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

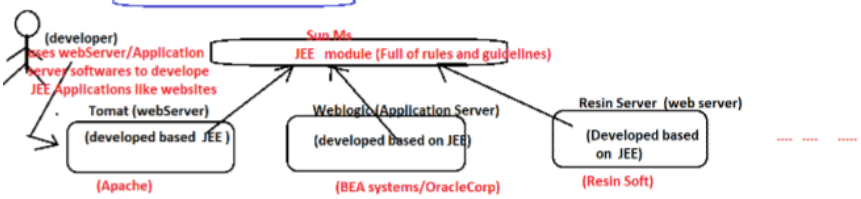
JAva Enterprise Edition (old name)
Jakarta Enerprise Edition (new name)

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 Applicalton server (like weblogic) softwares...

=> Working with WebServer or Application 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Enterprise Java Beans (outdated)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

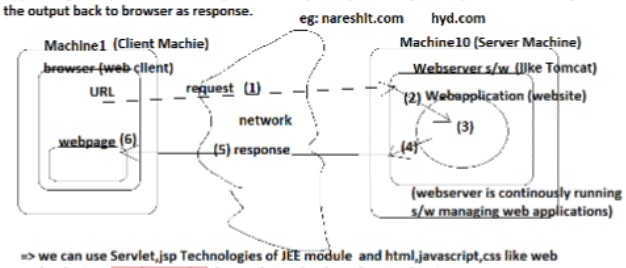
=>Using JEE module and its webServer/Application server s/ws ,we can develop Enterprise Apps like
webApplications and Distribued Apps/Remoting Apps

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.

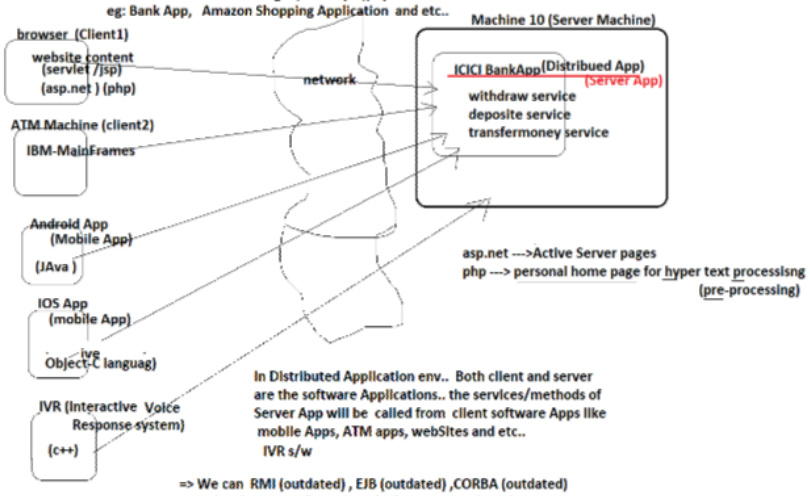


=> we can use Servlet,jsp Technologies of JEE module and html,javascript,css like web
technologies to gather to develop websites (web applications) in Java..

Distributed App /Remoting App
==========

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

eg: Bank App, Google , Phonepe ,payTM Amazon Shopping Application and etc..



asp.net --->Active Server pages
php ---> personal home page for hyper text processisng
(pre-processing)

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 ...

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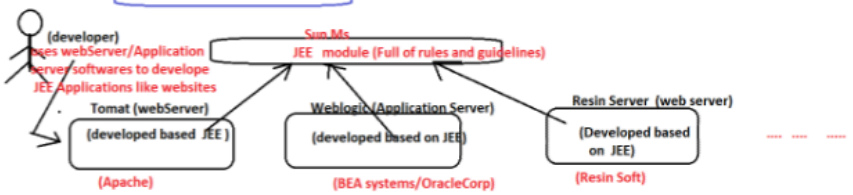

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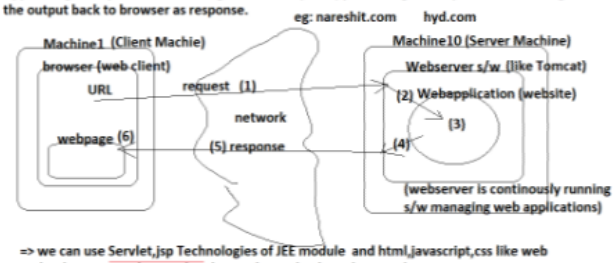
Struts, Spring ,hiberante and etc.. are frameworks and not part of Java modules (JSE,JEE,JME).. They need to be arranged seperately.

Struts ---->apache
spring --->Interface21 /Pivotal team
hibernate ---> softtree (RedHat)
and etc..

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.



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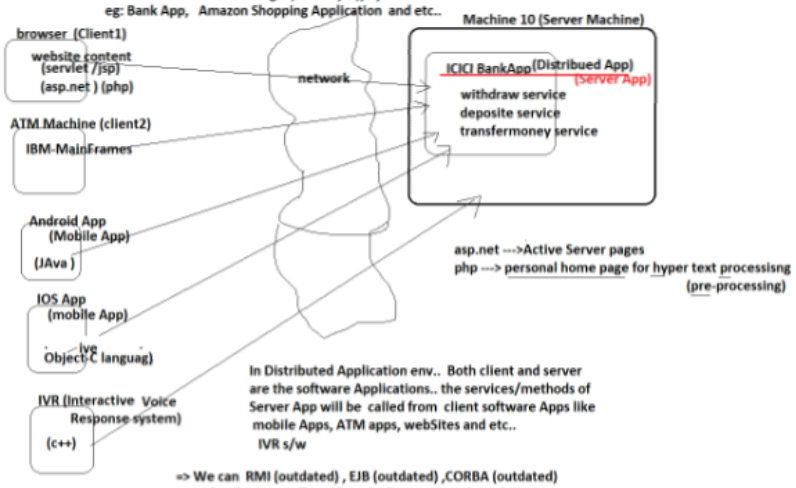
eg: Bank App, Amazon Shopping Application and etc.. Google pay, Phonepe ,payTM



asp.net --->Active Server pages
php ---> personal home page for hyper text processisng (pre-processing)

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 ...

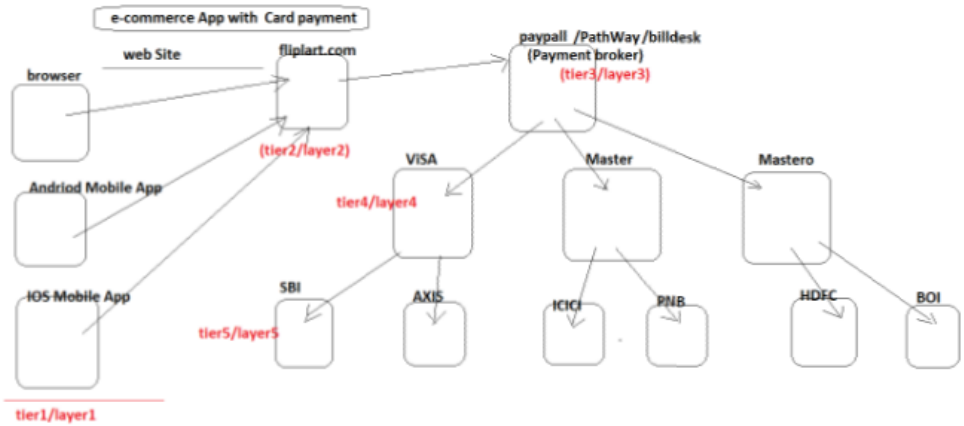
CORBA :: Common ORB Request broker Architecture
ORM :: Object Request broker

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.

	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...

Supperts 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.

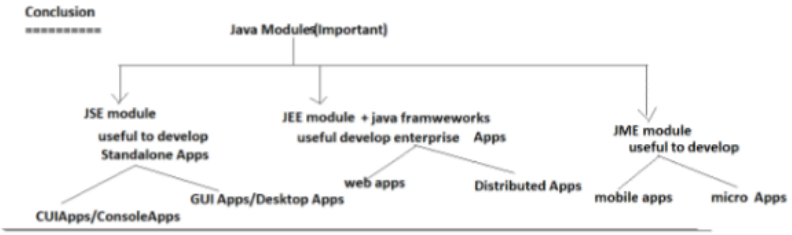
RTOS ::Realtime Operating System..

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 service 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 companj es
-> 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)

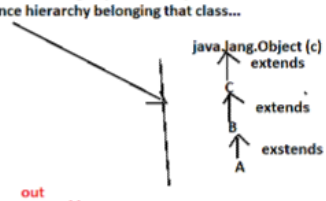
forName(-) makes jvn to load the give "java.util.Date" class dynamically at runtime

(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
```

(it can java9/10 also)

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 (it can java9/10 also)
cmd>java -version
cmd> javac DemoApp.java (success)
cmd> java DemoApp (sucesss)
output::
square vlaue :: 100

There is no javafx in jdk before java8 version..

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 (u can also use java12/13/14 /..)
cmd>java -version

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

cmd >javac DempApp.java
DemoApp.java:3: error: package javafx.application does not exist
public abstract class DemoApp extends javafx.application.Application
^
1 error

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

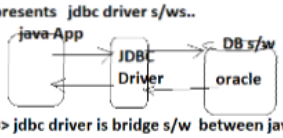
jar file
======

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

```
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%)
```

==========

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

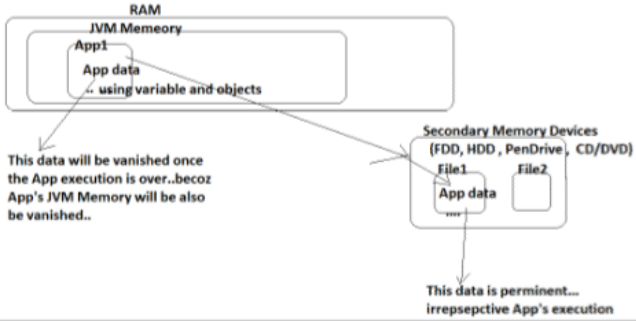
What is persistence?

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-Commerice 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...

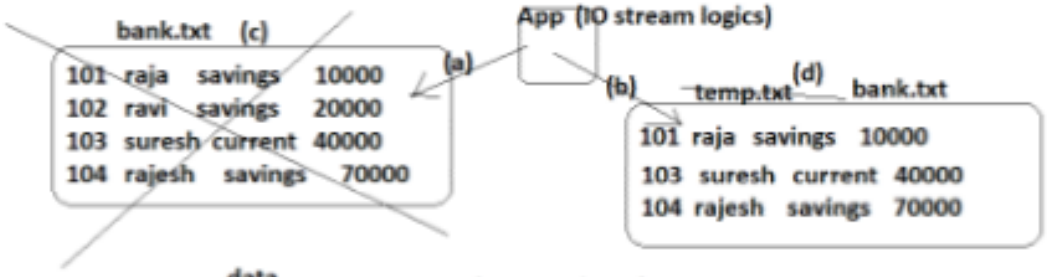
Java App ----------JDBC----------> RDBMS DB s/w (oracle,mysql,postgresql and etc..)

Limitations with files as Persistence stores

(a) No Security..
(b) Can not store huge amount data ..

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---> empployee 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)

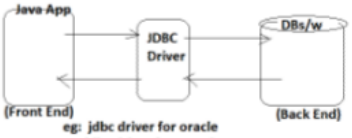
To overcome these problems we got NoSQL DB s/w... which allows to store data in different formats like docs ,graphs and etc.. but not as rows and cols..
eg:: MongonDB , Neo4j and etc...

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...

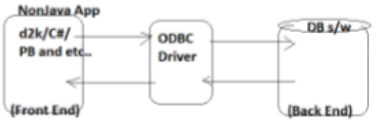
JDBC driver
==========

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 (Rice granuals)
==========
=>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 to compilers and interpeters.
=> Programming languages are bsse create s/w technologies , DB s/w , Operating systems, Device Drivers , Tools , frameworks and etc..

eg::
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 with JDBC drivers is nothing but working JDBC Techonology...

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

JTA : Java Transaction API
JAAS :: Java Authentication and Authorization service
EJB:: Enterpirse 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
==========

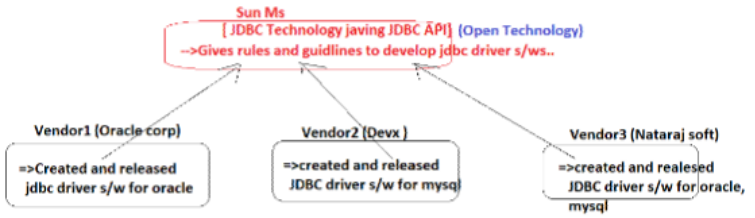
Here the rules and guidlines of technology are open to all s/w vendor companies to develop implementation s/ws...

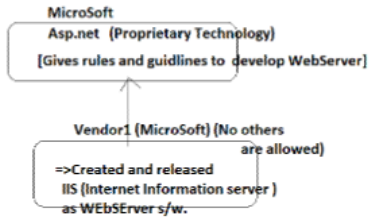
eg:: All Java Technologies like JDBC, Servlet , JTA and etc....

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...





note:: Since multiple Vendors of open Technology are giving their implementing s/ws .. based on the common rules and guidelines 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..

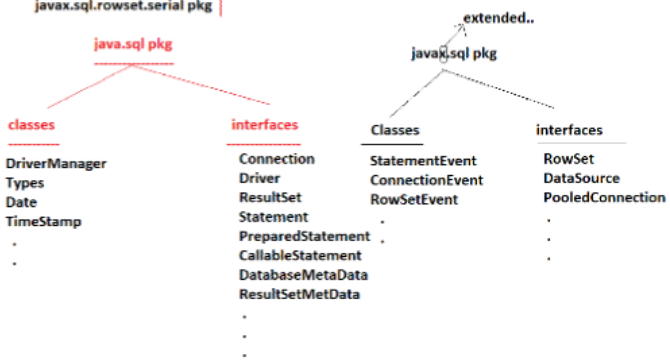
jdbc api packages (latest 4.x)

- java.sql pkg
- javax.sql pkg ,

Core pkgs

- javax.sql.rowset pkg,
- javax.sql.rowset.serial pkg

extended pkgs



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

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 of Software/Project Development (With respect to developers)

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

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 d 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)

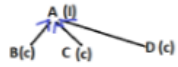
Signature of registerDriver(-) method of DriverManager class

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

(Interface)

alterts caller to handle the exception while calling the method

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..



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)

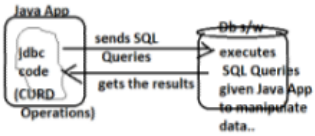
step2) Establish the connection with DB s/w from Java App by using the jdbc driver s/w that is there with DriverManager service
(It is like road b/w Java App and Db s/w)

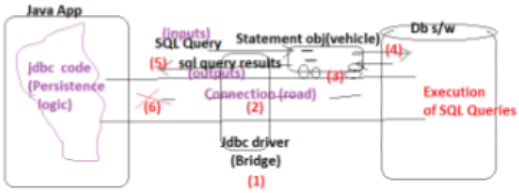
step3) Create STatement object
(It acts vehicle to send inputs (SQL queries) to Db s/w from Java App and to gather SQL Query Results (outputs) from DB s/w to java App)

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)

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

=>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)

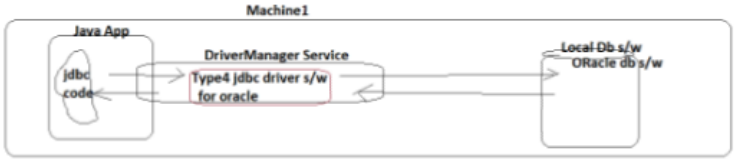
Four Wheeler Architectures
|---> Car
|---> Van
|---> MiniBus
|---> Mini Lorry
and etc...

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
==========

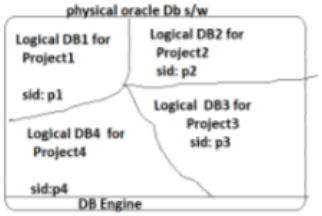


note:: for Every Db s/w , we need seperate type4 JDBC driver s/w..
=> Type4 jdbc driver oracle (eg:: ojdbc6/7/8.jar)
=> Type4 jdbc driver mysql (eg:: mysql-connector-java-<ver>.jar)

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 are given to connect hardware devices to our computer (physical ports)
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 adm

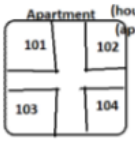
Socket number (It is extension of port number)

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..

Apartment (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

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

Oracle thin jdbc driver details are

-> jdbc driver class name ::: oracle.jdbc.driver.OracleDriver (or)
oracle.jdbc.OracleDriver
-> 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)
classes12.jar (oracle 9i) ojdbc7.jar (oracle12c)
ojdbc14.jar (oracle 10g) ojdbc8.jar (oracle 13c++)

* ---> IP address or hostname of Remote computer in the network where remote oracle DB s/w is running

---

protocol
=======

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

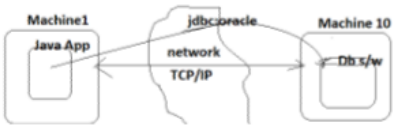
=>There are two types of protocols

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

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

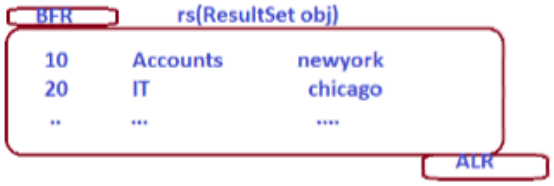
a) Select SQL queries (DRL Queries)
=>These Queries give Bunch of records (0 or more records)
eg:: SQL>Select * from emp;
->gives 14 records

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");
```



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

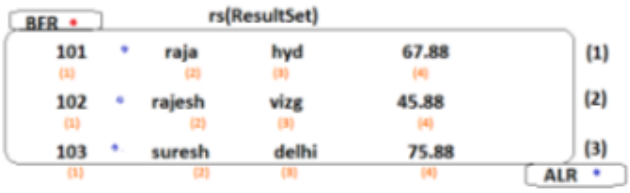
```
SQL> create table student(sno number(5), sname varchar2(20),sadd varchar2(20),avg number(10,2));
```

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)

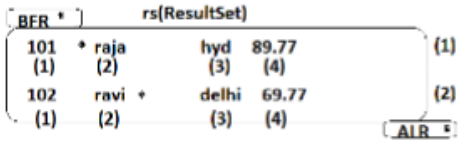
Hard Conding vs soft coding

```
int a=10;  //hard coding

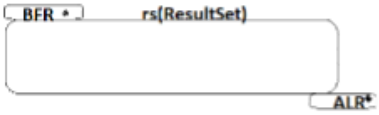
Scanner sc=new Scanner(System.in);
int a=sc.nextInt(); //soft coding
```

-> 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

a) Write a JdBc App to get Student details based on given initial characters of student name

b) Write a JDBC App to get Emp details based on given 3 desgs..

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)

```
try{
  ...
  ... //jdbc code
  ..
  ...
  ...
}
catch(...) { ...}
 catch(SQLException se){
  rs.close();
  st.close();
  con.close();
 }
 catch(Exception e){
     rs.close();
     st.close();
     con.close();
 }
```

(bad)

(if exception not raised... jdbc object will not closed here)

```
try{
  ...
  ... //jdbc code
 rs.close();
 st.close();
 con.close();
 }
 catch(...) { ...}
 catch(SQLException se){
   rs.close();
   st.close();
   con.close();
 }
 catch(Exception e){
     rs.close();
     st.close();
     con.close();
 }
```

(bad)

(The code of closing jdbc objs loosing its reusability)

```
try{
  ...
  ... //jdbc code
  ...
  ...
}
catch(ClassNotFoundException cnf){
  ..
}
catch(SQLException se){
  ..
}
catch(Exeption e){
  ..
}
finally{
 //close jdbc objs
   rs.close();
   st.close();
   con.close();
 }
```

(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 use 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..

```
public static void main(String args[]){
   Connection con=null;
   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
    ..
   }
}
```

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 Clases)

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

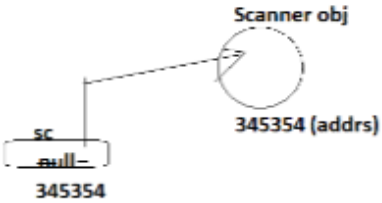
and etc.. .....

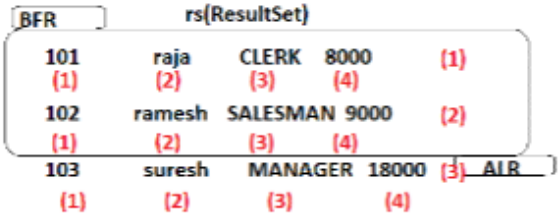
Q)Write a JDBC App to get empNo,ename,job,sal col values from emp db table based on given 3 three jobs order by job.

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

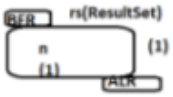
Step6) run the application...

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

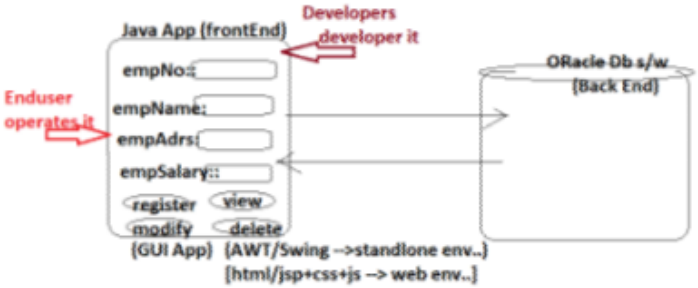
(or) ctrl+click

Ctrl+shift+t :: To get source code any random class/int 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..

```
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");

}
```

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

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 getUpdateCou

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.

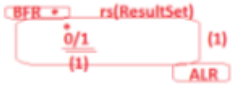
step1) create DB table having usernames,passwords

```
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)

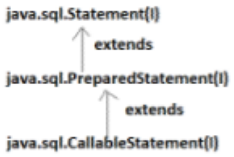
Example2

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)

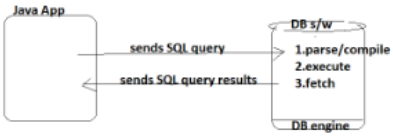
oracle date pattern:: dd-MMM-yy eg: 20-OCT-90
mysql date pattern :: yyyy-MM-dd eg: 1990-10-20

(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");
```

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 student details to DB able?

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

(PsInsetTest.java) --> GIT

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..

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

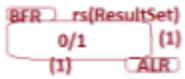
eg:: select * from student;

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.

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 --
↓
Quuer execution
params values are set as inputs (may contains --)
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
↓ here // will not be treated as comment.
as // input

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/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?

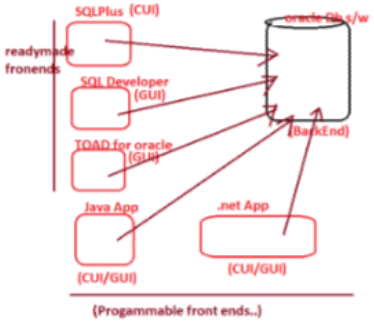
SimpleStatement obj	PreparedStatement obj
(a) Does not hold any pre-compiled query	(a) holds one pre-compiled SQL query
(b) Can be used only to execute static SQL queries	(b) Can be used to execute both static dynamic SQL queries
(c) May raise SQL Injection Problem	(c) does not raise
(d) Input values 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 multiple 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 (Testing at client org) | Prod Env.. (Project is in Live)

Dev Env ⇨ mysql
Test Env ⇨ mysql
UAT Env ⇨ mysql/Oracle ⇨ (Small Projects) (Big Projects)
Prod Env.. ⇨ 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?

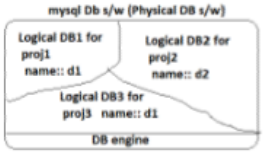
PRocedure to create logical DB having Db table with records

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 column , natural key column ,surrogate key column 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 aculquired by school2)

setup
=====
=> BankAccount db table in oracle with records (AndharBank)
=> BankAccount db table in mysql with rcords (Union bank)

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

nn-->not null
pk -->primary key
uk -->unique key
AI -->Auto Increment
One db table can have only one pk column

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)
==========

=> 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

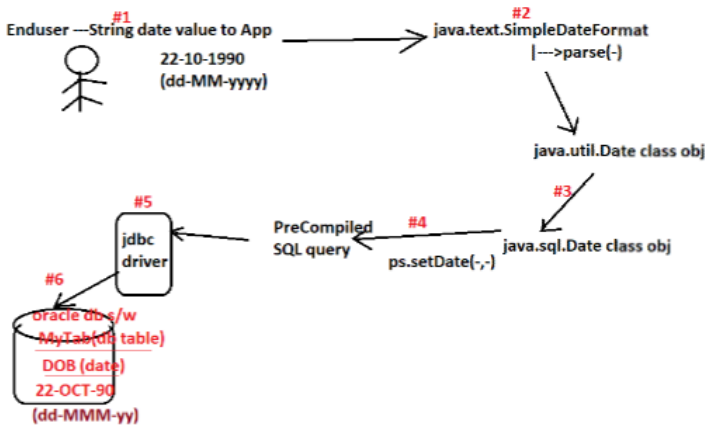
i
java.util.Date (c)
extends
java.sql.Date(c)

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

---



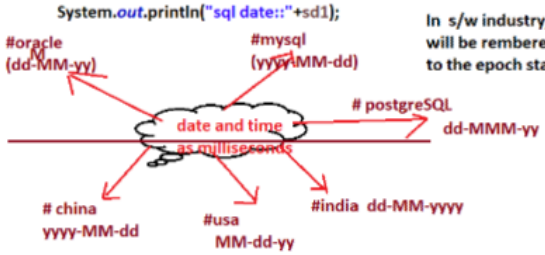

```
//converting String date value to java.util.Date class obj
        String d1="12-11-1990"; //dd-MM-yyyy
        SimpleDateFormat sdf=new SimpleDateFormat("dd-MM-yyyy"); //holding pattern of date
        java.util.Date ud1=sdf.parse(d1);
        System.out.println(ud1);
```

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

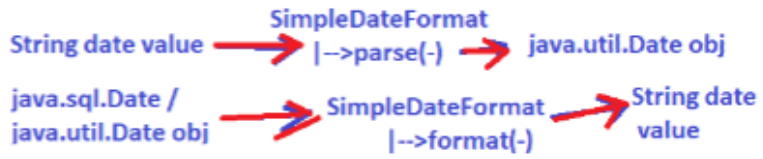
==========

=>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.

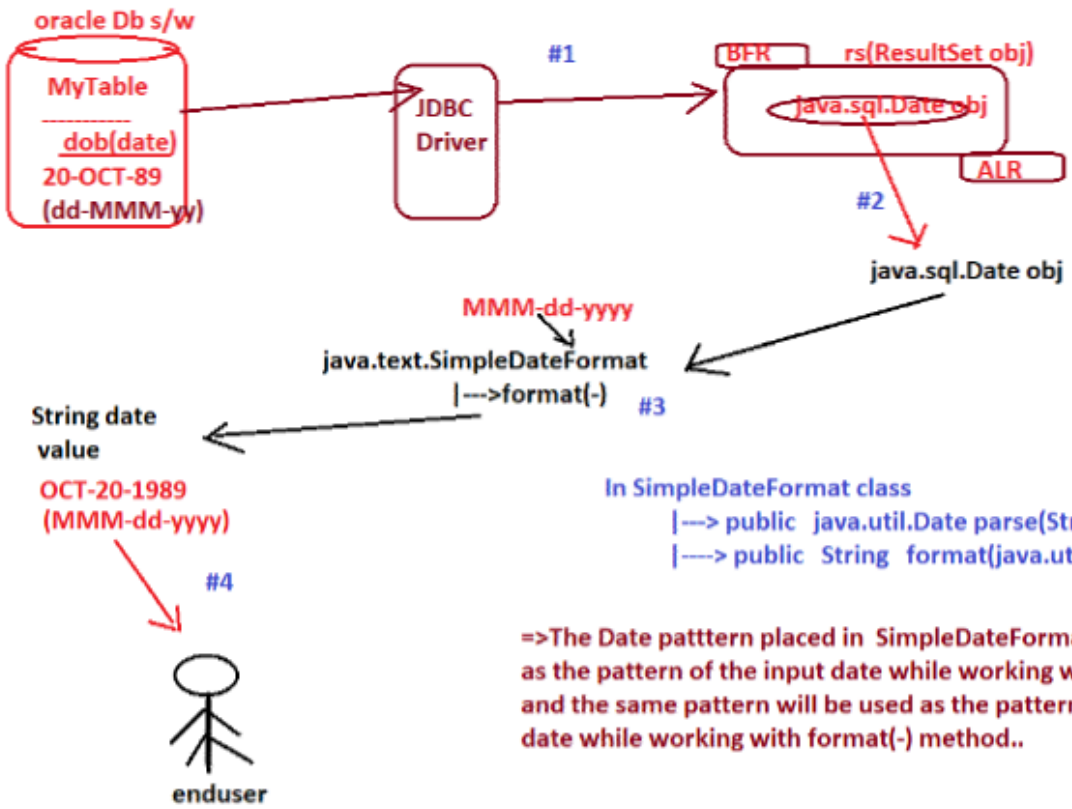
=>After getting Date values to ResultSet object by executing Select SQL query ,if we call rs.getString(-) the date values will come as string values having yyyy-MM-dd pattern .if we call rs.getDate(-) method then we get java.sql.Date class objs having yyyy-MM-dd pattern as internal pattern.

=>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..



