->ntaj114
|--->jdbc
|---->ConnTest.java

ConnTest.java
==========

```
//ConnTest.java
import java.sql.*;  //jdbc api

public class  ConnTest
{
    public static void main(String args[])throws Exception{
   // register oracle thin driver  with DriverManager service
        // create jdbc driver class object
                oracle.jdbc.driver.OracleDriver driver=new oracle.jdbc.driver.OracleDriver();
     //register jdbc driver
                DriverManager.registerDriver(driver);
                                    static method
    //establish the connection with DB s/w
          //Connection con=DriverManager.getConnection("<url> ","<dbuser>","<dbpwd>");
            Connection con=DriverManager.getConnection("jdbc:oracle:thin:@localhost:1521:xe",
                                    static method                "system",
                                                                 "manager");
            //check the connection
            if(con==null)
                System.out.println("connection is not established");
            else
                System.out.println("Connection is established");

    }//main
}//class
//cmd>javac  ConnTest.java
//cmc>java  ConnTest
```

step7) compile and execute the Application..
cmd> javac ConnTest.java
cmd> java ConnTest

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

getConnection(-,-,-) method called on DriverManager class performs
(a) Based on "jdbc:oracle:thin" info of jdbc url ,it makes the driver manager service to pick up the registered "oracle thin driver" from Driver Manager service..
(b) Based on "@localhost:1521:xe" info of jdbc url , it locates the oracle Db s/w running on 1521 port number having logical DB "xe" on the current current computer and establishes the connection b/w "xe" logical DB of Oracle and java App.. In that Process the it submits given "system" ,"manger" as username,passwords for authentication...
(c) returns "JDBC connection object" (it is implementation class obj of java.sql.Connection(I)) back to Java App representing connecton with Db s/w .. we are refering that jdbc connection object using java.sql.Connection(I) ref variable (con)

Instead of writing two lines of code to register jdbc driver s/w with DriverManager service , we can write single line of code for the same that is "loading jdbc driver class"

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

Q) In above line , how can say jdbc driver registered with DriverManager service becoz we are just loading jdbc driver class ?

Ans) Class.forName(-) method makes jvm to load given jdbc driver class dynamically at run time ---> In this proesss the static block of jdbc driver class executes and that static block contains logic to create current jdbc driver class object and to register that object with DriverManager service using registerDriver(-) method call...

In the static block of oracle.jdbc.driver.OracleDriver Class

```
static {
    try {
      if (defaultDriver == null) {
        defaultDriver = new oracle.jdbc.OracleDriver();
        DriverManager.registerDriver(defaultDriver);
      }
    ....
}
```

static block of com.mysql.cj.jdbc.Driver

```
static {
    try {
      DriverManager.registerDriver(new Driver());
    } catch (SQLException var1) {
      throw new RuntimeException("Can't register driver!");
    }
}
```

In all jdbc driver classes of different jdbc driver s/w.. we will be having this kind of static block.. So we can register all jdbc drivers with Driver Manager service by just loading their jdbc driver calsses... with the support Class.forName(-) method...

we can write any code using jdbc driver class that makes static block driver calss getting executed.. to register jdbc driver ...

eg:: oracle.jdbc.driver.OracleDriver driver=new oracle.jdbc.driver.OracleDriver();

eg2:: new oracle.jdbc.driver.OracleDriver();
(Anonymous object)

In the above two examples .. before creating objects jvm loads given jdbc driver class and its static block executes having logic to regiser jdbc driver with driver manager service.. but the explicitly created objects for driver classes will be wasted.. Do these are not good techniques..

=>jdbc technology latest version is 4.x --> 4.3
=> oracle latest version :: 19c
=> oracle thin driver latest version :: ojdbc10.jar
=> java latest version :: 14.x

=>upto jdbc3 there is not feature called auto loading driver class .. i.e we must load jdbc driver class directly or indirectly to register jdbc driver with DriverManager service..
eg:: oracle 10g gives ojdbc14.jar based jdbc 3 version and it does not support auto loading of driver calss..

=>jdbc4 onwords "Auto -loading of driver class" feature is introduced ..i.e we need to not load jdbc driver class directly or indirectly.. we just add jar file to class path and the driver class will loaded automatically...

eg:: ojdbc7/8/9/10.jar given oracle 11g/12c/13c/..../19c are given based on jdbc4. so they support auto loading jdbc driver class... So there is no need of writing even Class.forName(-)

http://www.java2s.com/Code/Jar/o/Downloadojdbc14jar.html
(This is get ojdbc14.jar file)

if oracle 10g based ojdbc14.jar is added classpath.. then we must write Class.forName("oracle.jdbc.driver.OracleDriver"); code in our App..

if oracle 11g....19c based ojdbc6/7/8/9/10.jar file is added to classpath then writing Class.forName("oracle.jdbc.driver.OracleDriver"); code in our App is optional..

How the "Auto Loading of jdbc jdbc driver class feature" is working from jdbc4 on words?

Q) In the call to DriverManager.getConnection(-,-,-) ,the static block of DriverManager class executes --->This static block having logic to search for META-INF/services/ java.sql.Driver file in all jar files that are added to CLASSPATH and it finds in one jar file like ojdbc6/7/8/9/10.jar file .. collects jdbc driver class name from that java.sql.Driver file and loads that class internally by using Class.forName(-) ... (This is called auto loading driver class)

ojdbc6/7/8/9/10.jar file is having java.sql.Driver file in META-INF/services folder as shown below , so they support autoloading driver calss

java.sql.Driver (file)

oracle.jdbc.OracleDriver..

ojdbc14.jar is given based on jdbc3 and it does not maintain java.sql.Driver file
So it does not support auto loading of driver class...

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

DriverManager.getConnection(-,-,-) returns jdbc con object ... and refering that object by using java.sql.Connection(I) ref variable (con)

Q) when java.sql.Connection is an interface, then how can we say DriverManager.getConnection(-,-,-) returns method jdbc connect object ?

Ans1) jdbc con obj is not object of java.sql.Connection(I) as we know the interfaces can not instantiated. jdbc con object is the object of underlying JDBC driver s/w supplied java class that implemetns java.sql.Connection(I) directly or indirectly.. Since the class name of jdbc con object changes jdbc driver s/w to jdbc driver s/ws and DB s/w to DB s/w.. so we never refer that jdbc con object using its original/actual class ref variable.. we always refer by using the common java.sql.Connection(I) ref variable to achieve loosely coupling...

```
System.out.println("jdbc con object class name::"+con.getClass());
```

In Oracle Thin driver(Type4 jdbc driver for oracle) the jdbc con object clss name is oracle.jdbc.driver.T4CConnection

```
Connection con=DriverManager.getConnection(-,-,-)
```

we can use "con" to refer "jdbc con objects" other jdbc drivers like type2 drviers ,type1 drivers ,mysql drivers , oracle drivers and etc.. (Loosely coupling)

```
T4CConnection con=DriverManager.getConnection(-,-,-);
```

=>we can not "con" to refer other jdbc driver s/ws related jdbc con objects.. (Tight coupling)

note:: DriverMAnager class is not implementing java.sql.Connection(I)

note:: DriverManager.getConnection(-,-,-) interanlly createing and returning the implementation class object java.sql.Connection(I) based on jdbc driver s/w we are using as jdbc connection object to App.. Since interface ref variable can refer its implementation calss object.. So we can refer jdbc con object given by DriverManager.getConnection(-,-,-) method using java.sql.Connection(I) ref variable (con)

Ans2)
=> Serializable object means it is the object of a java class that implemetnts java.io.Serializable(I)
=> Cloneable object means it is the object of a java class that implements java.lang.Cloneable(I)
=> List object means it is the object of java class that implements java.util.List(I) like ArrayList, Vector , Stack and etc..
=> jdbc con object means it is the object of java class given by underlying jdbc driver s/w implementing java.sql.Connection(I).

note:: In any Programming , if we are refering object name with interface name then it is not the object of interface.. it is the object of java class implementing that interfaces...

Ans3) Signature of DriverManager.getConnection(-,-,-)

```
public static  Connection  getConnection(String url,
                                         String username,
                                         String pwd)throws SQLException
```

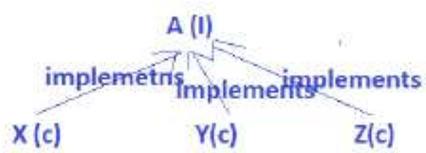
this method does not return java.sql.Connection(I) object becoz interfaces can not be instantiated.. i,e this method is returning java.sql.Connection(I) implementation calss object as jdbc con object..

3 imp statements on method return type
==========

a) if java method return type is an interface... then that method returns one impl class obj of that interface ..
b) if java method return type is an abstract calss .. then that method return one sub class object of that abstract class
c) if java method return type is concrete calss .. then that method can return either that concreate class object or one of its sub class object..

```
public Z/Y/X A m1(String type){

  if(type.equals("a"))
      return new X();
  else if(type.equals("b"))
      return new Y();
  else if(type.equals ("c"))
      return new Z();
  else
      throw new Exception();
}
```




```
X x1=m1("a");
Y y1=m1("b");
Z z1=m1("c");
```

```
A x1=m1("a");
A x1=m1("b");
A x1=m1("c");
```

(Loosely coupling... here we can refer object throguh common interface ref variable with out knowing its class name)

=>JDbc Statement object acts vehicle b/w Java App and Db s/w to send SQL querues as inputs to DB s/w from Java App and to get SQL query results back to Java App from DB s/w.

To create JDBc Statement object
==========
Statement st=con.createStatement();

here con.createStatement() method internally create and returns the implementation class obj of java.sql.Statement(I) as jdbc Statement object and refering that object using java.sql.Statement(I) ref variable (st)

JDBC Statement object means it is the object of underlying JDBc driver s/w supplied java class that implements java.sql.Statement(I).. Since this class name changes based on the jdbc driver s/w w So we always refer JDBC statement object using java.sql.Statement(I) ref variable(st).

Accoding Oracle Specification there are 4 types of SQL Queries
a) DRL Queries (Data Retrieving Language) --->Select SQL Queries
b) DML Queries (Data manipulation language) --> insert,update,delete SQL queries
c) DDL Queries (Data definitation language) --> create table, drop table, alter table and etc.
d) TCL Queries (Transaction control language) --> commit ,rollback ,savepoint and etc..

According java /JDBC we have two types of SQL queries
a) Select SQL queries (DRL Queries)
=>These Queries give Bunch of records (0 or more records)
eg:: SQL>Select * from emp;
->gives 14 records
b) Non-select SQL Queries (DML,DDL,TCL Queries)
=>these queries return numeric value (mainly DML queries) representing no.of records that are effected.

```
SQL> update emp set sal=sal+100 where empno>=7900;
   3 rows updated
SQL> insert into student values(101,'raja','hyd',67.88);
      1 record/row inserted
```

=>call executeQuery(-) on JDBC Statement object to send ,execute SQL query in Db s/w and to get JDBC ResultSet object having bunch of records...

```
ResultSet rs=st.executeQuery("select * from dept");
```

BFR rs(ResultSet obj)

10	Accounts	newyork
20	IT	chicago
..	...	....

ALR

Resulset object means it is the underlying JDBC driver s/w supplied java class that implements java.sql.ResultSet(I). it contains bunch of records selected from the Db table..

signaure ::
public ResultSet executeQuery(String query) throws SQLException

=> call executeUpdate(-) on JDBC Statement obj (st) to send and execute non-select SQL query in DB s/w.. This method returns numeric value .. representing the no.of records that effected..

```
int count=st.executeUpdate("delete from dept where deptno>=40");
```

if the above query deletes n records then it returns n value , if the above does not delete the records then it reurns 0.

signature of the method::
public int executeUpdate(String query)throws SQLException

It is checked exception representing different problems..

Write a jdbc App to get all records from db table "student"

step1) create db table in oracle having name "student" as show below

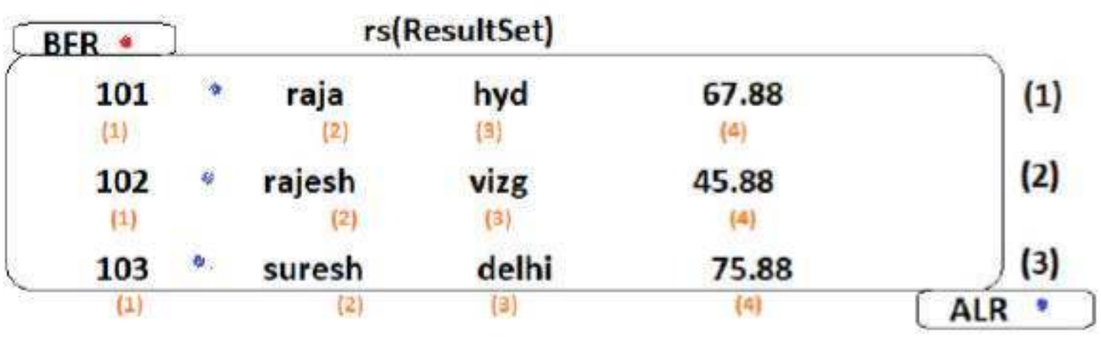
```
SQL> create table student(sno number(5), sname varchar2(20),sadd varchar2(20),avg number(10,2));
```

step2) insert records into Db table

```
SQL> insert into student values(101,'raja','hyd',67.88);
 1 row created.
SQL> insert into student values(102,'rajesh','vizg',45.88);
 1 row created.
SQL> insert into student values(103,'suresh','delhi',75.88);
 1 row created.
SQL> commit;
 Commit complete.
```

step3) Develop the JDBC App using oracle thin driver (Oracle corp supplied type4 jdbc driver s/w for oracle)

SelectTest.java



Gives exmaple jdbc url that u have u r company?

eg1:: jdbc:oracle:thin:@<host>:1521:<sid> (or)
eg2:: jdbc:oracle:thin:@polaris_sys:1521:openFx

collect from DBA or TL /commons docs of Project

eg3:: jdbc:oracle:thin:@184.77.55.4:1521:openFx

BFR :: Before First Record
ALR :: Ater Last Record

=>Records in ResultSet and col values in each record of ResultSet will have 1 based index.

=> When ResultSet object is created , by default Cursor resides in "BFR" position

rs.next() --> moves the cursor in ResultSEt object in forward direction .. i.e from current position to next position .. if the next position is record then it returns true otherwise it returns false.

```
while( rs.next() !=fasle){
        S.o.p( rs.getInt(1)+"   "+rs.getString(2)+"   "+rs.getString(3)+"   "+rs.getFloat(4));
  }
```

console

```
101   raja   hyd   67.88
102   rajesh vizag 45.88
103   suresh delhi 75.88
```

we can call rs.getXxx(-) methods either with col index or with col name to get col values from the records of ResultSet bject...

rs.getXxx(-) are like rs.getInt(-),rs.getFloat(-),rs.getString(-),rs.getLong(-) and etc...

=> JDBc Apps (any Front End App) can not read uncommitted data from DB table..
=> if we do not know col data types .. then we can get Db table all cols as String values.. by rs.getString(-) method either by passing col name or col index.
=> It recomanded to close jdbc objs at end of their utilization.. that to reverse of their opening..
=> All jdbc objs are internally IOStream and Network Socket objects.

=>rs.close() method closes the "ResultSet" object and does not allow to move the cursor in the ResultSet object and does not allow to process the records in the ResultSet obj
=>st.close() method closes the "Statement" object and does not allow to send,execute further SQL queries in DB s/w.
=>con.close() method closes the connection with Db s/w .. and does not any further interactions with Db s/w....

Assigment::
a) Write a JDBC to get all records for Dept Db table
b) Write a JDBC App to get Empno,ename,job,sal col values from emp db table..

To get default db table in oracle

step1) connect to oracle from SQL prompt
cmd> connect system/manager
step2) search for scott.sql file in Oracle Db s/w installation

step3) copy and paste the content of scott.sql on SQL prompt from line number 28 to til end

Write a JDBC App to get Student details based on given start ,end range of student numbers

---

SQL> select * from student where sno>=100 and sno<=200;

Go for softcoding
using Scanner class..

3 built-in stream of java

---

a) System.in -- points to keybord (standard input device)
b) System.out -- points to console (standard output device)
b) System.err --> points to console (standard output device)

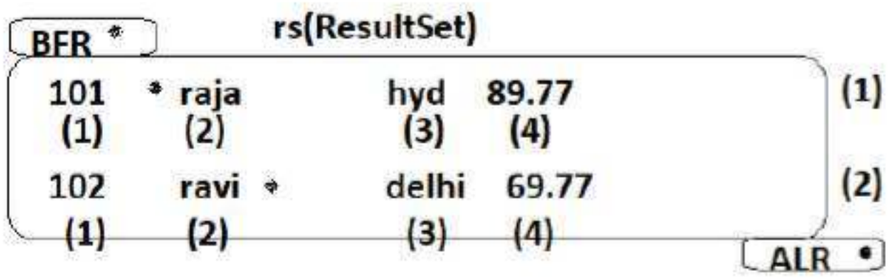
Hard Conding vs soft coding

==========

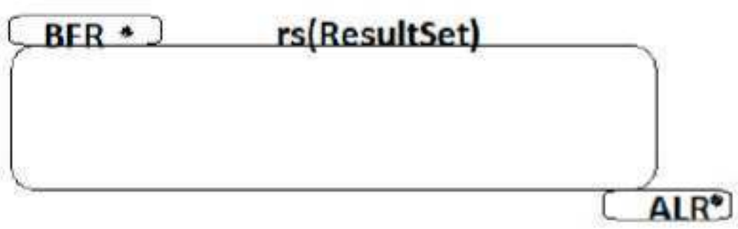
int a=10; //hard coding

Scanner sc=new Scanner(System.in);
int a=sc.nextInt(); //soft coding

-> placing inputs directly in .java file is called hard coding (bad pratice)
->collecting inputs from enduser through keyboad, cmdline args, system properties, properties file, GUI comps and etc.. comes under soft coding (good pratice)



101 * raja hyd 89.77
102 ravi * delhi 69.77



false

rs.next()!=false
true !=false --- > true
false!=false --> false

flag==false
true==false ---> false
false == false -->true

we are getting reverse of the input

we are getting reversse of input

```
System.out.println( !flag?"records not found":
                    "students whose sno >="+start+" and <="+end+ " details are displayed");
```

if flag is false

S.o.p("record not found");

if flag is true
S.o.p("students whose sno >="+start+" and <="+end+ " details are displayed");

---

support
When java does not pointers , why does it throws NullPointerException?

Date d=null; or Date d;
d.getYear(); --->Throws NullPointerException

=> When we invoke method or variable on the reference variable that holds/points to "null" value then "NullPointerException" will be raised..
=> Here the word "pointer" in NullPointerException is no way related to c,c++ pointers.. It is used having "english" meaning.. indicating method/variable is called on the ref varible that is pointing to "null" value..

note:: In java ref variables are capable of holding addresses of the objects, So pointers support is not required in java..

JDBC Apps Urls
==========
https://github.com/natarazworld/WorksShops/tree/master/JDBC

Java Coding Standards
==========

=>it is very important to develop the code by following java coding standards...
to make our code as industry standard code...

import coding standards
==========

a) write proper comments (single line or multiline)

b) Take names with self description

```
int x=30;  (wrong)
int  age=30;  (good)
int personAge=30;  (more good)
```

c) Follow camelCasing/hungarian notation while taking the names

->for classes/interfaces/enums every word starting letter should in uppercase

eg: EmployeeManagementService

eg:: HelloWorld

->for methods/variables first word every letter lowercase and second word onwords every word first letter should be uppercase letter.

```
eg:: int personAge
     float empSalary;
eg:  public int generateReport(Date startDate, Date endDate){
        ....
     }
```

d) Avoid implici pkg imports and prefer explicit pkg imports.. to imprive readability

```
import java.sql.*; //implict
import java.util.*; //implicit
```

```
import java.sql.Connection;
import java.sql.DriverManager;
import  java.util.Scanner;
```

explicit pkg imports

e) To avoid NullPointerException compltely from our Java Apps ... invoke methods or variables on ref variables by checking for not null..

```
if(con!=null)
   Statement st=con.createStatement();

if(st!=null)
   ResultSet rs=st.executeQuery("--------");
```

f) Do not declare the exception to be thrown using "throws" clause .. alway prefer catching and handling exception.. using try-catch block..

note:: try/catch helps to avoid the abnormal termination of the Application execution when exception is raised...

g) place multiple catch blocks followed by try block to catch and handle both known and unknow exceptions.. Place intial catch block to handle known exceptions..where as place catch block with Exception as the last catch block to handle the unknown exceptions.

```
try{
 ...
 ...   jdbc code
 ...
}
catch(Exception e){
 ...
 ..
}
```

```
try{
 ...
 ...   //jdbc code
 ...
 ...
}
catch(ClassNotFoundException cnf){   //known exception
  ..
}
catch(SQLException se){    //known exception
  ...
}
catch(Exception e){   //unknown exception
  ..
}
```

note:: we can info about exceptions to be thrown by methods with the support of soruce code or api docs..

h) do not close jdbc objs and stream objs either in try or in catch blocks prefer close them in finally block..

```
try{
 ...
 ... //jdbc code
 ..
rs.close();
st.close();
con.close();
}
catch(...) { ...}
catch(--) { ...}
catch(--) { ...}
```

(bad)

(if the exception raised control directly goes to catch block and jdbc objs will not be closed)

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try{
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 ...
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(The code of closing jdbc objs loosing its reusability)

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 //close jdbc objs
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```

(Best pratice)

finally block executes irrespective exception that is raised in try block. So it is better to close jdbc objs in the finally block..

note:: from Jdbc4 onwords which part of java8+ ,we can also try with resource to close jdbc objs automatically

i) It is recomanded to declare local variables at the top of method definitation... and intialize them sensible values..

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public static  void main(String args[]){
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    Statement st=null;
    int age=0;
    float price=0.0f;
    boolean flag=false;
    ResultSet rs=null;
    try{
      ~~ResultSet rs=st.executeQuery("....");~~
      rs=st.executeQuery("....");
    ...
      ...
      ..
    }
    catch(....)
     //use rs here
    }
    finally{
     //usr rs here
     ..
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```

only recomandation..

note:: In java no default values for local variables So they must be initialized with sensibe values...

note:: reference variable in java can hold either null or address of the object..

use rs here..

In java variable scope is block scope i.e variable declared inside the block is not visible outside the block.. So declare the variable before the block to use inside and outside the block..

j) Take every java class/interface/enum/annotation in package ...

(internall classes)

eg:: com.nt.jdbc;
com.nt.servlet;
com.nt.dao
com.nt.service;

eg: org.nt.jdbc;
org.nt.service;
org.nt.dao

eg: com.nt.openFx.dao
com.nt.openFx.service
com.nt.openFx.controller
com.nt.openFx.servlet

company naresit techologies — Project name — category classes

eg:: com.nareshtechnologies.jdbc
com.nareshtechnologies.service;
(reverse of the company domain /webiste name)

eg:: in.nit.servlet
in.nit.jdbc
in.nit.dao

k) Do not place more 2500 lines of code in .java file... if needed split into multiple .java file.. and keep them relationship like composition ,inheritence and etc..

l) prefer adding documentation comments.. /** .... * to generate java docs easily..

m) Write code having proper indentation /tar spaces (spaces)

```
public class Test{
int a;
 float b;
                public static main(String args[]){
                  ...
                }
}
```

Bad formatting

```
public class Test
{
  int a;
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   {
    ...
    ...
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and etc.. .....

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    boolean flag=false;
    ResultSet rs=null;
    try{
      ~~ResultSet rs=st.executeQuery("....");~~
      rs=st.executeQuery("....");
    ...
      ...
      ..
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                  ...
                }
}
```

Bad formatting

```
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{
  int a;
  float b;
  public static void main(String args[])
   {
    ...
    ...
   }
}
```
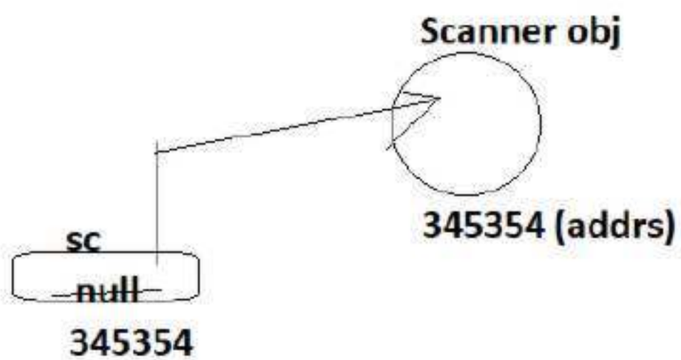

and etc.. .....