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

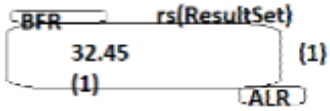
query in oracle (refer PersonAgeCalculatorOracle.java)
==========

```
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..

Java App — write data (stream) / read data (stream) — File / Array/Object/collection/ console/keyboard and etc..

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 streams representing files as query param value we can use (binary)

ps.setBinaryStream(-,-,-) /ps.setBinaryStream(-,-) (or) ps.setBlob(- - -)/ps.setBlob(- -) — for binary data..

1,2,3 — 1,2

1-->param index
2-->stream 3->length of file (from the begining)

To set Reader streams representing files as query param value we can use (text)

ps.setCharacterStream(-,-,-) /ps.setCharacterStream(-,-) (or) ps.setClob(-,-,-)/ps.setClob(-,-) — for character/text data..

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 can not hande size blob or clob values...

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.

Matriymony App (standalone)--->Go for BLOB,CLOB values directly in DB s/w
(jdbc Apps) (super market)
(colleage Apps, samall university Apps)

Matriymony App (web based)--->Go for file ssytem/cloud storage for files and insert only locations to the Db table cols (vc2)
(Servlet/Jsp env..)
(youtube, FB, Instagram, twitter and etc.. will fallow this model)
more eg::amazon,flipkart ..

oracle Db table

clipNo(n)(pk)	clipTitle(vc2)	type(vc2)	clipLocaton(vc2)
1	bahubhali	movie	d:/movies/babubhall.mkv

(no burden on the Db s/w --So good Performence)

d:\movies
|--->babubhall.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

=>"\" 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

==========

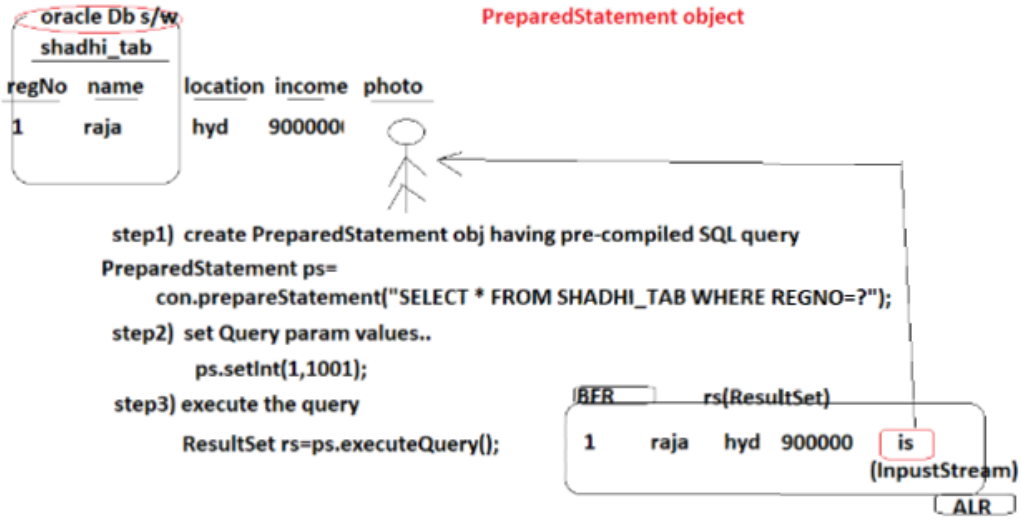
TINYBLOB	Up to 255 bytes
BLOB	Up to 64 Kb
MEDIUMBLOB	Up to 16 Mb
LONGBLOB	Up to 4 Gb

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



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();
```

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

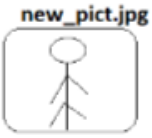
```
IOUtils.copy(is,os);
```

(It is from third party api given apache company jar file name:: commons-io-<ver>.jar)

⇧

(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)
)
```

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 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);
```

For example app refer CsProcedureCursorTest.java

prepare try with resource feature of jdk7

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)

Assigmnet2:: write a JDBC App to get Student details by calling PL/SQL procedure based on given initial chars of student name..

(cursor)

Calling PI/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                                     <mode> <paramname> <type>
      select pname,price,qty into name,rate,qnt from product where pid=id;
    END$$   col names        out param names        colname   IN param

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...

note:: we can use 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(-)
getRow()
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..

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

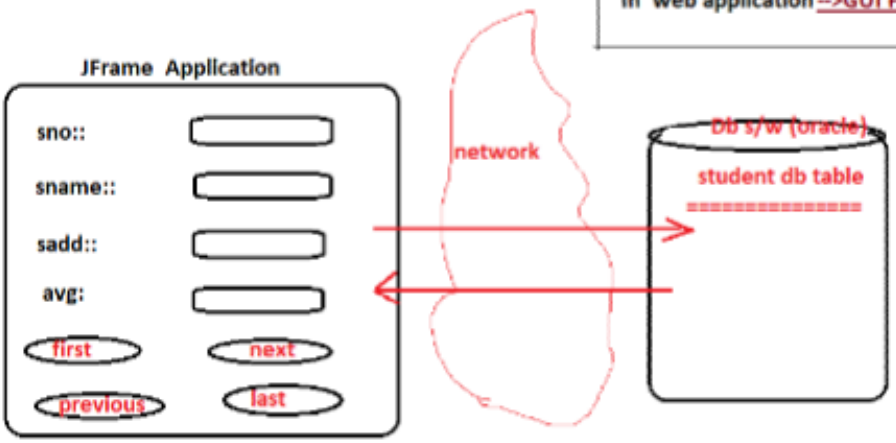
To create ScrollableRS while working with PreparedStatement object

```
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)

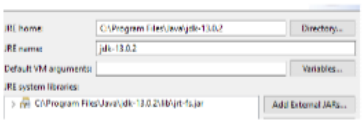
var d= new Date();
var age=30;
var price =56.77f;

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 ...

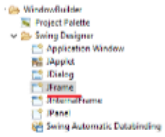
https://www.youtube.com/watch?v=0UVPbTYM25c&t=233s ====> installing Gui builder plugin...

Procedure to develop scroll frame GUI App using Eclipse GUI builder
==========

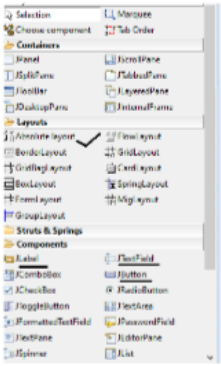
step1) make sure that GUI builder plugin is installed refer this ::: https://www.youtube.com/watch?v=QxokwM-v1yU

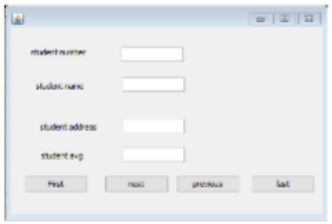
step2) develop Class in ur project as JFrame / Application window class...

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

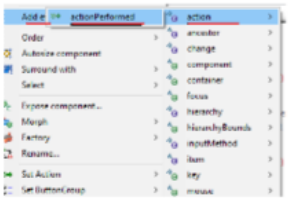




=>right click on Jframe window ---> set Layout :: absolute layout

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 ";
```

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, delele SQL querles..

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)

What is the difference b/w UpdatableRS and SensitiveRS?

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where as while working with ScrollableRS the modifications done in Db table recors will reflect to RS object..

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```

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

To update the record (with out 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

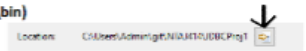
note:: if the PATH of the file given w.r.t current work location then it is called relative path and this will change work location to work location...
note:: if the PATH of the file given right from root dirve/directory then it is called absolute e path and this will remain same from any work location

How to make GUI Java App as destkop App? (launching app by using icon)
==========

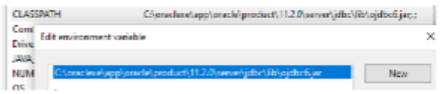
Ans) yes we can javaw tool.. (javaw --->java windows tool a built-in tool jdk s/w)

step1) try to know java version of the u r applicalton (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

⇩

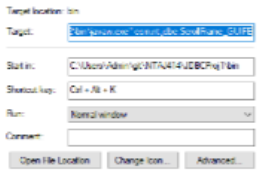
Shorcut name :: CollegeApp

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 ctr+alt +<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?
(Make 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?
==========

Need of creating exe file for Java App
==========

(a) To run Java App on non-Java Computers.. (where jdk is no
(b) To pack and release the Project to Client Organizations..
(c) To keep in the internet as downloadable Application...
and etc..

Ans) JAva App -----> jar file -----> exe file

⇩

J2E tool (Jar2 Exe Tool -- third party Tool)

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
---

space

Manifest-Version: 1.0 (presse enter key)
Main-Class: com.nt.jdbc.ScrollFrame_GUIFE (press enter key)

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...

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 methodologes 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- officially 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 architctures there are multiple vendor companies giving JDBC driver s/ws..

Applet
======

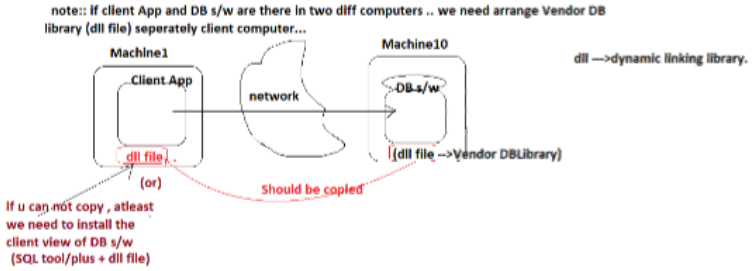
==>It is compiled java class that can be sent over the network as java based webpage.
two types Applets
---

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
==========

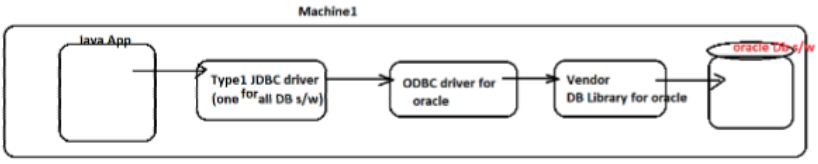
--> All ODBC drivers and some JDBC drivers(Like type2) locates and interacts with local or remoted DB s/w with the support of Vendor DB Library..
=> In windows oeperating Vendor DB Library comes in the form of .dll file (advanced exe file)
=> Oracle DB s/w gives Vendor DB library in form of oci.dll file...
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...

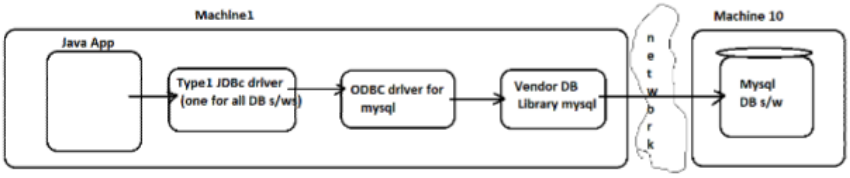


dll --->dynamic linking library.

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...

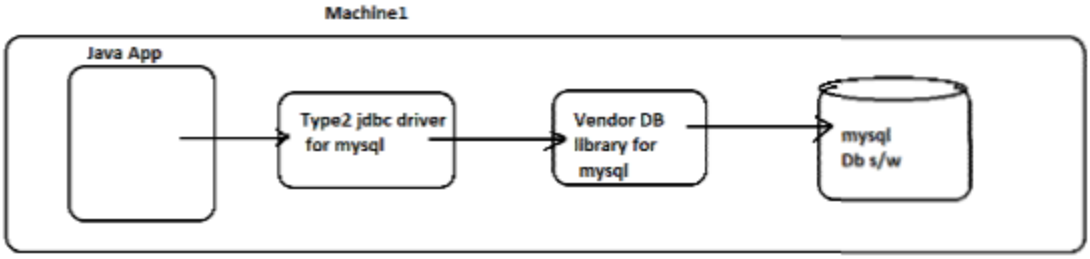
cons
====

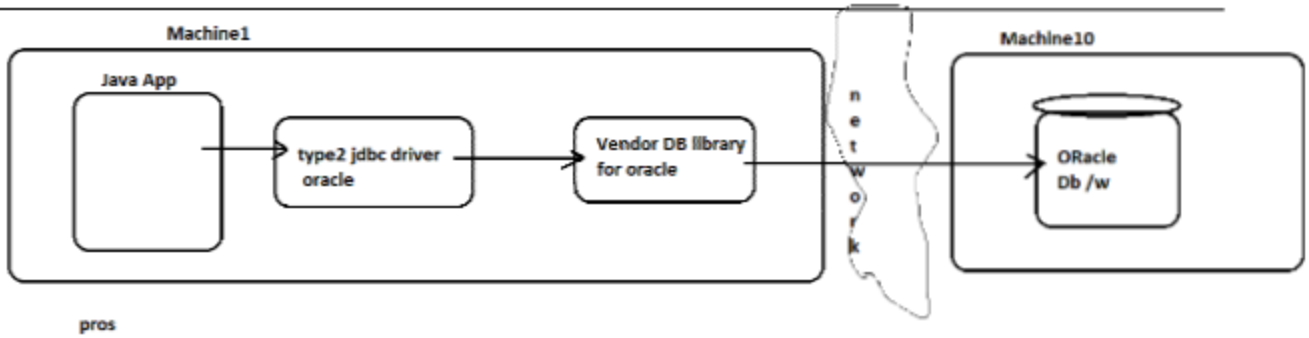
=> Removed from jdk 1.8 onwords.. and no other vendor is providing type1 jdbc driver s/w.. So simply outdated from java 8
=> We need to arrange ODBC drivers and Vendor DB libraries seperately for Each DB s/w.
=> Since mulitple comps are involved in Db s/w interaction.. like ODBC drivers and Vendor DB 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 mechine.. This driver can not be used for untrusted Applet to DB s/w communication

=> We need arrange this driver s/ws from third party vendors...

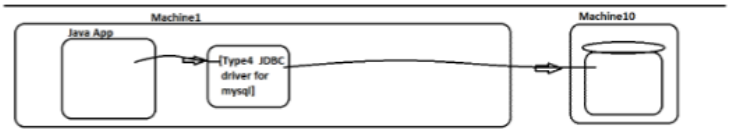
=> For every Db s/w , we need seperate type2 JDBC driver s/w..

eg: type2 jdbc driver for oracle , type2 jdbc driver for mysql ,...

=> It is not industry standard JDBC driver...

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 develloed 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
====

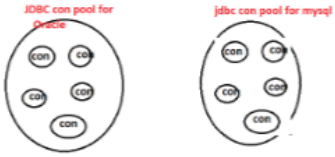
(In Memory variable having Set of same items, gives the reusability of same items, it can be implented as List collection)

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..

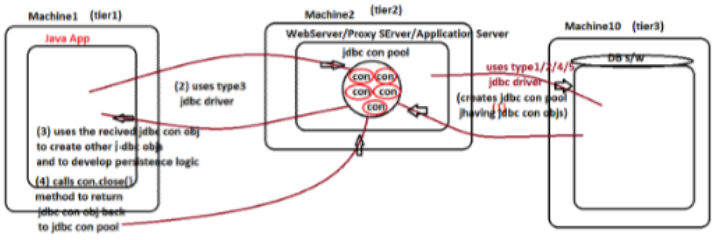
IDS :: Internet DB Access Server..

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 driver 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..

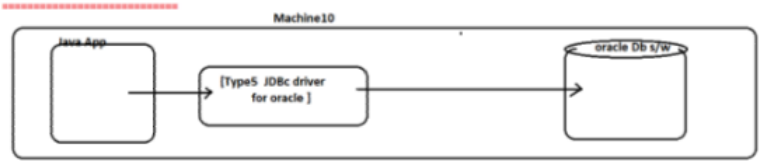
Type5 JDBC driver
==========

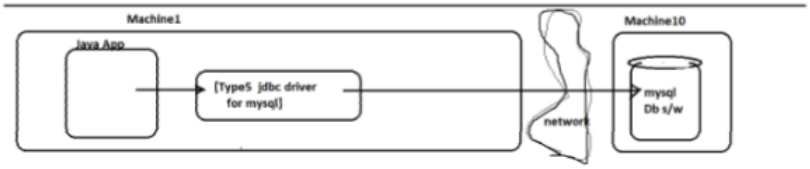
=>It is not official architecture to develop jdbc driver s/w....becoz archicture very much similar to type4 jdbc driver, but some third party vendors are giving it unofficially.

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)

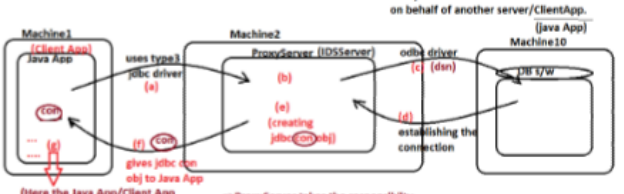
RTC on Project --->build path ---> cfg builpath --->libraries tab ---> add external jars --> ....

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 (download Lite edition)

IDS Server 4.2.2 Lite Evaluation

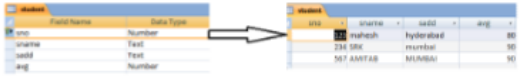
The Lite version does not support Secure Sockets (encryption using SSL). Other features are identical to the full version. This is a trial version with a maximum 16 concurrent thread limit. IDS Server includes IDS JDBC Driver

OS/Platform	Release Date	Download Size	Trial Period
Windows, 2000/2003/XP/2003/7	30-09-2015	9,666,523 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..



windows Btn +shift +s :: winddow snipper tool

step2) create System DSN to Odbc driver for Ms-AccessAcess..
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(...){
        ..
      }
```

note:: resoruce object we are passing try(--) must be autoclosable object..

```
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..

```
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 ){ ... }        =>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 definition having initial values while using the above features..

int age=0;
Calendar cal=null;
Statement st=nul;;

do not use from java 8 onwards...

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

BFR rs(ResultSet)

101 raja hyd 90.55
102 ravi vizag 91.55
103 suresh delhi 87.55

ALR

101 raja hyd 90.55
102 ravi vizag 91.55
103 suresh delhi 87.55

//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

 //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
```

avg ---> number(10,2)

precision: 10
scale :: 2

890.55

total length :: precision (10)
scale :: 2

```
//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

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 s

java.util.Properties (Map collection)

(Only String objs as keys,values of elements)

props (obj of java.util.Properties)

person.id	101	0
person.name	raja	1
person.addrs	hyd	2
keys (String)	values (String)	

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
```

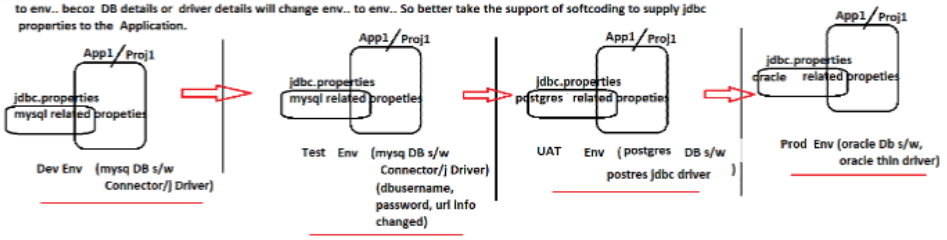
Collecting jdbc properties from PRoeprties file

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.

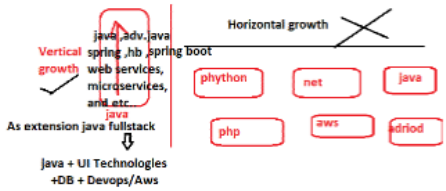


JdbcProj1
|--->src
|--->com.nt.commons
|--->jdbc.properties
|--->com.nt.jdbc
|--> SelectTest3WithPropertiesFileTest.java

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

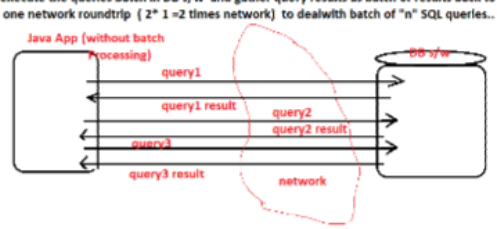
```
//Load the properties file into to java.util.Propertie class object
    InputStream is=new FileInputStream("src/com/nt/commons/jdbc.properties");
    Properties props=new Properties();
    props.load(is);

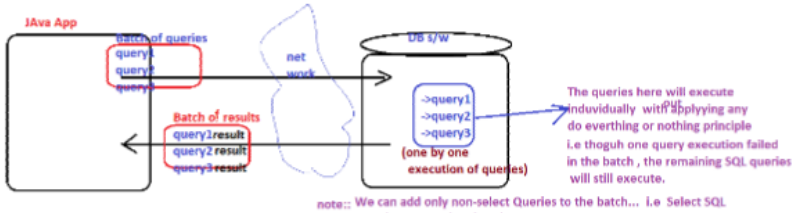
    //register jdbc driver s/w (optonal)
    Class.forName(props.getProperty("jdbc.driver"));
    //establish the connection
    Connection con=DriverManager.getConnection(props.getProperty("jdbc.url"),
                                               props.getProperty("db.user"),
                                               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 abovce problem keep multiple related SQL queries in a batch and send batch to Db s/w.. execute the queries 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");

//execute the batch
```

Like this we can add multiple non-select SQL Queries either dealing with same db table or different db table

- sends batch of SQL queries to DB s/w , executes them in Db s/w

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 quelres 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 TxMgmt 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 ultlization.

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 copled 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	(col names)
101	raja	hyd	
102	ramesh	vizag	col values
103	suresh	delhi	

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

note:: Excel_JDBC30.jar files must be added build path of the project

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

jdbc driver class name:: com.hxtt.sql.text.TextDriver

jdbc url :: jdbc:Text:///<LogicalDB - nothing but location of csv file>

note:: Text_JDBC30.jar files must be added build path of the

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

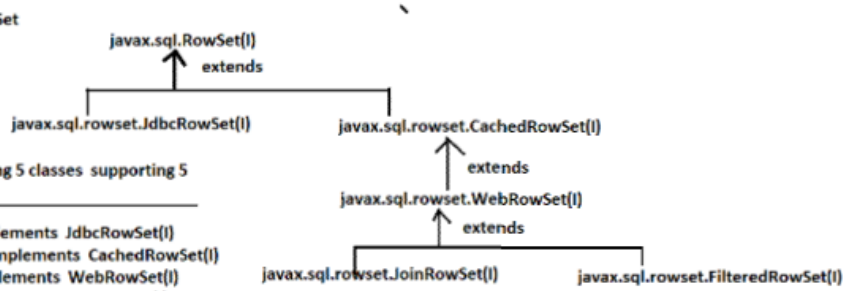
(a) ResultSet objects are connected objects i.e we can not do offline Data manipulation with out having connectivity with Db s/w.
(b) Does not support Bean style Programming (Programming with setter/getter methods)
(c) Does not support event handling
(d) ResultSet objs are not Serializable objects i.e 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 applicaitons) 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 rules 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;
            }
        }
```

refer FilteredRowsetTest.java

```
@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

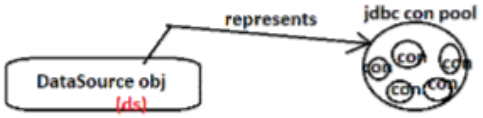
==========

=> 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, HikiariCP (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

========

```
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                    refer PooledConnTest .java
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
```

adv.java course (For java based web application/web site developemt)
==========

1. JDBC + misc (pre-requisite:: Core Java oops) | (11 am slot)
2. Servlet + misc (pre-requisite:: Core Java oops)
3. Jsp +misc (pre-requisite:: servlet) | (4pm slot)
4. Mini Projects (pre-requisite:: servlet,jsp,jdbc)

Option1:: Learn entire course in 11 am slot (100+ sessions) Link: zoom.us/j/93664073459
option2 :: attend both 11 am and 4 pm slots (70+ sessions)

Course fee :: 3500 /-
admin details :: Mr.Rambabu / Mr.Srikanth
9866545966 6302968665

natarazjavaarena@gmal.com
natarazjavaarena -->FB Group
https://www.facebook.com/groups/388095825162910

2 Hiberante f/w (pre-requistes :: 30% Jdbc) (In 3rd week of nov) (60+ sessions)
1 Spring with spring boot f/w (pre-requistes :: Stroing Core oops + anything little in adv.java) (nov 5th :: 6pm) (120 + sessions) (rs: 3500)
3 WebServices & MicroServices (pre-requistes :: servlet +jsp) (In month of december) (50 sessions)

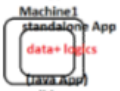
=>Sevlet ,jsp are technologies of JEE module which can be used to develope web applications/websites

Need of web applications/Websites
==========

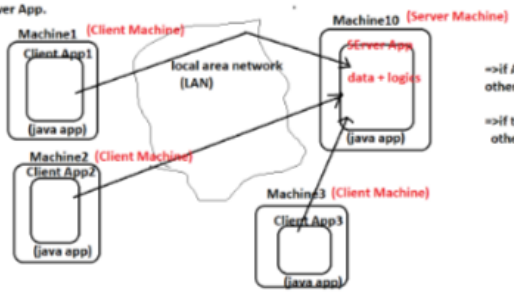
=>state is also called as Data
=>logic is also called as code in java methods

=>The data and logics of stanalone Apps are specific one computer ,where the application is executing.. and only one user can operate the application at time..

eg:: core Java Apps (class with main(-) method)
eg:: calculator Apps
eg:: AntiVirus software



=> In Client - Server Apps, the data ,logics of server App are visible and accessible in multiple client Apps that are taking to server App. Here the data and logics of server App are specific to a LAN (LocalAreaNetwok) using which the client Apps are talking to Server App.



=>if App/machine is ready gives services to others then it is called ServerApp /Machine

=>if the App/machine is taking services from other App /machine is callied ClientApp/Machine machine

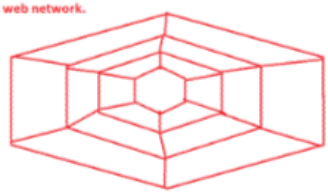
DB s/w :: Server s/w or App
Browser :: client App/ s/w

note:Using netwoking programming of java (java.net pkg) we can develop both Client Apps and Server Apps as java Apps.

=>To provide more global visiblity and accessiblity for the data and logics we need to use bigger network called WAN nothing but internet(network of networks).
=>we can not execute the regular standalone Apps, client-server Apps in the internet setup.. i.e we need to develop specifial Apps called websistes/web applications to execute in the internet setup.

eg:gmail.com, nareshit.com, fb.com and etc...

=>internet network is alos called as web network.. becoz internet network looks like spider's web network.



Internet=WAN=WWW

=> Currently 5 dominet technologies are to develop web applications/websistes

(a) Using PHP (Personal home page for hypertext pre-processing)
=>useful for small scale website.. development
=> useful for websites which need not be for long time
eg:: movie promotional websites , car model promotional websites)

(b) Using asp.net technology (asp --> active serverpages)
=>useful for medium scale web site development
eg:: college websites , university websites

(c) Using Java servlet,Jsp technologies (jsp : java server pages)
=> Useful for medium scale and large scale websites.. where security and complexity is involved
eg:: flipkart.com, amazon .com , icici.com, citibank.com

(d) Using NodeJS,ExpressJs
=>Grabbed PHP, asp.net market of developing small scale, medium scale web Apps Development..

(e) DJango (Extension phyton)
=>Came alternate to everthing.. but failed becoz of security and performence issues..

=>Initially java was used only to develope large scale complex website to take the advantage of java's performence and security..
=>Orginally java is not so strong in User-Interface Development.. i.e we do not readymaded advanced GUI comps to provide rich GUI..
=>With the arrivate jquery/agularJs/reactJs and etc.. UI development is simplified.. very much and these can integrated any env.. of website development like php,java, .net, djamgo, modejs and etc.. So Industry using java with jquery/angularJs/ReatJs /.. to even develop small scale and medium scale apps

Current trending technologies to develop the websites
==========

jsf: java server faces..

a) Java (For all Large scale webistes
Even for 40% small and medium scale web sites)
(2) (1)
(servlet /jsp(technologies) or spring mvc or jsf(old) or struts (outdated)
(techologies) (java frameworks)
+ jquery/angularjs/reactjs/angular
(good)

b) NodeJS +expressJs
=>To develope 60% small and medium scale webSites
+ jquery/angularjs/reactjs/angular
(good)

Java learning is all about
==========

1. java language -->Core Java --> like raw material
2. java technologies -->adv.java --> like semifinished products (jdbc, jndi, servlet,jsp and etc..)
3. Java frameworks --> spring, hiberante, web services -->fully finished products

I heard Facebook.com is developed in PHP. Is it true?

Ans) Yes (But in the background lots of java webservices are used)

what web application?

=>It is collection of web comps having capability to generate the webpages..
note:: any reusable code that is in the form of class or file is called comp
eg:: html file , servlet comp, jsp comp,php comp, asp.net comp and etc..

Two type web pages

a) static web pages /passive webpages
->The content of web page will remain same for all requests...
eg:: About Us page , ContactUs page , terms and condition page and etc..

b) Dynamic web pages /Active webpages
=>The content of web page will change based on the time of request generation or based in the input values of the request..

eg:: gmail In box page , Live game score page , wheather report page and etc..

note:: WebApplication or website contains both static and dynamic web pages..

3 types of web comps

=>A web application can have 3 types of web comps

a)static web comps

=>these are given to develop static web pages
eg:: html files

b) dyanic web comps

->These are given to develop dynamic webpages

eg: Servlet comp (class developed by using servlet technology)
jsp comp (file created using jsp technology/tags)
asp.net comp
php comp
and etc.

servlet,jsp, asp.net,php and etc..
web technologies
their programs or code or
files are called web comps

c) Helper web comps

=>These web comps do not generate any web pages directly , but they help other comps in the generration of webpages

servlets (x) -->wrong
servlet (valid)
oop (valid)
oops (invalid)

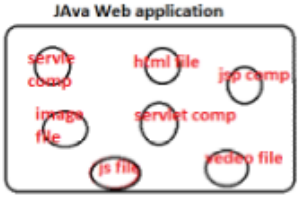
eg:: image files, audio files, video files, js files , css files , flex files and etc..
(.swf files)

In All env.. of web application development, we use the same helper web comps and static web comps but the dynamic webcomps will change env... to env.. i.e (java to .net to php to phyton and etc..)

=>In java web application dynamic web comps are servlet,jsp comps
=>In php web application dynamic web comps are php comps
=>In asp.net web application dynamic web comps are asp.net comps
=>In nodeJS/ExpressJS web application dynamic web comps are js files
=>In phyton /Django web applicatiin , the dyamic webcomps are .py files (django)

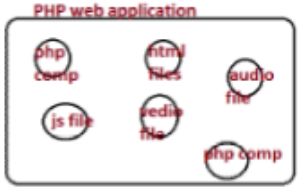
[In modern days we can use js files as hepler web comps(form validations) and also as dynamic web comps(In nodeJs env..)

JAva Web application

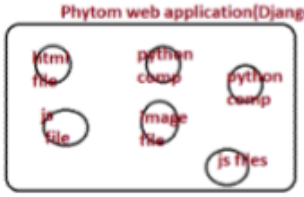


.net web application

PHP web application



Phytom web application(Django)



static and hepler comps are same in all env.. (technologies) based web application development.. but the dynamic web comps will change env.. to env.. or technology to technology as shown above..

=>since the standalone App is specific to one computer and will be operated by one user at a time we prefer manual execution of standalone App..

=> Since web applications or webiites get requests from multiple clients/browsers/users simultaenously from different locations and having different timings or same timings (24/7), it we better to executes Web application in a automated env.. like by keeping them web server s/w (like tomcat, IIS, weblogic and etc)... becoz manually execution of web application and its web comps practically impossible.

Standalone App ---> specific to 1 computer + allows 1 user at time
(Manuall execution app is sufficient)

Web application/website ---> requested by multiple clients/users
at a time from diff locations that to 24/7
[Here the manual execution of web comps when ever they
are requested not going to work out,So automation through
as special s/w called webServer s/w]

eg: Tomcat (java), IIS (.net), AWS(php), nodejs(js) and etc..