Q)Write a JDBC App to get empNo,ename,job,sal col values from emp db table based on given 3 three jobs order by job.

select empno,ename,job,sal from emp where job in('CLERK','SALESMAN','MANAGER') order by job desc;

collecting 3 jobs from enduser -->
converting them to uppercase --> decorating them as requied for SQLquery is the responsibilitu of programmer.. becoz enduser is non-technical guy and we can not exception technical SQL stype inputs..

note:: SQL keywords , Db table names, db col names are not sensitive, but the db col values are case-sensitive..



if ResultSet obj is holding specific col values of DB table.. then we should given col indexes in the order they are stored in ResultSet obj based cols orderin the SQL Query.. i.e we should not by cols order in the DB table..

Assignment :: Q) Write jdbc App to get Student details based on given 3 city names..
Q) Write jdbc app to get Emp details based on given emp no.

What is difference Editor and IDE?

=>Editors provide devlopement env.. (Typing env..) i.e they do not provide multiple options that are in required in App development , testing, debugging, execution, packaging , release , deployment and etc..

eg:: notepad , editplus , notepad++ , edit++ , vi , wordpad and etc...

=>IDE (Integrated Development Env..) is a single s/w where development, testing, debugging,execution, packing, release, deployment and etc.. are possible.

eg:: Eclipse(free) ,myeclipse (commercial), netbeans, jCreator , STS(spring tool suite) , JBuilder, RAD (Rational Applicaiton developer), Intellij and etc..

Popular java IDE Eclipse (95%)
IntelliJ +STS (5%)

note:: Eclipse is good but Eclipse with STS plugin is more good

plugin :: It a patch s/w or addtional s/w or extension s/w that can added to existing s/w to provide addtional functionalaties to existing s/w...

Eclipse
======
type :: IDE for java
version :: 2020-06 (latest) , 2019-12 (stable)
Vendor :: Eclipse
Open source
flavours :: Eclipse SDK (Only for Basic Java App (standalone) developement)
Eclipse JEE (for all types of Apps development)

(32-bit or 64-bit)

To download Eclipse :: download as setup file or zip file

https://www.eclipse.org/downloads/download.php?file=/technology/epp/downloads/release/2019-12/R/eclipse-jee-2019-12-R-win32-x86_64.zip

(good)

To install eclipse :: zip file (extract zip) or setup file (install it)

⇩ use eclipse.exe from extraction to launch it

⇩ use desktop icon to launch

Write JDBc App to get Employee details based on the given Employee number?
(develop using Eclipse IDE)

SQL> select empno,ename,job,sal from emp where empno=7499;

collect from enduser

Procedure
==========
step1) make sure Eclipse is installed in u r computer ... and launch it by choosing workspace folder

->The folder where Apps/ Projects will saved..
(E:\Workspaces\advjava\NTAJ414)

step2) Create Java Project using Eclipse having name JDBCProj1

File menu --->new -->Project --> java Project ---> name:: JDBCProj1 --->next--> next --> ...

step3) Add ojdbc6/7/8/9/10.jar file to the buildpath(classpath) of the above Project /

right click on project ---> build path ---->
configure build path ---> libraries tab ---> add extenal jar files ---> browse and select ojdbc<n>.jar from oracle installtation folders..

note:: jar files /directories add to mycomputer classpath env.. variable are not visible to IDE Projects.. So add them every project of IDE seperately..

step4) create java package in "src" folder of the project having name "com.nt.jdbc"..

righth click on "src" folder -->new or (ctrl+ n) --> package ---> name:: com.nt.jdbc

step5) develop the Jdbc App by adding class with main (-) method in "com.nt.jdbc" pkg.

right click on "com.nt.jdbc" pkg --> class ---> class name:: SelectTest3
select main method check box --> ....

ctrl++ /-- --> to increase /decrase font size..
ctrl+shift+o :: for import pkgs
ctrl+shift+f :: for formatting the code..
ctrl+a and ctrl+i :: for select all code and for doing indentation..
sysout + ctrl+space :: gives S.o.p (sout + space)
systrace +ctrs+space :: gives S.o.p(-) with message
ctrl+shift+x --> To make the selected content as uppercase content
ctrl+shift+y -->To make the selected content as lowercase content

BFR rs(ResultSet)

7499	ALLEN	CLERK	9000
(1)	(2)	(3)	(4)

ALR

```
if(rs.next()){
   S.o.p(rs.getInt(1)+" ..."+.....  );
 }
 else{
   S.o.p("record not found");
 }
```

=>if rs contains 0 or more reecords then use while(rs.next()) to Process the ResultSet
=>if rs contains 0 or 1 reecord then use if(rs.next()) to Process the ResultSet

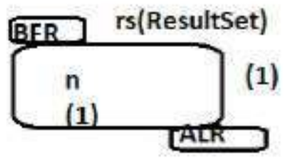
Step6) run the application...

use ctrl+f11
(or)
right click in .java file (where main(-) is there) -->run as ---> java App..
(or)
menu bar --> run Button

Assignments ::1) Write a JDBC App to get student details based given initial chars of student name
2) Write jdbc App that gives employees details who are having highest salary

Write a JDBC App to get Emps count from emp Db table?

select count(*) from emp;



=>if ResultSet obj contains always one value either o or positive number..i.e Resultset object does not come as an empty object. So we can directly call rs.next() method to process the ReusltSet i.e there is no need calling if(rs.next()) or while(rs.next()) method.

3 important statements of ResultSet obj Processing
==========

a) if the ResultSet object is going to have 0 or more records then use while(rs.next()) to process the ResultSet object

SQL> select * from emp where job="CLERK"; gives 0 or more records

b) if the ResultSet object is going to have 0 or 1 record then use if(rs.next()) to process the ResultSet object

SQL>select * from emp where empno=7499; //gives 0 or 1 record

c) if the ResultSet object is going to have 1 record always then use rs.next() to process the ResultSet object

SQL> select count(*) from emp; gives 1 record always

What the diff b/w calling toString() method and calling printStackTrace() method on any exception obj?

Ans) toString() called on exception object gives just exception calss name and message for the exception that is raised..

=> printStackTrace() called on the exception object gives the elaborated details of the exception that is raised.. if exception is raised the statck memory of method execution will be filledup with messages.. to print those messages on the console .. then for printStackTrace() ..

note:: catch block messages will not be used to display problems to enduser.. they are for programmer.. for endusers seperate non-technical guiding messages will be rendered through GUI front end like html with css or awt/swings...

f3: To get the source code of pointed code

(or) ctrl+click

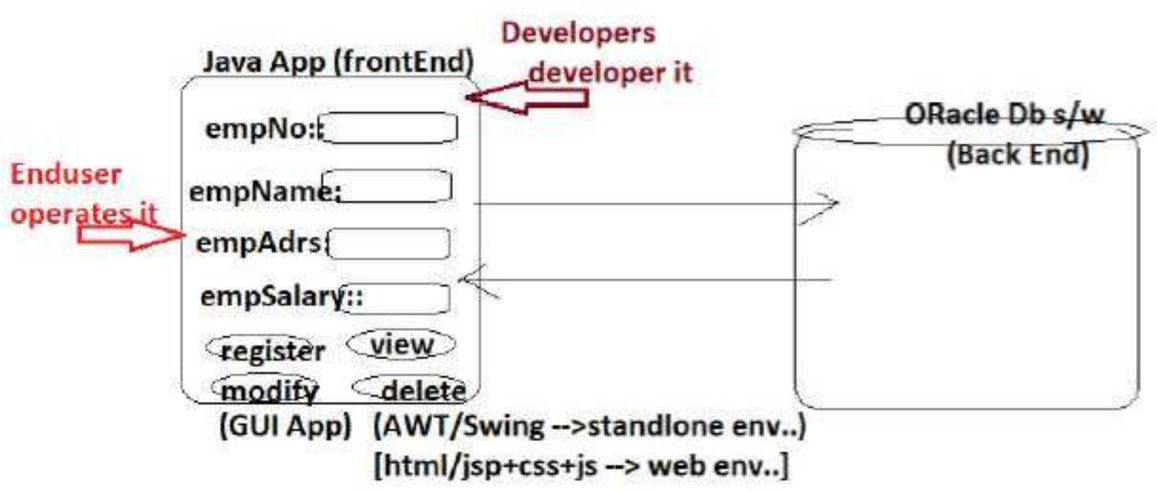
Ctrl+shift+t :: To get source code any random class/interface/ enum /annotation (type)

What is the need JAVA and JDBC app development , when we can send and execute SQL Queries to Db s/w from SQL Prompt?

a) Endusers are non-technical people ,so they do not know SQL... executing SQL queries from SQL prompt is not possible for them.. So they expect one s/w app as front App to interact with DB s/w and to manipulate Db s/w data .. based on the inputs given by enduser..

b) if enduser is operating DB s/w through SQL prompt then he will get unrestricated access to to Db s/w data.. which can be misused .. To avoid this one Front App is required to allow enduser to perfom restricted operations on Db s/w...

To develop such Front End Apps using java .. we need to take support of JDBC ...direclty or idirectly..



Executing non-select SQL Queries
==========

=> DML(insert,update,delete),DDL(create table,alter table ,drop table,..), TCL(commit,rollback,savepoint , ...) queries are called non-select SQL Queries.

=> DML Queries return numeric value representing no.of records that are effected after executing the SQL query..

=> invoke executeUpdate(-) on Statement object to send and execute Non-Select Query in DB s/w ...

signature ::

public int executeUpdate(String query)throws SQLException

=> while working with non-select SQL Queries there is no need of dealing with ResultSet object

Q)Write a Jdbc App to insert record into DB table by collecting inputs from enduser?

SQL> insert into student values(101,'rakesh','hyd',67.88)

=> The non-select SQL Query that goes to Db s/w from Java App executes in Db s/w by enabling autoCommit mode on Db s/w...

=>In the catch(-) that deals with SQLException object we can display user-friendly error Messages by uysing SQL error code that are stored in SQLException object.. These error codes are specific to each DB s/w..

SQL> alter table student add primary key(sno);
Table altered.

```
catch(SQLException se) {
        //se.printStackTrace();
    if(se.getErrorCode()==1)
        System.out.println("u can not insert duplidates in PK column sno");
    else if(se.getErrorCode()==12899)
        System.out.println("u can not insert values more than column size");
    else if(se.getErrorCode()>=900 && se.getErrorCode()<=999)
        System.out.println(" SQL Query Syntax problem");
    else
        System.out.println("unknow jdbc problem");

}
```

Assignment::

A) Write a JDBC App to insert values to empno,ename,job ,sal col of emp db table?

SQL> insert into emp(empno,ename,job,sal) values(567,'suresh','clerk',9000);

Write a JDBc App to delete records from Student db table based on the given city (addrss) ?

SQL>delete from student where sadd='hyd'

collect from enduser..

=>upto java7 (jdbc1/2/3) we have single executeUpdate(-) method to send and execute non-select SQL queries in Db s/w

=>From Java8 (jdbc4) onwords we have two methods to send and execute non-select SQL queries in Db s/w

a) executeUpdate(String query)

signature :: public int executeUpdate(String query) throws SQLException

a) executeLargeUpdate(String query)

signature :: public long executeUpdate(String query) throws SQLException

Large

(useful BigData /Larget DataSets applicaitons where we can manipulate 100 crores of records)

Assignment::
==========

Write JDBC App to delete student details based on given student number?

Using delete SQL Query we can delete complete record(s) .. i.e we can not delete specific col values from the records.. for that we need to use update query to empty specific col values..

Q)Write a JDBC App to update student address , name, avg with new values based on the given student number?

newName
newAvg
newAddrs
no

SQL> update student set sname='suresh',sadd='delhi',avg=67.87 where sno=102;

=>since update SQL query is non-select SQL Query , so we need to use executeUpdate(-) method to send and execute that SQL query in Db s/w..

Assignment:: Write a JDBC App to increase employee salary by 20% if the employee is SALESAMAN

SQL>update emp set sal=sal+(sal*0.2) where job='SALESMAN';

Assignment :: Write JDBC App to add 10.0 avg for students who secured less 45.0 avg

Q) Can we execute both select and non-select SQL query by invoking single method on JDBC Statement object?

Ans) possilbe using execute(-) on Statement object...

signature :: public boolean execute(String query)throws SQLException

=>if the executed SQL query is select SQL query then it returns true , so we need call seperate st.getResultSet() method to ResultSet object

=>if the executed SQL query is non-select SQL query then it returns false , so we need call seperate st.getUpdateCount() method to get numberic value representing no.of records that are effected.

(valueLabs and AppLabs)

```
boolean flag=st.execute(query);
 if(flag==true){
      S.o.p("Select SQL query is executed");
     ResultSet rs=st.getResultSet();
      while(rs.next()){
          ...
      }
 }//if
else {

   S.o.p("non-select SQL query is executed");
   int count=st.getUpdateCount();
    S.o.p("no.of records that are effected are ::"+count);

}
```

note:: working with execute(-) is not good pratice becoz it makes us to deal with 2 method calls in order to complete the execution.... Where executeQuery(-)/executeUpdate(-) methods allow us to deal with single method call.

select query = executeQuery(-) (or) execute(-) with getResultSet()

non-select query =executeUpdate(-) (or) execute(-) with getUpdateCount()

executeUpdate(-) ,executeQuery(-) internallys calls execute(-) method getResultSet()/getUpdateCount() methods ... So it is better to use executeUpdate() and executQuery() methods..

Assignment:: write a jdbc App that "nth" highest salary employee details

Login App Development

==========

=>Should Perform Authentication i.e given username,password must be matched with the username,password details that are already avaiable in DB table

=>HEre we talking login activity to App ... by connecting to Db s/w.

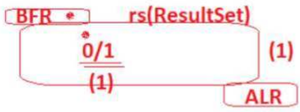
step1) create DB table having usernames,passwords

```
SQL> create table userInfo(uname varchar2(15) primary key,pwd varchar2(15));
Table created.
SQL> insert into userInfo values('raja','rani');
1 row created.
SQL> insert into userInfo values('ramesh rao','suresh');
1 row created.
SQL> insert into userInfo values('jani','begum');
1 row created.
SQL> insert into userInfo values('dhoni','cricket');
1 row created.
SQL> commit;
Commit complete.
```

step2) decide the best sql query to perform this Authentication..

```
SQL> select count(*) from userInfo where uname='raja' and pwd='rani';
 COUNT(*)
----------
      1  (valid credentials)
SQL> select count(*) from userInfo where uname='raja' and pwd='rani1';
 COUNT(*)
----------
      0  (invalid credentials)
```

step3) develop the application...



What is SQL Injection (Hacking Technique) and how does it raises?

Ans) making special SQL Instructions part of the SQL query by sending them along with input values of the Application to change the SQL query behaviour thus application behaviour is called SQL Injection Problem.

=> Hackers and jackers use this technique to get into other accounts with out username or/and password.

Example1

==========

enter username:: raja' -- (correct username)

enter password :: hyd (wrong password)

result :: Valid Credentials (SQL Injection Problem)

Example2

==========

enter username:: king' or 1=1 -- (wrong username)

enter password :: hyd1 (wrong password)

result :: Valid Credentials (SQL Injection Problem)

---

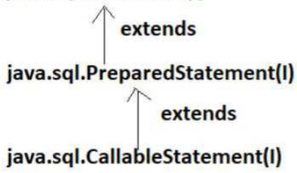
3 types of JDBC Statement objs

==========

a) Statement obj /Simple Statement object (Implementation class obj of java.sql.Statement(I)) (Working with this obj so far)

b) PreparedStatement object (Implementation class obj of java.sql.PreparedStatement(I))

c) CallableStatement object (Implementation class obj of java.sql.CallableStatement(I))



Limitations of Simple Statement objects

==========

(a) SQL Injection may raise

(b) Preparing SQL query by involving variables is very complex as we need to convert java inputs to SQL Inputs as required in the SQL query

(c) Does not allow to take params (?) in the SQL query

(d) Not suitable to execute same SQL query for multiple times either with same inputs or with diff inputs..

(e) Inserting date values is bit complex .. (we should give date values in patttern that underlying DB s/w supports)

oracle date pattern:: dd-MMM-yy eg: 20-OCT-90

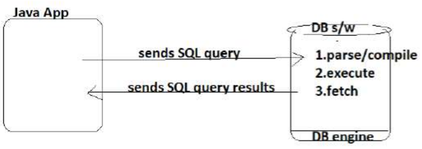
mysql date pattern :: yyyy-MM-dd eg: 1990-10-20

(f) Inserting Large Objects(files) is not possbile

note:: To solve the above problems ... take the support PreparedStatement objects...

Once SQL query goes to DB s/w .. the DB engine of DB s/w performs the 3 operations on the SQL query

a) Parse/compile
b) execute
c) fetch



parse/compile
==========
query will be splitted into tokens and the quert syntax will be verified

execute
=======
The parsed query will be executed in the Db s/w

fetch
=====
The output of executed query will be fetched out to send to java App..

=>while working with railway ticket resveration or bus ticket reservation application the insert SQL query will be executed for multuple times to insert different passenger details..
=>while watching live game score the same "select SQL query" will be executed for multiple with same gameid.

Working with SimpleStatement object to insert 1cr passenger details in day (Railway ticketing)
==========

a) 1cr times same insert SQL query goes to DB s/w from Java App with input values :: 1,00,00,000 * 0.001 secs =10000 secs
b) 1cr times same insert SQL query will be parsed in Db s/w :: 1,00,00,000 * 0.001 secs = 10000 secs

c) 1cr times same insert SQL query will be executed in DB s/w :: 1,00,00,000 * 0.001secs = 10000 secs
d) 1cr times same insert SQL query output is fetched :: 1,00,00,000 * 0.001secs = 10000 secs

40,000 secs

In the above table performing (a),(b) opeatations on same query for multiple times is uneccesary (20,000 secs are wasted) and perform (c),(d) operations on same query for multiple times is neccessary ..But while working with Simple Statement obj we can not avoid (a),(b) operations happening for multiple times..

We can overcome the the problem by using pre-compiled SQL query with the support of JDBC PreparedStatement object.

pre-compiled SQL query
==========
=>The SQL query that goes to DB s/w and becomes parsed/compiled SQL query irrespective of wheather it will be executed or not is called pre-compiled/pre-parsed SQL query.
=> JDBC PreparedStatement object rperesents/holds Pre-compiled SQL query i.e we can execute pre-compiled SQL query and we can results from that query execution with support of PreparedStatement object...

=> This pre-compiled query can be with inputs or can be with out inputs
=> This pre-compiled query can be static query with / with out inputs or can be dynamic query..

insert into student values(101,'raja','hyd',67.77) --->static query with inputs
select * from student ---> static query with out inputs
insert into student values(?,?,?,?) ---> dynamic query with params

=>Simple Statement obj deals with only static SQL query with or with out inputs
=>PreparedStatement obj deals with both static and dynamic SQL queries

1cr passenger railway ticket reservation using PreparedStatement object
==========

a) insert SQL query goes to Db s/w with params(?) only for 1 time :: 1 * 0.001 = 0.001 secs
b) insert SQL query will be parsed in Db s/w only for t time :: 1 * 0.001 = 0.001 secs
c) the Pre-compiled insert SQL query will be executed in Db s/w for 1cr times by setting diff input values to query params :: 1 ,00,00,000 * 0.001 secs =10000
d) 1 cr times insert SQL query result will be fetched out :: 1,00,00,000 * 0.001 secs =10000

20000.002 secs

=>Here (a),(b) operations are happening on the same query only for 1 time.. not for multiple times..i.e avoid uneccsary wastage of time while working Preparedstement object..

Procedure to work with PreparedStatement obj to execute same SQL query for multiple times with diff inputs

step1) create SQL query having params /placeholders/ IN params (?)

```
String query="insert into student values(?,?,?,?)";
                                         1 2 3 4
```

step2) make the SQL query as pre-compiled SQL query and return PreparedStatment obj representing that pre-compiled SQL query.

```
PreparedStatement ps=con.prepareStatement(query);
```

⇩

This method takes the given SQL query, sends to Db s/w. makes the SQL query as pre-compiled SQL query and returns Jdbc PreparedStatement obj having that pre-compiled SQL query

note:: Incase of SimpleStatement obj , when ask query for execution then it makes DB s/w to compile SQL query, So we can say compiled SQL query will definitely execute.. In case of PreparedStament query compilation takes place irrespective of wheather it will be executed or not.

step3) use setXxx(-,-) methods on PreparedStatement obj to set the values to the query params of PreparedStatement obj

```
ps.setInt(1,5670);
ps.setString(2,"ramesh");
ps.setString(3,"hyd");
ps.setFloat(4,67.88f);
```

step4) execute the pre-compiled SQL query

```
int result=ps.executeUpdate();
```

step5) process the results

```
if(result==0)
  S.o.p("record not inserted");
else
  S.o.p("record inserted");
```

note:: To repeate query execution for multiple times with diff inputs repeat 3,4,5 steps..

step6) close jdbc objs

```
ps.close();
con.close();
```

Write a JDBC App to insert "n" count no.of students details to DB able?

=>Here insert SQL query should be executed for "n" times to insert "n" student details So prefere using PreparedStatement object ..

(PsInsertTest.java) --> GIT

Conclusion on Simple Statement, PreparedStatement objs
==========

a) In the entire Application , if there is a need of executing SQL query only for 1 time that to with out any input values then prefere working with Simple Statement object
eg:: select * from student;
eg:: select empno,ename,job,sal from emp

b) if there is a need executing query with inputs for 1 or more times , without inputs for more times , to insert date values, large objs then go for PreparedStatement object.

It is recomanded to take SQL queries at top of class as String constant variable values for easy accessing and modifying of query if needed , with out searching where that SQL query is available in the entire program..

```
private static final String
        INSERT_STUDENT_QUERY="INSERT INTO STUDENT VALUES(?,?,?,?)";
```

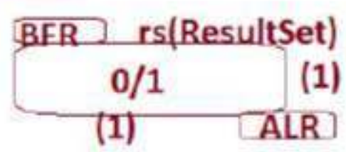
=>static final variables are called constants and generally that variable name will be in upper case letters

=> We can not take query having inputs as String connstant variable value (as shown above) while working with SimpleStatement object becoz the we take variables with values main method local variables and those local variables are not visible outside the main(-) at class level.

Assignment:: write jdbc App to insert multiple customer detials to Customer db table by collecting themfrom enduser.. (cols are cno,cname,cadd, billAmt)

note:: ps.setXxx(-,-) will take care converting given query param values as required for SQL query.. So programmers need not to do that convertion..

Login App development using PreparedStatement object
==========



Why there is no SQL Injection Problem with PreparedStatement obj and why that Problem is there with Simple Statement object?

SimpleStatemet obj
query with inputs with --
Query compilation
(inputs in compilation) with --
Query execution
inputs by recgonizing -- as SQL comment
(This changes query and applicaiton bahaviour-SQLInjection Problem)

PreparedStatement obj
no inputs only query with params (?) no --
Query compilation
(no inputs only params(?) no --
params values are set as inputs (may contains --)
Quuer execution
with inputs
but -- will not recognized as query comment so does not effect query and App behaviour So No SQL InjectionProblem)

// --> .java file ---> javac --->.class
// is comment
.java --->javac --> .class
as // input
here // will not be treated as comment.