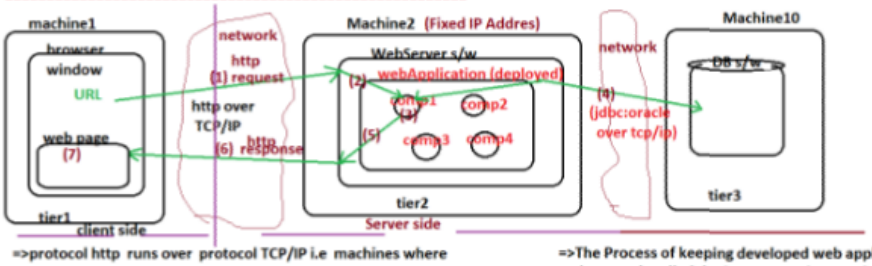
IIS ---> Internet Information server /service
AWS --> Apache WebSErver

What is WebServer?

=>WebServer is a piece of software that automates web application and its web comps execution.. i.e it listens to clients requests continuosly, takes them , passes them to appropriate web comps , executes them dynamically ,gathers the results from them and sends the results as responses to browser..

note:: We need not to develop webServer s/ws .. we have lots readily available webserver s/ws.
But developing web application having web comps and keeping that web application in webServer is our resposibility.

Understanding Web application setup that is required for execution



=>protocol http runs over protocol TCP/IP i.e machines where browser and webSErver reside will interact with each other using protocol TC/IP where as browser and webServer will use protocol http for inteaction so it is http over TCP/IP

http:: hyper text transfer protocol
https :: http over SSL (Secured socket Layer)

=> we can develop web application either as two-tier App (with out Db s/w) or as 3 -tier Application (with Db s/w)
=>In One WEbServer we can deploy multiple web applications...

W. r. to diagram

(1) Enduser types URL in the browser address and generates the request
(2) WebServer s/w that listens to requests continuosly takes the requests maps to appropriate web comp of apprpriate deployed web application
(3) WEb comp process the request
(4) If neccessary , the web comp interacts with Db s/w
(5) The output/results generated by the web comp goes to webSErver
(6) webServer sends that output/results to browser as response
(7) Browser recieves the response and displays to web page..

=>The Process of keeping developed web application in web server is called deployment and revese is called undeployment

=>Protocol is bunch of rules of followed by two parties who wants to participate in communication

Two types of protocols

(a) Network protocol
--> Gives rules to get interaction b/w Phyiscal computer

eg:: TCP/IP

(b) application protocol
->Gives rules to get interaction b/w two softwares or sftware application
eg:: jdbc:oracle , http, https , smtp and etc..

note:: Applicailton protocols run over network protocols

List of browser softwares /user-agents /web clients

Internet explorer ---> from MS (2)
Chrome ---> from Google (1)
FireFox ---> from Mozilla (3)
Opera ----> from Opera soft
Safari ---> from Apple (4)
Edge ---> from MicroSoft
hotJava ---> from RedHat
and etc...

Browser provides platform to enduser/visitor to send requests and to recieve response..

=>After requesting web comp, if it's code is coming to browser from web Server for execution then is called client side web comp.
eg: html file(html interpter is avaliable in the browser)
js code (js engine is avaliable in the browser

=> After requesting web comp, if it's code is executing in web server itslef then it is called Server Side web comp..

eg:: Servlet Comp ,jsp comp, php comp, asp.net comp and etc..

note:: Do not decide wheather web comp is client side or server side based on the place where it resides.. decide it based on the place where its code executes...

List of client side web technologies

=>given to client side web comps..

html ---> from w3c
css ---> from w3c
java script ---> from sun Ms+NetScape
vb script (old)-->from Ms
jquery ---> from Jhon Resig
angular/angularJS ---> from Google
ajax ---> from Google
reactJs ---> from FB

and etc..

Scripting language?

The language whose can not be executed directly or independently and must be embedded with other technology/language code is called Scripting language..

=>JS (java script) can not executed directly.. it must be embeded with html tags/code for execution.. So it is called scripting language

note:: Ajax, jquery, angular, angularjs, bootstrap, typescript, reactjs and etc .. java script extensions.

=>JS is basically client side language/technology becoz its code executs in browser by taking the support java engine..

Servlet videos
=>https://www.youtube.com/watch?v=2oTIHv-GwII&list=PLVIQHNRLfIP88b4uv8X_EtHAPHpjkw1qc

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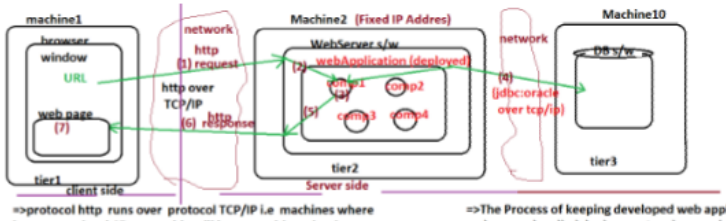

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List of server side web technologies

servlet -----> from sun Ms/Oracle corp (java)
jsp ----> from sun Ms/Oracle corp (java)
asp(old) ---> from Ms (micro soft) | .net platform
asp.net ----> from Ms
Php -----> from Apache | (php based)
SSJS -----> from netscape (ssjs -server side java script) | (js based)
nodeJs,ExpressJS ---> from ryan dahl (google)
cold fusion ---> from adobe

and etc..

=>in the market we have frameworks to develop server side web comps and web application very easily by interally using technologies

struts(old) ---> from apache (java)
spring MVC ---> from interface21 /Pivotal team
Spring boot MVC ---> from interface21 /Pivotal team | (java based)
Webwork ---> from openSymphony
ADF ---> from oracle corp

MVC :: Model View Controller

ADF --> Application developement framework

asp.net mvc---> from micro soft (.net platform)

dhrupal ---> from apache (php platform)

DJango ---> PSF (from python platform)
|--->python software foundation

note:: Use java technologies like Servlet,jsp to develop java based small scale web applications
eg:: univesity websites, collge websites
note:: Use java frameworks like spring mvc to develop java based large scale /complex web applications
eg: e-commerice website, banking websites and etc..

List of webServer s/ws

List of webServer s/ws
==========

=> To provide automated env.. to execute web application and its server side web comps

tomcat ----> from apache (java) (good for java env..)
jws ---------> from sun Ms (jws: java webServer) (java)
pws ----------> from Ms (ms platform)
(personal webSErver)
IIS -----> from Ms (.net platform) (good for .net env..)
(InternetInformationSErvice)
AWS ---> from apache (php platform) (good form php env..)
(apache web server)
NodeJs --> from chrome (provides JS run time env..) (Server Side Js platform) good (for for js env..)
NFTS --> from netscappe (for server side js)
(Netscape fast track sevrer)
DJango server --> PSF (python platform) (good for python)

Resin Server --> from Resin soft (java platform)
jetty ----------> from eclipse (java platform)
and etc...

note:: Use java webServer like Tomcat to automate the execution of java based small scale web applications
eg:: univesity websites, collge websites

note:: Use java Application Server like wildfly to automate the execution of java based large scale /complex web applications
eg: e-commerice website, banking websites and etc..

AppServer = webServer ++ (extension webServer)

weblogic --> from Oracle corp (3)
websphere --> from IBM
GlassFish ----> from Sun Ms /Oracle corp (2)
WildFly ----> from RedHat (Jbosss) (1)
Jrun -------> from adobe
Oracle10gAs --> from oracle corp
and etc..

java based

List of DB s/ws
==========

oracle --> from oracle crop
mysql ---> from DevX/ oracle corp
postgresql --> from enterprise DB
DB/2 ---> from IBM
mariaDB --> from maria and etc..

RDBMS-SQL
(for structured Data)

MongoDB — MongoDB Inc
and etc..

NoSQL DB
(for unstructture Data)

To develop and execute website
==========

(a) Choose any browser s/w
(b) choose any DB s/w
(c) choose one or more client web techologies to develop client side web comps
(d) Choose any webServer /App server to automate the execution
(e) Choose one or more Server Webtehcnologies to develope server side web comps

These are common for all domains/envs.. of
like java , .net, php, JS ,

[We choose webSErv
Server side webtech
having compitability]

JAva Full stack Developer (3 + /4+/.. experience)
==========

=> Java language (corejava) , java technologies (Adv.java) , Java frameworks (Spring , hibernate, webServices/micro services) , desgign patterns , tools and etc..
+
=> DB s/w (SQL, PL/SQL -->oracle)
+
=>UI Technologies (html,css,java script, BootStrap, jquery/angular/Angular Js/ReactJs and etc..)
+
=>DevOps and Aws (cloud)

Mean Stack developers

Java Fresher (Java developer)
==========
core java +adv java + oracle + spring +CRT (with boot)

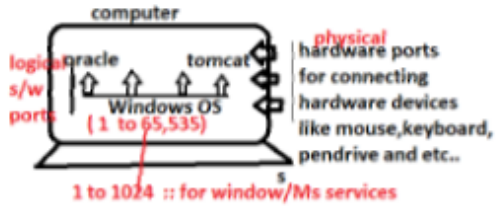
Java 1+ Experience d
==========
JAva Fresher topics + hibernate + design +tools (no CRT)

java 2+ experienced
==========
java 1+ experienced topics + WebSErveices/Microservices

java 3+/4+/5+....
==========
full stack devleoper refer above..

Adv.java course
|---> jdbc , servlet, jsp , mini Projects
11am 4pm slot

Tomcat
=======
type :: Java based webServer (upto version 6)
java based Application server (from version 7)
latest version:: tomcat 9.x (compitable with java8+/jdk 1.8+)
10 (compitable with jdk1.9+)
vendor :: Apache
default port no :: 8080 (changable)
Gives two built-in Containers : ServletContainer,jsp container
ServletContainer name :: CATALINA
Jsp container name :: JASPER
To download s/w :: https://tomcat.apache.org/download-10.cgi
(dowload as WindowsService Installer)



1 to 1024 :: for window/Ms services
1025 to 65,535 :: for externally installed s/ws..

During the installation of Tomcat server we need provide

a) http port number :: 8080 (default) ->change to 2020
b) The Installation folder path of jdk/jre
c) admin username and password :: admin (default username)
admin (defaul password)
d) Tomat Installation folder :: E:/Tomcat10.x
(<Tomcat_home>) (prefer other than C:\)

s/w -->	default port
oracle	1521
mysql	3306
tomcat	8080
postgreSQL	5432
and etc..	

OS manages software ports and every software port is identified with its port numbers..

Socket number :: <ip address of computer> + <software port no>

Machine1---> oracle Db s/w
oracle port number:: 1521
oracle socket number :: machine1+1521 (hostname +port no)
180:56:77:44+1521 (ip address+ port no)

note:: One externally installed will give multiple s/w services running on multiple software ports..
eg: Oracle Db s/w installation gives multiple s/w services
=>DB service :: 1521 (port no)
=>sqlplus :: 1234
=> web based sqlplus :: 8080
and etc..

To start tomcat server
==========
Go <Tomcat_home>\bin folder and use tomcat10.exe file

To see tomcat home page in browser
==========
open browser window type this url
http://localhost:2020 (or)
localhost:2020

[Giving request using protocol "http" from browser to tomcat server that is running 2020 port number of current computer (localhost)]

To stop tomcat server

Go to console window press ctrl+c or close button

C:\WINDOWS\system32>netstat -a (open cmd prompt as administrator)
→ To list out all port numbers of running services

To refer a computer being from that computer we can use "localhost" or 127.0.0.1

=>Change Tomcat server startup type manual after installing tomcat
=> open services.msc (window search box) ---> goto apache tomcat --->
right click --->properties ---> startup type :: manual ---> ....

Q) Tell me whether Tomcat is WebServer or WebContainer ?
Ans) WebServer upto version 6
Application server from version 7
=>It is webServer/Application server having two containers :: 1 Servlet container 2.jsp container

To view and change http port number of Tomcat server after installation

=>Go to <Tomcat_home>\conf\server.xml file and modify "port" attribute of first <Connector port="....."> tag --> restart tomcat server
|-->2020 to 3030

=> Display hom page
url in the browser address bar :: http://localhost:3030

To view and change admin username,password after Tomcat SErver Installation

==>Go to <Tomcat_home>\conf\tomcat-users.xml file and modify username,password attribute vaues of <user> tag --> restart tomcat server...

<user username="admin1" password="admin1" roles="admin-gui,manager-gui" />
change here changer

=> Display hom page
url in the browser address bar :: http://localhost:3030

Manager App => sumbit username ::admin1
password :: admin1
submit

--> Gives access to tomcat manager webpage/screen where we delploy, start, stop,reload and undeploy web applications..

Tomcat server Installation directory structure

```
G:\Tomcat 10.x
   |---bin
      |--->*.exe  (tomcat10.exe)
   |--->webapps
      |--->root,exampels, docs, manager and etc.. directories
      |---> *.war files
   |---conf
      |--->*.xml  (server.xml , tomcat-users.xml, context.xml and etc...)
   |--lib
      |---> *.jar (servlet-api.jar, jsp-api.jar,catalinar.jar ,jasper.jar and etc..)
   |--work
      |--->CATALINA
   |--logs
      |--->*.txt  (everyday one log file will be generated)
   |--temp
   |
   |--->other files
```

=>After web applications having web comps , we deploy them in tomcat web server by copy them to <Tomcat_home>\webapps folder either in the form of directories or in the form war file

war --->web application archieve (a kind of jar file)

=> we can deploy web applications to web SErvers either as directories or as war files..

The <Tomcat_home>\lib folder gives multiple jar files
catalinar.jar -->represents servlet container
jasper.jar -->represents jsp container
servlet-api.jar -->represents servlet technology api
jsp -api.jar -->represents jsp technology api

java module names
JSE (java standard edition) -->jdk s/w
JEE (java/jakarta enterprise edition)
JME (Java Micro Edition)
and etc...

=>In the development of core Java Apps , we use jdk apis like java.lang, java,util and etc... packages
=> In the development servlet comps (web comps) we use the support of servlet api

servlet api old package names
javax.servlet, javax.servlet.http,javax.servlet.annotation and etc..

servlet api new package names
jakarta.servlet, jakarta.servlet.http,jakarta.servlet.annotation and etc..

all these are available in servlet-api.jar

JEE --> java enterprise edition(old)
JEE --> jakarta enterise edition

jsp api old package names are
javax.servlet.jsp , javax.servlet.jsp.el , javax.servlet.jsp.tagext

jsp api new package names are
jakarta.servlet.jsp , jakarta.servlet.jsp.el , jakarta.servlet.jsp.tagext

all these are avalable in jsp-api.jar

note:: Every Servlet comp (web comp) is a java class that is developed by using servlet api , So before compiling that java class we must add <Tomcat_home>\lib\servlet-api.jar file to CLASSPATH.

note:: If our java code any api that is not part jdk apis (core java apis) then that api related jar file or directories should be added CLASSPATH env..

note:: Servlet api,jsp api and other JEE Technologies , framworks api are part not of jdk apis.. they are seperate apis .. If u want to use them as part u r java code /app development then add relavant jar files to CLASSPATH

jar file :: java level zip file

jar ->java archieve file

Diff types of Container based on the technology in which they are developed

a) ServletContainer --> Developed based on ServletTechnlology
b) Jsp container --> Developed based on ServletTechnlology + Jsp Technology
c) EJB Container (old) --> Developed based on EJB Technlology
d) IOC /SpringCotnainer --> Developed in spring framework
and etc..

Diff types of containers based on the location of container with respect to server

a) Standalone Container
-> Here Servlet and container together comes as single s/w program
eg:: ServletRunner (very old)

Container cum Server

b) In Process Container
-> Here Container resides inside the server as seperate unit which can be added/deleted based on the need..
eg:: Servlet container(catalina.jar) of Tomcat server
Jsp container (jasper.jar) fo Tomcat server

Server
container

c) Out of Process Container
=>Here container resides outside the server as seperate unit but linked with the SErver..
eg: ServletContainer linked with IIS (.net server)
Jspcontainer linked with IIS (.net server)

Container SErver

for FB group to get class notes
https://www.facebook.com/groups/388095825162910

for vedios
https://www.youtube.com/watch?v=2oTIHr-GwII&list=PLVIQHNRLfIP88b4uv8X_EtHAPHpjkw1qc

email Id::
natarajavaarena@gmail.com

Procedure to develope, deploy and test First Web application having static webpages (html files)

==========

step1) keep the following the s/w setup ready

a) editplus 2/3

b) Tomcat server 9/10

step2) create Deployment Directory structure representing the web application..

```
G:\FirstApp (web root folder)
    |------------>WEB-INF
    |-->home.html  |-------->classes
    |-->about_us.html
    |-->contant_us.html
    |-->nit.jpg
    |-->home.jpg
```

=>WEB-INF is the fixed named folder that acts as partiation in the web application to seperate static,helper and dynamic web comps.

=> we generally place java classes based web comps like servlet comps inside WEB-INF folder like WEB-INF/classes folder (fixed names locations) and we place static , helper web comps like html files,images files, audio files, video files, js files and etc.. outside the WEB-INF folder.

note:: The deployment directory struture /staging directory structure is given Sun Ms as part of servlet specification and all servers requested to recognize it ..So we can say the deployment directory is common for all based servers.

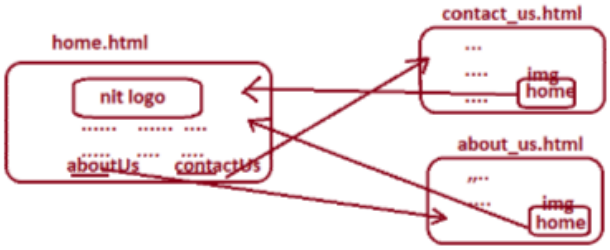
note:: web root folder name and location is not fixed.. we can take any thing but that folder name later becomes web application name in our case it is "FirstApp" but WEB-INF, classes,lib and etc are standard folder names i.e we can not change their names and locations..

We use WEB-INF/classes folder for placing java classes (both soruce code and compiled code) like servlet classes , helper classes and etc..

we use WEB-INF/lib folder for placing jar files

note:: In the current web application taking WEB-INF, classes folder is optional becoz we do not have any java classes as web comps or helper classes...

note:: Since Web Server and WEbCotntainer takes the resposibility managing and executing web application ,So we must create deploymennt directory as expected by WebServer and webcontainer..



<h1> to <h6> :: To present content as headings

<p>/<pre> :: To present content as paragraph

 :: to get new line

<a> :: for hyperlink

<img> :: to display image

<a> with <img> :: for grahical hyperlink

<a> with text :: for texual hyplink

  ---> gives single space (entity in html)

for html learning

https://www.w3schools.com/

step3) develop web comps (html files) by arranging helper web comps (images)

=> refer git url :: https://github.com/natarazworld/NTAJ414

ctrl+B :: to see preview in edit plus browser...

step1 to step3 :: complets the development of the web application

step4) start the Tomcat server...

use <Tomcat_home>\bin folder's tomcat10.exe file..

step5) Deploy the web application...

copy G:\FirstApp folder to <Tomcat_home>\webapps folder (E:\Tomcat 10.x)

step6) Test the web application...

open browser and type this url in address bar

http://localhost:3030/FirstApp/home.html

protocol | the host name and port number of Tomcat server | web app name/ context path/ context root | web comp name

note::: The web root folder name of deployment directory structure becomes the name of the web application/context path/context root.

----------home.html----------

```
<body  bgcolor="cyan">
  <h1  style="text-align:center;color:red"> Welcome to  Naresh It </h1>
    <img  src="nit.jpg"  width="600" height="300">
<h1>NNV Naresh, Founder and Managing Director. </h1>
<pre><b>A  recipient of "International Achievers Award for Education Excellence", </b>
NNV Naresh is an entrepreneur armed with a noble vision to make a difference in the career aspirations
of the students. 20+ years of experience in the education sector, Naresh is the founder and the driving
force behind the victorious journey of NareshIT.
<h4>Mission Statement </h4>
To create and provide innovative, quality educational environments and opportunities via affordability
fostering the society to grow, thrive, and prosper.  </pre>

  <a href="contact_us.html">contactUs</a>            <a
href="about_us.html">aboutUs</a>

</body>
```

----------contact_us.html ----------

```
<body bgcolor="grey">
    <h1 style="color:green;text-align:center"> Contact Us  page </h1>
  <pre>
<b>India – Hyderabad Office </b>
2nd Floor, Durga Bhavani Plaza, Ameerpet, HyderabadTel: +91 40 2374 6666 (IN – Hyderabad)
Tel: +91 40 2373 4842 (IN – Hyderabad)
+91 9000994007
+91 9000994008
for Projects : +91 9000994005
Email: info@nareshit.com

<b>India – Chennai Office</b>

2nd Floor Plot No.172 & 173, Above Axis Bank, Behind PTC Bus Stop, OMR, Thoraipakkam, Tamil Nadu, Chennai – 600097.
Mobile/Whats App:  +91 9566042345
Email: chennai@nareshit.com

<b>USA Office </b>
5007 Arbor View Pkwy NW Acworth, GA, 30101
Ph: +1 404-232-9879, +1 248-522-6925
Email: sriram@nareshit.com

<b>For Online Training </b>
Mobile/Whats App:
+91 81 79 19 1999
+91 92 93 22 6789
Email: online@nareshit.com
  </pre>

<br>  <a href="home.html"><img src="home.jpg" width="50" height="30"></a>

</body>
```

about_us.html
==========

```
<body bgcolor="pink">
  <h1 style="color:blue;text-align:center"> About Us Page </h1>

  <pre>
   Naresh i Technologies (Pronounced: NareshIT) is a leading software training institute providing Software Training, Project Guidance, IT Consulting and Technology Workshops.

Using our enhanced global software training delivery methodology, innovative software training approach and industry expertise, we provide high-value corporate training services that enable our clients to enhance business performance, accelerate time-to-market, increase productivity and improve customer service.

We serve Global 100 companies and the leading software vendors in Banking & Financial Services, Insurance, Telecommunications, Technology and Media, Information & Education industries.  We design and mentor human resources for our clients who create competitive advantage.

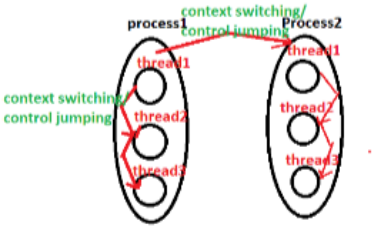
Founded in 2004 and headquartered in Hyderabad, India, we have offices and training institutes throughout the India.

Headquarters – Durga Bhavani Plaza, Ameerpet, Hyderabad.
Offices – Hyderabad, Chennai.
Training Institutes – Hyderabad, Chennai.

  </pre>
```

What is the difference between process and thread?

Ans) A thread is light weight process or sub process.



when we run a java app
1 process will be created having
two default sub processes
or threads (main thread,
gc thread)

note: both Process and thread
are managed by Operating
System.

=>context switching /control jumping between two threads of a process always takes less time where compare to context switching/control jumping between two processes.

Servlet web technologies (given to develop serveside web comps)

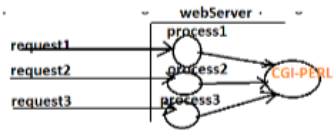
1.process based

CGI (Common Gateway Interface)

2.Thread based

servlet
jsp
asp.net
php
and etc..

=>In process web techologies for every request given to web comp one seperate process will be will be created

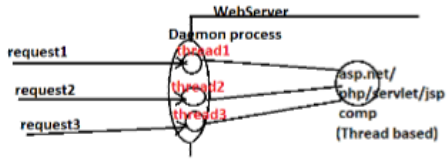


CGI Programs can be written
in diff languages like VB, C++,
PERL (best)
VB: Visual Basic
PERL :: pratical extraction reporting
language

note:: Since the context switching b/w processes take more time the performence of web application becomes very poor when no.of requests are increased.. This indicates process based web comps like CGI web comps do not allow to develope scalable web applications..

note:: if the web application is giving good performence for less no.of requests,but giving bad performence for more no.of requests then it is called non-scalable web application.. CGI web applications are non-scalable.. (out dated)

=>if u give request to thread based web based web comp like sevlet /jsp/aps.net/php comp..
one thread will be created for every request..



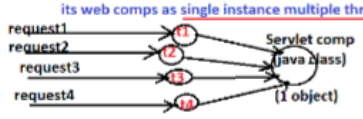
note:: Since the context switching b/w two threads of process takes less time the thread based web comps gives good performence irrespective of no.of requests increased or decreased.. This allows to develop scalable web applications..

What is Servlet? Definitation of Servlet?

Ans1) Servlet is a java based web technology that allows us to develop dynamic web comps having ability to generate dynamic web pages..

Ans2) Servlet is JEE module Server side web technology that can be used to enhance the functionalities of web Server/Http Server .

Ans3) Servlet is a java based Server side web technology that allows to develope its web comps as single instance multiple threads based web comps.



=>Servlet comp is java class
that is developed using servlet api
=>SErvletContainer manages servlet comp
life cycle i.e creating , managing and destorying
of sevlet class obj will be taken care by servlet
container...

note:: if we give 10 requests to a servlet comp..then the SErveletContainer creates only 1 object for servlet comp class and starts 10 threads on that object representing 10 requests. This make Servlet comp as "single instance -multiple threads" comp.

Ans4) Servlet is a JEE module server side web technlology that looks like rules and guidelines for vendor companies to develop ServletCotnainers and same thing looks like api for programmers to develop server side web comps in java web application.

for videos
==========
https://www.youtube.com/watch?v=2oTlHv-GwIl&list=PLVIQHNRLflP88b4uv8X_EtHAPHpjkw1qc

for classnotes
==========
https://www.facebook.com/groups/388095825162910/files

understanding servlet api
==========

it is having 4 packages

old days :: javax.servlet, javax.servlet.http,
javax.servlet.annotation , javax.servlet.descriptor

from tomcat10 :: jakarta.servlet, jakarta.servlet.http,
jakarta.servlet.annotation , jakarta.servlet.descriptor

3 important resources of servlet api
==========

javax.servlet.Servlet(I) (or)
jakarta.servlet.Servlet(I)

void init(ServletConfig) throws ServletException
void destroy()
void service(SeveletRequest req,ServletResponse res)throws SE,IOE
void getServletConfig()
String getServletInfo()

implements

javax.servlet.GenericServlet(AC) (or)
jakarta.servlet.GenricServlet(AC)

-> implments 4 methods of Servlet(I) and
keeps the left over method service(req,res) as abstract method
->contains its own methods also

extends

javax.servlet.http.HttpServlet(AC) (or)
jakarta.servlet.http.HttpServlet(AC)

public void service(ServletReuest req
ServletResponse res)throwsSE,IOE
protected void service(HttpServletRequest req,
HttpServletResponse res)throws SE,IOE
protected void doXxx(HttpServletRequest req,
HttpServletResponse res)throws SE,IOE
doGet(-,-)/doPost(-,-)/doPut(-,-)/doDelete(-,-)/
doOptions(-,-)/doHead(-,-)/doTrace(-,-)
->other methods
....

=>class extends from a class
=>class implements interface(s)
=>interface extends from interface(s)

SE-->ServletException
IOE-->IOException

=>javax.servlet.Servlet(I) or jakarta.servlet.Serlvet(I) is having 5 methods declaration.
=> javax.servlet.GenericServlet(AC) is implementing the above Servlet(I) providing implementation for 4 methods out of 5 methods. does not implement service(req,res) method ,So it is maintaed abstract methods by giving GenericServlet itself as abstract class. This class also having its own direct methods..

=>javax.servlet.http.HttpServlet(AC) (or) jakarta.servlet.http.HttpServlet(AC) is an abstract class containing no abstract methods.. It is having 2 service(-,-) methods (One inherited from GenericServlet and another one is direct method) .It is also having 7 doXxx(-,-) methods..lots of other methods..

=>In java programming we can take abstract class only having abstract methods or only having concrete method or mix of both

---

=> In SErvlet comp development , there will be no main(-) method becoz Servlet comp is not a stanalone App to begin the execution with main(-) method.. It is a web comp whose life cycle is managed by SErvletContainer birth to death(object creation to obj destruction). This Servletcontainer calls service(-,-) method on Servlet comp for request ,So we place request processing logic in service(-,-) method servlet comp.

=>SErvlet comp is a java class that is developed by using servlet api .Since this class is reusable class .. we can call it servlet comp/servlet comp class.

=>Only in standalone Apps development , we can see main(-) method becoz jvm directly executes the App

=>In webApps,webServices development ,there is no need of main(-) method. becoz here comps are executed by Containers.. not the jvm directly

3 Approaches of development SErvlet comp
==========

Approach1
==========

Take a java class implementing javax.servlet.Servlet(I) / jakarta.servlet.Servlet(I) and provide implementation for all the 5 methods .. having request processing logic in service(-,-) method.

```
//sample class
  public class TestServlet implements javax.servlet.SErvlet/jakarta.servlet.Servlet{

    ........
    .....  // all the 5 methods implementation including service(-,-)
    ......
     public void service(ServletRequest req,ServletReponse res)throws SE,IOE{
       ....
       ....   //req procesing logic
     }
  }
```

Limitations of Approach1
==========

a) generally we need to place only service(-,-) having request processing logic.. but in this approach programmer forced to implment all 5 methods..through remaining 4 methods are unneccessary.

b) We can not work with protocol http features like "auto refresh" and etc..

c) It is not industry standard..

note:: Servlet comp is a java class that implements javax.servlet.Servlet(I) /jakarta.servlet.Servlet(I) directly or indirectly.

note:: ServletContainer takes only those java classes as servlet comp classes who are implementing javax.servlet.Servlet(I)/jakarta.servlet.Servlet(I) directly or indirectly..

Approach2
==========

Take a java class extending from javax.servlet.GenericServlet(AC) / jakarta.servlet.GenericServlet(AC) and provide implemtation only for service(-,-) method having request processing logic..

```
//sampe code

public class TestServlet extends GenericServlet{

  public void service(ServletRequest req, SErvletResponse res)throws SE,IOE{
     .... //request processing logic
     ....
  }
}
```

while iheritering from abstract class we can override concre methods (but not mandatory) and we must implement abstract methods..

Advantages
==========

=> We need to implement only required service(-,-) method.. Le no need of implementing unneccesary methods

limitations
==========

=> we can not work with protocol "http" features..
=> It is not indurstry standard approach..

Approach3
==========
(Best)

Take a java class extending from javax.servlet.http.HttpServlet(Ac)/ jakarta.servlet.http.HttpServlet(AC) and override one of two service(-,-) methods or one of 7 doXxx(-,-) method having request processing logic..

```
//sample code

public class TestServlet extends HttpServlet{

  protected void service(HttpServletRequest req, HttpServletResponse res) throws SE,IOE{
     .... //request processing logic
     ...
```

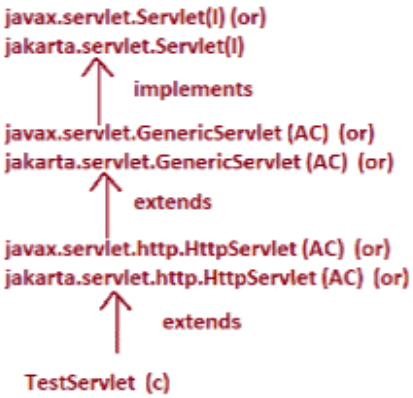
```
    protected void   service(HttpServletRequest req, HttpServletResponse res) throws SE,IOE{
        .... //request processing logic
        ...
    }
  }
```

advantages
==========

=>We can override our choice service(-,-) or doXxx(-,-) methods having request procesing logic
=>Allows to work with protocol "http" features
=> It is indurstry standard approach to develop servlet comp class.

GenericServlet (AC) :: does not allow to use protocol "http" features..

HttpServlet (AC) :: allows to work protocol "http" features..



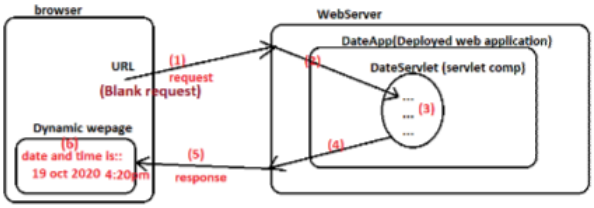
note:: we must take our servlet comp class as public class to make it visible outside its package , So servlet container can load the class and can manage the life cycle..

for videos
==========
https://www.youtube.com/watch?v=2oTlHv-GwII&list=PLVlQHNRLflP88b4uv8X_EtHAPHpjkw1qc

for class notes::

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

Procedure to develop java web application havaing Servletcomp as the dynamic web comp



step1) make sure that the following s/w setup is ready

Tomcat 9.x/10.x
jdk 1.8 /1.9
editplus 2+ /notepad++

step2) create Deployment directory /staging directory structure for web application..

=>request coming to public area web comps like html files does not any Server/container permission to execute the web comps where as the request coming to private area web comp like servlet comps will execute web comps only with permission of Server/contalner and we need to get permission through web.xml file..entries

=>Java calsses and java classes web comps are asked to place in private area (WEB-INF and its sub folder) to provide protection for soruce code(.java) and byte code(.class).

=> we place html files (static web comps) in public area (outside of WEB-INF folder and in the Webroot folder) becoz the html files code goes to browser for execution , So there is not possibility of protected source code of the html files.. where as the servlet comps code executes in the server and does not go to browser in any angel.. So the source protection is possible for servlet comps by keeping them private area.

=>web.xml , WEB-INF,classes folder,file names and locations are fixed .
=> webroot folder name and location is developer choice.. but later it becomes the name of web application...

note:: The WebContainer generally looks for java classes and servlet comps in private area like WEB-INF/classes folder and it looks for static web comps (like html files) and helper comps (like images, audio files ,video files and etc...) in public area of the web application...

step3) Develop the Servlet comp in WEB-INF/classes folder

```
//DateServlet.java
==============
package com.nt.servlet;
import javax.servlet.*; import java.io.*; import.java.util.*;
        jakarta
public class DateServlet extends GenericServlet{

  public void service(ServletRequest req,ServletResponse res)throws SE,IOE{
      //set response content type
        res.setContentType("text/html");
    //get PrintWriter stream obj from res obj
     PrintWriter pw=res.getWriter();

   //write b.logic /request procesisng logic
    Date d=new Date();

    //write output message to res obj using PrintWriter obj
    pw.println("<b> date and time::"+d.toString()+"</b>");

    //close stream
    pw.close();

  } //serivce(-,-)

}//class
```

=>We use PrintWriter or other streams in service(-,-) method to write generated output messages to response obj.. In this process there is a possibility of getting IOException.
=> if WEbContainer is having any problem towards calling and executing service(-,-) method then it throws SErvletException...

=>pw.close(); closes the PrintWriter stream that is pointing to "res" object, indirectly the output going to "res" from service(-,-) of servlet comp is finalized and committed.. i.e we can not further output messages to res object from service(-,-) method.

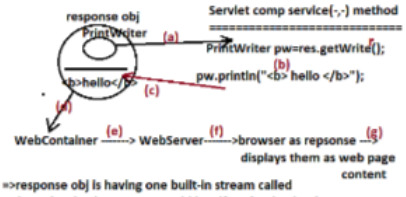
=>For every request ServletContainer creates 1 set of req,res objs and also calls service(-,-) method on servlet comp having that req ,res objs as the arguments..
=>Programmer uses the req, res objs in service(-,-) method while writing the request processing logic.. "req" obj is very useful togather inputs that are coming along with the request (like form data) where programmer places generated output in "res" object in order to send to browser as response ..

=> The output/results written to response obj goes to browser through web Cotnainer and webSever. At the end browser displays that output/response as web page..

service(-,-) generates output --->res obj ---> web contalner--> webServer ---> browser as response --> displays as webpage.

=> A Stream is continuos flow of data which can be used to read data from destination and also to write data to destination
=>Reader/InputStreams are caplable of reading data from destination
=>Writer/OutputStreams are capable of writing data to destination.
=>A stream can have file, console,keyborard, object,array and etc.. as the destinations.

=>System.in stream destination is keyboard
=>System.out srteam destionation is console
=>FileInputStream/FileOuputStreams takes the file as the destination



=>response obj is having one built-in stream called PrintWriter having response obj it self as the destination ..By calling res.getWriter() method, we get that stream to service(-,-) method and we use it to write output to response obj by calling pw.println(-,-) method..

=>System.out stream is pointing to console/monitor so System.out.println(-) writes the messages to console..
=>res.getWriter() given PrintWriter stream is pointing to response obj , So pw.println(-) writes the messages to response obj.

res.setContentType("text/html"); gives instruction to browser through res obj, WebContainer, webServer to treat the recieved output as html tags based text content.. so the web page will be displayed on browser by regonizing the html tags of the output text.
note:: Based on the content type instruction the browser s/w becomes ready to display web page in different fromats on the browser.

content types/ MIME types

- text/html ----> displays the web page as html tags based text content
- text/xml --->displays the web page as xml tags based text content
- application/msword -->displays the web page as msword application document
- application/ms-excel -->displays the web page as msexcel application document
- text/plain ---> displays the web page as plain text content.. no html tags, xml tags will be recognized

MIME:: Multipurpose Internet Mail Extension

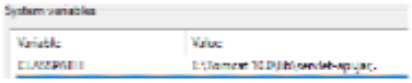
step4) add <Tomcat_home>\lib\servlet-api.jar file to CLASSPATH... becoz our sevlet comp class is servlet api that is avaliable in servlet-api.jar file. (E:\Tomcat\lib\servlet-api.jar)

(E:\Tomcat\lib\servlet-api.jar)

step4) add <Tomcat_home>\lib\servlet-api.jar file to CLASSPATH... becoz our sevlet comp class is servlet api that is avaliable in servlet-api.jar file.

This PC ---> properties ---> advanced system settings ---> env.. varibles --->
system variables ----> new -->
variable name :: CLASSPATH
value :: E:\Tomcat 10.0\lib\servlet-api.jar;.
-->ok -->ok -->ok

"." --> means current directlry



step5) compile servlet comp class

G:/DateApp/WEB-INF/classes>javac -d . DateServlet.java

(make sure that the active java version is java8/9)

-d → To create .class file in a package that is specified (com.nt.servlet)

. → (com.nt.servlet) new package will be created in the current directory

step6) Develop web.xml file to configure Servlet comp and to map Servlet comp with url.

=> Servlet configuration means giving the class name and package name of Servlet comp to ServletContainer to recgonize given class as Servlet comp

=> SErvlet mapping means linking certain request url with Servlet comp asking ServletContainer to allow request to private area SErvletComp for the specified request url

=>Xml is case-sensitive
=>Xml strictly typed

web.xml
=========

```
<web-app>
  <!--Servlet configuration-->
  <servlet>
     <servlet-name>date</servlet-name>
     <servlet-class>com.nt.servlet.DateServlet</servlet-class>
  </servlet>

  <!--SErvlet mapping-->
  <servlet-mapping>
     <servlet-name>date</servlet-name>
     <url-pattern>/first</url-pattern>
  </servlet-mapping>
</web-app>
```

logical name

fully qualified servlet class name

logical name

request url

The logical name of <servlet> tag and the logical name of <servlet-mapping> must match.. to link/map certain request url with certain servlet comp class .

note:: Here we are requesting SErvletContainer to allow request going to "DateServlet" t comp private area for the request url "/fir st"

note:: step1 to step5 completes the development of web application...

step6) Start Tomcat server
Go To <Tomcat_home>\bin directoy and tomcat10.exe file..

step7) Deploy the web application (DateApp)

copy G:/DateApp folder to <Tomcat_home>\webapps folder..

step8) Test the web application...

- http://localhost:3030/DateApp/first (In browser address bar)

protocol

host name and port number of tomcat server

web application name

the url /url pattern mapped with servlet comp

=>The Servlet comp is identified with its mapped url, So we must use that url to send request to servlet comp..i.e Servlet comp is not indentified with its class name or logical name..

=>The modifications done in Servlet comp Soruce code in the deployed web application will reflect only after recompilation of servlet comp and reloading of the web applicalton..

To recompile servlet comp class

E:\Tomcat 10.0\webapps\DateApp\WEB-INF\classes>javac -d . DateServlet.java

To reload the web application

open tomcat home page (http://localhost:3030) -->Manager App ----> username:admin , password: admin

Go to DateApp web application ---> reload (stop and starting the web application)

Different reasons to get 404 error

==========

404:: requested resource not found

a)wrong request url in the browser address bar

b) Wrong Deployment Directory structure (wrong folder names or locations)

c) for wrong entries in web.xml file

d) Wrong web.xml file name or location

and etc..

In Servlet comp , the message kept in pw.println(-) goes to browser through res objs, webcontainer and webServer where as the message kept in System.out.println(-) goes to Tomcat server console as log message/confirmaation message..

ServletContainer creates our servlet comp class obj using only 0-param constructor.. So we must place 0-param constructor in our servlet comp class directly (placed programmer) or indirectly(Generated by javac compiler as default constructor) If not placed then we get jakarta.servlet.ServletException: Error instantiating servlet class [com.nt.servlet.DateServlet]

=>The modifications done html files, web.xml file in the deployed web application will reflect automatically i.e there is no need reloading of web application.. where as the modifications done in the soruce code of Servlet comp will reflect only after recompilation of servlet comp and and reloading the web application..

Different reasons to get 500 Error

==========

500:: Servlet Instantitation Problem

(a) If Servlet comp class is not having public 0-param cosntructor directly or indirectly..

(b) If the servlet comp class is not taken as public class..

(c) If wrong class name of package name is specified in <servlet-class> of web.xml file

and etc..

=>If Servlet comp is getting 10 requests then ServletContainer

-> creates 1 object for servlet comp class

-> creates 10 sets of req , res objects represnting requests

-> ceeates 10 threads representing 10 requets

Single instance multiple threads behaviour..

note:: If each requested related response is delivered back to browser then that request related thread, (req,res objs) will be destroyed automatically

To prove the above concept pratically we need to place the following code in service(-,-) method of servlet comp and we need to give multiple requests simultaenously either diff browsers or different tabs of same browser..

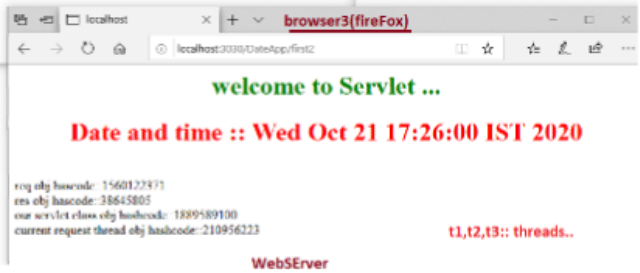
```
pw.println("<br>req obj hascode::"+req.hashCode());
pw.println("<br>res obj hascode::"+res.hashCode());
pw.println("<br>our servlet class obj hashcode::"+this.hashCode());
pw.println("<br>current request thread obj hashcode::"+Thread.currentThread().hashCode());
```

browser1 (Edge)

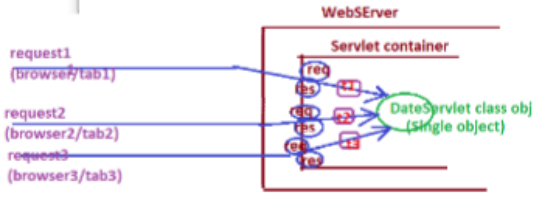
req obj hascode:: 753429267
res obj hascode::573542654
our servlet class obj hashcode::1889589100
current request thread obj hashcode::638582883

browser2 (Chrome)

req obj hascode::230661548
res obj hascode::58225259
our servlet class obj hashcode::1889589100
current request thread obj hashcode::122156764



t1,t2,t3:: threads..



natarajavaareana@gmail.com

Servlet Technonlogy is giving rules construct web.xml file having fixed tag names and attribute names in form of DTD document or XSD document.

DTD -->Document Type Definitation (Old --bad)
XSD ---> Xml Schema definitation. (Latest --Best)

xml file (with out XSD/DTD rules)	Xml file (Based on XSD/DTD rules)
all tags and attributes are user-defined	all tag names, attribute names , structure and etc.. are fixed as collected from XSD/DTD rules..
(it is like getting bol data with out format)	(it is like getting bio-data with format)

if every developer uses his own tags while creating web.xml then the SErvlet container can not apply meanings for the tags and tags data.. So Servlet technology is giving rules in the form DTD/XSD documents to all the developers to make all the developers developing their web.xml file based common rules, tags attributes and etc.. So Servletcontainer can apply standard meaning these fixed tags..

Servlet Technology
Supplied DTD/XSD Docs
(web_app_4.0.xsd/web_app_2.5.DTD)

we can use these
DTD/XSD for web.xml file
in servelt-api.jar file
(In Javax/servlet/resources folder)

Dev1 web,xml	Dev2 web.xml	Dev3 web.xml	Dev4 web.xml
same tags	same tags	same tags	same tags
(data varies)	(data varies)	(data varies)	(data varies)

Tomcat server latest version : 10.x
Jakarta Servlet latest version: 5.x
=>Servlet technology is part JEE module and JEE module latest version is JEE9

JEE --->Jakarta Enterprise Edition

=>if xml document is satisfying basic syntax rules (Strictly typed rules) then it is called "well-fom ed" xml document..

=> if xml document(file) is satisfying DTD/XSD doc rules then it called valid Xml document..

Strictly typed rules/Basic syntax rules

->tag , attribute names are cas-sensitive
->tags must be nested properly
->special chars are not allowed in the tag ,attribute names
-> attribute values must be quoated.
and etc..

=>Xml parser is java based s/w programmer that can perform the following operations

a) Loading xml document
b) checking well-formed , valid or not?
c) Reading xml file content
d) create InMemory MetaData of Xml file content
e) Processisng xml file content

and etc..

On the deployment of web application

RAM
JVM Memory of web Application
web.xml InMemory MetaData
... ...
....

web.xml (from HDD)

eg: SAX Parser , DOM Parser, JDOM Parser ,DOM4J Parser and etc...

SAX ::Simple API for xml Processing
DOM :: Document Object Model
JDOM :: Java Document Object Model
DOM4J :: Document Object Model for Java

Servlet container internally uses one or another Xml parser (like SAX parser) to create InMemory Metadata of web.xml file.. by loading and verifying web.xml file..

=>Xml Parser creates InMemory MetaData of xml file (like web.xml) in the In Memory where Application runs (that is JVM Memory of RAM) and that MetaData will be used for multiple during the execution of the Application..
This improves the performence becoz it avoids loading of xml files for multiple times , verifying xml files for multiple times .

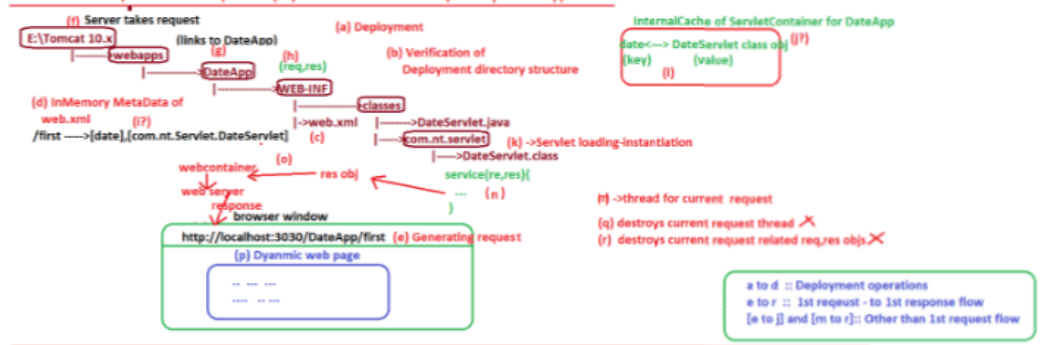
note:: The moment Application is stopped or completed execution.. its JVM memory in the RAM will be vanished.. In that process In Memory MetaData of xml file like web.xml will also be vanished..

What is the difference between Pool and Cache?

pool	Cache/Buffer
i1 i1 i1 i1 i1 i1	i1 i2 i3 i4 i5 i6 i7
[set of same items]	[Set of different items]
[Gives the resuability of same items]	[Gives the resuability of different items]
[use List collection to implemnent this]	[use Map Collection to implement this]

=>Both Pool and Cache are temporary memory allocating memeory in JVM memory of RAM.. So they will be vanished once App execution over..

Parital flow from request arrival to response display with the ald Servlet comp based java web applicalton



(a) Programmer has deployed DateApp web applicalton in Tomcat server

(b) Tomcat server or its webcontainer verifies the deployment directory structure of the deployed DateApp web applicalton

(c) webcontainer loads web.xml file and checks wheather it is well-formed, valid xml document or not .. if not exception will be thrown..

(d) webContainer creates InMemory MetaData of web.xml file in the JVM memory of RAM where webcontainer is running the deployed DateApp web application.

(e) Enduser generates the request by typing request url in the browser address bar
http://localhost:3030/DateApp/first

(f) Becoz of localhost:3030 info request url , the Tomcat server traps and takes the request..

(g) Tomcat server handovers the request to its WebContainer and this web container maps the request to the deployed "DateApp" web applicalton based on "DateApp" info of the request URL

(h) WebContainer creates 1 set of req,res objs for current requeset

(i?) Based on "/first" of the request url , the WebContainer seraches in the InMemory MetaData of web.xml file for as Servlet comp /web comp cfg that is mapped "/first" url .. and "com.nt.servlet.DateServlet" as servlet comp class and "date" as the logical name

(j?) webContainer Takes the logical name "date" and verifies for the SErvlet comp class object in internal cache and finds nothing.. (becoz of 1st request to servlet comp)

(k) WebContainer loads com.nt.servlet.DateServlet class from WEB-IN/classes folder , creates the object, intializes the object..

(l) Webcontainer keeps com.nt.servlet.DateServlet class object in the Internal cache having logical name (date) as the key and Servlet comp class object(DateServlet class obj) as the value.

(m) webContainer creates 1 thread for current request.

(n) The created thread calls service(-,-) on DateServlet class object having req,res objs as the arguments..

(o) service(-,-) process the request and writes the generated output browser as response through res obj --> webCotnainer ----> webserver.

(p) Browser recives the response and displays it on the browser as dyamic web page

(q) Web container destroys the current request related thread

(r) Web container destroys the current request related res,res objs.

Q) Can i map servlet comp with multiple url patterns/urls?

Ans) Yes possible as shown below

```
<!--Servlet configuration-->
<servlet>
    <servlet-name>date</servlet-name>
     <servlet-class>com.nt.servlet.DateServlet</servlet-class>
</servlet>

<!--SErvlet mapping-->
<servlet-mapping>
    <servlet-name>date</servlet-name>
    <url-pattern>/first</url-pattern>
    <url-pattern>/second</url-pattern>
</servlet-mapping>
```

=>With the support of mapped url of Servlet comp/web comp we hide the technology of web applicalton in which it being developed.. This process gives protection to web applicalton from hackers and jackers..

in web.xml
==========
<url-pattern>/nareshit/ameerpet/first.php</url-pattern>

the requqest url :: http://localhost:3030/DateApp/nareshit/ameerpet/first.php

=>web.xml file is called "Deployment Descriptor file" becoz webContainer reads this web.xml file the moment we deploy the java web application.

=>web.xml file is also called as "web applicalton configuration file" becoz we cfg multiple instructions to WebContainer from this file like

=>Servlet/jsp/html cfg
=>Servlet/jsp/html mapping with url/url patterns
=> Welcome/home page cfg
=> Security cfgs
=> Session timeout cfgs
and etc..

In the Deployment directory structure of Java web application only 4 standard names are there..
they are a) WEB-INF b)classes c) web.xml d)lib (we place inside WEB-INF) and remaning all folder and file names are developer choice

To display image on Servlet comp generated web page
==========

a) place image in public area

```
E:\Tomat 10.x\webapps
|---->DateApp
        |------------->WEB-INF
        |-- images ---------> Not a standard folder..
            |-->nit.jpg
```

b) add the following line in DateServlet comp class to display the image

```
pw.println("<img src='images/nit.jpg' width='100' height='60'>");
```

contentType/MIME type
==========

MIME :: Multipurpose Internet Mail Extension

text/html, text/plain, text/xml , application/ms-word, application/vnd.ms-excel and etc..

In Servlet comp
==========

res.setContentType("<mime type>");

eg:

res.setContentType("text/html");

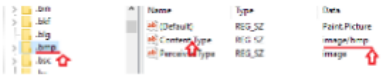
==>Servlet comp Gives instruction to browser along with response (ouput) through res object,WebContainer,webServer to display the recieved output/response in the MIME type format.

note::In most the browsers text/html will be taken as the default MIME type.

=>By using regedit (RegistryEditor) tool we can get MIME types of different file types.

Procedure::

windows button + r --> type regedit --> expand HKEY_CLASSES_ROOT --->choose extesion and get its content type in right side panel.



windows +shift+s :: to get snipper tool based screen short

App3) Develop web application having multiple Servlet comps generating the response in different formats

step1) make sure that following s/w setup ready

=>Tomcat 9.x/10.x

=> EditPlus 2/3

=> jdk 1.8/1.9 / any compitable version.

step2) create Deployment Directory Struccture

```
G:\
 |---->MIMEApp  ---> web root folder
        |------------->WEB-INF
                        |------>classes
                        |-->web.xml------>PlainServlet.java
                                 |-------->HtmlServlet.java
                                 |-------->ExcelServlet.java
                                 |-------->WordServlet.java
                                 |-------->XmlServlet.java
                                 |------>com.nt.servlet
                                            |---->*.class (5)
```

for

step3) develop the source code Servlet comps..

jakarta.servlet.GenericServlet(AC) gives only 1 service(-,-) that is "public void service(ServletRequest req, ServletResponse res)throws SE,IOE"

jakata.serlvet.http.HttpServlet(AC) gives 2 service(-,-) methods they are

a)public void service(ServletRequest req,ServletResponse res)throws SE,IOE (Inherited from GenericServlet)
(1st service(-,-) method)

b)protected void service(HttpServletRequest req,HttpServletResponse res)throws SE,IOE -->Direct methof HttpServlet
(2nd service(-,-) method)

ServletRequest,ServletResponse type req,res objs do not not allows us to work with protocol http features

HttpServletRequest,HttpServletResponse type req,res objs allow us to work with protocol http features

```
jakarta.servlet.ServletRequest(I)        |  jakarta.servlet.ServletResponse(I)
            ^                            |            ^
            |  extends                   |            |  extends
jakarta.servlet.http.HttpServletRequest(I) |  jakarta.servlet.http.HttpServletResponse(I)
```

```
//HtmlServlet.java
//package creation/delcaration
package com.nt.servlet;

//packages import
import jakarta.servlet.*;
import jakarta.servlet.http.*;
import java.io.*;

public class HtmlServlet extends HttpServlet
{

    //2nd service(-,-) method/protected service(-,-) method
  protected void service(HttpServletRequest req,HttpServletResponse res)throws ServletException,IOException{
        //set response content type
         res.setContentType("text/html");
         //get PrintWriter stream obj from response obj
         PrintWriter pw=res.getWriter();
         //write output message to response obj
     pw.println("<table border='1' bgcolor='cyan' align='center'>");
     pw.println("<tr><th>Team name </th> <th> owner name </th>  <th> captain name </th> </tr>");
          pw.println("<tr><td>MI </td> <td> Raliance </td>  <td> Rohit sharma </td> </tr>");
        pw.println("<tr><td>DC </td> <td> GMR-JSW </td>  <td> Shreys Iyer </td> </tr>");
    pw.println("<tr><td>KIXP</td> <td> Preity Zinta</td>  <td> KL Rahul </td> </tr>");
    pw.println("<tr><td>CSK </td> <td> Srinivasan </td>  <td> Ms dhone </td> </tr>");
   pw.println("<tr><td>SRH </td> <td>  Sun network</td>  <td> David warner </td> </tr>");
   pw.println("<tr><td>KKR </td> <td> Sharkh khan </td>  <td> Eoin morgan </td> </tr>");
    pw.println("<tr><td>RCB </td> <td> Vijay maliya </td>  <td> Kohli </td> </tr>");
    pw.println("<tr><td>RR </td> <td> raj kundra </td>  <td> steve smith </td> </tr>");
   pw.println("</table>");
      //close stream
      pw.close();
     }//service(-,-)
}//class
```

step4) make sure that servlet-api.jar is added to CLASSPATH env.. variable..

=>same as previous app

step5) compile SErvlet comps...

G:\MIMEApp\WEB-INF\classes>javac -d . *.java

step6) Create web.xml inside WEB-INF folder having all the 4 servlet comps cfgs and servlet mappings

```
<web-app>
 <!--SErvletCfg --giving servlet comp class details to WebContainer -->
 <servlet>
   <servlet-name>html</servlet-name>
   <servlet-class>com.nt.servlet.HtmlServlet</servlet-class>
 </servlet>
  <!--SErvletMapping --linking  Servlet comp with request url/path -->
 <servlet-mapping>
     <servlet-name>html </servlet-name>
    <url-pattern>/htmlurl </url-pattern>
    </servlet-mapping>

     <!--SErvletCfg --giving servlet comp class details to WebContainer -->
 <servlet>
   <servlet-name>excel </servlet-name>
   <servlet-class>com.nt.servlet.ExcelServlet</servlet-class>
 </servlet>
  <!--SErvletMapping --linking  Servlet comp with request url/path -->
 <servlet-mapping>
     <servlet-name>excel </servlet-name>
    <url-pattern>/excelurl </url-pattern>
    </servlet-mapping>

<!--SErvletCfg --giving servlet comp class details to WebContainer -->
 <servlet>
   <servlet-name>word </servlet-name>
   <servlet-class>com.nt.servlet.WordServlet</servlet-class>
 </servlet>
  <!--SErvletMapping --linking  Servlet comp with request url/path -->
 <servlet-mapping>
     <servlet-name>word </servlet-name>
    <url-pattern>/wordurl </url-pattern>
    </servlet-mapping>

<!--SErvletCfg --giving servlet comp class details to WebContainer -->
 <servlet>
   <servlet-name>plain </servlet-name>
   <servlet-class>com.nt.servlet.PlainServlet</servlet-class>
 </servlet>
  <!--SErvletMapping --linking  Servlet comp with request url/path -->
 <servlet-mapping>
     <servlet-name>plain </servlet-name>
    <url-pattern>/plainurl </url-pattern>
    </servlet-mapping>

<!--SErvletCfg --giving servlet comp class details to WebContainer -->
 <servlet>
   <servlet-name>xml</servlet-name>
   <servlet-class>com.nt.servlet.XmlServlet</servlet-class>
 </servlet>
  <!--SErvletMapping --linking  Servlet comp with request url/path -->
 <servlet-mapping>
     <servlet-name>xml</servlet-name>
    <url-pattern>/xmlurl </url-pattern>
    </servlet-mapping>
</web-app>
```

note:: All servlet comps of web application must be configured in web.xml file haivng unique fully qualified classs names, logical names and url /url patterns.

step7) Start Tomcat server
use tomcat10.exe file of <Tomcat_home>/bin directory..

step8) Deploy the web application
copy G:/MIMEApp folder to <Tomcat_home>/webapps folder..

step9) Test the Application..

In browser address bar
==========

http://localhost:3030/MIMEApp/htmlurl
http://localhost:3030/MIMEApp/excelurl
http://localhost:3030/MIMEApp/wordurl
http://localhost:3030/MIMEApp/xmlurl
http://localhost:3030/MIMEApp/plainurl

=>While overriding super class methods in sub class we can use either same modifier or strong modifier (recomanded)
=> while overriding super class protceted methods in sub class we can use the same protected moidifier or stroing public modifier (strong is recomanded for visibility)

=>The protected service(-,-) method HttpServlet can be overridden in our servlet comp class either with same protected modifier or with strong public modifier (recomanded)

=>Since there is posibility of overriding 2nd service(-,-)/protected service(-,-) method of HttpServlet having public modifier in our servlet comps..So it is recomanded to indentity service(-,-) methods as 1st or 2nd service(-,-) methods based their parameter types , not based on their modifers..

In our servlet comp
==========

```
public void service(ServletRequest req,ServletResponse res )throws SE,IOE
```
(1st service(-,-) method)

```
public void service(HttpServletRequest req,HttpServletResponse res)throws SE,IOE
```
(2nd service(-,-) method)

How can u enable auto-refresh on the web page generated by Servlet comp?

Ans) we can give instruction to browser along with response with the support reponse header "refresh" to enable auto-refresh the web page..

In Servlet comp 2nd service(-,-) method (should extend HttpServlet (AC))

```
res.setHeader("refresh","10"); (or)
res.setIntHeader("refresh",10); --> makes the browser to refresh the
                                    web pag after every 10 seconds..
```

autofresh on the web page is every useful while displaying live game scores, Stock market share values, random advertisements and etc..

=> response header are part of the generated response to browser giving instruction to browser towards displaying the web page...
contentType , refresh, location, server, and etc.. are response headers...

Q) SErvletRequest,HttpServletRequest and ServletResponse , HttpServletResponse are the interfaces of servlet api.. then how can say req, res are the objects created ServletContainer as we know interfaces can not be instantiated?