Simple Statement obj makes DB s/w to compile SQL query with inputs ,So the the special SQL Instructions like -- (SQL comment) partcipaties in Query compilation and will be as treated SQL instruction like SQL comment during the exection of SQL query.. This changes Query and App behaviour i.e SQL InjectionProblem is raised

PreparedStatement obj makes DB s/w to compile SQL query with out inputs but having params(?) ,So the the special SQL Instructions like -- (SQL comment) does not partcipatie in Query compilation and will not be treated as SQL instructions though it is given along with input values which will be set query after query compilation like during the exection of SQL query.. This does not change Query and App behaviour i.e there is not SQL InjectionProblem

=>The Pre-compiled Query of PreparedSatement object can be a
->select or non-select query
->static or dynamic query
->query with out inputs or with inputs

as hard coded inputs | through variables | through params(?)

(soft coding)

=>The parameters (?) of SQL query for PreparedStaement object can represent only inputs .. i.e they can not represent SQL key words , table names, cols names..

eg1:: select * from student where sno>=? and sno<=? (valid)

eg2:: select * from ? where sno>=? (invalid)

eg3:: select * from Student where ?>=? and ?<=? (invalid)

eg4:: select * ? ? ? sno>=? (invalid)

The advantages of PreparedSTatement obj
==========
a) Allows to work pre-compiled SQL Query
b) Can represent both static and dynamic SQL queries with params(?)
or with hard coded/soft coded inputs
c) Does not raise SQL Injection Problem
d) No need of converting input values as required for the SQL query
e) Suitable for executing same query for multiple either with same inputs or inputs
f) Suitable for insert Date values..to db table cols by collecting then from enduser in different formats
g) Suitable for inserting Large objects..(files) to Db table cols..

What is the difference SimpleStatement object and PreparedStatement?

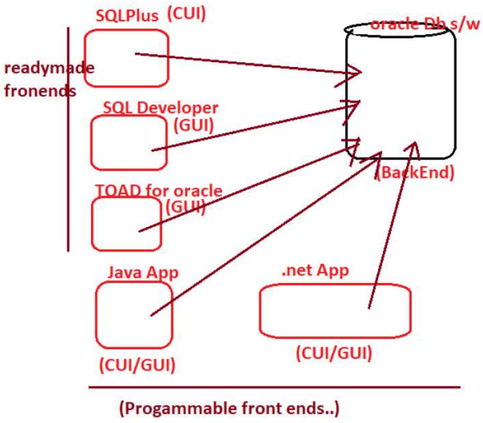
SimpleStatement obj	PreparedStatement obj
(a) Does not hold any pre-compiled query	(a) holds one pre-compiled SQL query
(b) Can be used only to execute static SQL queries	(b) Can be used to execute both static dynamic SQL queries
(c) May raise SQL Injection Problem	(c) does not raise
(d) Input values must be converted as required for SQL query	(d) not required to convert , the setXxx(-,-) metthods will take care of conversion
(e)does not params(?) in the query	(e) allows ...
(f) Not suitable to execute same SQL query for multiple times either with same inputs or with inputs ..	(f) suitable
(g) not suitable for date values insertion	(g) suitable
(h) not suitable for Large objs(files) insertions	(h) suitable
(i)* One Simple Statement obj can be used to execute multiple SQL queries one by one.. becoz it does not any hold query , So it can be used to execute multiple queries one by one	(i)* Every PreparedStatement obj represents one pre-compiled SQL query ,So that object should be used only to execute that query..i.e to execute multiple SQL queries, we need multip PreparedStatement objects..

=>Java/.net/php Developers in realtime do not work with SQL prompts directly..(cmd prompts).. They prefer using GUI Java DB tools to make operations easy.. To work with these tool strong \ SQL knowledge is not required...

eg:: SQL developer for Oracle given Oracle corp (seperate installation upto 11g-Xe)
Mysql SQL workbench given by MSQL DB s/w itself
SQL yog for mysql (seperate installation)
Toad for oracle (seperate)
Toad for mysql
PgAdmin for postgreSQL (will come with PosgreSQL Db s/w installation)

SQL developer for Oracle
==========
download from internet :: https://www.oracle.com/in/tools/downloads/sqldev-v192-downloads.html sqldeveloper-19.2.1.247.2212-x64.zip

Gives zip file having setup file..
use it for installation...
(install it only if u have 8gb+)



Procedure to create DB table with records in Oracle using SQL Developer tool
==========
step1) install and launch SQL developer
step2) Create Connection with Oracle DB s/w by giving username,password detials..
new Connection (+) --> name: con1 -->submit username,password -->Test->connect
step3) create Db table
expand con1 ---> right click tables --->new table --> ....
step4) perform all CURD operations on db table..

mysql
======

type :: Db s/w
vendor :: Devx /Sun Ms /Oracle corp
open source
default port no:: 3306
allows to create logical Dbs
default logical DBs are world , sys, shakila
default username :: root
pasword :: root (should be chosen during the installation)

version :: 8.x
url :: https://www.mysql.com/downloads/

mysql installation videos::
https://youtu.be/GIRcpjg-3Eg

Mysql installation gives mysql workbench as the built-in GUI DB tool

maria DB = mysql DB

Dev Env | Test Env | UAT Env | Prod Env..

Dev Env → mysql
Test Env → mysql
UAT Env (Testing at client org) → mysql/Oracle → (Small Projects) / (Big Projects)
Prod Env.. (Project is in Live) → mysql/ Oracle → (Small Projects) / (Big Projects)

UAT :: User Acceptence Test
also called sanity Test /Beta Test

mysql,postgreSQL can not store huge amount of data..
oracle can store huge amount of data...

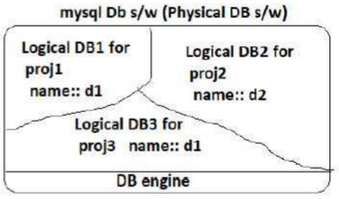
find out limitations of mysql DB s/w and benifits of oracle DB s/w?

PRocedure to create logical DB having Db table with records

step1) make sure that mysql Db s/w is installed and it is running mode

step2) create logical Db and use that logical DB..

```
mysql> create database ntaj414db;
Query OK, 1 row affected (0.16 sec)

mysql> use ntaj414db;
Database changed
```



step3) create db table student having records...

```
mysql> create table student(sno int(10) primary key ,sname varchar(15),sadd varchar(15),avg float);
Query OK, 0 rows affected (2.63 sec)

mysql> insert into student values(456,'ramesh','hyd',78.99);
Query OK, 1 row affected (0.10 sec)

mysql> commit;
Query OK, 0 rows affected (0.00 sec)
```

PRocedure to create logical DB having Db table with records using mysql work bench

step1) make sure that mysql Db s/w is installed and it is running mode

step2) launch mysql workbench and create connection...
Start button ---> prgs --->mysql ---> mysql workbench ---> create connection (+) ---> submit
details like connection name:: con1 --> .... password : root ---> test connection and ok .

step2) create logical Db and use that logical DB..
use icon --> name :: ntaj414db1

step3) create db table with records...
expan logical Db ntaj414db1 ---> tables ---> Righ click --->
enter the db table name ---> enter the col names ---> ....

-->apply --> ....

expand logical db (ntaj414db1) ---> right click tables ---> select all rows --->
insert values in the col boxes ---> apply -> ....

=>every DB s/w needs seperate type4 jdbc driver s/ws..
=> Devx supplied type4 mechanism based jdbc driver s/w for mysql is called Connector/j JDBcCdriver

Connector/j JDBC driver details (will not come along with mysql installation)
==========
driver classname :: com.mysql.cj.jdbc.Driver (or) com.mysql.jdbc.Driver
url :: jdbc:mysql:///<logicalDB name> (for Local mysql DB s/w)
jdbc:mysql://<hostname>/<ipAddress>:<port no>/<logicalDB name> (for remote mysql Db s/w)
host name or ipaddress machone and, port no of mysql Db s/w where it is running

jar file :: mysql-connector-java-8.0.21 .jar (supports autoloading of driver class name)
(collect from internet ---> mvnrepository.com)
https://mvnrepository.com/artifact/mysql/mysql-connector-java/8.0.21

PRocedure to make Java App interacting mysql Db s/w
==========

step1) keep any old jdbc App ready...
step2) add Connector/j JDBC driver jar file to build path/classpath..

step3) Modify the following details in the Applicaton...
(a) driver class name
(b) jdbc url (c) db username (d) db password.

```
//register jdbc driver s/w
//Class.forName("com.mysql.cj.jdbc.Driver");
//establish the connection
Connection con=DriverManager.getConnection("jdbc:mysql:///ntaj414db","root","root");
(or)
Connection con=DriverManager.getConnection("jdbc:mysql://localhost:3306/ntaj414db","root","root");
```

When Db s/w is changed for JDBc App the following jdbc properites will change
a) driver class name (optional)
b) jdbc url
c) db username d) db pwd (e) jdbc driver jar file..

note:: The class names of jdbc objects will change based on the jdbc Driver s/w and DB s/w we use ,So we never refer them with real class names related refer variables.. we always refer them with jdbc api supplied common interface reference variables .. to achieve loose coupling or run time polymorphism..

Candidate key columm , natural key column ,surrogate key columm and primary key column

Candidate key column

Db table in oracle

Person_deteails (db table)
- |--->pid (n) (ck)
- |--->pname
- |--->mobileNo (ck)
- |--->aadharNo (ck)
- |--->voterId (ck)
- |--->panNo (ck)
- |--->address
- |--->bankAcno (ck)
- |-->passPortNo (ck)
- |--->age

Candidate key column (ck)

The column in Db table ,whose values can be used to identity and access the records is called candidate key column.. This colum contains unique value..

Natural key column

=>The candidate key colum whose values are having business meaning and will be changed becoz of the outside world business policies are called natural key columns..
=> These colum values are expected from endusers.
=>These colum values can be used inside and outside and DB s/w to identity and access the information..

eg:: aadharNo, voterId ,panNo, bankAccount ,mobileNo and etc..

Surrogate key column

=>The candiate key column whose values are dynamically generated by the undelrying Db s/w or App or Project with out having any business meaning is called Surrogate key colum..
=>these column values will not be from endusers... will be generated dynamically by underlying Db s/w or Project/App.

eg:: => sequence r generated number in oracle
=>indentiy column(auto increment) number in mysql
=>hibernate generators
=> random number given by App/project

Limitations of taking natural key column as Primary key column

=> values are quite lengthy , so they need more memory
=> These values are having business meaning and they will be changed becoz of outside business polycies and this process distrubs other dependent db tables and java classes (Very costly)
=>These values are expected from enduser.. if enduser fails to gives record insertion will fail..

note:: Do not take natural key col as primary key colmn .. always prefere taking surrogate key column as pk column.

Advantages of taking surrogate key colum as pk column

=> Values are very small, So much memory is not required
=> No business meaning.. so they never change
=>not expected from endusers.. record insertion is still possible thorugh enduser is not supplying certain Data..

App development using Oracle sequence generated as the sno column value (pk col value) (standard)

step1) create sequence in oracle

```
SQL> create sequence stud_sno_seq start with 1000 increment by 1;
Sequence created.
```

=> natural key column, surrogate key column candidate key columns are theortical constraints.. i.e they can not be applied Db tables ...
=>The only possible real/pratical constraints are pk, fk, uk, nnk ..

step2) develope insert query based application using PreparedStatement obj. having insert SQL query sQL query as shown below..

```
private static final String
    INSERT_STUDENT_QUERY="INSERT INTO STUDENT VALUES(STUD_SNO_SEQ.NEXTVAL,?,?,?)";
```

1,2,3

note:: DB sequnce is not aware of wheather pk colum values given by sequence is inserted or not , deleted or not ... So it always generates next number... in sequence..

note:: Oracle supports sequences ... but mysql does not support sequences, So mysql we use identity col as pk value..

(The col having auto increment constraint , if insert values to other cols the identity col value will be generated automatically.)

In Mysql Db s/w to generate sno values by talking "sno" colum identity col (standard)

step1) make sno column as identity column by add auto increment constraint
mysql workbench --> go student db table settings ---> go to sno col and select ☑ AI (auto increment) -->apply..

step2) develop application using PreparedStatement obj having following sql Query..

```
private static final String INSERT_STUD_QUERY="INSERT INTO STUDENT(SNAME,SADD,AVG) VALUES(?,?,?)";
```

note:: the identity col of mysql first uses <max val>+1 formulae to generate the id value.. and next uses previous val+1 formuale

To geneate sno col value as random number through java code (for any Db s/w) (not standard)

```
private static final String INSERT_STUD_QUERY="INSERT INTO STUDENT VALUES(?,?,?,?)";

if(con!=null)
    ps=con.prepareStatement(INSERT_STUD_QUERY);
    //set values to query params(?)
    if(ps!=null) {
        ps.setInt(1, new Random().nextInt(100000)); // 0 to 99,999
        ps.setString(2,name);
        ps.setString(3, addrs);
        ps.setFloat(4, avg);
    }
```

Random class generated random number are not unique numbers... For unique number develope custom code or use third apis..

Interacting with multiple Db s/ws
==========

=> One JAva App can interact with multiple Db s/w as needed...

=> In one Jdbc App we can create multiple jdbc con objects, Statement objects, PreparedStatement objects, ResultSet objects ande etc...

=>In Jdbc App use Simple Statment object to execute SQL query only for 1 time with out having any conditions... PReparedStatement is good multiple operations like executing query for one time or multiple times with coditions .. for multiple times with out conditions. for date values insertion , for bol insertion and etc...

=>Usebase:: Bank1 has acquired bank2 then the records of bank1 will be transfered to another bank2

eg:: kotak mahindra has acquired ING vysya bank

eg:: Andhara is merged with Union bank

eg:: Syndicate bank is merged with canara bank..

Q) Write JDBC App to transfer the records of BankAccount db table (oracle) to BankAccount db table (mysql)

(Let us assume school1 is acuiquired by school2)

setup
=====

=> BankAccount db table in oracle with records (AndharBank)

=> BankAccount db table in mysql with rcords (Union bank)

nn-->not null
pk -->primary key
uk -->unique key
AI --->Auto Increment
One db table can have only one pk column

BankAccount db table oracle
==========

sno(pk)(n)	acno(uk) (nn)(n)	holdername(vc2) (nn)	balance(float) (nn)
1	34561	raja	7000
2	56778	ram	8000

select * from BankAccount
(Query with out condition for 1 time execution)

Java App

read from
(Simple Statement obj)

BankAccount db table mysql
==========

sno(pk)(i) (AI)	acno(uk) (nn)(i)	holdername(vc) (nn)	balance(float) (nn)
1	12345	suresh	60000
2	34567	ramesh	70000
3	34561	raja	7000
4	56778	ram	8000

insert into

we need to execute
"insert into BankAccount(acno,holdername,balance) values(?,?,?)"
for multiple times with diff inputs.. So use PreparedStatatment obj

=>Bank account numbers are unique atleast with in a country..

=>To get records from oracle Db table we write " Select * from BankAccount" SQL query . since this SQL query is not having any conditions and needs to be executed only for 1 time,So we can for SimpleStatement object.. To insert these recived bulk records into mysql Db table we need to execute insert SQL query for multiple times with diff values ,For this we need to use PReparedStatement object..

note:: upto oracle 11g there is no support for indentity colums.. oracle12c onwords supports indentity cols.

note:: mysql does not support for sequences. but it supports Identity cols.

Example App
==========

refer to OracleToMySQLDataTransferTest.java

---

with
Working date values
==========

=> while working DOB, DOJ,DOM ,DOD ,billDate, registration Date and etc.. values we need to insert and retrive date vlues..

=> inserting date values as String col values(varchar2) is bad pratice becoz we can not perform Arithmetic and logical operations on them

=> Insert date values to the "date" data type db table cols..

=> All major DB s/ws are supporting "date" data type...

=> Diff DB s/ws stores date values in diff patterns

oracle --> dd-MMM-yy eg:: 20-OCT-80

mysql --> yyyy-MM-dd eg: 1990-08-15

note:: Using Simple Statement we can insert date values but the SQL query should having date values directly in the pattern that underlying Db s/w supports.. which very complex to supply..becoz differt enduser beloging to diff countries will date values in diff patterns

india --> dd-MM-yyyy eg: 10-12-1980

usa --> MM-dd-yyyy eg:: 12-10-1980

china --> yyyy-MM-dd eg:: 1980 -12 -10

and etc..

MM ---> month

mm--> minutes..

IO Streams (read)
==========

and etc..

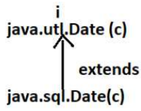
=> if give date value as the java.sql.Date object as PreparedStatement object query param value.. the jdbc driver inserts the date value in the pattern that underlying Db s/w supports.

ps.setDate(<param no> , <obj of java.sql.Date class >);

what is the diff b/w java.sql.Date and java.util.Date?

Ans)

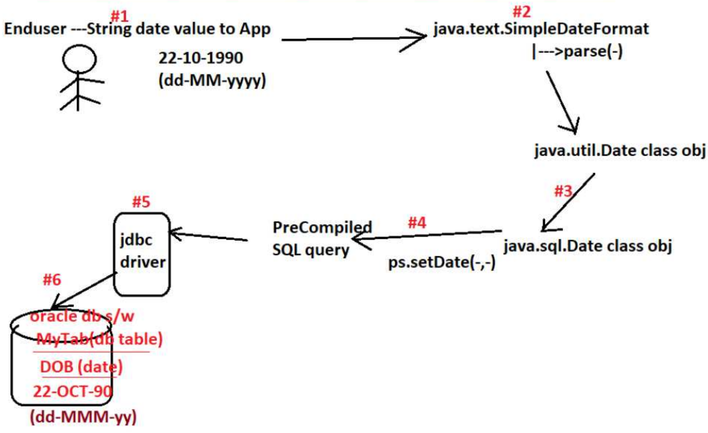
java.util.Date	java.sql.Date
a) holds both date and time	a) Holds only date.. not the time
b) Can not used DB Persistence operations	b) can bused used
c) can not be set as query param value in ps.setDate(-)	c) can be set..
d) super of java.sql.Date	e) sub class of java.util.Date



java.sql.Time ---> for time values
java.sql.Date --> for date values
java.sql.Timestamp --> for date and time values

oracle SQL data type for date,time
---
date --> for date values
timestamp -->for date,time values..

Standard Procedure(jdbc driver indepndent and DB s/w independent) in JDbc App to development to insert date values to db table cols



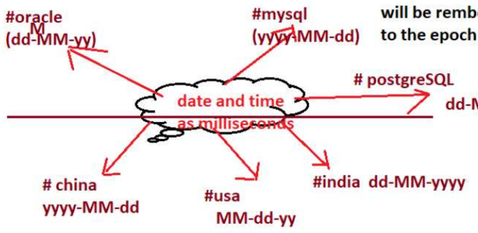

```
//converting String date value to java.util.Date class obj
String d1="12-11-1990"; //dd-MM-yyyy
SimpleDateFormat sdf=new SimpleDateFormat("dd-MM-yyyy"); //holding pattern of date
java.util.Date ud1=sdf.parse(d1);
System.out.println(ud1);
```

The parse(-) of this takes given String date in the specified pattern and converts it into java.util.Date object

=>always write java.util.Date and java.sql.Date classes with package names in the .java file to avoid ambigutity errors.

```
/converting java.util.DAte class obj to java.sql.Date class obj
long ms=ud1.getTime(); //gives no.of milliseconds that are elasped b/w
                // jan 1st 1970 midnight 00:00 hours(epoch standard) and ud1 obj's date,time
java.sql.Date sd1=new java.sql.Date(ms);
System.out.println("sql date::"+sd1);
```

In s/w industry, all date and time will be rembered as millis with respect to the epoch standard 1970 jan 1st midnigth 00:00 hours




```
/if String date value pattern is yyyy-MM-dd then it can be converted directly to
        // java.sql.Date class obj with out converting to java.util.Date class object.
        String d2="1995-10-21"; //yyyy-MM-dd
        java.sql.Date sd2=java.sql.Date.valueOf(d2); //static method
        System.out.println("sql date2::"+sd2);
```

Write a JDBC App to insert DOB,DOM ,DOJ date values from user along with pname, and address

DOB --> dd-MM-yyyy
DOM --> MM-dd-yyyy
DOJ --> yyyy-MM-dd

Collect from endusers in this pattern

DB table in oracle
==========
Person_date_info
---
pid (n) (pk) ---> collect from sequence
pname (vc2)
paddrs (vc2)
DOB date
DOJ date
DOM date

```
CREATE TABLE PERSON_DATE_TAB1
(   PID NUMBER(10) PRIMARY KEY,
    PNAME VARCHAR2(20),
    PADDRS VARCHAR2(20),
    DOB DATE,
    DOM DATE,
    DOJ DATE);

CREATE SEQUENCE PERSON_PID_SEQ
MINVALUE 1 MAXVALUE 1000000 INCREMENT
 BY 1 START WITH 1
```

DB table in mysql
==========
Person_date_info
---
pid (i) (pk) ---> generate using AI
pname (vc)
paddrs (vc)
DOB date
DOJ date
DOM date

```
CREATE TABLE `ntaj414db`.`person_date_info` (
 `pid` INT AUTO_INCREMENT PRIMARY KEY,
 `pname` VARCHAR(25),
 `paddrs` VARCHAR(25) ,
 `DOB` DATE ,
 `DOM` DATE ,
 `DOJ` DATE );
```

Refer DateInsertTest.java from workspace

Retrieving Date vlaues

==========

=>For this we can use either SimpleSTatement object or PreparedStatement obj

=> if u r just reading and display date values.. with out taking date value as the condition value the prefer Simple Statement object/PreStatement object, otherwise prefer using PreparedStatement obj.

=>After getting Date values to ResultSet object by executing Select SQL query ,if we call rs.getString(-) the date values will come as string values having yyyy-MM-dd pattern .if we call rs.getDate(-) method then we get java.sql.Date class objs having yyyy-MM-dd pattern as internal pattern.

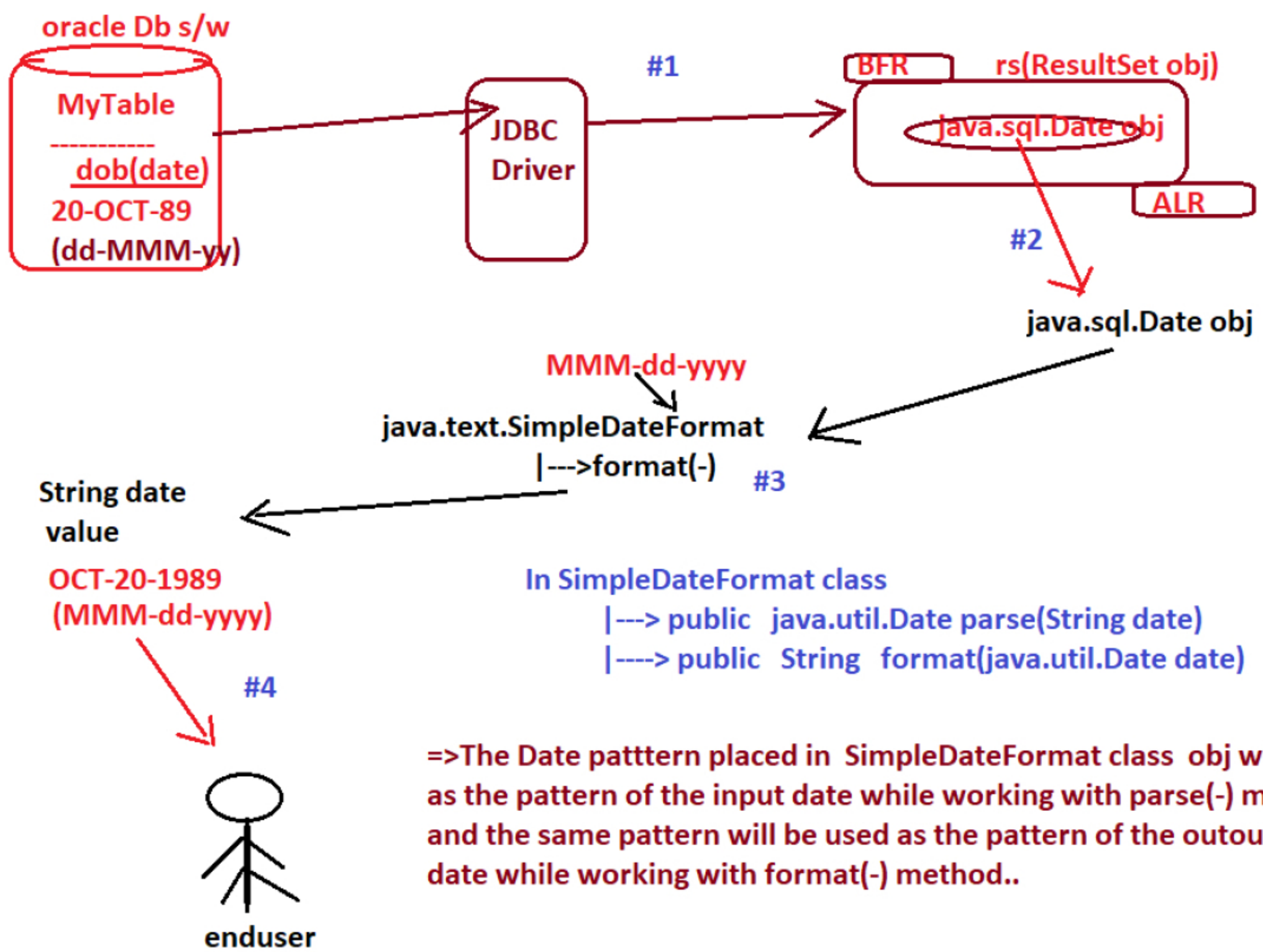
=>calling rs.getDate(-) method is good becoz we can use the recieved java.sql.Date class obj to present date in different formats as required for the enduser .. by using format(-) method of SimpleFormat class..

String date value → SimpleDateFormat |-->parse(-) → java.util.Date obj

java.sql.Date / java.util.Date obj → SimpleDateFormat |-->format(-) → String date value

DB s/w independent and JDBC driver indepedent procedure to retrieve and display date values from date data type DB table cols

==========



In SimpleDateFormat class

|---> public java.util.Date parse(String date)

|----> public String format(java.util.Date date)

=>The Date patttern placed in SimpleDateFormat class obj will be used as the pattern of the input date while working with parse(-) method... and the same pattern will be used as the pattern of the outout string date while working with format(-) method..

refer DateRetrieveTest.java from workspace

Assignment :: Writing a jdbc App to get person age in years based on the given person Id ?
(Use the Application Db table)

To calculate age based on given person id
==========

a) Using DB s/w specific SQL query
b) Using Java code (DB s/w idenpendent code)

a) Using DB s/w specific SQL query

query in oracle (refer PersonAgeCalculatorOracle.java)
==========

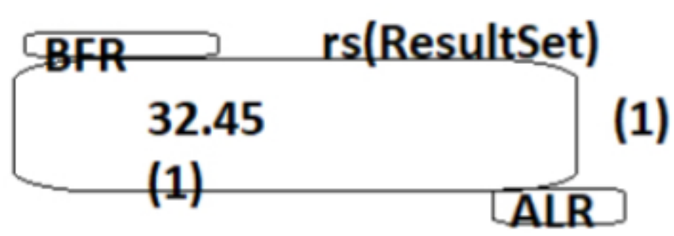
```
SQL> select (sysdate-dob)/365.25 from person_date_tab1 where pid=1;

(SYSDATE-DOB)/365.25
--------------------
        20.7739647
```

query in mysql (refer PersonAgeCalculatorMySQL.java)
==========

```
mysql> select from_days(datediff(now(),dob)) from person_date_tab1 where pid=1;
```

(or)

```
select datediff(now(),dob)/365.25 from person_date_tab1 where pid=1;
```



b) Using Java code (DB s/w idenpendent code)

Write java code for this
(<sys date in Ms> - <DOB date in Ms>)/(1000*60*60*24*365.25)
(refer PersonAgeCalculatorJavaCode.java)

```
if(rs!=null) {
        if(rs.next()) {
        // get System date in ms
          sysDateMs=new Date().getTime();
         // get DOB from from ResultSEt
      udob=rs.getDate(1);  // java.util.Date class ref variable (udob) is refering java.sql.Date class obj
                           //as super class ref can refer sub class obj
     dobMs=udob.getTime();
          System.out.println("Person age::"+(sysDateMs-dobMs)/(1000*60*60*24*365.25f));
        }
              else {
                    System.out.println("Record not found");
              }
  }//if
```

Working with Large Objects (files)
==========

Larget objects(LOBs/Files)

BLOB
(Binary Large object)
(eg:: image files, audio files, video files, av files, and etc...)

CLOB
(Character Large Object)
(eg: text files, Rich Text files (RTF), csv file and etc..

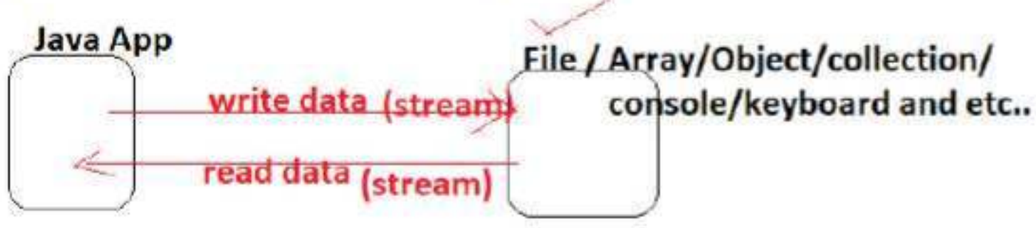
av files :: audio video files
csv file :: coma seperated values

=> All major DB s/ws are giving support for LOBs by supporting data types called BLOB and CLOB
=> while working with matrimony apps(match makings), job portal Apps (like naukri.com), social networking Apps(like fb), profile management Apps(aadhar Apps), e-commerce apps and etc.. we need to insert and retrieve large objects...

=>Simple Statement object SQL query expects files(lobs) directly as input values.. but that not possbile..So we can not use Simple Statement obj to insert large obejcts
=> PreparedStatement object allows to set streams representing files as query param values .. So we can use PreparedStatement object to insert Larget objects...

note:: The SimpleStatement obj SQL queery does not even allow streams as inputs values.. it expects total file content as the input value.. which is again not possbible..

Streams
=======
=>Stream is a continuous flow of data.. and acts as pipelines b/w source and destination using we can send/recieve to/from Destination..



Two types of streams based on type of data they carry
==========

(a) Byte Streams
=> These stream can carry both binary and text data ..
=> Here InputStream are given for reading data and OuputStreams given for writing data
eg:: FileInputStream , FileOuputStream, DataInputStream, DataOuputStream and etc...

(b) Character streams
=> These streams can carry only text data ..
=> Here Reader Streams are given for reading data and Writer Streams given for writing data
eg:: FileWriter , FileReader, BufferedReader, BufferedWriter and etc...

To set input binary streams representing files as query param value we can use
ps.setBinaryStream(-,-,-) /ps.setBinaryStream(-,-) (or) for binary data..
ps.setBlob(- - -)/ps.setBlob(- -)
1,2,3 1,2
1-->param index
2-->stream 3->length of file (from the begining)

To set Reader text streams representing files as query param value we can use
ps.setCharacterStream(-,-,-) /ps.setCharacterStream(-,-) (or) for character/text data..
ps.setClob(-,-,-)/ps.setClob(-,-)
1,2,3 1,2

JDBC driver and DB s/w independent PRocedure to insert image (BLOB value) to DB table col

step1) Create PreparedStatment having Pre-compiled SQL query

```
PreparedStatement ps=
    con.prepareStatement("INSERT INTO SHADHI_INFO VALUES( PID_SEQ.NEXTVAL, ?,?,? ,?)");
```
1,2,3,4

step2) Create ByteStream representing image file of the file system

```
InputStream is=new FileInputStream("d:/images/photo.jpg");
```

step3) set values to query params

```
ps.setstring(1,"ramesh");
ps.setString(2,"hyd"); ps.setFloat(3,600000);
ps.setBinaryStream(4,is);
```

step4) execute the query

```
int count=ps.executeUpdate();
```

oracle Db s/w
shadhi_info

regNo(pk)(n)	name (vc2)	addrs(vc2)	income(n)	photo(blob)
1	ramesh	hyd	600000	

(internally stores in the form of bindary info)

(Since lobs are stored directly in Db s/w ... the burden on Db s/w will increase.. So performence is bad)

photo.jpg (d:/images/photo.jpg)

=>in oracle Db s/w each blob /clob value can be upto 4gb
=>mysql Db s/w cannot store huge size blob or clob values...

Matriymony App (standalone) (jdbc Apps) (super market) (colleage Apps, samall university Apps) --->Go for BLOB,CLOB values directly in DB s/w

Matriymony App (web based) (Servlet/Jsp env..) (youtube, FB, Instagram, twitter and etc.. will fallow this model) --->Go for file ssytem/cloud storage for files and insert only locations to the Db table cols (vc2)

more eg::amazon,flipkart ..

note:: Storing LOBs (files) direcly in DB s/ws will be done only small scale Apps.. not for large scale Apps ... In Large scale Apps files will be saved in file system (HDD) and their locations will be saved in DB table cols as String values.

oracle Db table

clipNo(n)(pk)	clipTitle(vc2)	type(vc2)	clipLocaton(vc2)
1	bahubhali	movie	d:/movies/babubhali.mkv

(no burden on the Db s/w --So good Performence)

d:\movies
|--->babubhali.mkv

=>For storage purpose instead of Local fileSystems (HDD) they use cloud env.. like AWS, GoogleCloud, iCloud , Azure and etc... (Cloud provies high end.. hardware and s/w for companies on rental basis)

=>"\" is escape sequence character in java ... it will be useful to void literal meaning certain for characters like ' , " and etc.. to make them as printable characters..

\" -->gives "
\' --> gives '
\\ --> gives \
ande etc..

mysql blob data type are
==========

TINYBLOB	Up to 255 bytes
BLOB	Up to 64 Kb
MEDIUMBLOB	Up to 16 Mb
LONGBLOB	Up to 4 Gb

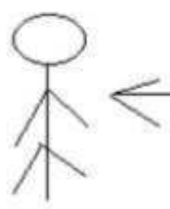
oracle having only blob data type having size upto 4gb

JDBC driver and DB s/w indepednet procedure to retrieve BLOB values to DB tables
==========

Here we can use either simple statement or PreparedStatement object

oracle Db s/w
shadhi_tab

regNo	name	location	income	photo
1	raja	hyd	900000	



step1) create PreparedStatement obj having pre-compiled SQL query

```
PreparedStatement ps=
      con.prepareStatement("SELECT * FROM SHADHI_TAB WHERE REGNO=?");
```

step2) set Query param values..

```
ps.setInt(1,1001);
```

step3) execute the query

```
ResultSet rs=ps.executeQuery();
```

BFR rs(ResultSet)

1	raja	hyd	900000	is (InpustStream)

ALR

step4) get InputStream from ResultSet representing DB table blob col value

```
InputStream is=null;
 if(rs.next())
   is=rs.getBinaryStream(5);
```

step5) create OutputSteam pointing new file

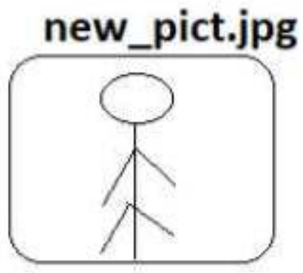
```
OutputStream os=new FileOuptuStream("new_pict.jpg");
```

step6) copy data of InputStream to outputStream file

```
IOUtils.copy(is,os);
```

(It is from third party api given apache company jar file name:: commons-io-<ver>.jar)

new_pict.jpg



(Download from internet)

(url ::https://mvnrepository.com/artifact/commons-io/commons-io/2.7)

=>IOUtils is thrid party suplied Utility class to simplify IO streams related operations..

=>The class that acts as helper class while doing major operations.. convert 1 form of data to another form data.. copying data and etc.. is Utility class

eg:: IoUtils , DateUtills, StringUtils, BeanUtils, Arrays and etc....

step7) close jdbc objs and streams

```
is.close(); os.close(); rs.close(); ps.close();
 con.close();
```

note:: refere PSBLORetrieve.java
==========

=>To insert clob value to DB table column we need set Reader Stream that pointing to text file as Query param value by using ps.setCharacterStream(-,-,-)/ ps.setCharacterStream(-,-) or ps.setClob(-,-,-)/ps.setClob(-,-) methods

=>For retrieving clob values from DB table col through JDBC ResultSet object us rs.getCharacterStream(-) that given Reader object..

=>To insert pdfs files,word docs prefer using BLOB cols becoz those file contain both text and images

=> To Insert text files, csv (ms excel), rich text files prefer using CLOB cols ..

Mysql CLOB data types are
==========

TINYTEXT upto 256 bytes
TEXT upto 65,535 bytes
MEDIUMTEXT upto 16,777,215 bytes
LONGTEXT upto 4,294,967,295 bytes

refer CLOBInsertTestOracle.java,CLOBInsertTestMySQL.java and CLOBRetrieveTest.java

Assignment :: develope Profile Mgmt Application to insert PHOTO,RESUME,VIDEO in a single DB table column..

PostgreSQL
==========

=>type :: DB s/w (Light weight)
=>vendor:: EnterpriseDB
=>default portno:: 5432
=>Allows to create logical DB , default logical name:: postgres
=>Gives PgAdmin4/5 as built-in GUI DB tool
=>To download and install :: https://www.enterprisedb.com/downloads/postgres-postgresql-downloads

default username:: postgres
password :: root (choose during installation)

Procedure to create DB table with records in PostgreSQL using PGadmin tool
==========

step1) make sure that postgreSQL Db s/w is installed.

step2) launch pgadmin4/5 tool (use start button ---> all prgs ---> posgresql ---> pgadmin4/5 --> submit password ->...)

step3) create Logical DB

right click on databases ---> create database ---> name :: ntaj414db --> ....

step4) create DB table product

expand ntaj414db---> expand schemas --->expand --->public -->right click tables-->new table name :: product --> go to colums tab -> add cols

pid inteteger pk (yes) nn(yes)
pname charcter varying 20
price real
qty real

--> ok...

generated SQL is

```
CREATE TABLE public.product
(
  pid integer NOT NULL,
  pname character varying(20) COLLATE pg_catalog."default",
  price real,
  qty real,
  CONSTRAINT product_pkey PRIMARY KEY (pid)
)
```

generated SQL is

```
CREATE TABLE public.product
(
  pid integer NOT NULL,
  pname character varying(20) COLLATE pg_catalog."default",
  price real,
  qty real,
  CONSTRAINT product_pkey PRIMARY KEY (pid)
)
```

step5) insert records into db table...

right click on product db table --->scripts ---> insert query ---> replace values for ? symbols
--> execute query (flash symbol -)

PostgreSQL supplied type4 mechanism based jdbc driver s/w for postgresql Db s/w is called postgresql thin driver and its details are

driver calss name :: org.postgresql.Driver
jdbc url :: jdbc:postgresql:<logical DB> (for Local postgresql Db s/w)
jdbc:postgresql://<host/ip address>:<port>:<LogicalDB> (for remote postgresql db s/w)
jar file :: postgresql-42.2.16.jar (supports auto loading driver class) seperate download from internet

⇩

mvnrepository.com
(https://mvnrepository.com/artifact/org.postgresql/postgresql/42.2.16)

Procedure to develop Java App interacting with PostGreSQL Db s/w
==========

(a) keep any old app ready and make sure that its DB table is available in postgreSQL

b) Write the following to create jdbc con object pointing to PostgreSQL Db s/w..

```
// register jdbc driver
 //Class.forName("org.postgresql.Driver");
//establish the connection
Connection con=DriverManager.getConnection("jdbc:postgresql:ntaj414db","postgres", "root");
```

jdbc url — dbuser — dbpwd

c) Change SQL query as per postgreSQL DB s/w..

```
ResultSet rs=st.executeQuery("SELECT PID,PNAME,PRICE,QTY FROM PRODUCT");
```

d) add postgresql thin jdbc driver s/w jar file to classpath or build path...

right clikc on the project--->build path---> cfg buildpath --->libraries tab --->add extenal archvies ---> browser and select the jar file.. (postgresql-42.2.16.jar (select from downloaded files location))

e)run the Application

---

note:: In Postgresql's pgadmin take all names like db table name, col names, sequence names and etc.. in lowercase.. but in front end App we can them in the SQL queries in any case.. (generally we prefer in upper case)

note:: Postgre sql supports sequences i.e we sequence generated value as pk col value while inserting record to db table cols.. and the qery sequence looks like this..

```
private static final String INSERT_QUERY="INSERT INTO PRODUCT VALUES(nextval('PID_SEQ'),?,?,?)";
```

⇩ *(to sequence generated value)*

To create sequence in postgreSQL
==========

u r logical DB --->schemas -- sequences-->create sequence -> name: pid_seq --->definitation tab ---> current value :: 1000 , min value : 1 , increment :1 end value : 100000 --> .... -->execute (flash symbol)

```
//Generated Quyery
CREATE SEQUENCE public."PID_SEQ"
INCREMENT 1
START 1000
MINVALUE 1
MAXVALUE 100000;
```

Assignment:: Develop Apps by choosing postgreSQL as Db s/w
(a) insert Date values (like DOB,DOM,DOJ)
(b) insert blob, clob values
(c) calculating age based given person id and his DOB

Also retrive operation

---

prepare and come for next class
==========
=> oracle /mysql PL/SQL procedures and functions
=> oracle Cursors (Sys_refcursor)

CallableStatement object (It is given to call PL/SQL procedure and functions)

PL/SQL Procedures/Functions

=>These are named blocks that reside and execute in DB s/w havig block of SQL and Non SQL Statements .. These are like java methods..

=> PL/SQL procedure does not return a value.. where as PL/SQL function returns a value
=> PL/SQL (PL by SQL) Procedure ot function params will have mode and type

3 modes are
- IN ---> input (To supply inputs)
- OUT --> To gather outputs
- INOUT ---> To supply inputs and to gather ouputs

pl sql logic in oracle
---
y:=x+x ; x --> in param , y out param

pl/sql logic in oracle
---
x:=x*x; x--> INOUT param

in SQL or PL/SQL

= for comparision
:= for assignment

note:: if want 10 results from PL/SQL procedure then we need to take 10 OUT params.. To do same thing with PL/SQL function we need to use 9 OUT params and 1 return value.

=>PL/SQL programing syntax is specific to each DB s/w...
=> These are also called as Stored Procedures and functions becoz they reside and execute in DB s/w..

=> Project
|--->modules
|---->Apps
|--->prgs..

=>Instead of writing same SQL query in multiple modules or Apps , It is recomanded to write in DB s/w only for 1 time as PL/SQL procedure or function and use it from multiple apps or modules having reusability.. It helps to centralize PErsistence logic by keeping in Db s/w with protection (i.e we can hide code from developers)

usecase1:: Instead authentication logic, attendent calculation logic in every module , Write it only for 1 time in Db s/w as PL/SQL Procedure or function and use in multiple modules..

In realtime project
=> 70% to 80% PErsistence logic in the form of SQL queries
=> 20% to 30% PErsistence logic in the form of PL/SQL procedure and functions

Simple PL/SQL procedure/functions should be devloped by Programmers directly.. where complex procedures and functions will be developed by SQL/DB Team.

=> JDbc Apps use CallableStatement obj to call PL/SQL procedures and functions..

This can be even used to execute static /dynamic SQL queries and pre-compiled SQL queries

java Project contains
|--->UI developers (html,css, js,jquery,angular,...)
|---->Java Developers (java, servlet,jsp, spring,hb,..)
|----> SQL developers (SQL, PL/SQL, DBA ...)

if u r full stack developer.. u should do all the 3 jobs/roles.
+ cloud env..knowlede(aws+ devops)
maven,gradle, jenkins, kubernates, docker and etc..

Sample /Example PL/SQL procedure in oracle using SQL Developer

right click on procedure ---> create procedure ---> name:: P_FIRST --> add(+) 3 params
x in number , y in number ,z out number
--> save (flopy disk) ---> compile (settings symbol -gear)

```
CREATE OR REPLACE PROCEDURE P_FIRST ( x IN NUMBER , y IN NUMBER , z OUT NUMBER) AS
BEGIN
  z:=x+y;
END ;
```

procedure name; param name; param mode; param type

default mode of param is "IN"

(or)

Process to create PL/SQL Procedure by using SQL command propmt / SQL Plus

=>open SQL prompt as administrator --->SQL> connect system/manager ---> SQL> select * from emp; (some dummany)
--> ed --> type the the above PL/SQL procedure ---> file menu save --> file menu exit ---> SQL> /

if any compilation error are there ---> SQL> show errors;

Steps to use Callable Statement obj to call PL/SQL procedure

step1) prepare Query having SQL92 syntax to call PL/SQL procedure

String query="{ CALL P_FIRST(?,?,?)}";
1,2,3

step2) Create CallableStatement obj by making the above Query as Pre-compiled SQL query

CallableStatment cs=con.prepareCall(query);

sends the given SQL to DB s/w , makes it as PL/SQL procedure or function and returns CallableStatement obj having the pre-compiled SQL query.

java.sql.Statement(I)
extends
java.sql.PreparedStatement(I)
extends
java.sql.CallableStatement(I)

step3) register OUT params with JDBC data types.

cs.registerOutParameter(3, Types.INTEGER);

param index; jdbc data type

JDBC data types are bridge data types b/w java data types and SQL Data types they are useful to give instructions to JDBC driver to convert java notation data to SQL notation data and vice-versa,

java datatype	jdbc type	sQL data type (oracle)
int	Types.INTEGER	number
float	Types.FLOAT	float , number(-,-)
short	Types.SHORT	number
java.sql.Date	Types.DATE	date
String	Types.VARCHAR	varchar,varchar2

and etc..

All these are constants (public static final variables) of java.sql.Types class.

step4) set values to IN params

cs.setInt(1,100);
cs.setInt(2,200);

no need of registering IN params with JDBC type.. these cs.setXxx(-,-) will register them internally..

step5) call /execute PL/SQL procedure

cs.execute(); (this uses the above SQL query with special syntax to call PL/SQL procedure.. In the prcoess the output will be stored in OUT params)

step6) get results from OUT Params

int result=cs.getInt(3);
S.o.println("result is::"+result);

note:: To execute PL/SQL procedure for multiple times with diff values repeat step4 to step6 for multiple times

step7) close jdbc objs
cs.close(); con.close();

Write a JDBC App that calls PL/SQL procedure of Oracle using CallableStatement obj to get Emp name,job salary based on the given employee number..

```
create or replace procedure p_getEmpDetails_By_No(no in number,
                                                  name out varchar2,
                                                  desg out varchar2,
                                                  sal out number)
as
begin
 select ename,job,e.sal into name,desg,sal from emp e where empno=no;
end;
/
```

col names out param names col name In param name

For Java App refer CsPRocedureTest2.java

Q) Write a JDBC App to call PL/SQL procedure using CallableStatement object to perform Authentication...

step1) make sure userinfo db table is already avaiable having usernames ,passwords.

```
SQL> select * from userinfo;
UNAME        PWD
-------------- --------------
raja          rani
ramesh rao    suresh
jani          begum
dhoni         cricket
```

step2) develpp PL/SQL procedure having Authentication logic..

```
Create or replace procedure P_AUTHENTICATION(user in varchar2,
                                             pass in varchar2,
                                             result out varchar2)
as
  cnt number;
begin
   select count(*) into cnt from userinfo where uname=user and pwd=pass;
   if(cnt<>0)then
     result:='VALID CREDENTIALS';
   else
     result:='INVALID CREDENTIALS';
  end if;
end;
/
```

step3) develop the App using CallableStatement object

refer CSProcedureTest3.java

=>Since CallableSTatement object is the extension of PreparedSTatement obj.. So, there is not SQL Injection Problem with CallableStatement object..