Ans1) req,res objs are not objects of the above said interfaces.. they are the objects of impl classes given by underlying WebContainer/WebServer..
=>req obj is the object of underlying webContainer supplied java class implements jakarta.servlet.http.HttpServletRequest(I) directly or indirectly
=>res obj is the object of underlying webContainer supplied java class implements jakarta.servlet.http.HttpServletResponse(I) directly or indirectly.
note: we do not expose req ,res obj class names in our servlet comp development becoz they are specific to each web container and if we specify them our servlet comp becomz WebContainer/WebSErver Dependent servlet comp.. So we refer req, res objs using the common ServletRequest(I)/HttpServletRequest(I) and ServletResponse(I)/HttpServletRespose(I) reference variables.. So that our servlet comp can be moved any WebServer/WebContainer with out any modifications.

In Servlet comp
==========

```
pw.println("<br> req object class name ::"+req.getClass());  //gives org.apache.catalina.connector.RequestFacade
pw.println("<br> res object class name ::"+res.getClass());  //gives org.apache.catalina.connector.ResponseFacade
```

```
public void service(RequestFacade req, ResponseFacade res)throws SE,IOE{
  ...
  ...
}
```

makes Servlet comp code specific Tomcat WebServer...
(Tight coupling with Tomcat server)

```
public void service(HttpServletRequest req,HttpServletResponse res)throws SE,IOE{
  ...
  ...
  ...
}
```

makes the servlet comp code as server independent i.e common to all servers.. nothing makes servlet comp as WODA
(WODA :: Write Once Deploy Anywhere)

Ans2) => Seriliazable object means , it is not object of java.io.Serializable(I), it is the object of java class that implements java.io.Serializable(I).
=>Map object means , it is not object of java.util.Map(I), it is the object of java class that implements java.Util.Map(I).
=>jdbc con object means , it is not object of java.sql.Connection(I), it is the object of java class that implements java.sql.Connection(I).
=>req object means , it is not object of jakarta.servlet.http.HttpServletRequest(I)/jakarta.servlet.ServletRequest(I), it is the object of java class that implements jakarta.servlet.http.HttpServletRequest(I) /jakarta.servlet.ServletRequest(I)
=>res object means , it is not object of jakarta.servlet.http.HttpServletResponse(I)/jakarta.servlet.ServletResponse(I), it is the object of java class that implements jakarta.servlet.httpHttpServletRsponset(I) /jakarta.servlet.ServletResponse(I)

Html to Servlet Communication
==========

=>Html is given to develop static web pages , Servlet is given to develop dynamic web pages ,So to get interaction b/w static web pages and dynamic webpages we need to go for html to Servlet communication..

=> Sending request to servlet comp by typing url in the browser address bar is very complex and technical. The non-technical endusers i.e visitors of website can not do that work properly..So it is better to provide GUI env.. like hyperlinks , forms and etc.. for endusers to send request to servlet comp. for this we need html to servlet communication.

3 ways of html to Servlet communication
==========

a) Using hyperlinks
=>To send request to servlet comp with out having end user supplied data
eg: getting current treding jobs , show trending news , getAllEmployees (usecases)

b) Using forms
To send request to servlet comp having enduser supplied inputs
eg:: Login page/form , registration form/page , payment page/form (use-cases)

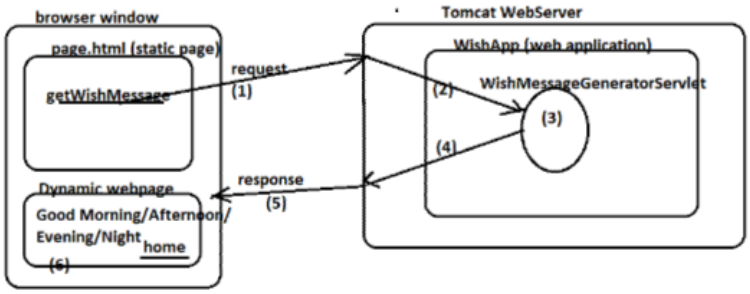
c) Using Java script
To send request to servlet comp based different java script events that are raised and from diff comps.

usecases
eg:: for Onload event (when web page is loaded)
request fetches all countries from servlet comps and puts in selectBox
eg: after choosing new email id , the request goes automatically to check wheather it is already available or not (OnBlur event --> form comp loosing the focus)
eg:: selecting a country in one select box sends request and gets list of states from Servlet comp and puts them in another select box. (Onchange Event :: This raises when u select item from the select box)

1 Html to servlet communication using hyperlinks
==========

=>For this we need to place the request url of servlet comp as the value of "href" attribute in the <a> tag.
syntax : <a href=" <request url of servlet comp>" > .... </a>

Example Application
==========



we can directly create the Deployment directory structure in <Tomcat_home>\webapps folder itself.

```
WishApp (web root folder)
  |---------->WEB-INF
  |--->page.html  |---------->classes
                  |-->web.xml   |-------->WishMessageGeneratorServlet.java
                                |------>com.nt.servlet          Servlet
                                        |---->WishMessageGenerator.class
```

WishMessageGeneratorServlet comp is mapped with "/wishurl" url pattern, so the request url for the servlet comp is "http://localhost:3030/WishApp/wishurl"

page.html (c)
==========

```
<h1 style="color:blue;text-align:center"> Html to Servlet communication using hyperlinks </h1>
<h2 style="color:red;text-align:center"> <a href="http://localhost:3030/WishApp/wishurl">
getWishMessage </a> </h2>
```
(d)

WishMessageGenerator.java
==========

```
//WishMessageGeneratorServlet.java
package com.nt.servlet;

import jakarta.servlet.*;
import jakarta.servlet.http.*;
import java.io.*;
import java.time.*; //java 8
```

(f)

```
public class WishMessageGeneratorServlet extends HttpServlet
{
        // 2nd service(-,-) method      (g)
       public  void   service(HttpServletRequest req, HttpServletResponse res)throws ServletException,IOException{
       //get PrintWriter object
              PrintWriter pw=res.getWriter();
              //set response content type
              res.setContentType("text/html");
              // Get System Time..
              LocalTime time=LocalTime.now();
              //get current hour of the day
              int hour=time.getHour(); // gives in 24 hours format
              //generate wish Message
              String msg=null;
              if(hour<12)
                     msg="Good Morning";
              else if(hour<16)
                     msg="Good Afternoon";
              else if(hour<20)
                     msg="Good Evening";
              else
                     msg="Good Night";
              //write  wish message to the response object
              pw.println("<h1 style='color:blue;text-align:center'>"+msg +"</h1>");
              //add home hyperlink
              pw.println("<a href='http://localhost:3030/WishApp/page.html'>home </a>");
              //close stream
              pw.close();
       }//service(-,-)
}//class
//cmd>javac  -d   .   WishMessageGeneratorServlet.java
```

web.xml

```
---------------
<web-app>
  <!-- Servlet configuration -->          (b1?)
  <servlet>
     <servlet-name>wish</servlet-name>
        <servlet-class>com.nt.servlet.WishMessageGeneratorServlet</servlet-class>
(e) </servlet>

  <!-- Servlet Mapping -->
  <servlet-mapping>
     <servlet-name>wish</servlet-name>
        <url-pattern>/wishurl </url-pattern>
  </servlet-mapping>
</web-app>
```

(a) deployment operations

request path

request url:: http://localhost:3030/WishApp/page.html (b)

=>While linking the recived request to web comp, the ServletContainer always gives first priority to private area web comps like servlet comps , if they are not avaiable mapped with currrent request url then the same comps will be verified in public area

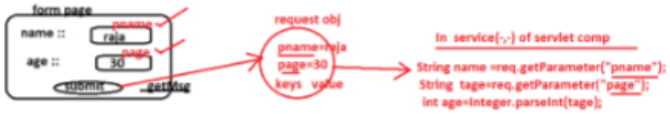
If the request path/url of servlet comp(private area web comp) and public area web comp (html file) is matching then the request goes to which web comp?

Ans) The request goes to private area web comp first (servlet comp)

java.util.Locale
==========

2.Html to Servlet communication using forms

=> Here request can be given servlet comp having form data supplied by enduser
usecases :: registration pages, login page , payment page and etc..
=> we need to place Servlet request url in "action" attribute of <form> tag (as action url) to make form submitted request going servlet comp..
=>The form data sent by form submisssion will be stored in to request object automatically having form comp name as the key and value/data as the value.. So we can read that form data in our servlet comp by uisng request object (like req.getParameter(-) method)



=> Browser can send request to servlet comp in two modes/methods/methodologies
1.GET mode ---> Designed to get data from server by sending request (default)
-> url typed address bar, hyperlinks generates GET mode request to servers/web comps
->This mode request can carry 2kb to 8kb (in Most of browsers it is 2kb) data as query data /query String along with the request telling it wants certain type of data from server..

http://localhost:3030/WishApp/wishurl?type=english &country=India
query String having type,country as request param names and english,India as the request param values

2.POST Mode ---> Designed to send unlimited amount of data along with request
---> suitable form registration forms , file uploading activities..
---> A form page can send either GET (default) or POST(recomanded) request request Server /Web comp

A typical form page contains
a) mode of request (GET(default)/POST(recomanded))
b) action url (target web comp(like servlet comp) request url)
c) form comps (like text boxes, password boxes, radio buttons and etc..)
d) Buttons (like submit(preffered) , reset and etc..)

sample form page
==========

action url

```
<form action=" <request url of taget web comp>" method="POST">
    name :: <input type="text" name="pname">
    age :: <input type="password" name="page">
    <input type="submit" value="send">
</form>
```

request mode/method
form comps which will become request param names and their value will become request param values

When form is submitted using this submit Button , the request goes to that web comp(Servlet comp) whose request url is placed as the action url in the "action" attribute of <form> tag.

note:: Developing servlet comp having service(-,-) method to process the request is not good pratice becoz as a single method we can not differentiate logics for "GET","POST" mode requests..place doXxx(-,-) methods (7 methods) in servlet comp having request processisng logic.. since we can place multiple doXxx(-,-) methods at a time in a servlet comp , so we can differentiate logics for different modes of requests

=>Ftp client App /Console clientApps are useful to Host webapplicaiton on the internet,to remove web application from the internet and also use ful to add,remove web comps from the hosted web applicaiton..
In this situation , this ftp client tries to send PUT,DELETE and modes of requests..
=> While devleoping and using Restfull webSErvices we are going to work with all the 7 modes of request.

7 doXxx(-,-) methods are (java methods)
==========

doGet(req,res) ---> To process "GET" mode request
doPost(req,res) ---> To process "POST" mode request
doHead(req,res) ---> To process "HEAD" mode request
doTrace(req,res) ---> To process "TRACE" mode request
doOptions(req,res) ---> To process "OPTIONS" mode request
doPut(req,res) ---> To process "PUT" mode request
doDelete(req,res) ---> To process "DELETE" mode request

Different clients like browser , ftp client and etc... togather can give 7 modes of requests to webapplicaitons/webcomps.. But browser can given only two modes of requests web comps/web application ..So while developing webapplications for endusers who operates websiste using browsers.. we just need to work with doGet(-,-) ,doPost(-,-) methods..

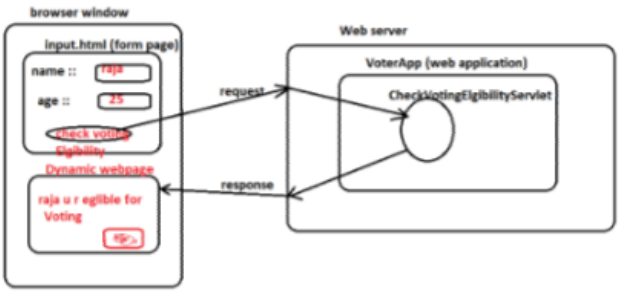
Conclusion::

=> Stop using service(-,-) method to place request processing logic in servlet comp becoz it can not differetiate logics for "GET" ,"POST" reuquets..
=> use doGet(-,-) method having request processing logic in servlet comp to handle the "GET" mode requests coming from hyperlinks, urls typed in browser address bar , forms having method="GET" .
=> use doPost(-,-) method having request processing logic in servlet comp to handle the "POST" mode requests coming from forms having method="POST" .

signature of 7 doXxx(-,-) methods
==========

protected void doXxx(HttpServletRequest req, HttpServletResponse req)throws SE,IOE

Example Web application on Html to servlet communication using form




```
VoterApp (web root folder)
|------------WEB-INF
|-->input.html   |------------classes
|-->images       |-->web.xml     |------->CheckVotingEligibilityServlet.java
   |-->home.png                 |------>com.nt.servlet
                                        |--> CheckVotingEligibilityServlet.class
```

=>It is always recomanded to take Html form comps as html table content to get control on alignment, styles and etc..

=>SErvletContainer does not call doGet(-,-)/doPost(-,-) directly on our servlet comp, they will be called through super class (HttpServlet) service(-,-) method i.e the service(-,-) HttpServlet class internally calls doGet(-,-) method for GET mode request and calls doPost(-,-) for POST mode request.

===Code===

input.html (b)

```
<h3 style="color:red;text-align:center"> Html to Servlet communication using forms </h3>
<h1 style="color:red;text-align:center"> ELECTION COMMISSION OF INDIA </h1>
<body bgcolor="pink">
<form action="http://localhost:3030/VoterApp/voterurl" method="POST">
  <table border="0" align="center" bgcolor="cyan">
    <tr>
        <td>Person name:: </td>
            <td><input type="text" name="pname"> </td>
        </tr>
        <tr>
          <td>Person age:: </td>
            <td><input type="text" name="page"> </td>
        </tr>
        <tr>
          <td><input type="submit" value="Check Voting Elgibility"> </td>
            <td><input type="reset" value="cancel"> </td>
        </tr>
    </table>
</form>
</body>
```

(d) (c)

web.xml

```
<web-app>
  <servlet>
    <servlet-name>voting</servlet-name>
        <servlet-class>com.nt.servlet.CheckVotingElgibilityServlet</servlet-class>
  </servlet>
  <servlet-mapping>
    <servlet-name>voting</servlet-name>
        <url-pattern>/voterurl </url-pattern>
  </servlet-mapping>
</web-app>
```

(e) MetaData will be used

CheckVotingElgibilityServlet.java

```
//CheckVotingElgibilityServlet.java
package com.nt.servlet;
import jakarta.servlet.*;  //servlet api
import jakarta.servlet.http.*; //servlet api
import java.lo.*;  //IO strerams api
public class CheckVotingElgibilityServlet extends HttpServlet
{
 public void doPost(HttpServletRequest req,HttpServletResponse res)throws ServletException,IOException{
     //set response content type
            res.setContentType("text/html");
            //get PrintWriter
            PrintWriter pw=res.getWriter();
            //read form data (req parameter values from req object)
            String name=req.getParameter("pname");
            int age=Integer.parseInt(req.getParameter("page"));

            //write b.logic or request processing logic
            pw.println("<h1 style='color:maroon;text-align:center'> ELECTION COMMISSION OF INDIA </h1>");
            if(age>=18)
                pw.println("<h1 style='color:green;text-align:center'> Mr/Miss/Mrs. "+name+"  you are eligible for Voting </h1>");
            else
        pw.println("<h1 style='color:red;text-align:center'> Mr/Miss/Mrs. "+name+"  you are not eligible for Voting wait for "+(18-age)+" years for voting </h1>"
            // add graphical hyperlink for home
            pw.println("<a href='http://localhost:3030/VoterApp/input.html'><img src='images/home.png' width='60' height='50'> </a>");
     //close stream
       pw.close();
  }//doPost(-,-)
}//class
```

(f) Servlet Loading and Instantiation

(g) through HttpServlet's service(-,-)

response to browser (h)

(a)

request url:: http://localhost:3030/VoterApp/input.html (from browser)

=>In Html to servlet communication do not give direct request to Servlet comp.. of servlet comp is not ready to process GET mode request , then we wll get "405" error.

=>While overriding super class methods in sub classes it is recomanded to place @Override on the top of method definitations.. in sub classes, So compiler never takes those methods as the direct methods in sub classes.. This helps to avoid typing mistakes , signature mistakes while overriding super class methods in sub classes.

note:: while overriding GenericServlet/HttpServlet's service(-,-)/doXxx(-,-) methods in our servlet comp it is recomanded to added @Override as shown below.

```
@Override
public void doPost(HttpServletRequest req,
        HttpServletResponse res)throws ServletException,IOException{
   ....
   ....
}
```

Eclipse
=======

type :: IDE for Java based applications development
version :: 2020-09
Vendor :: Eclipse Org
Open Soruce IDE (Free IDE)
Flavours :: Eclipse SDK (only for Standalone App development)
Eclipse JEE (for all kinds of App development including web applications, distrbuted Apps and etc..)
To donwload eclipse JEE :: download as zip file from
https://www.eclipse.org/downloads/packages/release/kepler/sr2/eclipse-ide-java-ee-developers
-->select windows 64 bit
To install Eclipse JEE :: Extract the zip file and use eclipse.exe to launch the IDE

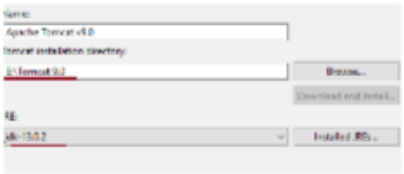
Procedure to develop MarriageApp (checking wheather person is elgible for marriage or not based on the given name,age and gender) usong Eclipse JEE IDE
==========

step1) Lannch Eclipse IDE by choosing the workspace folder
The folder where Eclipse Projects will be saved.
(G:\Workspaces\advjava\ntaj414)

step2) Configure Tomcat Server with Eclipse IDE..
Eclipse 2020-06 is not compitable with Tomcat 10.x , So keep the installation of Tomcat 9.x and configure it with eclipse..

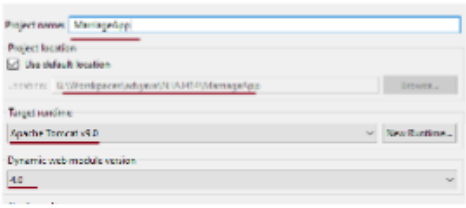
window menu--->preferences ----> server --> run time env.. ---->
add ----> select apache Tomcat 9.0 --->
server name :: apache Tomcat 9.0
Tomcat Installation folder :: E:/Tomcat 9.0
-->ok

In one computer , we can install multiple versions of jdk s/ws, eclipse s/ws and Tomcat s/ws and etc..



step3) Create Dynamic web Project in Eclipse IDE by choosing Tomcat server as the target Rumtime env..

File menu --->new --->Dynamic web project ---->
project name :: MarriageApp
Target runtime env.. :: Tomcat 9.0
web module version:: 4.0
-->next --->next --> select web.xml file -->finish.



step4) Understand Project directory structure that is generated

(short cut to open web.xml)
this content goes to WEB-INF/classes folder — To place java classes like servlet comps,helper classes
This content goes to web root folder — To place html files,jsp files, audio/viedo files,images and etc.. (public area content)
This content goes to WEB-INF folder — (Deployment Descriptor file)

note:: This is not Standard Deployment Directory Structure.. It is Eclipse Project structure.. to place various classes and files in to the project.. The deploymentn directory will be generated dynamically when we run the Project..

step5) place input.html (form page) in webcontent folder

note:: do not take single radio button, becoz once it is selected we can not deslect it. Always take multiple radio buttons having same name to group them into single unit . so if radion button of the group is selected , the other ones will be deselcted automatically.

note:: The selected radion button label will not go to server as req param value.. the data kept in "value" attribute of selected radion button goes to server as request param value..

```
<input type="radio" name="gender" value="M">Male
<input type="radio" name="gender" value="F" selected>FeMale
```

Gives "M" or "F" as req param value based on radio button that is selected.

input.html

```
<body bgcolor="magenta">
 <h1 style="color:red;text-align:center">Shaadi.com</h1>
  <center>
    <img src="images/marriage.jpg">
  </center>

   <form action="http://localhost:2020/MarriageApp/marriageurl" method="POST">
     <table bgcolor="aqua" align="center">
       <tr>
         <td>Person name:: </td>
         <td><input type="text" name="pname"> </td>
       </tr>
       <tr>
         <td>Person age:: </td>
         <td><input type="password" name="page"> </td>
       </tr>
       <tr>
         <td>Person Gender:: </td>
         <td>
             <input type="radio" name="gender" value="M">Male
             <input type="radio" name="gender" value="F"  checked>FeMale
         </td>
       </tr>
       <tr>
         <td><input type="submit"  value="Check Marriage Eligibility"> </td>
         <td><input type="reset"  value="cancel"> </td>
       </tr>
     </table>
   </form>
 </body>
```

step 6) **develop servlet comp in "java resoruces/src" folder in a java package "com.nt.servlet"**

MarriageServlet.java

```
package com.nt.servlet;
import java.io.IOException;
import java.io.PrintWriter;
import javax.servlet.ServletException;
import javax.servlet.http.HttpServlet;
import javax.servlet.http.HttpServletRequest;
import javax.servlet.http.HttpServletResponse;

public class MarriageServlet extends HttpServlet {

        @Override
        public void doPost(HttpServletRequest req, HttpServletResponse res) throws ServletException, IOException {
    // set response content type
            res.setContentType("text/html");
            //get PrintWriter
            PrintWriter pw=res.getWriter();
            //read form data (req param values)
            String name=req.getParameter("pname");
            int age=Integer.parseInt(req.getParameter("page"));
            String gender=req.getParameter("gender");
            //write b.logic or request processing logic
            if(gender.equalsIgnoreCase("M")) {
                if(age<21)
                    pw.println("<h1 style='color:red;text-align:center'> Mr."+name +" u r not elgible for marriage enjoy life </h1>");
                else
                    pw.println("<h1 style='color:green;text-align:center'> Mr."+name +" u r  elgible for marriage , But think once </h1>");
            }
            else {
                if(age<18)
                    pw.println("<h1 style='color:red;text-align:center'> Miss."+name +" u r not elgible for marriage, be happy </h1>");
                else
                    pw.println("<h1 style='color:green;text-align:center'> Miss."+name +" u r  elgible for marriage , But think Thrice </h1>");
            }

            //add graphical hyperlink for home  navigation
            pw.println("<br> <a href='http://localhost:2020/MarriageApp/input.html'><img src='images/home.png'> </a>");
            //close stream
            pw.close();
        }//doPost(-,-)
    }//class
```

step7) **Develop web.xml having code to confugure Servlet comp and mapping servlet comp with url patttern**

web.xml

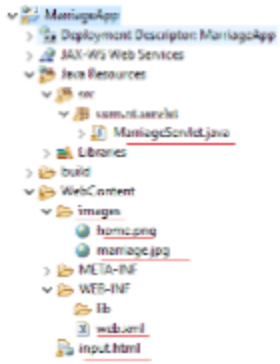
```
<?xml version="1.0" encoding="UTF-8"?>
<web-app xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
         xmlns="http://xmlns.jcp.org/xml/ns/javaee"
         xsi:schemaLocation="http://xmlns.jcp.org/xml/ns/javaee
           http://xmlns.jcp.org/xml/ns/javaee/web-app_4_0.xsd"
           id="WebApp_ID" version="4.0">
  <servlet>
    <servlet-name>marriage</servlet-name>
    <servlet-class>com.nt.servlet.MarriageServlet</servlet-class>
  </servlet>
  <servlet-mapping>
    <servlet-name>marriage</servlet-name>
    <url-pattern>/marriageurl</url-pattern>
  </servlet-mapping>
</web-app>
```

step8) Run the Application

Right click on project ----> run as --> run on server --->select Tomcat .....

request url::

http://localhost:2020/MarriageApp/input.html



When we run the Dynamic web Project .. The eclipse generates the deployment directory structure dynamically in the Tomcat integrated with Eclipse..

G:\Worskpaces\advjava\NTAJ414\.metadata\.plugins\org.eclipse.wst.server.core\tmp0\wtpwebapps

workspace location.

special folder of deploymnent in eclipse Tomcat..

note:: when Tomcat is configured with Eclipse IDE ,the Eclipse will not use that tomcat .. It creates a copy of tomcat in Eclipse workspace folder and use that tomcat..

G:\Worskpaces\advjava\NTAJ414\.metadata\.plugins\org.eclipse.wst.server.core\tmp0

The Location of Eclipse Tomcat with respect to our workspace folder..

To change port number of Eclipse Tomcat
==========

Project Explorer ---> servers --->Tomcat ---> open server.xml and modify "port" attribute value of <Connector> tag

(or)

Go to server tab ---> double click tomcat server ---> then modify "http/1.1" port number

=>By default eclispe web applications use eclipse internal browser .. to change to extenal browser use window-->browser ---> choose the browser (like chrome, firefox and etc..)

In eclipse based web application development the modifications done in the sorurce code web comps will reflect dyamically becoz the eclipse IDE automatically reloads the web applicaton.. So in eclipse no need to think recompilation and reloading..

=> To make java web application as WODA(Write Once Deploy Anywhere) web application , we need to use relative urls in the place of absolute urls..

```
<form action="http://localhost:3030/MarriageApp/marriageur">
  ....
  ...
  ...
}
```

=>absolute url which changed time to tome based on the dest server port number and host name.. Not recomanded to use.

JAva apps are WORA(write Once Run Anywhere)
java web applications are WODA(Write Once Deploy Anywhere)

```
<form action="marriageurl" >
  ----
  ....
</form>
```

relative url .. which server and host name independent. (recomanded to use)

```
pw.println("<a href='http://localhost:3030/MarriageApp/input.html'>home </a>");
```

absolute url (bad pratice)

```
pw.println("<a href='input.html'>home </a>");
```

relative url (good pratice)

---

welcome files configuration
==========

=>The web page that comes automatically as first page when we give request to web application/website is called home page/welcome page/landing page .. we can configure html files or jsp files or servlet comps as welcome file comps in web.xml file using <welcome-file-list> <welcome-file> tags..

in web.xml
==========

```
<welcome-file-list>
  <welcome-file> input.html </welcome-file>
  <welcome-file> input.jsp </welcome-file>
  <welcome-file> home.html </welcome-file>
</welcome-file-list>
```

If multiple welcome files are configured then the web container picksup the welcome files based on the order availability and order of configuration. and remaining files acts as back up welcome files.

=>Only In Tomcat server , if not welcome file is configureed then index.html or index.jsp will be taken as default welcome (If both are there Index.html will be taken as welcome file)
(In other servers, there is no support for default welcome files)

=> if web application is having both default welcome files and explicitly cfg welcome files then one of the explicitly cfg welcome file will be taken welcome page or home page

=> if web application is having both default welcome files and explicitly cfg welcome files , but the explictily cfg welcome files are not physical not there in the web application then that web application run with no welcome file.

=>we can cfg servlet comp as welcome file.. but we should take its url pattern(with out "/") as welcome file

Servlet Features
==========

a.portable
b.secured
c.Integratable
d.expendable
e.Inexpensive
f.efficient
and etc..

1.portable
========

=>Servlet comps and its web applications are deployable in all java web servers with out having single modifications in the source code of web comps including servlet comps.. This servlet comps and its web applications as portable or WODA (Write Once Deploy AnyWhere).

=>To continue this feature make sure u r working with "relative urls" and "interface model programming"

2.Secured
========

=> While delivering servlet comps based web application to clients or while hosting same web applications on to the internet .. we just need to place servlet comps based ".class" files.. not .java file.. i.e we can protect servlet comp by hiding their source code.. This makes Servlet comps as secured comps.

=>By providing url pattern to servlet comps ,we hide the technology in which the web comp is developed from endusers/visitors of website. This is also a kind of security.

=>We keep servlet comps source and byte code in the private area of web application's directory structure to protect them from outsiders.. becoz only underlying Webserver/wecontainer can get access to private area web comps. This also provides safety..

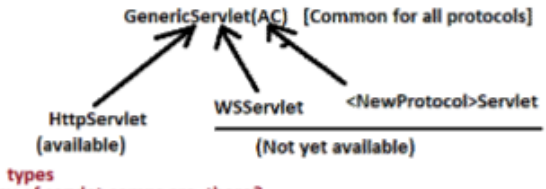
Integretable
==========

=> While developing servlet comps, we not only can use servlet api.. we can also ther apis like networking api, io streams api, utility api and etc..

=> we can also intergrate servlet comps with hiberate,spring and other frameworks

Exapndable
==========

=> servlet technology is expandable to work with different protocols.. currently servlet api supporting protocol http... becoz entire web is designed based on porotocol "http".. if another protocol has come.. in web env.. our servlet technology is expandable to work with that protocol also.



types

How many of servlet comps are there?

wrong Answer is a)GenericeServlet b) HttpServlet

correct answer is there is a possibility of developing "n" types of servlet comps like HttpServlet, WSServlet, SMTPServlet and etc.. GenericServlet is not a seperate type of Servlet

currently not available)

It is common super class for all types of servlet comps as disccessued above.. As of now there is only one sub class for GenericServlet that is "HttpServlet" becoz the entire web is running based on the protocol "http".

InExpensive
==========

=>Servlet technology is an open technology and most of the vendors are giving servlet based webServers as free webServers.. So the development and deployment of java web applications doesnot need much money.

=> Servlet comps are single instance multiple thread comps.. this indicates servlet comp takes less memory and cpu time during the execution..

note:: The above two points make servlet technology as InExpensive ..

Effiicient
=======

=>Using Servlet technology features , we can develop the web applications having end to end fetures.. i.e servlet technology is offering great features that are required web application development.

Q)How to make our servlet comp flexible enough to process to process both GET,POST mode requests either having same logic or different logics

There are 3 approaches for this
==========

Approach1 (bad)
========

=> provide request processing logic in service(-,-) method

sysout + ctrl+space :: gives System.out.println()
sout + ctrl+space :: gives System.out.println()
systrace +ctrl+sace :: gives system.out.println(-) with message

```
public class MarriageServlet extends HttpServlet{

  public void service(HttpServletRequest req,HttpServletResponse res)throws SE,IOE{
      ....
      ....
      .... request processing
      ...
    }
}
```

note:: service(-,-) can process both GET,POST mode/method requests..

Limitations of service(-,-) method
==========

a) we can not differentiate logics for GET,POST mode requests i.e if GET , POST mode requests are coming to servlet comp at a time (like hyperlink ,form submission) then we can not differentiate logics in servlet comp.

=>GET mode request sends data or gives query data as query String appended to the request url .. So it is not safe.
http://localhost:3030/MarriageApp/marriageurl?pname=karan&page=34&gender=F
(not safe)

=>POST mode request sends data to server as request body (which is internal process) So no query String appended to the request url appears in the browser. It is safe to send data.
http://localhost:3030/MarriageApp/marriageurl

b) 1st service(-,-) gives ServletRequest, SErvletResponse objs which can not be used to work with protocol "http" features.. (as alternate we can use 2nd service(-,-) method)

c) service(-,-) is not designed to process 7 modes requests that are coming to servlet comp from different types of clients..

d) service(-,-) is not designed based on protocol "http" standards.. So it is not reomanded to use in all angels..

note:: To overcome all these limitations of service(-,-) method start using doXxx(-,-) methods (especially doGet(-,-),doPost(-,-) methods)

Approach2 (Best pratice)
==========

Version1: if both GET,POST mode requests want to have same request processing logic

=>Override both doGet(-,-),doPost(-,-) methods and place request processing logic in one method and call that method from another method.

```
public class MarriageServlet extends HttpServlet

  public void doGet(req,res)throws SE,IOE{
    ....
    ... //request processing logic
    ...
  }
  public void doPost(req,res)throws SE,IOE{
      doGet(req,req);
  }
}
```

Version2: if GET,POST mode requests want to have two different logics to execute.