Assigment1:: get StudentDetails based on the given sno by Calling PL/SQL procedure.
Assigment2:: get Dept Details based on the given depnto by calling PL/SQL procedure.

Cursor
======

=>It is a InMemory variable of oracle's PL/SQL programming having ability to store bunch of records given by Select SQL query.. Cursor is like jdbc REsultSet object

=> SYS_REFCURSOR is a built-in Cursor data type.. in oracle's PL/SQL programming

```
empDetails sys_refcursor;  //cursor variable declaration
  open empDetails for
    select empno,ename,job,sal from emp;
```

[The records given by select SQL query execution will be stored in cursor variable "empDetails"

Write a PL/SQL procedure that gives Employee(empno,ename,job,sal) details based on given given two desgs. order by desgs..

```
CREATE OR REPLACE PROCEDURE P_GET_EMPDETAILS_BY_DESGS
(
 DESG1 IN VARCHAR2
, DESG2 IN VARCHAR2
, EMPDETAILS OUT SYS_REFCURSOR
) AS
BEGIN
open EMPDETAILS for
  SELECT EMPNO,ENAME,JOB,SAL FROM EMP WHERE JOB IN(DESG1,DESG2) ORDER BY JOB;
END ;
```

(Procedure name)

(In params)

Cursor type out params

the records given by select query will be stored here

In java.sql.Types class we do not have JDBC data type to register Cursor type Out params.
So we need to use OracleTypes.CURSOR as alternate (given in ojdbc6/7/8/9/10.jar file)

```
cs.registerOutParameter(3,OracleTypes.CURSOR);
```

=>we can get output from sys_refcursor type out parameter by calling cs.getObject(-) which actually gives Jdbc ResultSet object...

```
ResultSet rs=(ResultSet)cs.getObject(3);
```

prepare try with resource feature of jdk7

For example app refer CsProcedureCursorTest.java

Calling PL/SQL function by using CallableStatement object
==========

=> PL/SQL function return a value..

=> if PL/SQL function wants to return 10 results.. then it gives 9 results through OUT params one result through return value.

=> SQL 92 syn :: { ?=call <functio-name>(?,?,?,...)}

1 2,3,4,...

=> return param (?----->1) should be treated as out param and must be registered JDBC data type..

Write a Oracle PL/SQL function to get Student name,addrs,avg based on the given Student number

3 results (In PL/SQL function 2 out params , 1 return value)

```
CREATE OR REPLACE FUNCTION FX_GET_STUD_DETAILS_BY_SNO
(
 NO IN NUMBER
, NAME OUT VARCHAR2
, ADDRS OUT VARCHAR2
) RETURN FLOAT AS
  PERFORMENCE FLOAT;
BEGIN
  SELECT SNAME,SADD,AVG INTO NAME,ADDRS,PERFORMENCE FROM STUDENT WHERE SNO=NO;
  return PERFORMENCE;
END;
```

function name

return type

Local variable

col names

out params

local variable name

db table

col name

IN param name

return statement returning the value..

SQL 92 syntax is :: { ?= call FX_GET_STUD_DETAILS_BY_SNO(?,?,?)}

1 2,3,4

---

refer CsFunctionTest5.java

{?=call FX_GET_STUD_DETAILS_BY_SNO(?,?,?)}

1 2,3,4

Assingment :: write a JDBC App that calls PL/SQL function to get Emp details(name,job,sal,deptno) by given number.. (eno)

Calling Pl/SQL procedures and functions

In oracle

=>SYS_REFCURSOR ---> built-in cursor data type (To hold bunch of records given by select Query)
=>SQL%ROWCOUNT --> returns the numeric value representing the no.of records that are effected when non-select SQL query is executed.

note: we can have both select and non-select SQL queries in a PL/SQL procedure..

example PL/SQL function in oracle to View and delete student record:::

```
CREATE OR REPLACE FUNCTION FX_VIEW_DELETE_STUD_BY_SNO
(
 NO IN NUMBER
, STUDDETAILS OUT SYS_REFCURSOR
) RETURN VARCHAR2 AS          return type

 CNT NUMBER(3);
 RESULT VARCHAR2(30);         local variables

BEGIN

  OPEN STUDDETAILS FOR
    SELECT SNO,SNAME,SADD,AVG FROM STUDENT WHERE SNO=NO;   holds record given select qurey

  DELETE FROM STUDENT WHERE SNO=NO;
  cnt:=SQL%ROWCOUNT;   no.of records deleted by delele SQL query will be stored in to cnt through SQL%ROWCOUNT

  IF (CNT=1) THEN
    RESULT:='RECORD DELETED';
  ELSE
    RESULT:='RECORD NOT FOUND FOR DELETION';
  END IF;
    RETURN RESULT;
END;          return statement returning the value..
```

query calling PL/sQL function

```
{ ?=call FX_VIEW_DELETE_STUD_BY_SNO(?,?) }
```

1 (return Param)

2,3 → (IN param) (out param)

refer CsFunctionTest6.java

Creating PL/SQL procedure in MYSQL Using Workbench to get prod name,price,qty based on given pid

lanuch workbench ---> expand ntaj414db ---> right click stored procedures --->create new procedure

-->type ** content in the existing template code --> apply --> more code is added ---> execute -> ...

```
DELIMITER $$   //start of procedure code
USE `ntaj414db`$$

CREATE PROCEDURE `P_GET_PROD_DETAILS_BY_PID` (in id int,out name varchar(10),
                                              out rate float,out qnt float )
BEGIN
  select pname,price,qty into name,rate,qnt from product where pid=id;
END$$
```

** col names; out param names; colname; IN param; <mode> <paramname> <type>

```
DELIMITER ;   //end of procedure code
```

Refer CsProcedureMySQLTest7.java

note:: No Cursors are given in mysql ... but no problem.. we can bunch of records directly... with out having any support..

PL/SQL procedure in mysql that gives product details based given two product names

```
DELIMITER $$
USE `ntaj414db`$$
CREATE PROCEDURE `p_GET_PRODS_BY_NAMES` (in name1 varchar(10),
                                         in name2 varchar(10))
BEGIN
   SELECT PID,PNAME,PRICE,QTY FROM PRODUCT WHERE PNAME IN(name1,name2);
END$$

DELIMITER ;
```

Query to call the above PL/SQL procedure :: {CALL p_GET_PRODS_BY_NAMES(?,?) }

To get Select Query results from PL/SQL procedure using CallableStatement obj

```
ResultSet rs=cs.getResultSet();
```

Conclusion JDBC Statement objs
==========

(a) To execute SQL query only for 1 time that to with out any input values go for SimpleStatement object

(b) To execute SQL query for 1 or more times with inputs values , for more times with out input values, for inserting date values, for inserting BLOB/CLOB values. by making the SQL query as pre-compiled SQL query go for PreparedStatement object

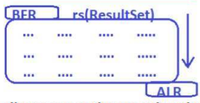
(c) if the persistence logics/b.logics are placed in DB s/w as stored procedures or functions for centralization , for reusability and for security.. then go for CallableStatement object to call those PL/SQL procedures and functions...

use

note:: we can all the 3 JDBC statement objs togather for any no.of times in a JDBC App.

Diff types of JDBC ResultSets objs

Non-Scrollable ResultSet obj

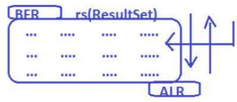


It allows access the records only in one direction that is top to bottom.So this ResultSEt obj is called as sequential RS or uni-directional RS or Non Scrollable RS

note: To access 100th record we must go throguh 99 records.

By default every RS is Non-Scrollable RS

Scrollable ResultSet obj (best)



=>It allows to access records bi-diretionally, non-sequentially,randomly and directly..

=> Here the cursor in the RS can be moved dynamically..

=> To access 100 th record we can jump the cursor directly to 100th record with out going through other records. (gives better performence)

To create Non-ScrollableRS
==========

```
Statement st=con.createStatement();
ResultSet rs=st.executeQuery("SELECT * FROM STUDENT");
```

To create ScrollableRS
==========

```
Statement st=con.createStatement(type,mode);
ResultSet rs=st.executeQuery("SELECT * FROM STUDENT");
```

type (ResultSet type) (int constatns of ResultSet(I))
====

ResultSet.TYPE_SCROLL_SENSITIVE (1005) possible values for
ResultSet.TYPE_SCROLL_INSENSITIVE (1004) type
.
.
.

=>if the Statement obj is created having RStype,RSmode then that Statement gives us ScrollableRS otherwise it will give NonScrollable RS.

mode(ResultSet mode) (int constants of ResultSet(I))

ResultSet.CONCUR_READ_ONLY (1007)
ResultSet.CONCUR_UPDATABLE (1008) possible values for mode
.
.
.

Example code to create Scrollable RS
==========

```
Statement st=con.createStatement(ResultSet.TYPE_SCROLL_SENSITIVE,
                                 ResultSet.CONCUR_READ_ONLY);
```

(or)

```
Statement st=con.createStatement(1005,1008);
ResultSet rs=st.executeQuery("SELECT * FROM STUDENT");
```

ScrollableRS
|--->SensitiveRS
|--->InSensitiveRS
|--->UpdableRS
|---->ReadOnlyRS

methods invokable on Non-ScrollbleRS
==========

next()
getXxx(-)
get Row() --->To get current position of the cursor in RS
close()

methods invokable on ScrollableRS
==========

next()
previous()
getXxx(-)
get Row()
close()
first()
last()
beforeFirst() -->To move the cursor to BFR position
afterLast()
isFirst() -->to check wheather cursor is there in first record or not
isLast()
relative(+/-n)
absolute(+/-n)

Swings
Event Handling
https://www.youtube.com/c/NaresHIT/search?query=swing++

What is the diff b/w relative(+/-n) and absolute(+/-n) method?

=>relative(-/+n) method moves the cursor in RS with respect to current position of the cursor .. here positive indicate forward direction and -ve number indicates reverse direction..

=>absolute(+/-n) method moves the cursor in RS with respoect to BFR or ALR position .. +ve number indicates forward direction with respect to BFR position and -ve number indicates reverse direction with respect to ALR position.

Let us assume ,we have RS with 10 records
==========

absoulte(3) ---> goes to 3rd record
absoulte(-6) ---> goes to 5th record (from the bottom 6th record)
absolute(5) --> goes to 5th record
absolute(-3) --> goes to 8th record
relative(3) --> goes to 10th record (with respect to curent position)
relative(-6) --> goes to 4th record
relative(-3) --> goes to 1st record
relative(-5) ---> throws Exception..
absolute(-10) -->throws Exception..
relative(12) --->throws Exception..

Example App ScrollableRS ---> refer ScrollableRSTest.java
PsScrollableRSTest.java

=>Non-Scrollable RS is also called as ForwardOnly ResultSet ...if we try to perform scrollable RS opertaions on Non-ScrollableRS then java.sql.SQLException: Invalid operation for forward only resultset : previous

=> if u try to move the cursor before BFR or after ALR position then we get java.sql.SQLException: Exhausted Resultset

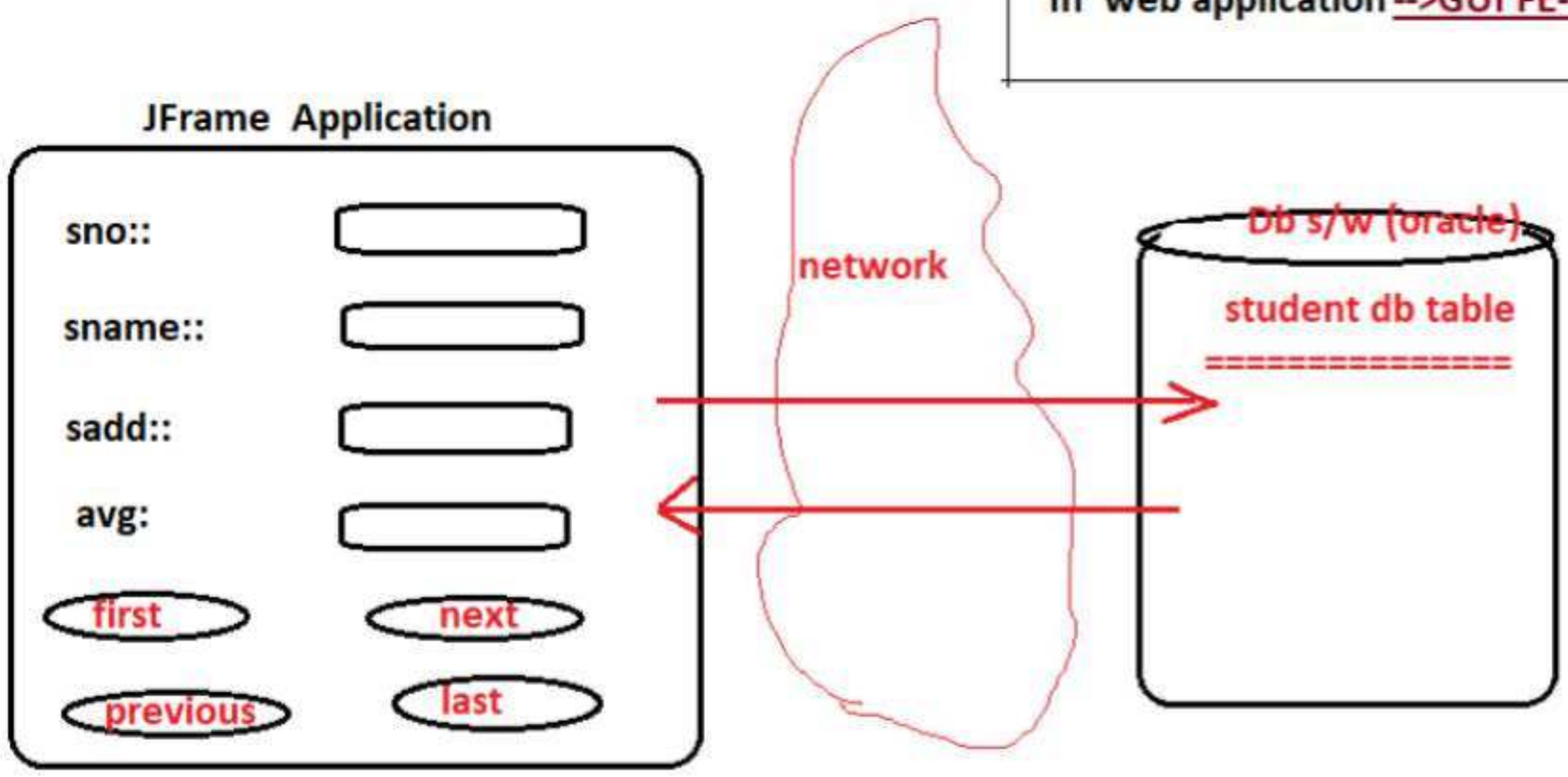
To create ScrollableRS while working with PreparedStatement object

```
PreparedStatement ps=con.prepareStatement("SELECT SNO,SNAME,SADD,AVG FROM STUDENT",
                                          ResultSet.TYPE_SCROLL_SENSITIVE,
                                          ResultSet.CONCUR_READ_ONLY);
ResultSet rs=ps.executeQuery();
```

Mini Project having GUI frontend (swings)
==========

In Java standalone Env -->GUI front end --> Swing/AWT
(new) (legacy)

In web application -->GUI FE---> (html/jsp +css+ Javascript)



=>Since the enduser can click any button dynamically .. and we need to move the cursor in the RS dynamically ,So it is recomanded to take RS as scrollable RS..

=> Since there is no next record for last record, So call rs.isLast() method before calling rs.next() method to ensure that the cursor is not already there in the last record
=> Since there is no previous record for first record, So call rs.isFirst() method before calling rs.previous() method to ensure that the cursor is not already there in the first record.

Container (Which holds the comps)
==========
JFrame

Comps
=========
JTextFiled ---> (4)
JLabel ---->4
JButton ---> 4

LayoutManager
==========
FlowLayout (keeps horizontally center)

In java every thing is an object like thread, array , event, exception and etc...

Event
=====
ActionEvent(c) (clicking on the button)

EventListener
==========
This provides env.. to handle event (executing logics when event is raised) by providing event handling method)
ActionListener(I) ---> contains method decl

Event Handling method
---
public void actionPerfromed(ActionEvent ae) ---> this method will be called automatically when the ActionEvent is raised.

=>To develop Frame , take a class extending JFrame
=> To develope any Event Listener take a class implementing XxxListener(I) like ActionListener

```
public class ScrollFrame extends JFrame implements ActionListener{
  ....
  ....
  ....
}
```

refer ScrollFrame_GUIFE.java

=>In Java 10, the var keyword allows local variable type inference, which means the type for the local variable will be inferred by the compiler, so you don't need to declare that.

var flag=false; (can be applied for local variable)

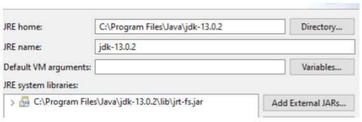
var d= new Date();
var age=30;
var price =56.77f;

How change the jdk version of eclise project?

step1) make sure new jdk s/w that u want to configure is installed in u r computer

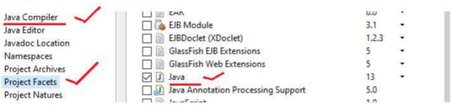
step2) Change to new jdk

right click on project ---> build path ---> library tab-->remove existing jdk ---> edit --> add ---> installed JREs ---> add ---> standard VM ---> Directory (select jdk new version installation folder) --> .....



step3) change compiler to new jdk version and also in project facets..

right click on project --->properties ----> java compiler :: 13
Projectfactets ---> java :: 13



=>By adding GUI builder plugin to Eclipse IDE ... we can develop AWT/Swing apps in drap and drop env..

=>plugin is a patch s/w that provides addtional functionalities to existing s/w or App..

Eclipse is offering two types of plugins

a) Eclipse supplied plugins (use Installable new s/w option of help menu)
eg:: GUI builder

b) Third paty supplied plugins (use Eclipse market place)
eg: STS plugin , maven plugin , git plugin and etc..

Procedure to install guid bulider plugin in eclipse 2019 -12 IDE
==========

Help menu --->install new s/w ---> selecct 2019-12 - http://download.eclipse.org/releases/2019-12 --->
go to general pupose tool -->select all options that are having swing and swt ... next ---> next --->
accept terms and conditions ---> restart ide ...

https://www.youtube.com/watch?v=0UVPbTYM25c&t=233s ====> installing Gui builder plugin...

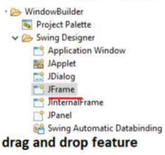
Procedure to develop scroll frame GUI App using Eclipse GUI builder
==========

step1) make sure that GUI builder plugin is installed

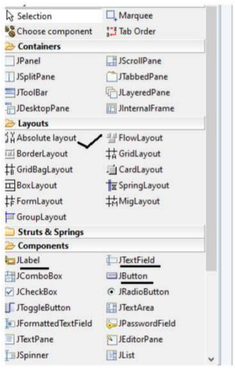
refer this ::: https://www.youtube.com/watch?v=QxokwM-v1yU

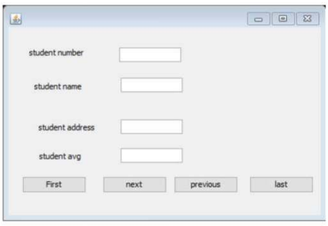
step2) develop Class in ur project as JFrame / Application window class...

right click on package (com.nt.jdbc) ---> new ---> others ----> search for Jframe/App window ----> give class name :: ScrollFrame_GUI_WBFE ---> go to design mode..



step3) Desing App by using drag and drop feature

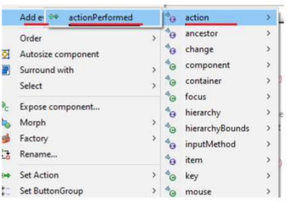




=>right click on Jframe window ---> set Layout :: absolute layout

step4) Add action event handling on 4 button comps..

right click on button --->action-->
add event handling ---> actionPerformed -> ....



step5) Go to source tab add user-defined method private void jdbcInitialize() having logic to create Scrollable RS and call that method from constructor and also declare neccessary jdbc related instance variables.

```
private Connection con;
private PreparedStatement ps;
private ResultSet rs;
private static final String GET_STUDENTS_QUERY="SELECT SNO,SNAME,SADD,AVG FROM STUDENT ";
private void jdbcInitialize() { //private methods are usefull to seperate logics adn use with in a class
        System.out.println("ScrollFrame_GUIFE.jdbcInitialize()");
        try {
                //establuhs the connection
                con=DriverManager.getConnection("jdbc:oracle:thin:@localhost:1521:xe", "system", "manager");
                //create PreparedStatement object
                ps=con.prepareStatement(GET_STUDENTS_QUERY,
                                        ResultSet.TYPE_SCROLL_INSENSITIVE,
                                        ResultSet.CONCUR_UPDATABLE);
                //create ScrollableResultSet object
                rs=ps.executeQuery();
        }//try
        catch(SQLException se) {
                se.printStackTrace();
        }
        catch(Exception e) {
                e.printStackTrace();
        }
}
```

step6) add "first" logic in actionPerformed(-) of first button. also for other buttons...

```
public void actionPerformed(ActionEvent e) {
        try {
                rs.first();
                textField.setText(rs.getString(1));
                textField_1.setText(rs.getString(2));
                textField_2.setText(rs.getString(3));
                textField_3.setText(rs.getString(4));
        }
        catch(SQLException se) {
                se.printStackTrace();
        }
}
```

step7) run the Application..

A Scrollable RS can be

a) SensitiveRS | ResultSEt types
b) InSensitiveRS
c) UpdatableRS | ResultSet modes
d) ReadOnlyRS

What is the difference b/w SensitiveRS and InSensitiveRs ?

Ans) when RS object is representing DB table records.. if the modifications done in underlying DB table are reflecing to RS immediately then it is called Sensitive RS... if not reflecting then it is called InSensitiveRs..

Sensitive RS usecases :: getting stock market share values, displaying live game scores and etc..

InSensitive RS usecases :: report generation having static data like sales report , progress report and etc...

To create SensitiveRS

```
Statement st=con.createStatement(ResultSet.TYPE_SCROLL_SENSITIVE,
                                 ResultSet.CONCUR_UPDATABLE);
ResultSet rs=st.executeQuery("SELECT SNO,SNAME,SADD,AVG FROM STUDENT");
```

oracle thin driver,
mysql connector/j driver and etc..
supports ScrollableRS but we need perform two addtional operations
=> we should avoid * from in SELECT SQL Query
we should col names..
=> In each iteration of while(rs.next()) we should place rs.refreshRow()

To create InsensitiveRS

```
Statement st=con.createStatement(ResultSet.TYPE_SCROLL_ INSENSITIVE,
                                 ResultSet.CONCUR_UPDATABLE);
ResultSet rs=st.executeQuery("SELECT * FROM STUDENT");
```

All jdbc drivers gives suport Insensitive RS with out any extra settings.. By default Non-ScrollableRS is Insensitive RS

Code for InSensitiveRS

```
st=con.createStatement(ResultSet.TYPE_SCROLL_INSENSITIVE,
                       ResultSet.CONCUR_UPDATABLE);
//create ResultSet object (scrollable)
if(st!=null)
rs=st.executeQuery("SELECT SNO,SNAME,SADD,AVG FROM STUDENT");

System.out.println(" Scrollable RS created....");

if(rs!=null) {
    while(rs.next()) {
        if(count==0)
            Thread.sleep(30000); //during this period modify DB table records from SQL prompt/developer
        System.out.println(rs.getInt(1)+" "+rs.getString(2)+" "+rs.getString(3)+" "+rs.getFloat(4));
        count++;
    }//while
}//if
```

Code for SesnsitiveRs

```
if(con!=null)
    st=con.createStatement(ResultSet.TYPE_SCROLL_SENSITIVE,
                           ResultSet.CONCUR_UPDATABLE);
//create ResultSet object (scrollable)
if(st!=null)
rs=st.executeQuery("SELECT SNO,SNAME,SADD,AVG FROM STUDENT");

System.out.println(" Scrollable RS created....");

if(rs!=null) {
 while(rs.next()) {
   rs.refreshRow();
     if(count==0)
       Thread.sleep(30000); //during this period modify DB table records from SQL prompt/developer
     System.out.println(rs.getInt(1)+" "+rs.getString(2)+" "+rs.getString(3)+" "+rs.getFloat(4));
     count++;
     }//while
}//if
```

What is the difference b/w Updatable RS and ReadOnlyRs?

Ans) Using ReadOnly we can perform only read Operations on the Db table..
Using Updatable Rs, we can perform all CRUD Operations on Db table.. that means we can perform insert,update,delete opeations on DB table with out using insert,update, delete SQL queries..

What is the difference b/w UpdatableRS and SensitiveRS?

Ans) while working with Updatable RS , the modifications done in RS object will reflect DB table records...
where as while working with ScrollableRS the modifications done in Db table recors will reflect to RS object..

To create ReadOnly RS

```
Statement st=con.createStatement(ResultSet.TYPE_SCROLL_SENSITIVE,
                                 ResultSet.CONCUR_ READ_ONLY);
ResultSet rs=st.executeQuery("SELECT * FROM STUDENT");

while(rs.next()){
   S.o.p(rs.getInt(1)+" "+rs.getString(2)+.....);
}
```

//Using ReadOnly Rs we can perform only Read Operations on Db table.

By detault Non-Scrollable RS is ReadOnly RS, Insensitive RS

To create Updatable RS

```
Statement st=con.createStatement(ResultSet.TYPE_SCROLL_SENSITIVE,
                                 ResultSet.CONCUR_ UPDATABLE);
ResultSet rs=st.executeQuery("SELECT SNO,SNAME,SADD,AVG FROM STUDENT");
```

oracle thin driver, mysql connector/j driver supports updatable RS , but we should not place * from in the SQL query.. i.e we should write col names..

To read records (select operation)

```
while(rs.next()){
   S.o.p(.........................);
}
```

To insert new record in Db table (insert operation with out using insert SQL query)

```
rs.moveToInsertRow(); //--creates empty record in RS

rs.updateIn1(1,5678);
rs.updateString(2,"ramaesh");
rs.updateString(3,"hyd");
rs.updateFloat(4,78.88f);
```

setting data to empty record of RS

```
rs.insertRow();
```

inserts new record to DB table from Rs out

To update the record (with using update SQL query)

```
rs.absolute(3);
rs.updateFloat(4,89.56f);
rs.updateRow();
```

updates 4col value of 3rd record

=>This updation reflects to Db table..

To delete the record

```
rs.absolute(4);
rs.deleteRow();
```

Deetes 4th record from Db table and RS

Performing non-select operations on Db table using UpdatableRS is not recomanded , the reasons are

(a) Some jdbc drivers do not support updatableRS
(b) Bulk non-select operations are complex to perform
(c) criteria /condition based non-select operations are complex to perform
(d) Not at all industry standard.

conclusion:: prefere using insert,update,delete SQL queries directly to perfrom non-select operations

---

What is the difference b/w Absolute PATH and relative PATH?

```
E:\abc
   |---->xyz
         |--->f1.txt
```

work location is E:\abc folder

asolute path of f1.txt :: e:\abc\xyz\f1.txt (give from root directory)
relative path of f1.txt :: .\xyz\f1.txt (give w.r.t current location)

work location is E:\abc\123 folder

asolute path of f1.txt :: e:\abc\xyz\f1.txt (give from root directory)
relative path of f1.txt :: ..\xyz\f1.txt

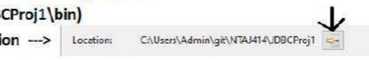
note:: if the PATH of the file given w.r.t current work location then it is called relative path and this will change work location to work location...
note:: if the PATH of the file given right from root dirve/directory then it is called absolute e path and this will remain same from any work location

How to make GUI Java App as destkop App? (launching app by using icon)

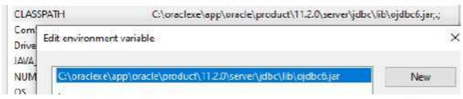
Ans) yes we can javaw tool.. (javaw --->java windows tool a built-in tool jdk s/w)

step1) try to know java version of the u r applicaiton (java 13)

step2) try to know the location package and .class of the Applicaiton ...
(C:\Users\Admin\git\NTAJ414\JDBCProj1\bin)
RTC on Project ---> properties --->locacation --->



step3) make sure that jdbc driver jar file (ojdbc6.jar) file is added to CLASSPATH .



step4) make sure that App jdk version..(java 13) is also in active mode at cmd prompt level.. (java13)

```
C:\Users\Admin>java -version
java version "13.0.2" 2020-01-14
Java(TM) SE Runtime Environment (build 13.0.2+8)
Java HotSpot(TM) 64-Bit Server VM (build 13.0.2+8, mixed mode, sharing)
```

step5) create short cut ...

RTC on desktop ----> short cut ---->

javaw com.nt.jdbc.ScrollFrame_GUIFE

⇩

Shorcut name :: CollegeApp

step6) Add addtional proeprties to the icon or short cut..

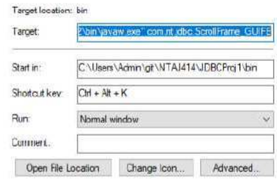
RTC on shortcut -----> properties ----->

target :: "C:\Program Files\Java\jdk-13.0.2\bin\javaw.exe" com.nt.jdbc.ScrollFrame_GUIFE

start In :: (C:\Users\Admin\git\NTAJ414\JDBCProj1\bin)

short cut key :: press any key then ctrl alt k<key> becomes short cut key
⇩
ctrl +alt +k

changet Icon : .....



note:: To work with javaw tool ... we need Jdk installation in computer...

step6) run the App by clicking on the Icon

How make Java CUI App as destkop App /ICON?

Ans) take the support of batch file.. (.bat file)

note:: step1 to step4 :: same as above

step5) create .bat file... on desktop

App.bat
```
======
c:\
cd C:\Users\Admin\git\NTAJ414\JDBCProj1\bin
java com.nt.jdbc.SelectTest3
pause
```

step6) run the batch file...

double click on the App.bat file..

How to create exe file representing Java GUI or CUI Application?

Ans) JAva App -----> Jar file -----> exe file
⇩
J2E tool (jar2 Exe Tool -- third party Tool)

Need of creating exe file for Java App

(a) To run Java App on non-Java Computers.. (where jdk is not installed)
(b) To pack and release the Project to Client Organizations..
(c) To keep in the internet as downloadable Application...
and etc..

step1) create jar file representing our App having manifest file specifying the main class name..

⇩ (helper file holding addtional Info about jar file.)

⇩ (To pickup class name with main(-) to begin the execution when jar /exe file is executed)

```
E:\DemoExe
   |----->ScrollFrame_GUIFE.java
   |--->com.nt.jdbc
          |---->ScrollFrame_GUIFE.class
   |--->mymani.mf
```

(cmd> javac -d . ScrollFrame_GUIFE.java)

create as text file having .mf extension

(while saving keep "mymani.mf" to avoid default .txt extension)

mymani.mf
```
----------------
Manifest-Version: 1.0
Main-Class: com.nt.jdbc.ScrollFrame_GUIFE
```
(presse enter key)
(press enter key)

space

space

(Very sesitive file... create carefully)

```
e:\DemoExe>jar cmf mymani.mf nitApp1.jar
```

c-->create new jar file/archieve file
m --->specify manifest file
f---> specify jar file name

=>nitApp1.jar file is now executable jar file

step2) download jar2exe tool from internet...

step3) Extract the s/w from zip file and isntall it...

step4) Launch jar2Exe tool to convert given jar file to exe file...

launch tool ---> next ----> browser and select the above jar file ----> choose java min(8) and max(14) version
--->select windows ---> next ---> sleect GUI App --->next ---> select splash img ---> add ojdbc6.jar --->
--> select hide and encrypt class name --->next ---> choose name and location of exe file --> finish..

Working with different types JDBC drivers
==========

There are 4+1 (5) mechanisms or architectures or methodologies to create JDBC driver s/ws for different DB s/ws based on the rules and guidelines of JDBC Technology...

=>Type1 JDBC driver (JDBC-ODBC Bridge Driver)
=>Type2 JDBC driver (Native API/Partly Java Driver)
=>Type3 JDBC driver (Net Protocol/ All Java Driver)
=> Type4 JDBC driver (Native Protocol /All Java Driver)
=>Type5 JDBC driver (Not- offcially given by Sun Ms -- So there is no technical name for it)

=> Vendor companies can give JDBC drivers for 1 or more DB s/w based on 1 more architectures..
=> Only sun Ms has given Type1 architecture based JDBC Drivers upto java 8 ... Now they stopped ...giving ..
(Indirectly as of now there is no Type1 Architecture based jdbc driver in the latest java versions)

=>Based Type2 to Type5 archictures there are multiple vendor companies giving JDBC driver s/ws..

Applet
======

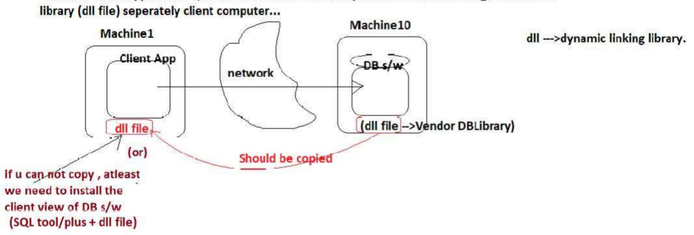
==>It is compiled java class that can be sent over the network as java based webpage.
two types Applets
---

a) Trusted Applets
--> these applets come to our computer from Internet and they allowed to interact(read,write operations) with the file system of the computer .In that process it may bring virus computer (can damage computer).
-->These are not secured applets...

b) UnTrusted Applets (By default all applets are untrusted Applets)
--> These applets come to our computer from internet but can not interact with file system i.e can not perform read/write operations on file system .. (no virus can be attacked)
==>These are secured Applets ..

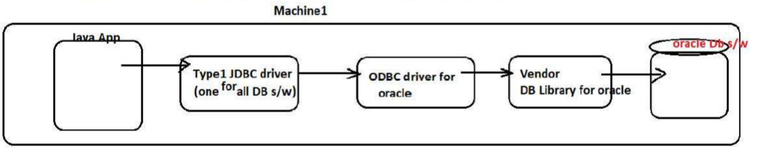
Vendor DB Library / Native DB Interface
==========

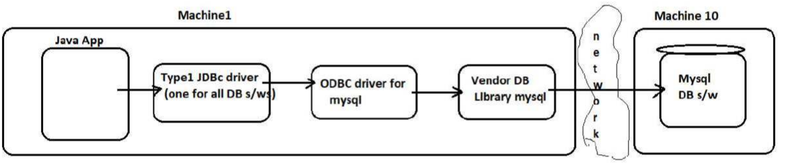
--> All ODBC drivers and some JDBC drivers(Like type2) locates and interacts with local or remoted DB s/w with the support of Vendor DB Library..
=> In windows oeperating Vendor DB Library comes in the form of .dll file (advanced exe file)
=> Oracle DB s/w gives Vendor DB library in form of oci.dll file...
In mysql it comes as msdia80.dll file..
=> in Client App to Db s/w communication , this .dll files is required at client side..
note:: If client App and DB s/w are there in two diff computers .. we need arrange Vendor DB library (dll file) seperately client computer...



Type1 JDBC driver Architecture
==========

=>This jdbc driver is given to locate and interact with Db s/w by taking the support of ODBC driver and Vendor Db library
=> Only sun Ms has supplied this Architecture based JDBC driver s/w as built-in JDBC driver for Jdk s/w (upto java7) ... Now not coming..
=> By using single Type1 JDBC driver and different ODBC drivers and Vendor DB libraries , we can talk with multiple DB s/ws .. (for DB s/ws , single Type1 JDBC driver s/w is sufficient)





pros
=====

=> One type1 jdbc driver can interact with multiple Db s/w.. by using multiple Vendor DB libraries and ODBC drivers
=> upto java7 ,it is built-in JDBC driver in jdk s/w.. so there is no need arranging it seperately..
=> Only for type1 architecture , sun Ms is providing JDBC driver s/w...

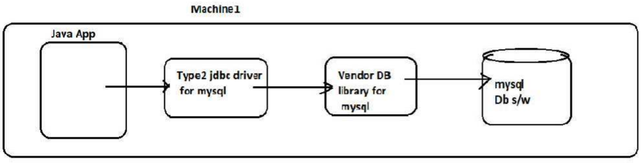
cons
====

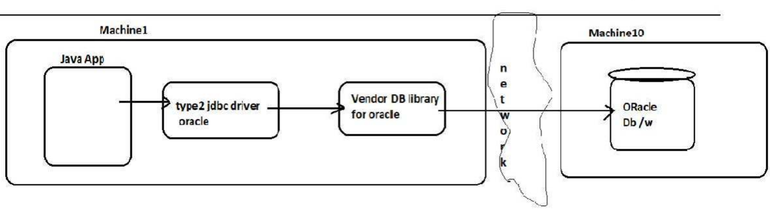
=> Removed from jdk 1.8 onwords.. and no other vendor is providing type1 jdbc driver s/w.. So simply outdated from java 8
=> We need to arrange ODBC drivers and Vendor DB libraries seperately for Each DB s/w.
=> Since mulitple comps are involved in Db s/w interaction.. like ODBC drivers and Vendor DB libraries.. the performence of this Type1 JDBC driver s/w is very poor.
=> Does not support Untrusted Applets to DB s/w interaction..
=> It is not industry standard JDBC driver s/w..
=> It is SingleThread driver (becoz methods are synchronized methods)..i.e it allows 1 thread at a time to interact with Db s/w through Driver.. (So performence is very bad)

Why ODBC Driver s/w is involved in type1 JDBC driver ?
Ans) Intially Sun Ms , though of using already availble ODBC drivers to interact with Db s/w.. Since they failed to use directly...So they have given type1 jdbc driver using ODBC driver to interact with Db s/w..

Type2 JDBC driver
==========

=> It is given to interact with Db s/w directly by directly using Vendor DB library and with out using the support of ODBC driver.





pros
===

=>No need of arraging ODBC driver s/ws
=>Gives quite good performence when compare to Type1 JDBC driver s/w
=> given as multi-threaded jdbc driver

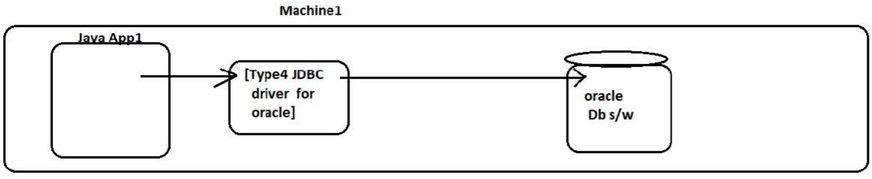
cons
====

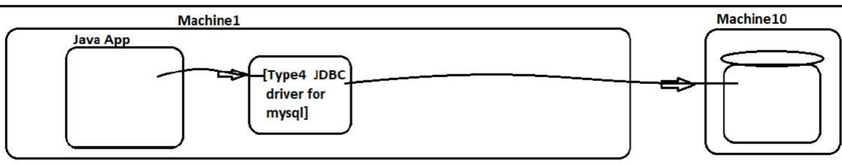
=> This driver performence is not good for medium scale and large scale projects
=> Since vendor DB library is required at client machine.. This driver can not be used for untrusted Applet to DB s/w communication
=> We need to arrange this driver s/ws from third party vendors...
=> For every Db s/w , we need seperate type2 JDBC driver s/w..
eg: type2 jdbc driver for oracle , type2 jdbc driver for mysql ,...
=> It is not industry standard JDBC driver...

=> It is not industry standard JDBC driver...

Type4 JDBC driver
==========

This JDBC driver s/w is given to locate and interact with DB s/w directly with out taking the support of Vendor DB Library and ODBC driver ..





Advantages
==========

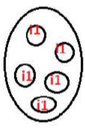
=> Since JDBC driver s/w directly locates and interacts with Db s/w.. So there is no need of arranging ODBC driver s/w and Vendor DB Library
=> This Perfomence is quite good and suitable for Medium scale and Large scale Apps..
=> Suitable for untrusted Applet to DB s/w communication
=> Given as multi thread jdbc driver s/w (i.e methods are given as non-synchroized methods)
=> This jdbc driver s/w can be downloaded dynmically from internet.. (using mave,gradle like tools)
=> This jdbc driver s/w is totally develioed in java,, So it can be used in any platform.. (OS)
=> It is industry standard JDBC driver s/w..

cons
=====

=>For every DB s/w , we need seperate Type4 JDBC driver s/w..
(Like type4 jdbc driver s/w for oracle , type4 jdbc driver s/w for mysql and etc...)
=> We need to arrange this driver s/w from Thrird party vendors..

oracle thin driver, mysql connector/j driver, postgresql thin driver are type4 mechanism jdbc drivers..

Pool
====



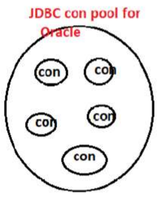
(In Memory variable having Set of same items, gives the reusability of same items, It can be implented as List collection)

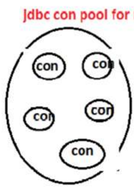
Cache/Buffer
==========

[In Memory variable having set of different items , gives the reusability of different items , it can be implemented as Map Collection becoz every item as should have a key to access)

JDBC Connection pool
==========

=>It is a factory that contains bunch of jdbc con objects before actually being used...
=>All jdbc con objects in jdbc con pool represents the connectivity with same Db s/w..
eg:: JDBC con pool for oracle means .. all jdbc con objs in jdbc con pool represents conenctivity with oracle DB s/w
eg:: JDBC con pool for mysql means .. all jdbc con objs in jdbc con pool represents conenctivity with mysql DB s/w





Generally WebServer like Tomcat or Proxy Server like IDS server will manage these jdbc con pools..

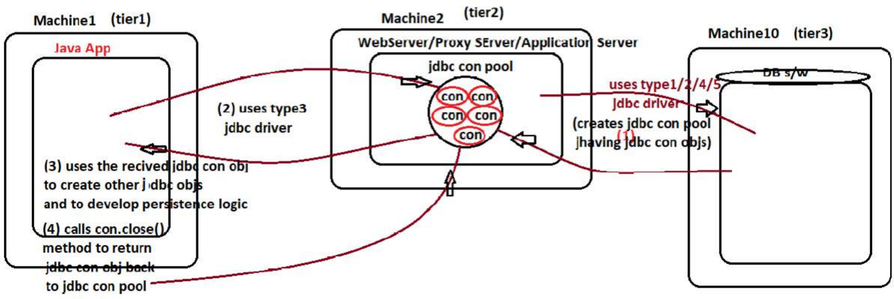
IDS :: internet DB Access Server..

jdbc con pool advantages
==========

a) gives the resuability of jdbc con objects..
b) With minimum no.of jdbc con objects ,we can make more clients /Apps /requests taking with DB s/w...
c) creating jdbc con object in con pool, using that jdbc con obj and closing jdbc con object will be taken care by jdbc con pool itself..

Type3 jdbc Drvier
==========

This JDBC driver s/w is given to interact with WebSErver or Proxy Server and to get jdbc con object from jdbc con pool.. or from some other process.



pros
=====

=> we can take all advantages of jdbc con pool (refer above)
=> we can control jdbc con pool with parameters like initialSize, maxSize ,capacity increment and etc..

(if there is a need of creating new jdbc con objs.. it specifies how many new jdbc con objs should be created in the jdbc con pool)

cons
=====

=>We should the heavy height WebServer /App server /proxy server s/w .. to work this driver s/w..

Q) What is the JDBC driver that u have used in u r Project?

Ans) if the Project is web application or webSErver Application which is deployable/excutable in the servers..like web servers.. then go for Type3 with Type4 jdbc driver.. i.e use type4 jdbc driver to create jdbc con objects in jdbc con pool and use type3 jdbc drive to get jdbc con objects from jdbc con pool (Industry standard)

=>if the project is standalone project (i.e not executable in the sever) then go for Type 4 jdbc driver...

=>oracle corp supplied type 2 jdbc driver for oracle is called oracle oci driver (oci-->oracle call interface)
=>oracle corp supplied type4 jdbc driver for oracle is called oracle thin driver
=>Both these jdbc driver s/ws are coming in the form of single jar file that is ojdbc6/7/8/10.jar

=>Type1/Type2 architecture based jdbc drivvr s/ws are called "Thick JDBC drivers" Becoz they need multiple comps to locate and interact with Destination DB s/w..
=>Type4/Type5 architecture based jdbc drivver s/ws are called "Thin JDBC drivers" Becoz they can locate and interact with Destination DB s/w directly with out taking the support multiple other comps like ODBC drivers and Vendor DB Libraries..

oracle oci driver details (Oracle corp supplied type2 mechanism based jdbc driver for oracle)
==========
jdbc driver class name::: oracle.jdbc.driver.OracleDriver (o) oracle.driver.OracleDriver
jdbc url :: jdbc:oracle:oci8:@<sid>
protocol sub name

jar file:: ojdbc6/7/8/10.jar (supports Autoloading of jdbc driver class)

=>if the sub name is "thin" then type4 jdbc driver(oracle thin driver)of ojdbc6/7/8/9/10.jar file will be pickedup.
=>if the sub name is "oci8" then type2 jdbc driver (oci driver) of ojdbc6/7/8/9/10.jar file will be pickedup.

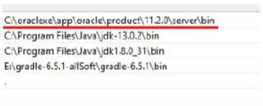
Example App
==========
step1) keep any oracle thin driver App ready
step2) change jdbc url of DriverManager.getConnection(-,-,-) as shown below..

```
Connection con=DriverManager.getConnection("jdbc:oracle:oci8:@xe","system","manager");
```

step3) run the App..

While running the above App , if the below Exception comes
Exception in thread "main" java.lang.UnsatisfiedLinkError:
no ocijdbc11 in java.library.path: then we
need to perform the following operations

(a) Add Oracle Instanatllatin related "bin" directory to PATH env.. variable as the first value..



This pc -->proerties ---> adv system settings ---> env.. variables ----> system variables --->
variable name ::PATH
add new value :: C:\oracleexe\app\oracle\product\11.2.0\server\bin

(refer image)

(b) restart the eclipse IDE...

note :: Only few vendors are giving type2 JDBC drivers for DB s/ws becoz Type2 are not industry standard..