=> override doGet(-,-) method having GET mode request processing logic and override doPost(-,-) method having POST mode request processing logic

```
public class MarriageServlet extends HttpServlet{

  public void doGet(req,res)throws SE,IOE{
      ....
      .... //logic for GET mode request..
      ....                 like hyperlink request)
  }
  public void doPost(req,res)throws SE,IOE{
      ....
      .... //logic for POST mode request..
      ....                 (like form submission)
  }

}
```

Approach3 (Extension of approach2) (not recomanded)
==========

version1:: if both GET,POST mode requests want to execute same request processing logic

Write request processing in user-defined method and call that method from both doGet(-,-),doPost(-,-) methods

```
public class MarriageServlet extends HttpServlet {
                                  user-defined method..
  public void process(req,res) throws SE,IOE{   // It should have same signature of
      ....                                        doXxx(-,-) methods..
      ... //request processing logic
      ....
  }

  public void doGet(req,res)throws SE,IOE{
    prcoess(req,res);
  }

  public void doPost(req,res)throws SE,IOE{
    process (req,res);
  }
}//class
```

version2:: if GET,POST requests want to execute two different logics

=>write GET mode request procesing logic in one user-defined method and call it from doGet(-,-) method, similarly write POST mode request procesing logic in another user-defined method and call it from doPost(-,-) method.

```
public class MarriageServlet extends HttpServlet{

  public void processGet(req,res)throws SE,IOE{
      ....
      .... //logic for GET mode request
      .....
  }
  public void processPost(req,res)throws SE,IOE{
      ....
      .... //logic for POST mode request
```

These two methods are use-defined methods but should have same signature of doXxx(-,-) methods..

Conclusion:: Approach2 is good.. :: reason is no need placing extra user-defined methods..

Advantages of working with doXxx(-,-) methods (doGet(-,-),doPost(-,-) methods)
==========

a) allows to differentiate logics for both GET ,POST mode requests..i.e if GET,POST mode requests are given to servlet comp at time then we differentiate their logics using doGet(-,-),doPost(-,-) methods
b) The parameters of doXxx(-,-) are HttpServletRequest, HttpServletResponse objs. so we can work with protocol "http" features..
c) 7 doXxx(-,-) methods are given to handle 7 modes of requests comming from different types of clients
d) doXxx(-,-) are designed based on the protocol "http" standards..

Form Validations
==========

=>Verifying the pattern and format of form data before it is getting used in the b.logic as inputs is called form validations , otherwise b.logic may give invalid results or exceptions by taking the inputs...
eg:: checking required fields are filledup or not
checking wheather age is typed as numeric value
and etc..

What is the difference b/w formvalidation logic and b.logic?

=>In form validation logic , the pattern and format of the form data will be verified. where b.logic/request processing logic takes form data as inputs uses them to process the request and to generate the results..

examples
==========
=>checking credit number is having 16 digits or not (format verified) (form validaton)
=>checking credit number is exsiting/valid number or not (b.logic)
=> checking wheather date vlaue is given in dd/MM/yyyy pattern or not (pattern verification) (form validation)
=> getting sales report before given data value (b.logic)
=> checking wheather age is given as numberi value or not.. and it is in the ranage of 1 through 150 is form validation logic
=> Checking wheather person is elible to vote or not based on the given age is b.logic
and etc..

Form Validation logic in web applications

Client Side

=>place java script code in form page as form validation logic

=>Executes in browser by coming browser along with form page

Server side

=>place java code before b.logic in servlet comp as form validation logic

=> always resides and executes in server by becoming part of Servlet comp code.

=>Decide wheather code is client side or server side code based on the place where is executing .. not based on the place where it is residing.

Different approaches of writing form validation logics
==========

Approach1) Write only Server side form validation logics

Limitation:: if the form page is rejected for multiple times..then there will be more network round trips b/w browser and web server.

Approach2) Write only client Side form validation logics

advantage:: reduces network trips b/w browser and webServer , enen though form page is rejected for multiple times becoz of form validations
Limitation :: there is a possibility of disabiling java script code execution through browser settings..then no form validation take place..

Approach3) write both client side and server side form validations

Advntages:: reduces network trips b/w browser and webServer , enen though form page is rejected for multiple times becoz of form validations

Though client Side java script disabled..the server side java code will take care of form validations..
Disadvantage :: => performence issue becoz of validating same form data at client side and server side

Approach4) write both client side and server side form validations but enable server side form validations only when client side form validations are not done.. (Best pratice)

Advntages:: reduces network trips b/w browser and webServer , enen though form page is rejected for multiple times becoz of form validations

Though client Side java script disabled..the server side java code will take care of form validations..

=>No Performence issue becoz server side will executes only when client side form validaitons are not done.

=> if u r copy pasting Dynamic web project of Eclipse IDE... change its context path using web project settings.. otherwise new web application name/context path will not reflect in urls..
right click on project ---> properties ----> web project settings ---->contextPath:: <new context path>--> ....

=> If the mehtod return type is void .. then the return statement placed in method definitation will not return the value.. but returns the control caller from the current method definitation.. i.e return statement with out value can be used for not executing further statements in the java method definitation.

```
public  void  m1(){
    ....
    ..
    return ;
    ... | These statements will not be executed
    .. |
}
```

note:: The error messages or success messages given by servlet/jsp comps can not be displayed in the same web page from where requested generated with out taking the support of ajax directlry or indirectly.
ajax :: AsynchronousJavaScriptAndXml (now a days every one using through angular/angularJs/ReactJs

java8 features
==========
=>forEach() method
=>lamda expression
=> functional interface
=> :: reference operator
=> Stream API
=>Date Time API
and etc...

place the following code before b.logic of MarriageServlet.java to perform server side form validations
==========

```
//read form data (req param values)
        String name=req.getParameter("pname");
        String tage=req.getParameter("page");
        String gender=req.getParameter("gender");
        //form validation logic (server side)
        List<String> errList=new ArrayList();
        System.out.println("MarriageServlet.doPost():: Server side form validation logic");
        if(name==null || name.equals("") || name.length()==0) { //required rule
            errList.add("Person name is required");
        }
        else if(name.length()<5) { //min length rule
            errList.add("Person name must have minimum 5 characters");
        }

        int age=0;
        if(tage==null || tage.equals("") || tage.length()==0) { //required rule
            errList.add("Person age is required");
        }
        else {
            try {
             age=Integer.parseInt(tage); // numeric value rule
             if(age<1 || age>125) { //range rule
                errList.add("Person age must be given 1 through 125");
             }//if
            }//try
            catch(NumberFormatException nfe) {
                errList.add("Person age must be numeric value");
            }//catch
        }//else
    //Display form validation error messages
        if(!errList.isEmpty()) {
            errList.forEach(msg->{   //java8 foreach() method with Lamda expression
                pw.println("<li><span style='color:red'>"+msg+"</span></li>");
            });
            return;
        }//if
```

Client Side form validation using java script

What is the different b/w java and java script?

java	java script
a) It programming language given by sun Ms/Oracle corp	a) It is scripting language whose code must be embedded with html tags directly or indirectly for execution and it is given bu sunMs/oracle corp + Netscape.
b) It is object oriented programming language	b) It is object based (no Inheritence and polymorphism) language
c) To execute JAva code,we need JRE/JVM	c) To execute Java Script code , we need java script engine of browser s/w
d) In web application in can be in servlet/jsp comps as server side code.	d) In web application , it can be used along with html code as client side code..
e) can be used to all kinds of applications like standalone Apps, web application, distributed Apps and etc..	e) can be used only in web application development.

JavaScript
=========
=>It is based on DOM (Document Object Model).. i.e every tag will be treated as an object.. having methods and properties(attributes).
=>It is giving lots of built-in objects.. like document, window, navigator, history,frames and etc..
=>It supports event driven programing i.e we can execute logics based on the events that are raised like onclick, onblur, ondbiclick, onchange and etc..
=> Java script not strictly typed
=> Java script is case-sensitive
and etc..

Client side form validations in MarriageApp input.html form page using Javascript
==========

=>person name is required
=>person name must have min of 5 chars
=>person age is required
=>person age must be numeric vlaue
=>person age must be there between 1 through 125

To define function in JS

```
function <function-name>(params,...){
    ....
    ...
}
```

To declare variables in JS

```
var <variablename>;
 or
let <variablename>;
```

=>parameter data types and variable data types will be decided dymamically based on the values that are assigned.
=>No return type is required for the function.. but function can return any value.

input.html (form page with client side form validations)
==========

```
<script language="JavaScript">
  function validate(frm){
    //read form data
    let name=frm.pname.value;
    let age=frm.page.value;
    let flag=true;
    //client side form validation logic
    if(name==""){ //required rule
     alert("person name is required");
     frm.pname.focus(); //text box gains the focus
     flag=false;
    }
    else if(name.length<5){ // min length
      alert("person name must have min of 5 chars");
      frm.pname.focus(); //text box gains the focus
      flag=false;
    }

    if(age==""){ //required rule
      alert("person age is required");
      frm.page.focus();
      flag=false;
    }
    else if(isNaN(age)){ //numer value rule
      alert("person age is not a number");
      frm.page.focus();
      flag=false;
    }
    else if(age<1 || age>125){ // age range rule
      alert("person age must be through 1 through 125");
      frm.page.focus();
      flag=false;
    }
    return flag;  //true --> no form validations , false for form validation errors
  }//function
</script>


<body bgcolor="magenta">
 <h1 style="color:red;text-align:center">Shaadi.com</h1>
  <center>
    <img src="images/marriage.jpg"  width="400" height="100">
  </center>

  <form action="marriageurl" method="POST" onsubmit="return validate(this)">
    <table bgcolor="aqua" align="center">
      <tr>
        <td>Person name:: </td>
        <td><input type="text" name="pname" > </td>
      </tr>
      <tr>
        <td>Person age:: </td>
        <td><input type="text" name="page"  > </td>
      </tr>
      <tr>
        <td>Person Gender:: </td>
        <td>
           <input type="radio" name="gender" value="M">Male
           <input type="radio" name="gender" value="F" checked>FeMale
        </td>
      </tr>
      <tr>
        <td><input type="submit"  value="Check Marriage Eligibility"> </td>
        <td><input type="reset"  value="cancel"> </td>
      </tr>
    </table>
  </form>
</body>
```

(Here keeping "return" is very important befor js function call becoz it takes validate(-) function result (true/false) and gives to browser and browser uses that to check form validation errors are there (false) or not there(true) ..if not there it sends the request server based on action url.. otherwise it blocks the request in the browser itself)

To disable java script using Mozilla FireFox

---

type "about:config" In browser address bar ---> accept risk ---> search java script ---> go to javascript.enabled key ---> change the value to false

To disable java script using chrome browser

Chrome "customize conntrol button" ⋮ -->settings ---> search for java script

-->go to site settings ---> java script --->blocked.

HTML 5 is supplying some form validation rules.. like requured,min,max,maxlength and etc..
Working with them are having some limitations

a) Very less form validations are given
b) Can not customize form validation error messages
c) writing some validation logics through java script and some other logics through html 5 form validations does not look good.

and etc..

note:: Write all client side form validations using JAva script..

```
<input type="text" name="pname" required maxlength="10" >
input type="text" name="page" min="1" max="125" >
```

=>To Improve resuability of JS code across the multiple webpages given by different comps and to hild java script code soruce visibility from browser's view resoruce option.. it recomanded place java script code in .js file and link to that file to multiple web comps..

input.html

==========

```
<script language="JavaScript" src="js/validation.js">
 </script>
```

webcontent

|--->js

|-->validation.js

```
function validate(frm){
    ...
    ...
    ...
    ...
}
```

refer

=> innerHTML/outerHML

=>document.getElementById(-)

=>In recent versions of html like html4/5 the <font> tag deprecated and as alternate two tags are given

a) ---> To apply styles on 1 line of text

b) ---> To apply styles on multiple lines of text..

note:: we can get any tag as object based on id by using document.getElementById(-) method as part of JS DOM Programming.. and we can replace body to that tag usisng innerHTML/innertText or we can replace total tag with new content using outerHTML/outerText.

```
document.getElementById("nameErr").innerHTML="person name is required";
```

=By using hidden box support the form page can send signal to Server/Servlet comp along with the request wheather client side JS form validations are performed or not.. if performed then it will disable server side form validations otherwise it will execute server side form validations..

(Approach4 based form validations)

input.html (c)

```
<script language="javaScript" src="js/validation.js">
 </script>


<body bgcolor="magenta">
 <h1 style="color:red;text-align:center">Shaadi.com</h1>
  <center>
    <img src="images/marriage.jpg"  width="400" height="200">
  </center>
                                                                    (h)  (e)
   (i)
   <form action="marriageurl" method="POST"  onsubmit="return validate(this)">
    <table bgcolor="aqua" align="center">
      <tr>
        <td>Person name:  </td>
        <td><input type="text" name="pname"  ><span style="color:red" id="nameErr"></span> </td>
      </tr>
      <tr>
        <td>Person age:  </td>
        <td><input type="text" name="page"  > <span style="color:red" id="ageErr"></span> </td>
      </tr>
      <tr>
        <td>Person Gender:  </td>
        <td>
            <input type="radio" name="gender" value="M">Male
            <input type="radio" name="gender" value="F" checked>FeMale
        </td>
      </tr>
      <tr>                                                  (d)
        <td><input type="submit"  value="Check Marriage Eligibility"> </td>
        <td><input type="reset"  value="cancel"> </td>
      </tr>
    </table>
     <input type="hidden" name="vflag"  value="no"/>
   </form>
</body>
```

validation.js (f)

```
function validate(frm){
      alert("client side...")
    //empty the form validation error messages
     document.getElementById("nameErr").innerHTML="";
     document.getElementById("ageErr").innerHTML="";

      //read form data
      let name=frm.pname.value;
      let age=frm.page.value;
      let  flag=true;
      //client side form validation logic
      if(name=="){  //required rule
       document.getElementById("nameErr").innerHTML="<i>person name is required</i>";
       frm.pname.focus(); //text box gains the focus
       flag=false;
      }
      else if(name.length<5){  // min length
        document.getElementById("nameErr").innerHTML="person name must have min of 5 chars";
        frm.pname.focus(); //text box gains the focus
        flag=false;
      }

      if(age=="){  //required rule
         document.getElementById("ageErr").innerHTML="person age is required";
         frm.page.focus();
         flag=false;
      }
      else if(isNaN(age)){  //numer value rule
        document.getElementById("ageErr").innerHTML="person age must be numeric value";
         frm.page.focus();
         flag=false;
      }
      else if(age<1  || age>125){  // age range rule
        document.getElementById("ageErr").innerHTML="person age must be between 1 throuhg 125";
         frm.page.focus();
         flag=false;
      }
      //change  vflag (hidden box) value to "yes"  to indicate client side form validations are done
       frm.vflag.value="yes";
(g)  return flag;   //true --> no form validations , false for form validation errors
  }//function
```

MarriageServlet.java (i)

```java
public class MarriageServlet extends HttpServlet {

    @Override (k)
    public void doPost(HttpServletRequest req, HttpServletResponse res) throws ServletException, IOException {
     System.out.println("MarriageServlet.doPost(-,-)");
            // set response content type
            res.setContentType("text/html");
            //get PrintWriter
            PrintWriter pw=res.getWriter();
            //read form data (req param values)
            String name=req.getParameter("pname");
            String tage=req.getParameter("page");
            String gender=req.getParameter("gender");
            String vstatus=req.getParameter("vflag");
            //execute server side form validation logic only when client side JS is disabled
            int age=0;
  if(vstatus.equalsIgnoreCase("no")) {
            //form validation logic  (server side)
            List<String> errList=new ArrayList();
            System.out.println("MarriageServlet.doPost():: Server side form validation logic");
            if(name==null || name.equals("") || name.length()==0) {  //required rule
                    errList.add("Person name is required");
            }
            else if(name.length()<5) {  //min length rule
                    errList.add("Person name must have minimum  5 characters");
            }


            if(tage==null || tage.equals("") || tage.length()==0) { //required rule
                    errList.add("Person age is required");
            }
            else {
                    try {
                     age=Integer.parseInt(tage);  // numeric value rule
                     if(age<1 || age>125) {  //range rule
                            errList.add("Person age must be given 1 through 125");
                     }//if
                    }//try
                    catch(NumberFormatException nfe) {
                            errList.add("Person age must be numeric value");
                    }//catch
            }//else
    //Display form validation error messages
             if(!errList.isEmpty()) {
                    errList.forEach(msg->{   //java8 foreach() method with Lamda expression
                            pw.println("<li><span style='color:red'>"+msg+"</span></li>");
                    });
                    return;
             }//if
}//if
else {
     age=Integer.parseInt(tage);  // To convert String age value to numeric value
}//else

            //write b.logic or request processing logic
            System.out.println("MarriageServlet.doPost():: Server side b.logic");
            pw.println("<h1 style='color:blue;text-align:center'> Shaadi.com </h1>");
            if(gender.equalsIgnoreCase("M")) {
                    if(age<21)
                            pw.println("<h1 style='color:red;text-align:center'> Mr."+name +" u r not elgible for marriage enjoy life </h1>");
                    else
```

web.xml

```xml
<?xml version="1.0" encoding="UTF-8"?>
<web-app xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
         xmlns="http://xmlns.jcp.org/xml/ns/javaee"
         xsi:schemaLocation="http://xmlns.jcp.org/xml/ns/javaee
           http://xmlns.jcp.org/xml/ns/javaee/web-app_4_0.xsd"
           id="WebApp_ID" version="4.0">
  <servlet>
    <servlet-name>marriage</servlet-name>
    <servlet-class>com.nt.servlet.MarriageServlet</servlet-class>
  </servlet>
  <servlet-mapping>
    <servlet-name>marriage</servlet-name>
    <url-pattern>/marriageurl</url-pattern>
  </servlet-mapping>
(i) <servlet>
    <servlet-name>welcome</servlet-name>
    <servlet-class>com.nt.servlet.WelcomeServlet</servlet-class>
  </servlet>
  <servlet-mapping>
    <servlet-name>welcome</servlet-name>
    <url-pattern>/welcomeurl</url-pattern>
  </servlet-mapping>

  <welcome-file-list> (b)
     <welcome-file>input.html</welcome-file>
     <welcome-file>home1.html</welcome-file>
    <welcome-file>input1.jsp</welcome-file>
    <welcome-file>home1.jsp</welcome-file>
  </welcome-file-list>

</web-app>
```

(m)

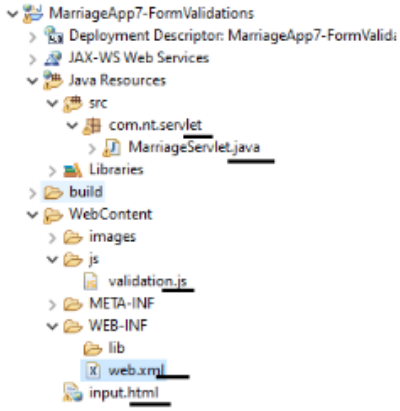
```java
                    if(age<21)
                            pw.println("<h1 style='color:red;text-align:center'> Mr."+name +" u r not elgible for marriage enjoy life </h1>");
                    else
                            pw.println("<h1 style='color:green;text-align:center'> Mr."+name +" u r  elgible for marriage , But think once </h1>");
            }
            else {
                    if(age<18)
                            pw.println("<h1 style='color:red;text-align:center'> Miss."+name +" u r not elgible for marriage, be happy </h1>");
                    else
                            pw.println("<h1 style='color:green;text-align:center'> Miss."+name +" u r  elgible for marriage , But think Thrice </h1>");
            }

            //add graphical hyperlink for home  navigation
            pw.println("<br> <a href='input.html'><img src='images/home.png' width='50' height='50'> </a>");
            //close stream
            pw.close();
    }//doPost(-,-)

    @Override
    public void doGet(HttpServletRequest req, HttpServletResponse res) throws ServletException, IOException {
     System.out.println("MarriageServlet.doGet(-,-)");
            doPost(req,res);
    }
}//class
```

URL in browser addres bar

(a)

http://localhost:3030/MarriageApp-FormValidations

(we are assuming no form validation errors and JS code is executed)



GIT URL :: https://github.com/natarazworld/NTAJ414

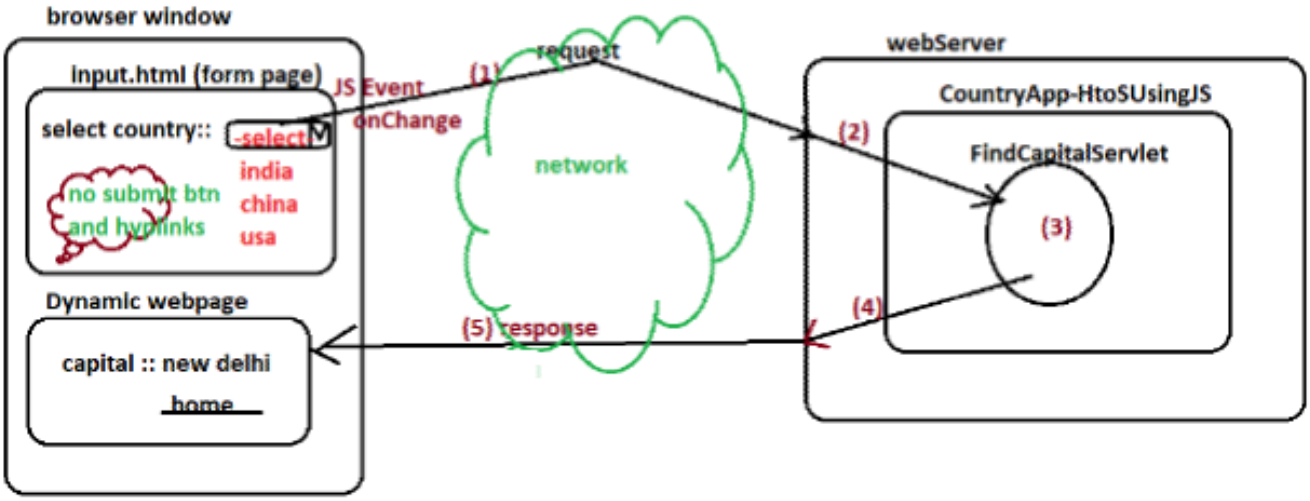
Html to servlet communication using Java Script
==========

=>It is very useful to send requests to Servlet comp html file not by using hyperlink or submit button .. just by using various events raised in web page or form comps like onblur, onLoad ,onchange, onFocus ,onClick ,onkeydown,onkeyup and etc...

eg:: after choosing new password .. it should given wheather password is weak or strong for onblur (loosing focus) event raised on password box.

eg:: After selecting the country from the select box the request should go and should capital on country for onchange event (changing the item of select box)

(While working these uses cases of java script event based request submission we need to take support ajax to inorder to recieve response and display response in the same webpage from where request is generated)



=>we can use form obj.submit() method to send request to destionation web comp

formal args/params

```
public int sum(int x,int y){
  return x+y;
}
```

```
int a=10;
int b=20;
sum(a,b);
```

note:: formal params and actual params need not to match.

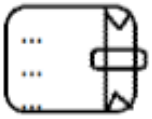
actual params/args

While working the following comps of the form page.. the select item visible text/data will not go to server as request param value.. The value/data kept in "value" attribute of selected item will go to server as request param value.

=>radion buttons

=>check boxes

=> Select box /combo Box / DropDown box (Allows to select 1 item a time)

=> List Box  (Allows to select more than 1 item a time by holding ctrl key)

Example App code
==========

input.html (c)
=========

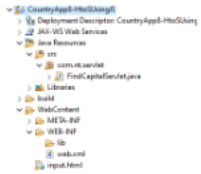
```
<body bgcolor="lightblue" >
      <h1 style="color:red;text-align:center"> Html to  Servlet communicaiton Using JS </h1>
       <form action="countryurl" name="frm"  method="POST">
          Select country :: <select  name="country"  onchange="send()"> (e)
                              <option value="" selected>--select---</option>
                              <option  value="0"> India </option>
                              <option  value="1"> China </option>
                              <option  value="2"> USA </option>
                              <option  value="3"> Germony </option>
                              <option  value="4"> Japan </option>
                             </select>
                  (d)
                  select
                  on time

       </form>
</body>
  <script language="JavaScript">
      function  send(){ (f)
        frm.submit();  //JS method invoked form object (frm)
      }      (g)
  </script>
</html>
```

web.xml

```
<?xml version="1.0" encoding="UTF-8"?>
<web-app xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns="http://xmlns.jcp.org/xml/ns/javaee"
xsi:schemaLocation="http://xmlns.jcp.org/xml/ns/javaee http://xmlns.jcp.org/xml/ns/javaee/web-app_4_0.xsd" id="WebApp_ID"
version="4.0">
 <display-name>CountryApp8-HtoSUsingJS</display-name>
(b) <welcome-file-list>
  <welcome-file>input.html</welcome-file>
 </welcome-file-list>
 <servlet>
(i)  <servlet-name>capital</servlet-name>
  <servlet-class>com.nt.servlet.FindCapitalServlet</servlet-class>
 </servlet>
 <servlet-mapping>
  <servlet-name>capital</servlet-name>
  <url-pattern>/countryurl</url-pattern>
 </servlet-mapping>
</web-app>
```

FindCapitalsSErvlet.java

```
package com.nt.servlet;

import java.io.IOException;
import java.io.PrintWriter;

import javax.servlet.ServletException;
import javax.servlet.http.HttpServlet;
import javax.servlet.http.HttpServletRequest;
import javax.servlet.http.HttpServletResponse;
                    (j)
public class FindCapitalServlet extends HttpServlet {

      @Override    (k)
      public void doPost(HttpServletRequest req, HttpServletResponse res) throws ServletException, IOException {
        //get PrintWriter
            PrintWriter pw=res.getWriter();
            //set response content type
            res.setContentType("text/html");
            //read form data
             int countryCode=Integer.parseInt(req.getParameter("country"));
             //write b.logic /request processing logic
             String capitals[]=new String[] {"New Delhi","Bejing","WashingtonDC","Berlin","Tokyo"};
             //write response /output to  response obj
             pw.println("<h1 style='color:red;text-align:center'> Capital City name is ::"+capitals[countryCode]+"</h1>");
             //add home hyperlink
             pw.println("<br><a href='input.html'>home</a>");
             //close stream
             pw.close();
      }//doPost(-,-)

      @Override
      public void doGet(HttpServletRequest req, HttpServletResponse res) throws ServletException, IOException {
        doPost(req,res);
      }//doGet(-,-)


}//class
```



(a)

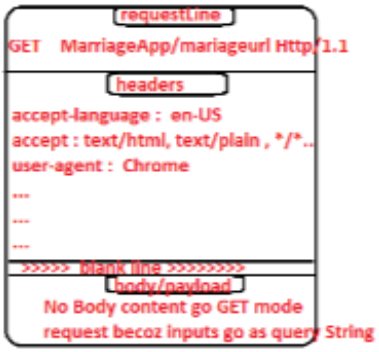
request url :: http://localhsot:3030/CountryApp8-HtoSUsingJS/

Q)After getting webpage on to browser.. i modified the source code of webpage using view-source option.Can u tell me wheather webcontent will be effected or not?

Ans) will not reflect in the web page.. becoz after modification.. it we say referesh. the request server .. and the server web content executes which is not modified..

http://localhost:3030/MarriageApp/marriageurl?pname=raja&page=30&gender=M (request url) (GET)

Http request structure



GET mode request carries enduser supplied form data/other data as query String.

After recieving request based on different actions done enduser like typing url in the browser address bar, clicking on hyperlink , submitting form raising java script event and etc.. the browser generated request structure putting some extract info as shown in the diagrams..

---

http://localhost:3030/MarriageApp/marriageurl (request url) (POST)

Http request structure

POST mode request carries enduser supplied form data/other data as request body content /payload

=>requestLine contains basic Info about the currently generated request.

=>request header names are fixed and given by protocol "http" sepcification and automcally carray more Info about browser or client setup along with request.. To read these request header values in our servlet comp we need to request.getHeader(-) and etc..

=>HttpServletRequest object provides multiple getXxx() methods to read various details from request object that like request line info, request header Info, request params Info and other misc Info..

```
public abstract java.lang.String getAuthType();
public abstract jakarta.servlet.http.Cookie[] getCookies();
public abstract long getDateHeader(java.lang.String);
public abstract java.lang.String getHeader(java.lang.String);
public abstract java.util.Enumeration<java.lang.String> getHeaders(java.lang.String);
public abstract java.util.Enumeration<java.lang.String> getHeaderNames();
public abstract int getIntHeader(java.lang.String);
public default jakarta.servlet.http.HttpServletMapping getHttpServletMapping();
public abstract java.lang.String getMethod();
public abstract java.lang.String getPathInfo();
public abstract java.lang.String getPathTranslated();
public default jakarta.servlet.http.PushBuilder newPushBuilder();
public abstract java.lang.String getContextPath();
public abstract java.lang.String getQueryString();
public abstract java.lang.String getRemoteUser();
public abstract boolean isUserInRole(java.lang.String);
public abstract java.security.Principal getUserPrincipal();
public abstract java.lang.String getRequestedSessionId();
public abstract java.lang.String getRequestURI();
public abstract java.lang.StringBuffer getRequestURL();
public abstract java.lang.String getServletPath();
public abstract jakarta.servlet.http.HttpSession getSession(boolean);
public abstract jakarta.servlet.http.HttpSession getSession();
public abstract java.lang.String changeSessionId();
public abstract boolean isRequestedSessionIdValid();
public abstract boolean isRequestedSessionIdFromCookie();
public abstract boolean isRequestedSessionIdFromURL();
and etc...
```

Methods of javax.servlet.http.HttpServletRequest(I)

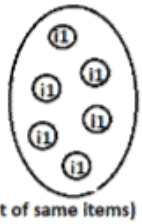
What is the difference between GET and POST mode requests?