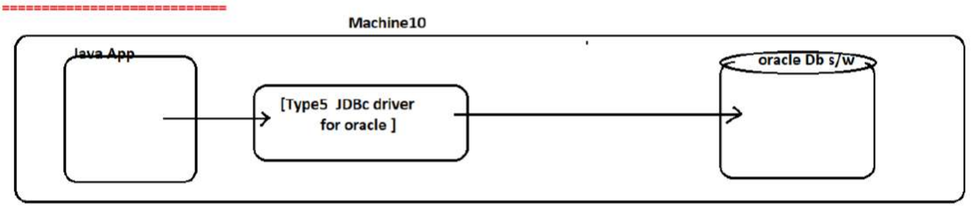
Type5 JDBC driver
==========

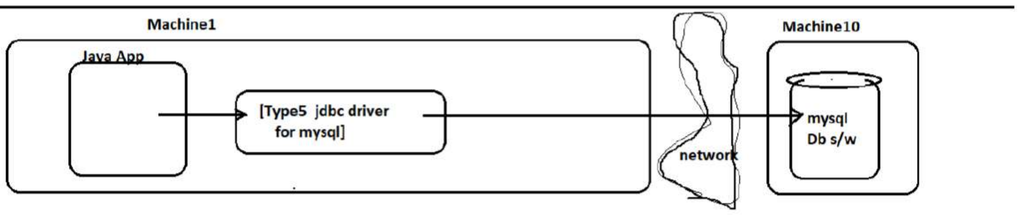
=>It is not official architecture to develop jdbc driver s/w....becoz archicture very much similar to type4 jdbc driver, but some third party vendors are giving it unofficially.

Advantages of type5 jdbc driver (Claimed by Vendor comany)
==========
a) Consistent Performence..
b) Flexibility of Enhancement (we can add new features easily)
c) Standardization of features .. (All jdbc features can be coded using common jdbc api interfaces.. to work with different drivers and DB s/w..)
d) All one deployment (everything comes in the form of single jar file)
and etc..

All these features are already found in Type4 So there is no need of going for type5 drivers..

Type5 jdbc driver architecture
==========





As of now "Progress DataDirect" company is giving Type5 JDBC drivers for different DB s/w .. as commercial drivers (30 days trial period)

Type5 driver for Oracle Details
==========
driver class name:: com.ddtek.jdbc.oracle.OracleDriver
jdbc url :: jdbc:datadirect:oracle://<host>:<port>;serviceName=<sid>
protocol | sub name | hostname and port number of oracle | service id or logical DB

jar file :: oracle.jar (get it https://www.progress.com/download?interface=jdbc&ds=openedge&os=win) using big Process
(supports autoloading of jdbc driver class)

Example App
==========
a) keep any Type4 jdbc drivee App ready

b) Load driver class and establish the connection as shown below..

```
//register jdbc driver s/w (optonal)
    Class.forName("com.ddtek.jdbc.oracle.OracleDriver");
//establish the connection
    con=DriverManager.getConnection
            ("jdbc:datadirect:oracle:// localhost:1521;serviceName=xe","system","manager");
```

c) add oracle.jar file to the build path of project.. (Collected from the group or git hub or internet)

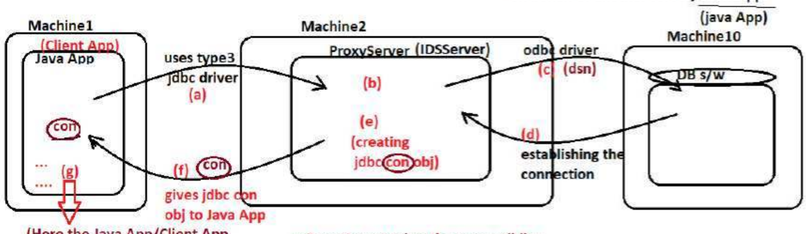
RTC on Project --->build path ---> cfg builpath --->libraries tab ---> add external jars --> ....

note:: if u r using Faculy suppled oracle.jar file then change system date :: 2011 ..

d) run the application

Type3 JDBC driver praticals by using IDS server (the Proxy server)
==========

Proxy Server means.. the server that do work on behalf of another server/ClientApp.



(Here the Java App/Client App recieves the jdbc con object to create other jdbc objs and to develop persistence logic)

=>ProxyServer takes the responsibilty of creating jdbc con object for multiple Client Apps/Java Apps. if any change in DB s/w location or details.. will be taken care of proxy server.. with out effecting the Client Apps/Java Apps

=>Windows installation gives built-in ODBC drivers .. like
odbc driver for oracle ,odbc driver for mysql, odbc driver for postgresql, odbc driver for ms-access and etc..
=> every odbc driver is identified with its DSN (dataSoruce Name)
3 types of DSN are there
userDSN :: Specific to current logged in windows user
System DSN :: specific all the windows users of a computer
FileDSN :: Sharable in the network..
note: we need to create DSN by using some process..

IDServer
========
type:: Proxy Server
Vendor :: Microsoft
default port no :: 12
Gives type3 jdbc driver as built-in driver in <IDSServer_HOOME>\classes folder
commercial s/w (30 trail period)

url:: http://www.idssoftware.com/download.html (downlod Lite edition)

IDS Server 4.2.2 Lite Evaluation

The Lite version does not support Secure dbAccess (encryption using SSL). Other features are identical to the full version. This is a trial version with a maximum 16 concurrent thread limit. IDS Server includes IDS JDBC Driver.

OS/Platform	Release Date	Download Size	Trial Period
Windows (2000/2003/XP/2008/NT)	09-09-2015	4,686,020 bytes	30 days

IDS Server supplied Type3 JDBC driver details
==========
driver class name:: ids.sql.IDSDriver
url :: jdbc:ids://<host>:<port>/conn?dsn=<dsnvalue>
location of jdbc driver s/w :: <IDSSERVER_HOME>\classes folder
eg:: c:\IDSServer\classes folder

=>Procedure to develop example App to interact with Ms-Access DB s/w Using Type3 Driver supplied by IDSServer
==========

step1) create LogicalDB in Ms-Access having DB table with records
Launch -Ms Access (from Ms-Office) ---->new ----> select DB name :: CollegeDB --->select location(E:/workspaces/advjava/ntaj414) -->
Open Table1 in design view --> choose db table name (Student) ---> add cols ----> ctrl+w ----> enter values as records..

student

Field Name	Data Type
sno	Number
sname	Text
sadd	Text
avg	Number

sno	sname	sadd	avg
123	mahesh	hyderabad	80
234	SRK	mumbai	90
567	AMITAB	MUMBAI	90

step2) create System DSN to Odbc driver for Ms-AccessAcess..

windows Btn +shift +s :: winddow snipper tool

search for odbc ---> system DSN tab ---> add ----> select MS Access Driver (*.accdb) --->
datasoruce name :: accdsn
DB --->select the above fole G:/workspaces/advjava/NTAJ414/College

step3) make sure IDSServer is installed and running (After installation it wills start automatically)

step4) Develop the Application using IDS server supplied type3 driver details

```
//register jdbc driver s/w (optonal)
Class.forName("ids.sql.IDSDriver");     //no auto loading of driver class
//establish the connection
con=DriverManager.getConnection("jdbc:ids://localhost:12/conn?dsn=accdsn");
```

the above created DSN

step5) make sure the C:/IDSServer/classes folder is added to CLASSPATH or BuildPATH of Eclipse Project..

RTC on Project ----> cfg build PATH ----> libraries tab ---> classpath ---> add extenal class folder---> browse and select C:/IDSserver/classes folder

refer Type3DriverSelectTest .java

step6) run the Application..

---

try with resource (java 7 feature)
==========

=> So far we are using finally block to close jdbc objs and stream objs.
=> from Java 7 most of the objects are given auto closable objects.. i.e they will be closed automatically at certain point.
=> the class of the object is implementing java.lang.AutoClosable(I).. then that object becomes autoclosable object automatically.. (java 7)
=> From Java7 all stream objects are auto closable objects .. from JAva 8 onwords jdbc objs are given as autoclose objs.. The close() method of AutoClose() interface executes .. automatcially and closes the resource /object..

=> if we create object by using try with resoruce then.. at the end of try block the object will be closed automatically..

```
syn:: try( resource){
        ....
        ...
      } //At this Level the resource
      catch(...){   will be closed automatically
      }
      catch(...){
        ..
      }
```

```
try(Connection con=DriverManager.getConnection(-,-,-)){      // java 8 code
    ....
    ....        use con here
    ...
  } //here jdbc con object will be closed automatically
  catch(SQLException se){ .... }
  catch(Exception e ){ ... }        //we can not use con here
```

note:: no need of taking finally block here..

note:: resoruce object we are passing try(--) must be autoclosable object..

```
Connection con=DriverManager.getConnection(-,-,-); //either final variable or effectively final
try{con){
  ...      here con here                                  //jav9 code..
  ...
} //here jdbc con object will be closed automatically
catch(SQLException se){ .... }
catch(Exception e ){ ... }
```

use
=>we can con here

note:: no need of taking finally block here..

try with resource in jdbc
==========

=>Its support is added to jdbc from jdk 1.8 ... (jdbc4) ..
=> All jdbc objs are auto closable .. So we can create/opne them in try with resource.. and no need of cosing them seperately in finally block..becoz they will be closed automatically at the end of try block

```
// Usng java8 syntax of try with resource

try(Connection con=DriverManager.getConnection("jdbc:oracle:thin:@localhost:1521:xe", "system", "manager")) {
        try(Statement st=con.createStatement()){
            try(ResultSet rs=st.executeQuery("SELECT SNO,SNAME,SADD,AVG FROM STUDENT")){
                while(rs.next()) {
                    System.out.println(rs.getInt(1)+" "+rs.getString(2)+" "+rs.getString(3)+" "+rs.getFloat(4));
                }//while
            }//try3
        }//try2
    }//try1
    catch(SQLException se) {
        se.printStackTrace();
    }
    catch(Exception e) {
        e.printStackTrace();
    }
```

refer SelectTestUsingTWR.java

Java9 syntax based javac code having try with resource
==========

```
try(Connection con=DriverManager.getConnection("jdbc:oracle:thin:@localhost:1521:xe", "system", "manager")) {
    Statement st=con.createStatement();
    try(st){
        ResultSet rs=st.executeQuery("SELECT SNO,SNAME,SADD,AVG FROM STUDENT");
        try(rs){
            while(rs.next()) {
                System.out.println(rs.getInt(1)+" "+rs.getString(2)+" "+rs.getString(3)+" "+rs.getFloat(4));
            }//while
        }//try3
    }//try2
}//try1
catch(SQLException se) {
    se.printStackTrace();
}
catch(Exception e) {
    e.printStackTrace();
}
```

refer SelectTestUsingTWR9.java

note:: While working with try with resource and other java8 features like LAMDA Expressions and etc.. we need to make most of the local variables either as final or as effectively final. So better not to declare local variables at the top of method definitation having initial values while using the above features..

```
int age=0;
Calendar cal=null;
Statement st=nul;;
```

do not use from java 8 onwords...

Jdbc MetaData
==========

MetaData :: data about data is meta data.. it may be gathering more data about existing data or it may be passing more data /info about existing data..

=> MetaData/MetaInfo speaks about either gathering info or passing info about existing data/info.

=> JDBC MetaData is about gathering more info about underlying DB s/w representing jdbc con obj... and underlying DB table reprsented by ResultSet object.. underlying query params(?) represented by PreparedStatemet or CallableStatement objs

3 types of JDBC MetaData::
---

a) DatabaseMetaData (To know limitations and capabilities underlying DB s/w)
b) ResultSetMetaData (To get More info Db table that is represented by ResultSet obj)
c) ParameterMetaData (most of jdbc drivers not supporting this feature)

DatabaseMetaData
==========

=> Gives limitations and capabilities of underlying Db s/w represnted by jdbc con obj
=>To create this object

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

⇩

we can call 50+ methods on this object to get more info underling DB s/w..

Some methods are::

```
getMaxColumnNameLength()
getMaxColumnsInGroupBy()
getMaxColumnsInIndex()
getMaxColumnsInOrderBy()
getMaxColumnsInSelect()
getMaxColumnsInTable()
getMaxConnections()
getMaxCursorNameLength()
```

refer DatabaseMetaDataTest.java

and etc..

=>DatabaseMetaData means it is the obj of undelying JDBC driver s/w supplied java class that implements java.sql.DatabaseMetaData(I)

note:: The values given by DatabaseMetaData object will change based on the DB s/w and jdbc driver we use..

=>if any method of JDBC MetaData programming is giving 0 or 0.0 or null .. that is not correct info about DB or table or param.. that indicates the underlying JDBC driver can not gather that info..

=>Realtime usecases of DatabaseMetaData ::
->Will be used in the development of GUI Db tools like SQL developer, mysql workbench ,sql yog and etc..

ResultSetMetData

==========

=> Gives more info about Db table like (col names, col types other details about cols) represented JDBC ResultSet object

=>ResultSetMetaData means it is the object of java class that implements java.sql.ResultSetMetaData(I).

=>To create ResultSetMetaData object

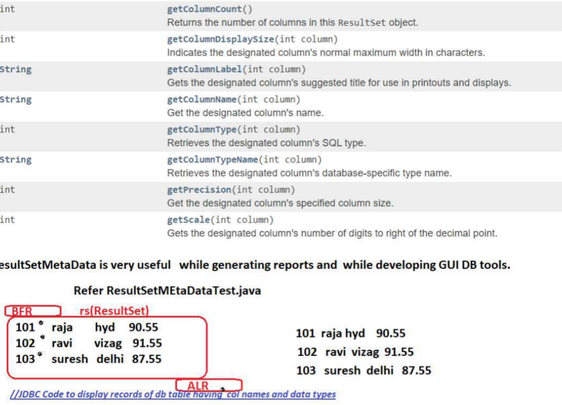
```
ResultSet rs=st.executeQuery("SELECT * FROM STUDENT");
ResultSetMetaData rsmd=rs.getMetaData();
```

=> we can invoke 20+ methods on "rsmd" object to know more about Db table represented by ResultSet object (rs).

String	getCatalogName(int column) Gets the designated column's table's catalog name.
String	getColumnClassName(int column) Returns the fully-qualified name of the Java class whose instances are manufactured if the ResultSet.getObject is called to retrieve a value from the column.
int	getColumnCount() Returns the number of columns in this ResultSet object.
int	getColumnDisplaySize(int column) Indicates the designated column's normal maximum width in characters.
String	getColumnLabel(int column) Gets the designated column's suggested title for use in printouts and displays.
String	getColumnName(int column) Get the designated column's name.
int	getColumnType(int column) Retrieves the designated column's SQL type.
String	getColumnTypeName(int column) Retrieves the designated column's database-specific type name.
int	getPrecision(int column) Get the designated column's specified column size.
int	getScale(int column) Gets the designated column's number of digits to right of the decimal point.

=> ResultSetMetaData is very useful while generating reports and while developing GUI DB tools.

Refer ResultSetMEtaDataTest.java




```
//JDBC Code to display records of db table having col names and data types
    //create ResultSetMetaData obj
     ResultSetMetaData rsmd=null;
     if(rs!=null)
     rsmd=rs.getMetaData();

    int count=0;
    if(rsmd!=null) {
          count=rsmd.getColumnCount();
          //print col names
          for(int i=1;i<=count;++i)
                System.out.print(rsmd.getColumnLabel(i)+"  ");

          System.out.println();
          //print col data types
          for(int i=1;i<=count;++i)
                System.out.print(rsmd.getColumnTypeName(i)+"  ");

          System.out.println();
    }//if
```

avg ---> number(10,2)

precision: 10
scale :: 2

890.55

total length :: precision (10)
scale :: 2

```
     //display all records
    if(rs!=null) {
          while(rs.next()) {
           for(int i=1;i<=count;++i) {
                 System.out.print(rs.getString(i)+" ");
           }
           System.out.println(); //new line
    }//while

//Getting more info about db table cols
          for(int i=1;i<=rsmd.getColumnCount();++i) {
                System.out.println("col index ::"+i);
                System.out.println("col name::"+rsmd.getColumnLabel(i));
                System.out.println("col data type name::"+rsmd.getColumnTypeName(i));
                System.out.println("col scale ::"+rsmd.getScale(i));
                System.out.println("col precision ::"+rsmd.getPrecision(i));
                System.out.println("col is nullable?"+rsmd.isNullable(i));
                System.out.println("col is case-sensitive?"+rsmd.isCaseSensitive(i));
                System.out.println("col is AutoIncrement?"+rsmd.isAutoIncrement(i));
                System.out.println("-------------------------");
          }//for
```

ParameterMetaData

=>Allows to gather more info about parameters (?) that in the SQL query represented by the JDBC PreparedSatement or CallableStatement object

=> Most of the jdbc drivers not supporting this concept.. becoz they are not providing any implementation class for this interface "ParameterMetaData".

=> It is the object of underlying JDBC driver s/w supplied java class that implements java.sql. ParameterMetaData(I)

=>To create this object

```
PreparedStatement ps= con.prepareStatement("insert into Student values(?,?,?,?)");
ParameterMetaData pmd=ps.getParameterMetaData();
```

=>we can invoke methods on "pmd" object to get more info parameters(?)..

Modifier and Type	Method and Description
String	getParameterClassName(int param) Retrieves the fully-qualified name of the Java class whose instances should be passed to the method PreparedStatement.setObject.
int	getParameterCount() Retrieves the number of parameters in the PreparedStatement object for which this ParameterM contains information.
int	getParameterMode(int param) Retrieves the designated parameter's mode.
int	getParameterType(int param) Retrieves the designated parameter's SQL type.
String	getParameterTypeName(int param) Retrieves the designated parameter's database-specific type name.
int	getPrecision(int param) Retrieves the designated parameter's specified column size.
int	getScale(int param) Retrieves the designated parameter's number of digits to right of the decimal point.
int	isNullable(int param) Retrieves whether null values are allowed in the designated parameter.
boolean	isSigned(int param) Retrieves whether values for the designated parameter can be signed numbers.

```
try(PreparedStatement ps=con.prepareStatement(GET_ALL_STUDENTS_QUERY)){
          //create ParameterMetaData object
          ParameterMetaData pmd=null;
          if(ps!=null)
            pmd=ps.getParameterMetaData();
          //get more info about parameters
          int count=pmd.getParameterCount();
          System.out.println(count);
          for(int i=1;i<=count;++i) {
                System.out.println("parameter number::"+i);
                System.out.println("parameter mode::"+pmd.getParameterMode(i));
                System.out.println("parmater type name::"+pmd.getParameterTypeName(i));
                System.out.println("parameter scale ::"+pmd.getScale(i));
                System.out.println("parameter precision::"+pmd.getPrecision(i));
          }//if

     }//try2
```

This code will give exception.. becoz All popular JDBC driver s/ws are not supporting this ParameterMetaDAta... concepts..

java.sql.SQLException: Unsupported feature

Working with Properties file

=>The text file that maintains the entries in the form of key-value pairs is called properties file..

=>We can give any extension to properties file.. but the recomanded extension is .properties

(com/nt/commons)

personalInfo.properties

```
#Personal Information  -comment
person.id=101
person.name=raja
person.addrs=hyd
```

java.util.Hashtable (any objs as keys, values, of elements)

extends

java.util.Properties (Map collection)

(Only String objs as keys,values of elements)

props (obj of java.util.Properties)

keys (String)	values (String)	
person.id	101	0
person.name	raja	1
person.addrs	hyd	2

Logic to copy Properties file info to java.util.Properties class obj

==========

```
//Locate properties file
 InputStream is=new FileInputStream("src/com/nt/commons/pesonalInfo.properties");
//create java.util.Properties object
 Properties props=new Properties();
//Load from file
 props.load(is);   (Performs the actual task)

S.o.p(pros);
S.o.p(" person.name  key value is::"+props.getProperty("person.name"));  //raja
S.o.p("person id ::"+props.getProperty("person.id")); // 101
```

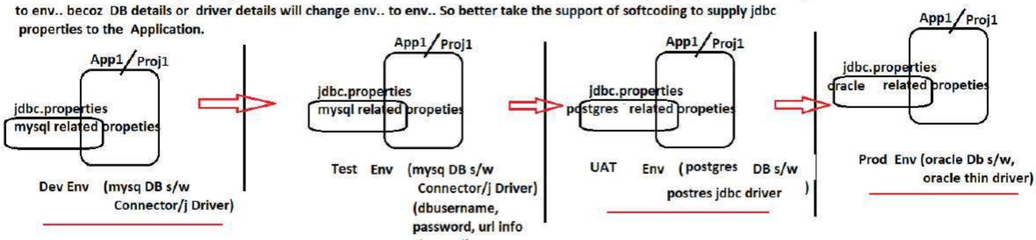
Collecting jdbc properties from PRoeprties file

note:: The slogan in the software industry is . Do not hardcode inputs in u r App source code that are changable in the future. Try collect such values to the Application from outside the Application.. by taking the support of different options like properties file or xml file or cmd line args os system properties or steams like Scanner and etc... (softcoding)

=> jdbc driver class name, jdbc url , db username, db pwd and etc.. are called jdbc properties. these values change based on jdbc driver and DB s/w we use.. So it is recomanded not hardcode in our App source code.. collect them from outside the application using the one of the softcoding techniques..

(Genertally we prefere properties file (standalone App) and xml file (web.xml) in web applications)

Use case:: =>while moving the project from Dev Env.. to Test env.. to UAT env ... Prod env.. The jdbc properties will change env.. to env.. becoz DB details or driver details will change env.. to env.. So better take the support of softcoding to supply jdbc properties to the Application.

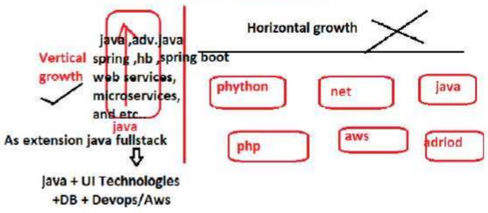



```
JdbcProj1
 |--->src
     |--->com.nt.commons
          |----->jdbc.properties
     |--->com.nt.jdbc
          |-----> SelectTest3WithPropertiesFileTest.java
```

Refer SelectTest3WithPropertiesFileTest.java

FOCUS :: Focus on One Course Until u Succeded

Knowlege growth :: Vertical Growth



Example code

jdbc.properties (com/nt/commons)

```
# JDBC properties
jdbc.driver=oracle.jdbc.driver.OracleDriver
jdbc.url=jdbc:oracle:thin:@localhost:1521:xe
db.user=system
db.pwd=manager

#jdbc.driver=com.mysql.cj.jdbc.Driver
#jdbc.url=jdbc:mysql:///ntaj414db
#db.user=root
#db.pwd=root
```

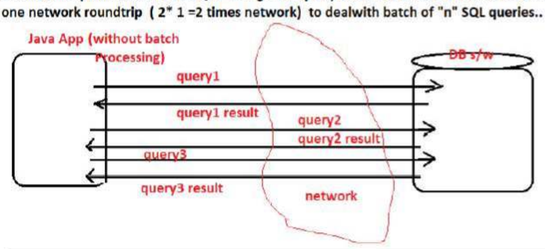
In any Jdbc App place code this code to collection jdbc properties from properties file and to create jdbc con object

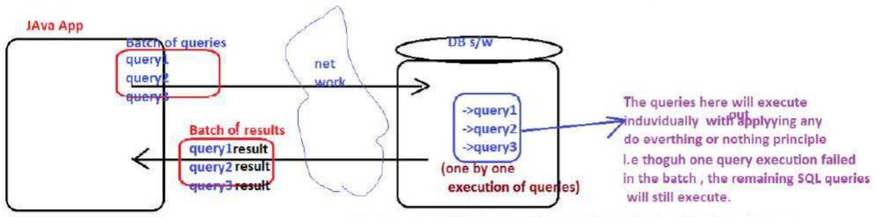
```
//Load the properties file Into to java.util.Propertie class object
    InputStream is=new FileInputStream("src/com/nt/commons/jdbc.properties");
    Properties props=new Properties();
    props.load(is);

    //register jdbc driver s/w (optonal)
    Class.forName(props.getProperty("jdbc.driver"));
    //establish the connection
    Connection con=DriverManager.getConnection(props.getProperty("jdbc.url"),
                                               props.getProperty("db.user"),
                                               props.getProperty("db.pwd"));
```

Batch Processing /Batch Updation

=> In a normal JDBC App , to send and to execute "n" SQL Queries to DB s/w we need to use "n" roundtrips b/w Java App and DB s/w i.e we need to use network for 2*n times.. some it is very costly..