GET	POST
a) This is default mode ,if no mode is specified for the request.	a) This is not a default mode
b) It is designed to "GET" data from server by sending request	b) It is desinged to POST data server along with request
c) It can query data from SErver by sending limitted amout of query data(input) along with the request that 2kb to 8kb (In many browsers it is 2kb)	c) it can POST/send unlimited amount of data to server along with request
d) Sends query data to server along with request as queryString appended to the request url (refer diagram)	d) Sends data to server along with request as request body/payload (refer diagram)
e) GET Mode request Structure does not contain request BODY/Payload (refer diagram)	e) POST Mode request Structure contains request BODY/Payload (refer diagram)
f) HEre there is data no Security/Secracy as form data appeares in the browser address bar as query String	f) The Data security/secracy is possible with POST mode request becoz data goes as request body
g) Does not support file upload activitity	g) supports file uploading
h) can send only text data along with request.	h) can send both text and binary data(images,audio,vedio andetc..) along with the request.
i) In General GET PErforms read operation on server	i) Performs both read and write/update operation on the server. (In General)
j) GET mode requests are safe to repeat. (Idempotent) (Using refresh or back button)	j) POST mode requests are not safe to repeat. (non-Idempotent)
k) To processs GET mode requests in servlet comp use service(-,-) or doGet(-,-) method	k) To process POST mode requests in servlet comp use service(-,-) or doPost(-,-) methods
l) GET Mode request is bit faster to go server	l) POST mode request is bit slow compare to GET mode request
m) Does not support data encrytion	m) supports ..
n) GET Supports bookmarking of web pages (in all situations)	n) POST does not support in most of situations becoz there is no query String in the url
o) GET Support caching /buffering web page content	o) POST does not support becoz it is not having query String in the request url
p) GET is recommaded for hyperlinks based requests	p)POST recomand form related submit button, java script related requests.
q) To generate GET mode request mode requests i) typing url in the browser address bar ii) clicking on hyperlinks iii) <form action="....">...</form> iii) <form action="..." methpd="GET">...</form>	q) To generate POST mode request <form action="....." method="POST">.... ... </form>

note:: Certain web page will come , not just becoz of request url ,also becoz of the query String inputs.. So in bookmarking we need both url and query String..

=>To Book mark any web in google chrome press star symbol of browser address bar or Ctrl+D.

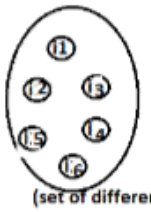
Pool



(set of same items)

(Gives the reusability of same items)

Cache/Buffer



(set of different items)

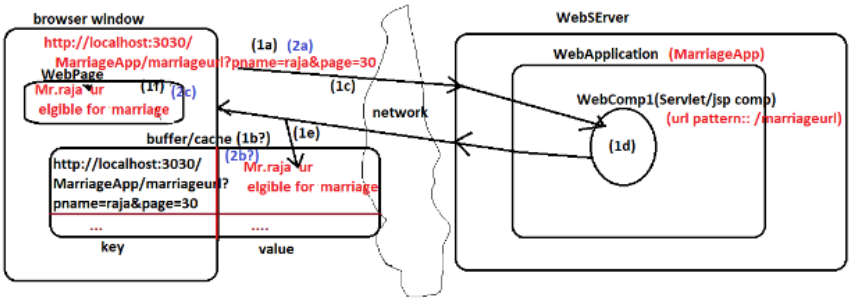
(Gives reusability of different items..)

Cache/Buffer
==========

=> It is a tempoary memory that holds data for temporary period..

=> In Client- Server App the cache/buffer at client side holds server supplied data and uses that data across the multiple same requests .This process reduces the network round trips between client and server ..

=> the cache/buffer at browser side holds web server/web application supplied data and uses that data across the multiple same requests .This process reduces the network round trips between browser and web applicaton(webServer) ..



(1a) to (1f) :: 1st request
(2a) to (2c) ::other than 1st request like 2nd/3rd/4th request.. and etc..

(all requests are same requeusts i.e they have same request url and query string data)

=>Once we close the browser window.. the buffer/cache will be vanished automatically..

=>The buffer/cache can have multiple requesturls with different req param as keys their result/response data as values.

Limitation of buffer/cache
==========

if the web comp of web application changing its result/response not based on inputs ..but based on time of request generation.. better disable buffer/caching at browser side for that web comp generated response/result.

eg1:: The web comp that displays Live game score details like crickinfo.com

eg2:: The web comp that displays Stock market share details like sharekhan.com

=>To instruct browser not to kee comp certain web comp resutls/response in the buffer/cache use "cache-control"(http 1.1) or pragma(http1.0) response header .

code in servlet comp::

```
res.setHeader("cache-control","no-cache"); (or)
res.setHeader("pragma","no-cache")
```

note:: GET mode request url contains queryString and the keys in browser cache/buffer expects request url.. So GET more request support caching/buffering where as POST requeest does not support becoz the POST mode request url does not contain query String.

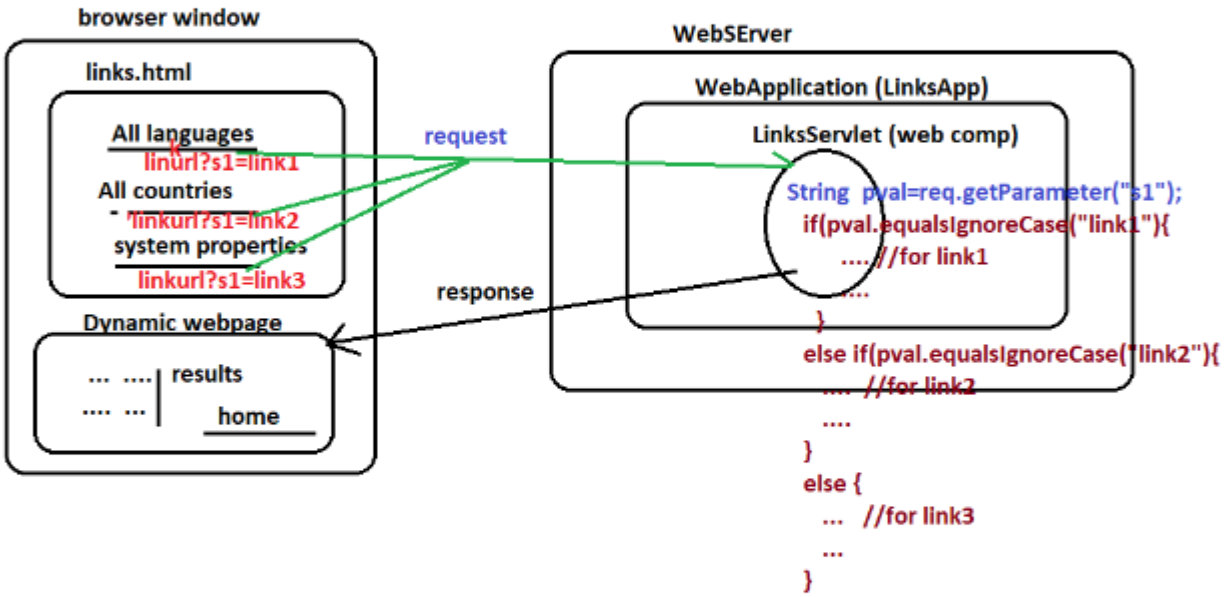
<a href="wishurl"> go </a> (Does not carry any thing along with request)

<a href="wishurl?sno=101&sname=raja"> go </a> (Carries static/fixed addtional data along with request becoz we appended query string to the request url)

In Servlet comp

```
----------------------------
int no=Integer.parseInt(req.getParameter("sno")); //gives 101
String name=req.getParameter("sname"); //gives raja
```

How to differentiate logics in Servlet comp , if multiple hyperlinks are giving request to same servlet comp?



=> we need append query String to the "href" url of of hyperlinks having same request param name and with different values . we can take this additional request param value as the criteria value in servlet comp to differentiate the logic.

input.html

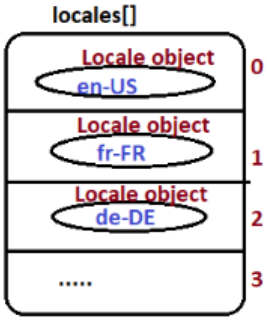
```
----------------
<a href="linkurl?s1=link1"> all languages </a>
<a href="linkurl?s1=link2> all contries </a>
<a href="linkurl?s1=link3> system propertoes  </a>
```

=>Locale means language+country

eg:: en-US (english as it speaks in USA)
fr-FR
de-DE (Germain as it speaks in Germany)
fr-CA
hi-IN (Hindi as it speaks in India)

Each java.util.Locale class obj reperesents one Locale.. and This class gives static method called Locale.getAvailableLocales() which returns Locale class object []

```
Locale locales[]=Locale.getAvailableLocales();
```



To get only countries

```
==============
for(Locale l: locales){
        S.o.p(l.getDisplayCountry());
  }
```

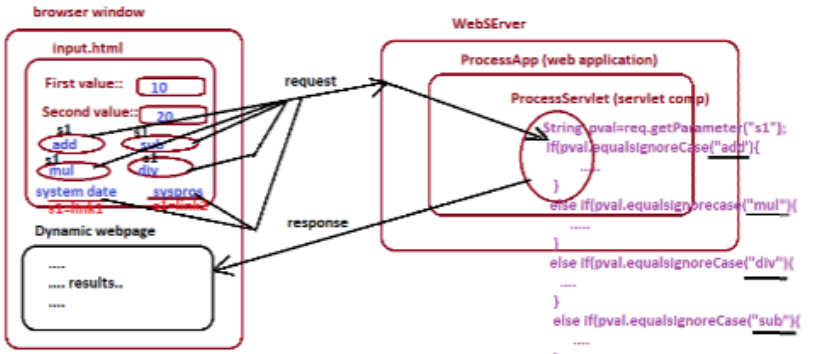
To get only languages

```
==============
for(Locale l: locales){
        S.o.p(l.getDisplayLanguage());
  }
```

To get System properties

```
=======================
Properties props=System.getProperties();
```

How to diffentiate logics in servlet comp when multiple hyperlinks and submit buttons are giving request same servlet comp




```
String pval=req.getParameter("s1");
if(pval.equalsIgnoreCase("add"){
    ....
}
else if(pval.equalsIgnorecase("mul"){
    ....
}
else if(pval.equalsIgnoreCase("div"){
    ....
}
else if(pval.equalsIgnoreCase("sub"){
    ....
}
else if(pval.equalsIgnoreCase("link1")){
    ....
}
else if(pval.equalsIgnoreCase("link2")){
    ...
}
```

give same name and differnt captions to submit buttons alos give addtional params to hyperlinks having submit button name as additional req param name(s1). we can use this addtional req param value (s1) as the criteria value to differentiate the logics..
(refer the diagam)

```
<form action="..." method="...">
  ....
  ...
 <input type="submit" name="s1" value="send">
</form>
```

=>Sends the submit caption to server as req param value s1=send

---

```
<form action="...." method="....">
  ....
  ...
 <input type="submit" value="send">
</form>
```

It does not send the caption of submit to server as the request param value.

```
PeocessApp10-WorkingMultipleSubmitButtons-hyperlinks (EDWP)
    |----->java resoruces
            |--->src
                |---->com.nt.servlet
                        |---->ProcessServlet.java
    |----->webcontent
            |----->input.html
            |----->WEB-INF
                    |--->web.xml
```

note:: the hyperlinks added to form page does not carray form comps data when they generate request..

Diffferent types html form comps

standard form comps

- textbox (<input type="text" ...>)
- password ((<input type="password" ...>)
- textarea (<textarea> ... </textarea>)
- radio buttons (<input type="radio" ...)
- single checkbox (<input type="checkbox"..)
- grouped checkboxes (<input type="checkbox"..)
- select box /drop down box <select > <option> ... </option> </select>
- List box <select multiple > <option> ... </option> </select>
- file upload <input type="file" ...>
- submit button <input type="submit" ..>
- reset button <input type="reset" ... >
- standard button <input type="button" ..>
- hidden <input type="hidden" ...>

Html5 form comps

- date
- datetime-local
- time
- datetime
- color
- search
- tel
- number
- url
- range
- month
- week
- image
- email
- and etc..

<input type="....." .....>

note:: if form comp/rquest param is having only one value then
use req.getParameter(-) to read the form comp value (for most of form comps this is enough)
⇩
return String obj

note:: if form comp/rquest param is having multiple values then
use req.getParameterValues(-) method to read the form comp values (for List Box, grouped checkboxes)
⇩
returns String[]

In form page::

```
Hobies:: <input type="checkbox" name="hb" value="reading">Book Reading
         <input type="checkbox" name="hb" value="watching">Watching movies
         <input type="checkbox" name="hb" value="listening">Listening to music
         <input type="checkbox" name="hb" value="roaming">Travelling
```

In servlet comp::

```
String hobies[]=req.getParameterValues("hb");
```

⇩

if all checkboxes selected the hb[] contains "reading","watching","listening","roaming" as the element values..

Working different types of form comps

=>Html basic + htm5 togather is offering 30+ form comps..

=>Html 5 is offerning new comps... also giving some comps as as text boxes with builtin- form validations.

=>Except ListBox,checkbox comps the remaining the comps will send either emptry string or default value as the request parameter value even though they are not selected or not filledup with values , Where as for list box and check comps the values will give to server as request parameter values only when they are selected otherwise no request parameter will be formed for them. So for these comps we must non-select state explicity.. (i.e we must assign on or other value at servlet comp if they are not selected)

```
String ms=req.getParameter("ms");
    if(ms==null)
        ms="single";                    //for checkbox

    String hobies[]=req.getParameterValues("hb");
    if(hobies==null)
        hobies=new String[] {"no hobies are selected"};   //for group for checkboxes

    String languages[]=req.getParameterValues("languages");
    if(languages==null)
        languages=new String[] {"no languages are selected"};   Lisb Box
```

Servlet Life cycle

==========

=>Life cycle means all activities from start to end or birth to death.

=>Human Life cycle contains

- ->Birth
- ->start of schooling
- ->end of schooling
- -> getting job
- -> marriage
- ->retirement
- -> death

as the life cycle activities or life cycle events

=> Servlet Contains manages servlet comp life cycle having the following life cycle events/activities

- ->Servlet Instantiation Event (1)
  (Raises when Servletcontainer creates our servlet class obj)
- -> request processing event (2)
  (raises for every request, when the servlet comp is ready to process the request)
- -> Destruction Event (3)
  (raises when the servlet comp is about to destroy by SErvletcontainer)

=>Keeping track of Servlet comp activies /events form its birth to death (object creation to Object destruction) is called Servlet life cycle.

=>The methods that will be executed servlet container automatically for life cycle events are called Servlet life cycle methods or container callback methods.

1) init(ServletConfig cg) --> Life cycle method of Instantitation Event

signature :: public void init(ServletConfig cg)throws ServletException

=>It is one time executing block of servlet comp life cycle.

=>Programmer overrides this method in servlet comp class having initilaization logic like creating jdbc connection with Db s/w.

=> init() method also there in servlet api... but it is not life cycle method , It is given as convience method for programmer..

note:: ServletConfig obj is 1 per Servlet class obj and will be useful to pass addtional info to servlet comp and to gather more about servlet comp.

2) service(ServletRequest req,ServletResponse res)---> Life cycle method of request processing event

signature :: public void service(ServletRequest req,ServletResponse res)throws ServletException,IOException (1st service(-,-) method)

=> Once Servlet Comp instantation and intialization is completed and when it is ready to process then this request processing event will raised and service(-,-) life cycle method will be called.

note:: This repeatedly executing block of servlet comp life cycle... It executes for every request ,So we place request processing logic(b.logic) in this method.

note:: 2nd service(-,-) method and 7doXxx(-,-) are not life cycle methods... they are given as convience methods for programmers to work protocol http features.

note:: 2nd service(-,-) and 7doXxx(-,-) are called through 1st service(-,-) method directly or indirectly by Serlvet Container..

3) destroy() --- Destruction Event

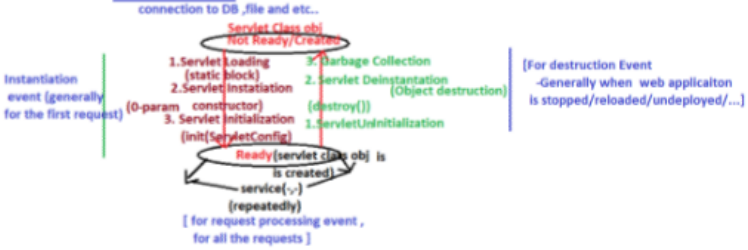
=> signature :: public void destroy()

=>When ServletContainer is about to destroy our servlet comp class object ,then destruction event will be raised and this life cycle method destroy() will execute.

=> This is one time executing block of servlet comp life cycle.

=>By overriding this method programmer keeps uninitialization logics like closing jdbc connection and releaseing non-java resources from Servlet comp.

connection to DB ,file and etc..

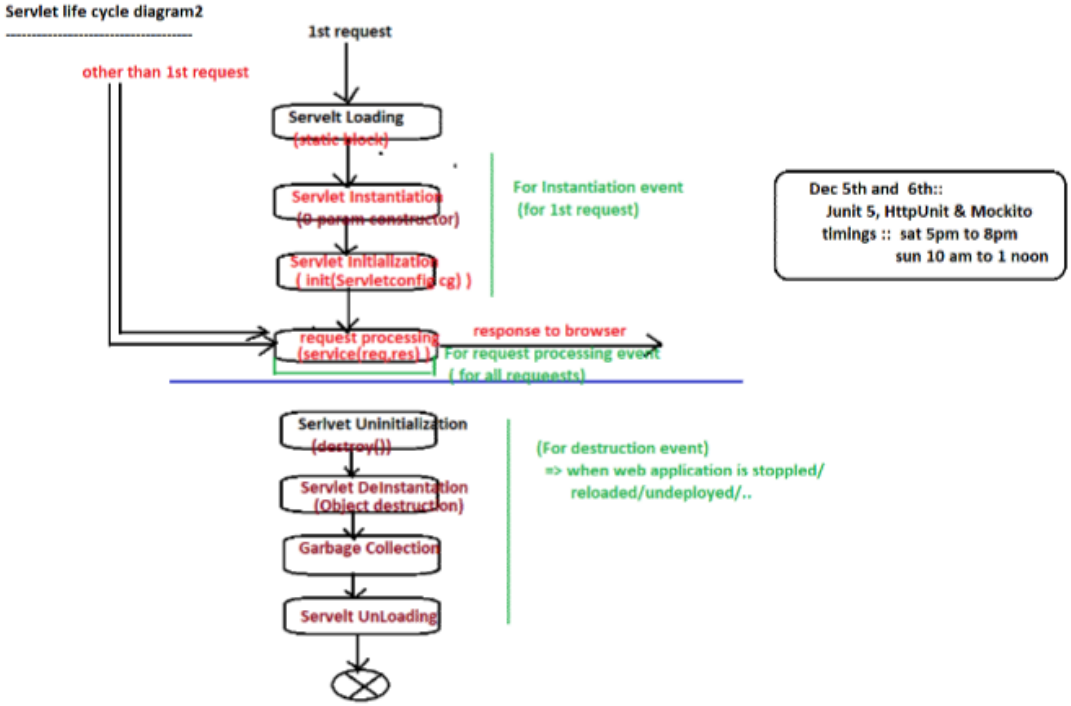


=>Servlet Container is giving servlet life cycle methods to programmers for two reasons

a) To overiride servlet life cycle methods to place programmer choice logics in servlet comp.. So programmer logics will execute even though the entire life cycle servlet comp is taken care by servlet container

b) To get access ServletContainer created objects in our servlet comp as the parameters of servlet life cycle methods. like init(-) method Servletconfig obj and service(-,-) method gives ServletRequest, ServletResponse objs

Servlet life cycle diagram2



=>While working with Eclipse Tomcat (Tomcat integrated with Eclipse IDE) we can not see tomcat home page or Manager page .. i.e we can not perform stop , reload and undeploy activities on the web applications. But we can deploy web application developed in Eclipse IDE in out side Tomcat Server (extenal server) by using export option.. (For this external Tomcat Java version and Eclipse web application Java version must be compitable)

(the one that is chosen during the installation of Tomcat)

(Check by using Project Facets java version from web application properties)

Right On Eclipse web applicationProject ---> export ---> war file --->
Destination :: E:/Tomcat 9.x/webapps folder -->select all checkboxes (optional) -->Finish..

note:: we can stop web application or web server but servlet comp directly.. but by stopping web application or webServer we are indirectly destroying the servlet class object.

note:: ServletContainer does not use init(-) method logic to create our servlet class object.. It is having its own internal logic to create our servlet class object. So programmer uses init(-) method for writing his choice intialization logics

note:: ServletContainer does not use destroy() method logics to destroy our servlet class object.. It is having its own internal logic to destroy our servlet class object. So programmer uses destroy() method for writing his choice uninitialization logics.

=>SErvletContainer/WebContainer does not use JVM's Garbage Collector to destroy our servlet class objs ,It will use its own Garbage collector for the same becoz Servletcontainer to destroy our servlet class objects even though it is in utilization forcefully when required.. but JVM Gargbage Collector can destroy the objs only when they are completely free/idle having no reference.

Limitations of "new" operator
==========

Test t=new Test();

note:: new Operator creates the object at runtime , but expects the presence of the java class from compile time onwords.. i.e we can not use new operator to create the object of java class whose class name comes to Application dynamically at runtime. For this we need to use newInstance() method of Java.lang.Class .

Test t=(Test)Class.forName("Test").newInstance();

Loads the java class at runtime

creats the object of loaded class at runtime

ServletContainer does not use "new" operator create our servlet class object becoz it servlet class name from web.xml file will be collected dynamically at runtime and object should created at runtime itself. So it uses newInstance() method for object creation.

LcTestServlet lc=(LcTestSErvlet)Class.forName("com.nt.servlet.LcTestServlet").newInstance();

Loads our servlet class at runtime by collecting from the InMemory MetaData of web.xml

->creates the object of the loaded servlet class at runtime.

what happens if we call destroy() method from service(-,-) method?

what happends if we call init() method from service(-,-) method?

what happends if we call destroy() method from init(-) method?

Can we place main(-) method in our servlet comp class?

Ans) Yes , we can place .. but that will not executed becoz it is not the life cycle method of servlet comp class.

Q) How Servlet comp is executing with out main(-) method?

Ans) Servlet container is executing servlt comp through life cycle methods.. Since main(-) method is not life cycle method of servlet comp .. it is not required in servlet comp class.

Ans2) only standalone Apps begin their execution by JVM using main(-) method.... Servlet comp is not a standalone App .. It is web comp whose execution is taken care by SErvletContainer throguh life cycle methods, So main(-) method is not required in Servlet comp as main(-) is not life cycle method of servlet comp.

Ans3) JVM starts the webServer by calling main(-) method.. This main(-) creates SErvlet Container ---> ServletContainer manages the given SErvlet comp life cycle through life cycle methods . So main(-) is not required in SErvletcontainer and also in Servlet comps.. i.e main(-) will be there only in the class that starts server.. In Tomcat server that class name is org.apache.catalina.startup.BootStrap.

Clicking on tomcat9.exe file --> goes to <Tomcat_home>\bin\bootstrap.jar---> from META-INF/manifest.mf file it collects org.apache.catalina.startup.BootStrap name as the main class name and call main(-) method on that class----> The main(-) creates ServletContainer (Catalina) -----> Servlet container manages the given servlet comps life cycle (by creating and managing the objects)

To use online decompiler ---> launch decompiler.com --> select u r jar file (bootstrap.jar) ---> Decompile -->get the source code

---

=>We can deploy web applicalton in any server either in the form of directory or in the form war file.
war file --> web application archieve (jar file for web application having the extension of .war)

=>We need to prepare war file on the Deployment directory structure

```
E:\VoterApp
  |------------WEB-INF
  |              |------------classes
  |-->input.html |->web.xml   |----->VoterServlet.java
                               |---->com.nt.servlet
                                        |----->VoterServlet.class
```

(manual process)

VoterApp.war

```
E:\VoterApp> jar cvf VoterApp.war .
```

c-->create archieve
v-->verbose mode
f-->specify archieve file name (jar file name)

=> To prepare war file from Eclipse Dyamic web project use "export " war file option

Right click on Eclipse Dyamic web Project ----> export -->war file --->
Destionation:: <Select the location where to get the war file> ----> select all check boxes---> finish.

There are 3 approaches for the deployment of web application in web server

a) Hard Deployment
(copy directory or war file to Server Deployment folder/location like <Tomcat_home>\webapps folder)

b) Console Deployment
Use Admin console screen of server (like Tomcat manager) to deploy the web application either in the form of directory or in the form of war file.

c) Tool Based Deployment (Best)
=>Use IDE like Eclipse or maven tool or gradle tool for deployment.

Performing Console deployment of web application in Tomcat server

step1) prepare war file representing the entire web application
refere the above VoterApp.war

step2) start tomcat server manually using <Tomcat_home>\bin\tomcat9.exe file

step3) Open the Tomcat Manager/Admin page and deploy the web application..
Tomcat home page (http://localhost:3030) ---> Manager App
-->submit username :: admin password:admin -----> Go to war file to deploy section ---> choose the war file --> VoterApp.war (This step keeps the given war file in <Tomat_home>\webapps folder and also extracts that file)

note:: when war file is deployed , the war file name becomes the context path of the web application.

step4) Test the web application..
URL :: http://localhost:3030/VoterApp/input.html

To undeploy the web application through admin console of Tomcat

open Tomcat manager /admin screen --> Go to u r web application (VoterApp) ---> undeploy.

note:: For Hard deployment of web application in Tomcat server copy war file(like VoterApp.war) or directory(VoterApp) to <Tomcat_home>\webapps folder

---

What is the diffence b/w COLD Deployment and HOT deployment?

=>if we deploy the web application when the server is running mode.. then it is called HOT Deployment..
=> if we deploy the web application when the server is in stopped mode then it is caled COLD Deployment..

note:: HardDeployment /ToolBased Deployment can be HOT or COLD Deployment where as Console Deployment must always be Hot Deployment.

ServletConfig object
==========

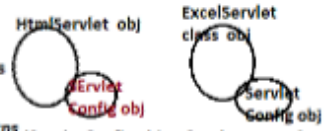
=>It is created on 1 servlet class object basis

=> ServletContainer creates this object during the deployment of web application or during Server startup based servlet cfg done in web.xm file.

=> ServletConfig wil lbe assigned to respective Servlet class object by calleing init(ServletConfig) method , the moment Servlet class object is created by Serletcontainer.

=>It is called right hand object to our Servlet class object becoz Servlet class can use that object to pass additional info Servlet class from out side and to gather more about SErvlet comp class

=> SErvletConfig object means, it is object of java class that implemetns javax.servlet.ServletConfig(I).



(ServletConfig obj to Servlet comp class obj is like PA to Minister)

=>Hard Coding Inputs in Servlet comp is bad pratice.. So we should go for soft coding ..

=> We can pass input values to Servlet comp (softcoding) in two ways

a) As request parameters (form data)

b) As ServletInit Parameters (from web.xml)

Servlet comp (TestServlet)

|--> /testurl (url pattern)

```
String no=req.getParamter("no");
String name=req.getParameter(name");
```

```
String user=cg.getInitParameter("dbuser");
String pwd=cg.getInitParamter("dbpwd");
```

(Non-Technical Inputs)
request parameters

->given by enduser

->suitable for passing non-technical input values like name,gender,age and etc..

->will be stored automatically in request object

-> we can use req.getParameter(-) method to read the input values.

..../testurl?no=101&name=raja

request obj
no:101
name=raja

=>request param name and values are completely user-defined

=>request parameters scope is request scope i.e they will change request to request

Init Parameters (technical inputs)

->Give by Programmer by writing tags/entries in web.xml file under <servlet> tag

->suitable for passing technical input values to SErvlet comp like jdbc driver class name, jdbc url, db username, db password and etc..

-> will be stored automatically in SerlvetConfig object (cg)

-> we can cg.getInitParameter(-) method to read these input in our servlet comp

In web.xml (passing technical inputs)

```
<web-app>
  <servlet>
    <servlet-name>test</servlet-name>
    <servlet-class>com.nt.servlet.TestServlet</servlet-class>
    <init-param>
      <param-name>dbuser</param-name>
      <param-value>system</param-value>
    </init-param>
    <init-param>
      <param-name>dbpwd</param-name>
      <param-value>manager</param-value>
    </init-param>
  </servlet>
  <servlet-mapping>
      <servlet-name>test </servlet-name>
      <url-pattern>/testurl</url-pattern>
  </servlet-mapping>
</web-app>
```

SErvletConfig
dbuser=system
dbpwd=manager

Init-param names and values completely user-defined

=>Init parameters scope is specific to SErvlet class for which ServletCofing obj is created. i.e only that servlet comp for which init parameter created in web.xml can read the init parameter values.

Deployment --> loading of web.xml ---> InMemory Meta data of web.xml ---> <some operations..> --> checks servlet configurations ---> found n servlet configurations --> creates n ServletConfig objs on 1 per servlet comp basis) -->each ServletConfig obj holds its respective Servlet comp's init param values ---> pre-instantation of servlet comps on which <load-on-startup>is enabled ---> initilization of same servlet comps by assinging their servlet config objects to servlet comps takes pace by calling init(Servletconfig) methods.

What happens if we call destroy() method from service(-,-) method?

Ans) Servlet class obj will not destroyed.. but the logics of destroy() method executes along with service(-,-) method logics

note:: When the life cycle event is raised , the life cycle method will be called automatically.. since we call life cycle method manually the life cycle event will not be raised .

What happens if the init(-) is called from servcle(-,-) method?

Ans) the logics init(-) method also executes from service(-,-) method.. but new object for servlet comp class will not be created.

what happens if destroy() is called from init(-) method?

Ans) the logics of destory() method will execute along with init(-) method

What is pre-instantiation or eager/early instantiation of servlet comp?

Ans) Generally first request given servlet comp partcipates in servlet loading, Servlet Instantation and Servlet Intiallzatioon before peforming request processing.. This is called Lazy Instantiation of Servlet comp becoz ServletContainer is creating our servlet class object lately only when we give first request. The other than first requests given to servlet comp directly participates in request processing. due to this the response time(time taken to get output) of first request is bit high compare to other than 1st requests.

To minimize first request's response time and to equalize with other than 1st request , we need to make Servlet container to create our servlet class object either during server startup or during the deployment web application by enabling <load-on-startup> on the servlet comp .. this called eager/early/pre -instantation of servlet comp.. (Makeing servlet container to create our servlet class object either during server startup or during the deployment web application irrespective of wheather it recieves the requests or not)

```
<servlet>
  <servlet-name>lc</servlet-name>
  <servlet-class>com.nt.servlet.LCTestServlet</servlet-class>
  <load-on-startup>1</load-on-startup>
</servlet>
<servlet-mapping>
  <servlet-name>lc</servlet-name>
  <url-pattern>/lcurl</url-pattern>
</servlet-mapping>
```

<load-on-startup> priority value (It can any positive number or zero)

note:: It is not mandatory that we must enable <l-o-s> on every servlet comp.

note:: it is recomanded to enable <l-o-s> on such a servlet that must be requested guaranteely after the deployment of the web application.

eg:: sevlet comp giving home page, servlet comp main menu page, Servlet comp that traps all requests (FrontController)

when Servlet Container creates our servlet class obj?