=>To overcome the above problem keep multiple related SQL queries in a batch and send batch to Db s/w.. execute the queries of batch in DB s/w and gather query results as batch of results back to DB s/w .. It just uses one network roundtrip (2* 1 =2 times network) to dealwith batch of "n" SQL queries..





note:: We can add only non-select Queries to the batch... i.e Select SQL qureries can not be placed..

Sample code using Simple Statememnt object

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

//adding queries to the batch
st.addBatch("insert into student values(101,'raja','hyd',90)");
st.addBatch("insert into student values(102,'rajesh','hyd',80)");
st.addBatch("update student set sadd='hyd' where sno>=100");
st.addBatch("delete from student where sno>=1000");
```

Like this we can add multiple non-select SQL Queries either dealing with same db table or different db table

```
//execute the batch
int result[]=st.executeBatch();
```

sends batch of SQL queires to DB s/w , executes them in Db s/w bring their results as batch in the form of int[] (result[])

```
//process the results
int total=0;
for(int i=0;i<result.length;++i){
  total=total+result[i];
}

S.o.p("no.of records that are effected is "+total);    //gives 5
```

result[]

1
1
3
0

BatchProcessisng does not perform "do every thing or nothing principle" based Query execution.. if want to apply that then go for IxMgmt on the top of batch results.

Can u explain different execute() methods of jdbc api?

Ans) executeQuery() :: For select SQL queries
executeUpdate() ::
executeLargeUpdate() :: (For non-select SQL queries)

execute() :: For both select and non-select Quies and also for calling PL/SQL procedures/functions
executeBatch() :: For batch processing.

Q) Why we can not add "select SQL queries to batch of Batch Processing"?

Ans) The return type of executeBatch() method is int[] i.e it can not hold the select SQL query generated RS object .. So we can not add select SQL queries to batch of the BatchProcessing/Updation

sir then how to execute group of select queries?
Ans) Not possbile...

TransactionMangement
==========

=>The Process of combining related operations into single unit and executing them by applying do everything or nothing principle is called TxMgmt(Transaction Management)

usecases:: 1. transferMoney operations (withdraw amt from source account, deposite amount into dest account) needs Txmgmt
2. Employee Registration(insert record in hr table , insert record finance Db table) needs Tx mgmt

=>Batch Processing does not support TxMgmt by default .. we need to add addtional logics on the top BatchProcessing
a) disable auto commit on Db s/w (con.setAutoCommit(false)) -->default true..
b) Write addtional on the result[] of executeBatch to commit or rollback Tx

```
boolean flag=false;
for(int i=0;i<result.length;++i){
    if(result[i]==0){
      flag=true;
      break;
    }
}
if(flag==true){
    con.rollback();  //Rollback Tx     //TCL
}
else{
    con.commit();  //commit Tx     //TCL
}
```

Why commit() or rollback() are given on "con" object, why not in Statetement object?

Ans) Since we execute different SQL Queries using different STatement objs ..In order to commit or rollback all these queries related TxMtmt in single short they have given con.commit() and con.rollback() methods in connection obj who creates multiple statement objects.

TxMgmt Code
==========

a) Begin Tx
con.setAutoCommit(false);

b) execute logics/queries
-->we can go for batch processing /updation
c) commit or rollback Tx
-->based on the results of batch processing/updation we can call con.commit() /con.rollback() method

TransferMoney Operation Having JDbc TxMgmt
==========

Db table (JDBC_ACCOUNT)
==========

acno(pk)	holdername	balance
101	raja	90000
102	rani	80000

refer TxMgmt_TransferMoneyTest.java

=>Do not use try with resource while working TxMgmt becoz.. doing con.commit() , con.rollback() inside try block is not good pratice. It is good to do in finally block .. so prefer using the tradional try-- catch --finally clauses in Tx Mgmt..

```
try{
  ....
  ....
  ....
}
catch(Exception e){
  ....
}
finally{      chekc cond
  //con.commit() or con.rollback()
}
```

=> finally not possible while working with try with resoruce...

=> In try with resource con obj will be closed at the end of try block.. So calling con.commit() or con.rollback() throws exception..

```
try(Connection con=DM.getConnection(-,-,-){
  ....
  ...
  ...
}
catch(Excetion e){
  ..
}
//con.commit() or con.rollback() not possible here.
```

Not at all good

```
List<String> list=new ArrayList() ; //bad   //gives mutable object

List<String> list= List.of("A","B","C"); //good   //give immitable obejct      // from java9
```

(Not best in all cases)

Q) sir generally why we close all connections after use... what is the main reason behind closing?

Ans) To avoid memory leaks we sholuld close sockets and streams at the end of thier uitlization.

About Memory Leaks in java
https://stackify.com/memory-leaks-java/

note:: We can not use PReparedStatement object in batch Processing towards adding multiple SQL queries to that batch becoz each PreparedStatement object can represent only one Pre-compiled SQL query. Same limitation is also threre with CallableStatement object..

```
PreparedStatement ps=
      con.prepareStaement("UPDATE JDBC_BANKACCOUNT SET BALANCE=BALANCE-? WHERE ACNO=?");
```

Interacting with unconventational DB s/ws
==========

3 types of DB s/w

|----> Conventational RDBMS /SQL DB s/w
eg::oracle,mysql, postgreSQL and etc..

|---> UnConventional DB s/w
eg: Ms-Excel , TextFiles (csv files, table file) (These are not DB s/ws.. but we are going to take them as Db s/ws)

|---> NoSQL Db s/w
eg: MongoDB, Cassandra and etc..

What is the need of unConventional DB s/w?

=>Indurstry uses conventional Db s/w as main DB s/ws.. and unconventional Db s/ws as helper DB s/w.. for taking print outs.. for mangaing data temporary..

Usecase1:: ICICI Bank uses oracle as main DB s/w . for managing DB s/w.. and uses Ms-Excel as helper DB s/w to account statement prinouts after every 3months.

Usecase2:: The teachers collected census info will be typed to Ms-EXcel by DEOs (Data Entry Operators) and later it will be copied To Main Db s/w like Oracle..

=>HXTT Company is supplying type4 mechanism based JDBC driver for Ms-Excel and JDBC drvier Text files..

URL :: http://www.hxtt.com/text.html
http://www.hxtt.com/excel.html

Inteacting with Ms-Excel
==========

step1) Create MsExcel Work book and sheets with Data and indentity what is Logical DB, db table and physical DB in that

Ms-Excel s/w (Physical DB)

E:\worspaces
|---->advjava
|---->ntaj414
|-->College.xlsx (Logical Db -WorkBook)
|--->Sheet1 (db table1)
|--->Sheet2 (db table2)
|--->Sheet3 (db table3)

Sheet1 (db table1)

sno	sname	sadd
101	raja	hyd
102	ramesh	vizag
103	suresh	delhi

(col names)

col values

step2) Arrange HXTT company supplied Excel JDBC driver.. and gather its details

jdbc driver class name :: com.hxtt.sql.excel.ExcelDriver

url :: jdbc:Excel:///<Directory Location where xlsx file is saved>

jar file :: Excel_JDBC30.jar (supports auto loading of jdbc driver class)

note:: we can download entire driver s/w as zip file from http://www.hxtt.com/excel.html

step3) Develop the Application using HXTT JDBC driver

refer ExcelSelectTest.java

refer ExcelSelectTest.java

```
public class ExcelSelectTest {
    //<Workbookname>.<SheetName> is the db table
  private static final String EXCEL_ALL_SELECT="SELECT * FROM COLLEGE.SHEET1 ";
    public static void main(String[] args) {
        try(Connection con=DriverManager.getConnection("jdbc:Excel:///G:/Worskpaces/advjava/NTAJ414")){
            try(PreparedStatement ps=con.prepareStatement(EXCEL_ALL_SELECT)){
                try(ResultSet rs=ps.executeQuery()){
                    while(rs.next()) {
                        System.out.println(rs.getInt(1)+" "+rs.getString(2)+" "+rs.getString(3));
                    }//while
                }//try3
                }//try2
        }//try1
        catch(SQLException se) {
            se.printStackTrace();
        }
        catch(Exception e) {
            e.printStackTrace();
        }

    }//main
}//class
```

For Inserting records to ExcelDB refer
ExcelInsertTest.java

Inteaacting with Text files (csv files) using JDBC
==========

step1) create csv file in any folder of u r choice

```
G:\Workspaces (logical DB)
physical    |--->advjava (logical DB)
DB                |--->NTAJ414 (logical DB)
                        |---->file1.csv (db table1)
                        |---->file2.csv (db table2)
```

file1.csv
========

```
101,raja,hyd,89.67
102,rajesh,hyd,59.57
103,suresh,hyd,84.74
106,suresh,hyd,84.74
```

col values

step2) Gather details Hxtt supplied Text driver

note:: Text_JDBC30.jar files must be added build path of the project

jdbc driver class name:: com.hxtt.sql.text.TextDriver
jdbc url :: jdbc:Text:///<LogicalDB - nothing but location of csv file>

jar file :: Text_JDBC30.jar (supports autoloading of jdbc driver class)

note:: here fhe csv file names (like file1.csv ,file2.csv will be taken as db table names)

step3) Develop the Application.....

CSVSelectTest.java
==========

```
public class CSVSelectTest {
    //csv file name as the db table name
  private static final String CSV_ALL_SELECT="SELECT * FROM file1.csv";
    public static void main(String[] args) {

    try(Connection con=DriverManager.getConnection("jdbc:Text:///G:/Worskpaces/advjava/NTAJ414")){
        try(PreparedStatement ps=con.prepareStatement(CSV_ALL_SELECT)){
            try(ResultSet rs=ps.executeQuery()){
                while(rs.next()) {
                    System.out.println(rs.getInt(1)+" "+rs.getString(2)+" "+rs.getString(3)+" "+rs.getFloat(4));
                }//while
            }//try3
            }//try2
    }//try1
    catch(SQLException se) {
        se.printStackTrace();
    }
    catch(Exception e) {
        e.printStackTrace();
    }

    }//main
}//class
```

For inserting records into CSV Files refer :: CSVInsertTest.java

---

Select SQL Query is giving 30 records but i want see only 10 records in to RS object with out changing SQL query?

Ans) rs.setFetchSize(<n>); or st.setFetchSize(<n>); note: Most of jdbc drivers are not supporting this features..

RowSets
==========

==>Rowset is extension of ResultSet to hold bunch of records given by "select SQL query" execution.

==>Every RowSet object is the object of java class that implements javax.sql.RowSet(I)

extends

java.sql.ResultSet(I)

Limitations of ResultSet
==========

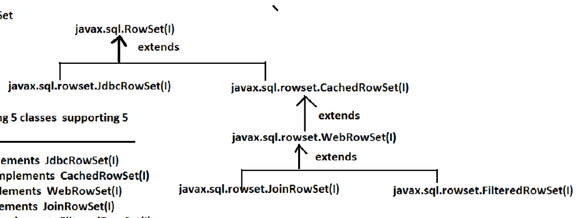
(a) ResultSet objects are connected objects i.e we can not do offline Data manipulation with out having connectivity with Db s/w.
(b) Does not support Bean style Programming (Programming with setter/getter methods)
(c) Does not support event handling
(d) ResultSet objs are not Serializable objects i.e we can not send them over the network..

To overcome these limitations we can use RowSets and advatantages are

(a) we can get all basic functionality of ResulSet object
(b) ** these disConnected objects i.e we can modify RowSets obejcts in offline mode with out having connection with Db s/w... and we make these modifications reflecting to Db s/w once Connection is back
(c) supports bean style prorgamming
(d) Supports event handling.. (The action done one record of RowSet can be made reflecting on other records)
(e) Most of the RowSet objs are Serializable objs,So they can be sent over the network..

5 types of RowSets are there
==========

a) JDBCRowSet
b) CachedRowSet **
c) WebRowSet **
d) JoinRowSet
e) FilteredRowSet



ORacle thin/oci driver is giving 5 classes supporting 5 types of RowSets

1.OracleJdbcRowSet(c) implements JdbcRowSet(I)
2.OracleCachedRowSet(c) implements CachedRowSet(I)
3.OracleWebRowSet(c) implements WebRowSet(I)
4.OracleJoinRowSet(c) implements JoinRowSet(I)
5.OracleFilteredRowSet(c) implements FilteredRowSet(I)

JdbcRowSet
==========

=> It is connected RowSet object
=> It is not a serializable object
=>It is given in RowSet to work like ResulSet
=> Supports Bean Style proramming
=> Does not support offline data manipulation
=>These Rowsets are default scollable
=>we can use Sensitive or InSenstive Behaviour JdbcRowSet..
=> These RowSets are Read Only Rowsets by default and we can not make them as Updatable RowSets in any angel

Q)How restrict no.of records That should come RS or RowSet though its select SQL query is giving more records?
Ans) rs/st.setFetchsize(n); or rowset.setFetchSize(-) meethods are not working in most of the JDBC drivers.. as alternate we can use st.setMaxRows(n) or rowset.setMaxRows(n) methods.

refer JDBCRowSetTest.java

```
try(OracleJDBCRowSet jrowset=new OracleJDBCRowSet()) {
        //set jdbc propeties
        jrowset.setUrl("jdbc:oracle:thin:@localhost:1521:xe");
         jrowset.setUsername("system");
         jrowset.setPassword("manager");
        //set SQL Query
         jrowset.setCommand("SELECT SNO,SNAME,SADD,AVG FROM STUDENT");
         jrowset.setMaxRows(4);
         //execut the SQL query
         jrowset.execute();
         //process the RowSet
         //int count=0;
         while(jrowset.next()) {
                /* jrowset.refreshRow();
                if(count==0)
                        Thread.sleep(40000);*/

            System.out.println(jrowset.getInt(1)+" "+jrowset.getString(2)+" "+jrowset.getString(3)+" "+jrowset.getFloat(4));
          // count++;
         }
         jrowset.absolute(3);
            System.out.println(jrowset.getRow()+" -->"+jrowset.getInt(1)+" "+jrowset.getString(2)+" "+jrowset.getString(3)+" "+jrowset.getFloat(4));
            jrowset.updateString(3,"dubai");
            jrowset.updateRow();
            System.out.println(jrowset.getRow()+" -->"+jrowset.getInt(1)+" "+jrowset.getString(2)+" "+jrowset.getString(3)+" "+jrowset.getFloat(4));
    }//try
    catch(SQLException se) {
        se.printStackTrace();
    }
    catch(Exception e) {
        e.printStackTrace();
    }
```

CachedRowSet

=> It is disconected RowSet i.e offline processing is possible
=> It Serializable object
=> It is Scrollable, Sensitive/Insensive, Updatable/ReadOnly (Both read and write are possible)
=> The modifications done in offline env.. (not having connection with DB) can be reflected back to DB after getthing connection by calling acceptChanges() method.

=> While developing PDA (Personal Digital Assistant -->like tab applicaltons) these are rowset very popular.
eg:: flipkart delivery boy tab, Insurance agent Tab , Bank Marketing Employee tab and etc..

CachedRowSetTest.java
==========

refer CachedRowSetTest.java

```
try(OracleCachedRowSet crowset=new OracleCachedRowSet()) {
        //set jdbc propeties
        crowset.setUrl("jdbc:oracle:thin:@localhost:1521:xe");
         crowset.setUsername("system");
         crowset.setPassword("manager");
        //set SQL Query
         crowset.setCommand("SELECT SNO,SNAME,SADD,AVG FROM STUDENT");
        // crowset.setMaxRows(4);
         //execut the SQL query
         crowset.execute();
         //process the RowSet
         crowset.setReadOnly(false);
         while(crowset.next()) {
                System.out.println(crowset.getInt(1)+" "+crowset.getString(2)+" "+crowset.getString(3)+" "+crowset.getFloat(4));
         }
         System.out.println("................Stop DB s/w.............................");
         Thread.sleep(40000);
         crowset.absolute(4);
         crowset.updateString(3,"newyork");
         crowset.updateRow();  //This is called offline/disconnected data processing
         System.out.println("................Start DB s/w.............................");
         Thread.sleep(40000);
         //process the RowSet
         crowset.acceptChanges();
         while(crowset.next()) {
                System.out.println(crowset.getInt(1)+" "+crowset.getString(2)+" "+crowset.getString(3)+" "+crowset.getFloat(4));
         }
```

WebRowSet
==========

=>same as Cached Rowset ..but very useful to render Db table data as xml data and also to write xml file..
=>Very useful in Soap Based WebServices where data will be carried in the form of Xml
=> Useful in Ajax(Extension of JS) env.. to send to response browser as xml content..

note:: Xml is a mechanism of creting, describing data having bunch files and we can also *send* this data over the n/w text data having Platform and s/w independency..

refer WebRowsetTest.java

```
try(OracleWebRowSet wrowset=new OracleWebRowSet()) {
        //set jdbc propeties
        wrowset.setUrl("jdbc:oracle:thin:@localhost:1521:xe");
         wrowset.setUsername("system");
         wrowset.setPassword("manager");
        //set SQL Query
         wrowset.setCommand("SELECT SNO,SNAME,SADD,AVG FROM STUDENT");
         // wrowset.setMaxRows(4);
         //execut the SQL query
         wrowset.execute();
         //process the RowSet
         wrowset.setReadOnly(false);
         while(wrowset.next()) {
                System.out.println(wrowset.getInt(1)+" "+wrowset.getString(2)+" "+wrowset.getString(3)+" "+wrowset.getFloat(4));
         }
         System.out.println("Wrting RowSet object data to Xml file");
         //write to xml file
         Writer writer=new FileWriter("student_info.xml");
         wrowset.writeXml(writer);
         System.out.println("Wrting RowSet object data on the console in xml format");
         wrowset.writeXml(System.out);
    }//try
    catch(SQLException se) {
        se.printStackTrace();
    }
    catch(Exception e) {
        e.printStackTrace();
    }
```

JoinRowSet
==========
=>Allows to combine multiple Rowsets into single RowSet by applying SQL inner joins

```
try(OracleCachedRowSet crs1=new OracleCachedRowSet();
        OracleCachedRowSet crs2=new OracleCachedRowSet();
        OracleJoinRowSet jnRowset=new OracleJoinRowSet()){
    crs1.setUrl("jdbc:oracle:thin:@localhost:1521:xe");
    crs1.setUsername("system");
    crs1.setPassword("manager");
    crs1.setMatchColumn(5);
    crs1.setCommand("SELECT EMPNO,ENAME,JOB,SAL,DEPTNO FROM EMP");
    crs1.execute();
```

refer JoinRowSetTest.java

```
    crs2.setUrl("jdbc:oracle:thin:@localhost:1521:xe");
    crs2.setUsername("system");
    crs2.setPassword("manager");
    crs2.setMatchColumn(1);
    crs2.setCommand("SELECT DEPTNO,DNAME,LOC FROM DEPT");
    crs2.execute();

    //add multiple cached rowsets to joinrowsets
    jnRowset.addRowSet(crs2);
    jnRowset.addRowSet(crs1);

    //process the JoinRowSet
    while(jnRowset.next()) {
        System.out.println(jnRowset.getInt(1)+" "+jnRowset.getString(2)+" "+jnRowset.getString(3)
                +" "+jnRowset.getString(4)+" "+jnRowset.getString(5)+" "
                +jnRowset.getString(6)+" "+jnRowset.getString(7));
    }

}
catch(SQLException se) {
    se.printStackTrace();
}
```

note:: instead of working with JoinRowsets .. better to use SQL query with Joins

---

Filtered RowSet

=> Allows to filter the records that should come to RowSet based on java code based conditions..
=>This Condition will be prepared as Predicate object nothing but class that is implementing Predicate(I) and we write conditional logic in the evaluate(-) method.
=> For every record this evaluate(-) method executes.. if this method returns true then record will be there in FilteredRowSet otherwise will not be there in FliteredRowSet .

Example code
==========

```
try(OracleFilteredRowSet frs=new OracleFilteredRowSet()){
    frs.setUrl("jdbc:oracle:thin:@localhost:1521:xe");
    frs.setUsername("system");
    frs.setPassword("manager");
    frs.setCommand("SELECT EMPNO,ENAME,JOB,SAL,DEPTNO FROM EMP ");
    frs.setFilter(new Filter1("ENAME","S"));
    frs.execute();

    //process rowset
    while(frs.next()) {
        System.out.println(frs.getInt(1)+" "+frs.getString(2)+" "+frs.getString(3)+" "+frs.getFloat(4)+" "+frs.getInt(5));
    }
}
catch(SQLException se) {
    se.printStackTrace();
}
}//main
    private static class Filter1 implements Predicate{
        private String colName;
        private String condData;

// alt +shift +s ,o --> generates constructor
        public Filter1(String colName, String condData) {
            this.colName = colName;
            this.condData = condData;
        }

        @Override
        public boolean evaluate(RowSet rs) {
            System.out.println("FilteredRowSetDemo.Filter1.evaluate(-)");
            try {
            String colValue=rs.getString(colName);
             if(colValue.startsWith(condData))
                return true;
             else
                return false;
            }
            catch(SQLException se) {
                //se.printStackTrace();
                return false;
            }
        }

        @Override
        public boolean evaluate(Object value, int column) throws SQLException {
            // TODO Auto-generated method stub
            return false;
        }

        @Override
        public boolean evaluate(Object value, String columnName) throws SQLException {
            // TODO Auto-generated method stub
            return false;
        }
```

noite:: It is better condtion directly in the SQL query itself intstead woking with FilteredRowset having codition java code..

```
    }
```

Flow :: when frs.next() method is called.. each record given Select Query of "frs" goes to evaluate(-) as RowSet object there read given "ename" col value and checks against given condition data and return true/false .. if true then it keeps the record in "frs" otherwise it will not keep. (frs--->Filterered RowSet)

note:: Industry uses CachedRowSet and WebRowSet in projects..

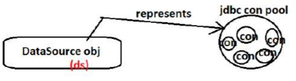
JDBC Con pool
==========

=> It is the factory that contains set of readily available jdbc con objs before actually being used..

different types of JDBC con pools

- Standalone Apps
  - =>Useful in standalone Apps
  - eg:: oracleThinDriver jdbc con pool (built-in in jdbc driver)
  - ApacheDBCP, C3P0, HikariCP (best) (third party)
- Sever Managed Jdbc con pool
  - =>created and manged by webServer /App server like Tomcat,weblogic and etc.. (will be learned in servlet,frameworks)

=>DataSource obj acts enttry point for jdbc con pool.. i.e to create con objs in jdbc con pool and to get con objects from jdbc con pool we need DataSource object.



note: Datasource obj means , it is the object of java class that implemetns javax.sql.Datasource(I)

```
Connection con=ds.getConnection();
```

|-->Gives on jdbc con object from jdbc con pool

Two types of jdbc con objs
- a) Direct JDBC con object
  - ->created by the programmer manually
  - Connection con=DriverManager.getConnection(-,-,-);
- b) Pooled JDBC Con object
  - ->Gathered from JDBC con pool using Datasource object
  - Connection con=ds.getConnection();

Example
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```
OracleDataSourceConnectionPool ds=new OracleConnectionPoolDataSource();
ds.setURL("jdbc:oracle:thin:@localhost:1521:xe");
ds.setUser("system");
ds.setPassword("manager"); //use all these details and creates
                            jdbc con pool having initial 4 jdbc con objs(default)
//get pooled jdbc con obj
con=ds.getConnection();
//create Statement obj
Statement st=con.createStatement();
//send and execute SQL query
 ResultSet rs=st.executeQuery("SELECT SNO,SNAME,SADD,AVG FROM STUDENT");
//process the RS
while(rs.next()) {
    System.out.println(rs.getInt(1)+" "+rs.getString(2)+" "+rs.getString(3)+" "+rs.getFloat(4));
}//while
```

refer PooledConnTest .java

END