If the <load-on-startup> is not enabled

a) when servlet comp gets first request
b) when servlet comp gets first request after restaring/reloading/redeploying the web application.
c) when servlet comp gets the first request after restarting server.

If <load-on-startup> is enabled

a) during the deployment of web application or during the sever startup
(For Hot Deployment) (For cold deployement)

What is the difference b/w COLD deployment and HOT Deployment?

Ans) if we deploy the web application when server is in stopped mode.. then it is called COLD deployment.
If we deploy the web application when server is in active/running mode.. then it is called HOT deployment.

When SErvletcontainer destroys our servlet class obj?

Ans)
a) when the web application is stopped/reloaded/undeployed
b) when the webServer is stopped/crashed
c) if our servlet class obj is continuosly idle for long time.

note:: Servletcontainer does not give any special priority towards the destruction of our servlet class object .. even though <load-on-startup> is enabled on it.

<load-on-startup> priority value

=>If multiple servlet comps of a web application are enabled with <load-on-startup> then their order of pre-instantiation will be decided based on the <load-on-startup> priority value.

=>Hight value indicates low priority.
=>Low value indicates high priority.
=> -ve value ignores the enabled <load-on-startup>

SErvlet1,Servlet2,Servlet3,Servlet4 are comps of WebApplication1

	<l-o-s> value	<l-o-s> value	<l-o-s> value
Servlet1	10 (III)	5 (II)	10
Servlet2	20 (IV)	16 (III)	10
Servlet3	5 (I)	0 (I)	10
Servlet4	6 (II)	-5 (Inores <l-o-s>)	10

Server decides the order.. (Generally the random order will be chosen)

note:: taking <l-o-s> with out priority value throw an exception.

LcTestServlet -->1 (i)
WordServlet---> 5 (ii)
ExcelServlet---> 20 (vi)
PlainServlet---> 8 (iii)
XmlServlet---> 15 (v)
HtmlServlet ---> 10 (iv)

ServletConfig object
==========

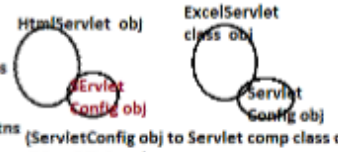
=>It is created on 1 servlet class object basis

=> ServletContainer creates this object during the deployment of web application or during Server startup based servlet cfg done in web.xm file.

=> ServletConfig wil lbe assigned to respective Servlet class object by calleing init(ServletConfig) method , the moment Servlet class object is created by Serletcontainer.

=>It is called right hand object to our Servlet class object becoz Servlet class can use that object to pass additional info Servlet class from out side and to gather more about SErvlet comp class

=> SErvletConfig object means, it is object of java class that implemetns javax.servlet.ServletConfig(I).



(ServletConfig obj to Servlet comp class obj is like PA to Minister)

=>Hard Coding Inputs in Servlet comp is bad pratice.. So we should go for soft coding ..

=> We can pass input values to Servlet comp (softcoding) in two ways

a) As request parameters (form data)

b) As ServletInit Parameters (from web.xml)

Servlet comp (TestServlet)

|--> /testurl (url pattern)

```
String no=req.getParamter("no");
String name=req.getParameter(name");
```

```
String user=cg.getInitParameter("dbuser");
String pwd=cg.getInitParamter("dbpwd");
```

(Non-Technical Inputs)
request parameters

->given by enduser
->suitable for passing non-technical input values like name,gender,age and etc..
->will be stored automatically in request object
-> we can use req.getParameter(-) method to read the input values.

..../testurl?no=101&name=raja

request obj
no:101
name=raja

=>request param name and values are completely user-defined

=>request parameters scope is request scope i.e they will change request to request

Init Parameters (technical inputs)

->Give by Programmer by writing tags/entries in web.xml file under <servlet> tag
->suitable for passing technical input values to SErvlet comp like jdbc driver class name, jdbc url, db username, db password and etc..
-> will be stored automatically in SerlvetConfig object (cg)
-> we can cg.getInitParameter(-) method to read these input in our servlet comp

In web.xml (passing technical inputs)

```
<web-app>
  <servlet>
    <servlet-name>test</servlet-name>
    <servlet-class>com.nt.servlet.TestServlet</servlet-class>
    <init-param>
      <param-name>dbuser</param-name>
      <param-value>system</param-value>
    </init-param>
    <init-param>
      <param-name>dbpwd</param-name>
      <param-value>manager</param-value>
    </init-param>
  </servlet>
  <servlet-mapping>
    <servlet-name>test </servlet-name>
    <url-pattern>/testurl</url-pattern>
  </servlet-mapping>
</web-app>
```

SErvletConfig
dbuser=system
dbpwd=manager

Init-param names and values completely user-defined

=>Init parameters scope is specific to SErvlet class for which ServletCofing obj is created. i.e only that servlet comp for which init parameter created in web.xml can read the init parameter values.

Deployment --> loading of web.xml --> InMemory Meta data of web.xml --> <some operations..> --> checks servlet configurations --> found n servlet configurations --> creates n ServletConfig objs on 1 per servlet comp basis) -->each ServletConfig obj holds its respective Servlet comp's init param values --> pre-instantation of servlet comps on which <load-on-startup>is enabled --> initlization of same servlet comps by assinging their servlet config objects to servlet comps takes pace by calling init(Servletconfig) methods.

their servlet config objects to servlet comps takes place by calling init(ServletConfig) methods.

ServletContainer creates which Object first?

a) ServletConfig obj b)Servlet class object

Ans) (a) -->With respect to above discussions the answer is (a)

=>we can not write messages to browser from init(-) and destroy() methods becoz to do that we need response object based PrintWrtier and response obj is not visible in the init(-) and destroy() methods.

=>we can write message to browser from service(-,-) and doXxx(-,-) methods becoz response object PrintWriter is visible and accessible in those methods..

=> req,res objs not visible and accessible in init(-) and destroy() methods .. they are just specific to service(-,-) and doXxx(-,-) methods..

Example code on Servlet Init parameters

==========

in web.xml

```
<servlet>
  <servlet-name>lc</servlet-name>
  <servlet-class>com.nt.servlet.LCTestServlet</servlet-class>
  <init-param>
    <param-name>dbuser</param-name>
    <param-value>system</param-value>
  </init-param>
  <init-param>
    <param-name>dbpwd</param-name>
    <param-value>manager</param-value>
  </init-param>
  <load-on-startup>10</load-on-startup>
</servlet>
<servlet-mapping>
  <servlet-name>lc</servlet-name>
  <url-pattern>/lcurl</url-pattern>
</servlet-mapping>
```

In the init(-) of LcTestServlet

```
public void init(ServletConfig cg) {
        System.out.println("LCTestServlet.init(-)");
        System.out.println("db user init param value::"+cg.getInitParameter("dbuser"));
        System.out.println("db pwd init param value::"+cg.getInitParameter("dbpwd"));
    }
```

note: when we write JDBC code Servlet comp .. instead of hardcoding jdbc properties in in Servlet comp.. it is recomanded to get them from web.xml file as init parameter values through ServletConfig object..

Why we are not prefering properties file to collect the jdbc properties.. why we prefering to gather from web.xml file as init param values?

Ans) Instead of taking seperate or addtional properties file .. It is recomanded to work with the already avalable web.xml to pass such technical info (any how web.xml is part of web application development and we can not avoid it)

Is our servlet comp class is singleton java class?

Ans) The Java class that allows us to create only one object in all situations is called singleton Java class ...
Though class is allowing to create more objects.. if we are creating one only for that class then that

Two init methods of servlet life cycle
==========

=>Servlet api is offering two init() methods we can use both methods for placing Programmer/application spefic intialization logic like creating jdbc con object and etc...

1st init() method or init(-) with parameter method or init(ServletConfig cg) method
==========

Signature: public void init(ServletConfig cg)throws ServletException

=> This servlet life cycle method for instantiation event.

=> This method is orginally declared in javax.servlet.Servlet(I) and implemented in javax.servlet.GenericServlet(AC) and inherited to javax.servlet.http.HttpServlet(AC)

=>Servletcontainer hanovers the Servletconfig object to its repspective Servlet class obj by calling this init(ServletConfig) method

2nd init() method or init() with no parameter method
==========

signature :: public void init() throws ServletException

=>This is not a life cycle method of Servlet comp .

=>This is given as convience method to programmer to place initialization logic.

=> Instread of init(ServletConfig) mehod to place initialization logics.. It is recomanded to place logics in init() method by taking as convinence method.

=>This method is direct concrete method with no body (null method) in javax.servlet.GenericServlet(AC)

note:: HttpServlet is not having any init() method.. but as the sub class GenericServlet class it inherits and uses init() method of GenericServlet (AC)

GenericServlet.java (abstract class)
==========

```
public abstract class GenericServlet implements javax.servlet.Servlet{

  private ServletConfig config;
     //1st init() method
   public void init(ServletConfig cg)throws ServletException{
       this.config=cg;  // ServletConfig obj initialization
       init();
   }
   //2nd init() method
   public void init() throws ServletException{
     }
   public ServletConfig getServletConfig(){
     return config;
   }
   public abstract void service(ServletRequest req,ServletResponse res)throws SE,IOE;
   ...
   ... //other methods
   ...
}
```

Empty method definitation or null method definitation

our servlet comp classes can call this method to get Access to the above initliazed SErvletconfig obj

```
public class Test{
 public void m1(){ (b)
    m2(); (c)
  }
  public void m2(){
    ..
  }
}

public class Demo extends Test{

  public void m2(){ (d)
    ..
  }
}
```

```
Demo d=new Demo();
d.m1(); (a)
```

There are 3 approaches to palce init() methods in our servlet comp::

Approach1:: override init() method (no-param method) and place application/programmer specific intialization logics. (Best)

Approach2:: override init(Servletconfig) method (1-param method) and place application/programmer specific intialization logics.

Approach3:: override init(Servletconfig) method (1-param method) and place application/programmer specific intialization logics and call super.init(cg) method

Approach1:: override init() method (no-param method) and place application/programmer specific intialization logics. (Best)

GenericServlet.java (abstract class)
==========

```
public abstract class  GenericServlet  implements   javax.servlet.Servlet{

  private ServletConfig config;
     //1st init() method       (d)
   public  void init(ServletConfig cg)throws ServletException{
       this.config=cg;  // ServletConfig obj initialization
       init();   (e)
   }
   //2nd init() method
  public void init() throws ServletException{
    }

  public   ServletConfig  getServletConfig(){
    return config;
  }

  public  abstract void service(ServletRequest req,ServletResponse res)throws SE,IOE;

   ---
   --- //other methods
   ---
}
```

Empty method definitation or
null method definitation

our servlet comp classes can call this method
to get Access to the above initliazed SErvletconfig obj

our Servlet comp class
==========

(a)1st request (no <l-o-s>) (b) ServletLoading and Instantiation (c)Instantation event and calling init(ServletConfig cg) method on our Servlet class obj)

```
public class LCTestServlet extends  GenericServlet/ HttpServlet

    public void init(){
      //our intialzation logic like creating jdbc con object
       ----          (f)
       ---   ServletConfig cg=getServletConfig();
    }

  public void service(ServletRequest req,ServletResponse res)throws SE,IOE{
     ----          (g)
     ---- //request processing logic
     ----   ServletConfig cg=getServletConfig();
   }
}
```

=> To call super class public methods in sub class and to call same class methods there is no need of object/reference variable.. we can call those methods directly..

note:: In this approach we need not intialize Servletconfig object manually (taking SErvletconfig object given by Servletcontainer assigning to one instance variable) that job will be taken care by super class init(ServletConfig) method (GenericServlet class init(ServletConfig) method).. To access Super class intialized ServletConfig object in our servlet comp we need to call getServletConfig() in various method.

note:: init(ServletConfig) method is life cycle method for instantiation event .. But recomanded method to place init() (init no param method) becoz it make programmer not to worry about initializing ServletConfig obj manually (GenericServlet init(Servletconfig) method takes care it), So we need to write only our initialization logics in the init() method (no param method) ..So it called convienence method given to programmers

<urname>-<uniqueid> : pavan-NAJ012

What happens if do not palce any init() method in our servlet comp class?

Ans) The super class (GenericServlet) init(ServletConfig) and init() method methods execute (as Init(ServleConfig) inernally calls init() method)

What happens if place both init() and init(ServletConfig) in our servlet comp class?

Ans) init(ServletConfig) method executes.. becoz it is life cycle method of Servlet comp and init() (no param) will not execute..

Approach2:: override init(Servletconfig) method (1-param method) and place application/programmer specific Intialization logics.

(Bad becoz Programmer may forget the explicit initialization of ServletConfig object)

GenericServlet.java (abstract class)

```
public abstract class GenericServlet implements javax.servlet.Servlet{

  private ServletConfig config;
    //1st init() method
  public void init(ServletConfig cg)throws ServletException{
      this.config=cg; // ServletConfig obj initialization
      init();
  }
  //2nd init() method
  public void init() throws ServletException{
  }
```

Empty method definitation or null method definitation

```
  public ServletConfig getServletConfig(){
    return config;
  }
```

our servlet comp classes can call this method to get Access to the above initliazed SErvletconfig obj

```
  public abstract void service(ServletRequest req,ServletResponse res)throws SE,IOE;

  ...
  ... //other methods
  ...
}
```

LcTestServlet.java (Our Servlet class)

(a) 1st request (no <l-o-s>) (b) Sevlet Loading and Instantiation (c) Instantiation Event –calls init(ServletConfig method).

```
public class LCTestServlet extends HttpServlet{

  private ServletConfig cg;
  public void init(ServletConfig cg){
    this.cg=cg; //ServletConfig object Initialization (d)
      .... //our initialization logic like creating jdbc con object
      ....  use cg here..
      ...
  }

  public void service(ServletRequest req,ServletResponse res)throws SE,IOE{
      ....  (e)
      .... //request processisng logic
      ....  //use cg here
  }
}
```

note:: We need to intiaalize ServletConfig object explicly in the overrider init(ServletConfig) method of SErvletComp class inorder use to that ServletConfig object in other methods like service(-,-) method. If we forget to do that work then accessing servletConfig object in service(-,-),destroy() methods becomes not possible.. In this calling getServletConfig() of GenericServlet class returns null becoz we have not given any chance to execute GenericSevlet's init(-) initialize to ServletConfig object there.

Approach3:: override init(Servletconfig) method (1-param method) and place application/programmer specific intialization logics and call super.init(cg) method

(Bad Approach becoz programmer may forget to call super.init(cg) method)

GenericServlet.java (abstract class)

```
public abstract class GenericServlet implements javax.servlet.Servlet{

  private ServletConfig config;
    //1st init() method (f)
  public void init(ServletConfig cg)throws ServletException{
      this.config=cg; // ServletConfig obj initialization
      init(); (g)
  }
  //2nd init() method
  public void init() throws ServletException{ (h)
  }
```

Empty method definitation or null method definitation

```
  public ServletConfig getServletConfig(){
    return config;
  }
```

our servlet comp classes can call this method to get Access to the above initliazed SErvletconfig obj

```
  public abstract void service(ServletRequest req,ServletResponse res)throws SE,IOE;

  ...
  ... //other methods
  ...
}
```

LcTestServlet.java (Our Servlet class)

(a) 1st request (no <l-o-s>) (b) Sevlet Loading and Instantiation (c) Instantiation Event –calls init(ServletConfig method).

```
public class LCTestServlet extends HttpServlet{
                                (d)
  public void init(ServletConfig cg)throws ServletException{
      super.init(cg); (e)
      .....  =>use cg
      ..... //our initialization logics
      .....  (i)  like creating con obj
  }

  public void service(ServletRequest req, ServletResponse res)throws SE,IOE{
      ....  (j)
      ....  ServletConfig cg=getServletConfig();
      ....
  }
}
```

=>HEre we need not to initialize ServletConfig object explicitly in our servelt comp ,,, becoz super class init(ServletConfig) is getting chance to execute becoz super.init(cg) placed in our servlet comp...So we can call getServletConfig() in all the methods of Servlet comp to get access to ServletConfig object.

=> But programmer may forget to call super.init(cg) method our init(Servletconfig) method of Servlet comp.. This leads

Understanding two service(-,-) methods and 7 doXxx(-,-) methods Servlet api
==========

1st service(-,-) method /public service(-,-) method
---

signature :: public void service(ServletRequest req,ServletResponse res)throws ServletException,IOException
=>It is life cycle method for request processing event.
=> This is orginally declared in javax.servlet.Servlet(I) ,
maintained as abstract method in javax.servlet.GenericServlet(AC) and implemented in
javax.servlet.http.HttpServlet having logic to convert ServletRequest ,ServletResponse objs
to HttpServletRequest ,HttpServletResponse objs and calling 2nd service(-,-) or protected service(-,-)
method.

note:: It is not a recomanded method to place request processing logic

2nd service(-,-) method /protected service(-,-) mehthod
---

signature protected void service(HttpServletRequest req,HttpServletResponse res)throws ServletException,IOException

=>It is not a life cycle mthod for request processing event. It is given convienence method for programmers
to work with request processing logic
=> It is direct concrete method of javax.servlet.http.HttpServlet(AC) This method contains logic to get
current request request method/mode and to call one of the 7 doXxx(-,-) methods..

note:: This not good method to place our request processing logic in our servlet comp.

7 doXxx(-,-) methods (doGet(-,-),doPost(-,-),doDelete(-,-),doHead(-,-),doOptions(-,-),doTrace(-,-),doPut(-,-))

Signature :: protected void doXxx(HttpServletRequest req,HttpServletResponse res)throws SE,IOE

=>These direct concreate methods of javax.servlet.http.HttpServlet(AC) having to return 405 error
response to browser indicating our servelt comp is incomplete to process th e request..

note:: It is recomaned to place request processisng logics by overriding doXxx(-,-) methods in our servlet (especially doGet(-,-)/doPost(-,-))

=>GenericServlet is having only one sevice(-,-) method that is public service(-,-)/1st service(-,-) method
that to abstract method
=>HttpServlet is having only two sevice(-,-) methods and 7doXxx(-,-) methods as concrete methods..

HttpServelet.java (Abstract class)

```
public abstract class HttpServlet extends GenericServlet{

 //1st service(-,-) method     (5)
 public void service(ServletRequest req,ServletResponse res)throws SE,IOE{
   HttpServletRequest request=(HttpServeltRequest)req;
   HttpServletResponse response=(HttpServeltResponse)res;
   //calling 2nd service(-,-) method
    service(request,response);  (6)
 }

 //2nd service(-,-) method     (7)
  protected void service(HttpServletRequest req,HttpServletResponse res)throws SE,IOE{
      //get current request method/mode
      String method=req.getMethod();
      if(method.equals("GET"))
           doGet(req,res);  (8)              calls 7 doXxx(-,-)based on current request mode
      else if(method.equals("POST")
           doPost(req,res);
      else if(method.equals("HEAD");
        doHead(req,res);
          ....
          ....
  }

  public void doXxx(HttpServletRequest req,HttpServletResponse res)throws SE,IOE {
          ....
          .... //logic to 405 error response to browser..
          ....
   }

   .... //other method definitations
   ....
}//class
```

//LCTestServlet.java (ourServlet comp)
==========

(1) GET mode request from browser

(2) Container creates ServletRequest, ServletResponse objs

(4) Since SErvlet obj ready, the request processing event raises and calls 1st service(-,-) having ServletRequest, ServletResponse objs (life cyle method) but not found in our Servlet comp

(3) ServletContainer creates locates Servlet class obj If created completes all instantiation formalaties

```
public class LCTestServlet extends HttpServlet{

  public void doGet(HttpSeErvletRequest req,HttpServletResponse res)throws SE,IOE{
       ... //request processing  (9)
        ...
     }
  }
```

Hosting of Java web application
==========
=>It is all about keeping java web application on to the Internet having domain name (website name)
For this we need to take the support of DomainRegistar company like goDaddy, jelastic(java), Indiarocks, i9, Indiabricks and etc..

Domain Registrar gives following 3 services
a) Selling/allocating space in the webserver /App server of Static IP Adress(fixed) machine.
b) Selling domain names/web site names
c) AMC (Annual Maintenance Contract) of website.

jelastic.com
|---> Cloud based Domain registrar. (cloud-taking hardware/software infrastructure on rental basis)
|---> Allows 14 trail period based email id.
|---> supports java based hosting .. Godaddy is not supporting java hosting as of now.

Procedure for hosting /placing java web applicaiton (website) on to the internet
==========

step1) register with jelastic.com by submitting email id ..

=>jelastic.com ---> services --> java hosting --> submit email id : ... (rightside of the screen) ...
=> Open the submitted email account --> open jelastic email id --> click on link to choose the password and to complete the registartion process

step2) create the env.. in jelastic

Choose Tomcat 9.x --> choose open jdk 14 --> choose NITHYD as env.. name -->create.

step3) create war file representing the web applicaiton...

Right click on Dynamic eclipse Project --> export -->war file --> select the folder to save the war file (Desktop --> MarriageApp.war)

step4) upload and deploy the war file.. to Tomcat server of Env..

Jelastic console screen --> upload -->select the war file .. (MarriageApp.war) --> go to war file --> deploy to --> select select env.. name(NITHYD) --> providato context path :: MarriageApp

step5) Test the web applicaiton...

URL :: http://srk27.cloud.interhostsolutions.be/MarriageApp/Input.html

---

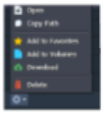
Maintenance of hosted Project/Web application (Working with hosted Application)

To modify the source code of html file

Go to domain (NITHYD) ---> go to Application server(Tomcat) ---> config (wrench symbol) --> go webapps (downside) -->Go to MarriageApp --> go input.html file -->modify source code -->save. and refresh browser window where is the application is running..

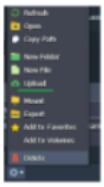
To delete the any web comp of hosted web application

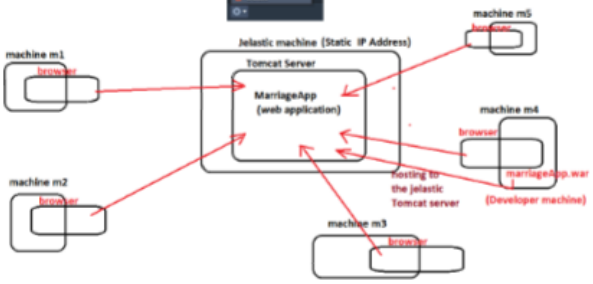
Go to the webcomp location (as show as above) --> use additionaliality button --> delete ..



add
To new web comp to the hosted web application
==========

=>Go to parent folder where u want to upload --> use additionality button --> upload --> browse and select html file.





To modify the source code of Servlet comp in the hosted web application
==========

a)delete existing .class file of servlet comp from the hosted web application
b) modify source the servlet comp in Eclipse Applicaiton and test it (Local modifications)
c) gather .class file of Locally modified servlet comp (from Eclipse Tomcat server folder like wtpwebapps)
d) upload locally upded .class file of servlet comp to jelastic hosted Marriage Web application to WEB-INF/classes/com/nt/servlet folder
e) restart the Tomcat server node.. from the env..

=>If modifications are happing in the huge scale.. then updated all modifications to Local Eclipse Application.. over the certain time period (like for 20 days like that....) prepare the war file and replace existing hosted war file with new war file.

Understanding different Http Request methods /modes/methodologies
==========

GET
POST
HEAD
PUT
DELETE
OPTIONS
TRACE

CONNECT (reservedfor future)

Understanding Http methods/modes

protocol http latest version : 1.1

1.GET
2.POST
3.HEAD
} http 1.0

4.PUT
5.DELETE
6.TRACE
7.OPTIONS
} http 1.1

8.CONNECT (Reserved for future)

GET
====

=> Given to give the request to web server and to GET response for from server
=> This is default request mode
=> This http request does not cotain body becoz input data/query data along with request goes to server as query string appedend to the url.

GET-HttpRequest

No request body
form data /request prameters
go to server as queryString appened to the request url

=> This is request idempotent (safe to repeat request)
=>This request related response contains all 3 parts
a) response line b) response headers c) response body

GET -HttpResponse

POST
====

=>Not the default request mode
=>Can carry unlimited data along with request as request body content
=> request structure contains a)request line b)request headers c) request body
=> given to send/post data to server along with the request and also get data from server
=> This request is not idempotent (not safe to repeat the request)

POST -HttpRequest

form data /request parameters go to server as the request body

POST -HttpResponse

HEAD
=====

==>Same as GET but .. HEAD request mode related response does not contain reponse body.
==> It is given for checking wheather certain web comp is available or not (active or not)

HEAD -HttpRequest

no request body

HEAD --Http Response

no response body

As Enduser Cleint ,the browser can generate only GET,POST mode reuquests.

As admin Cleint , the jelastic cpanel, ftp clients can generate all the 7 modes of request.

PUT
===

=> Useful to generate request to place new comps / web applications in webServer..
=> Admin clients like jelastic cpanel , ftp clients will use this option in order to provide env.. for uploading of web applications or new web comps to exiting web applications.
=> PUT mode request is : idempotent becoz it will try to put the same web comp by replacing the existing web comp with out any side effect (It is safe to repeat the request)
=>In reamaing all aspects PUT mode request is same as POST mode request.

=> if we are developing normal web applcattions to serv endusers th we need to work with doGet(-,-) ,doPost(-,-) methods
=> if we are developing cpanel ,ftp client applcattions to serv admin we need to work with all the 7 doXxx(-,-) methods.

DELETE
=======

=>Useful to generate request for deleting existing web comps of the web applicaiton or web applicaiton itself.
=> Admin clients like jelastic cpanel, ftp clients will use this DELETE mode request to delete the existing web comps and also to undeploy the web applicaitons..
=>DELETE mode request is non idempotent.. if we try delete already deleted web comp by repeating request then we get exception error.
=>In reamaing all aspects DELETE mode request is same as POST mode request.

TRACE
======

=>Useful for admin clients to trace/monitor various that are happening from request to response for a web comp..
=>Useful for debugging and to know reasons for successful /failure execution of web comps..
=>Useful to know how many forwards /redirects are happened for given request related response generation.
=> TRACE mode request is idempotent.. i.e safe to repeate the request..
=> In remaining all aspects it is same as GET mode request.

OPTIONS
========

=>if we OPTIONS mode request to any web comp then it will determine and give different request modes that possible to give.
=>This is useful to analyze web comp and to know what different request modes that should be used to generate the request to certain web comp.

For example
==========

```
public class TestServlet extends HttpServlet{

  public void doGet(-,-)throws SE,IOE{
    ...
    ...
    }
}
```

=>if we give OPTIONS mode request to this web comp then get the following response
allow :: GET,TRACE,HEAD,OPTIONS

```
public class TestServlet extends HttpServlet{

  public void doPost(-,-)throws SE,IOE
    ...
    ...
    }
}
```

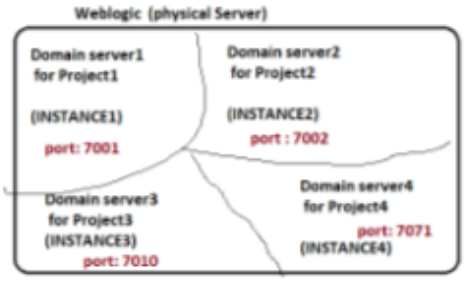
=>if we give OPTIONS mode request to this web comp then get the following response
allow :: POST,TRACE,OPTIONS

---

weblogic
========

type :: Application server (web Server++)
version :: 12c (compitable with jdk 1.7+)
vendor :: BEA Systems /oracle corp
default port number :: 7001
Allows to create domains .. Every domain is 1 instance of weblogic acting as seperate application server..
(The multiple projects in company will use the mutliple domains of same weblogic server)

commercial S/w https://www.oracle.com/middleware/technologies/weblogic-server-installers-downloads.html
weblogic-12.1.3-kepler-installer-win32.exe (get this setup file)
(search for this setup file)



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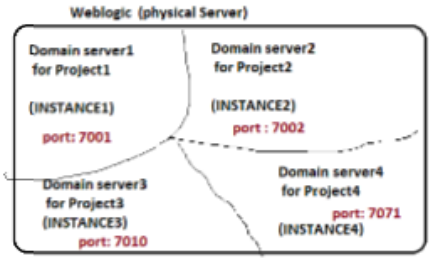
weblogic-12.1.3-kepler-Installer-win32.exe (get this setup file)
(search for this setup file)

supports all 3 modes of deployment like console deployment, hard deployment and tool based deployment.



Procedure to create domain server/instance in weblogic 12c s/w
==========

search and launch oracle weblogic configuration wizard ---> select basic domain --> type domain name (WLNTAJ414Domain) as the directory name--->next--->next ---> choose username ,password (javaboss, javaboss1) --->next-> choose other jdk Location (max java8) ---> next --->select adminstration server ---> next---> choose port number --->next--> create..

Procedure to perform console deployment of Java web application in weblogic domainserver
==========

step1) prepare war file representing the web application..
note1:: make sure all .class files are generated by using java8 compiler
note2:: Remove XSD import statement from web.xml file.

VoterApp.war

```
E:\VoterApp\WEB-INF\classes>set path=C:\Program Files\Java\jdk1.8.0_31\bin
E:\VoterApp\WEB-INF\classes>set classpath=E:\Tomcat 9.0\lib\servlet-apl.jar
E:\VoterApp\WEB-INF\classes>javac -d . VoterServlet.java
E:\VoterApp>jar cf VoterApp.war .
```

step2) start weblogic domain server (WLNTAJ414Domain)
go to C:\Oracle\Middleware\Oracle_Home\user_projects\domains\WLNTAJ414Domain folder and use startWeblogic.cmd file.

step3) open admin console of weblogic domain server by submitting username,password
http://localhost:7070/console --> submit username:: javaboss and password :: javaboss1 ---> login

step4) upload the war file and deploy the war file..
Admin console screen ---> deployments ---> Install ---> upload your files ---> select the war file (VoterApp.war) --->next-->next->next->next-->save

step5) Test the web application..
http://localhost:7070/VoterApp/input.html

---

note:: To undeploy the web application from admin console screen
Go to admin console screen ---> deployments ---> select the webapplicaiton (VoterApp) ---> delete.

=>To perfrom HArdDeployment web appliation in weblogic domain server copy war file (VoterApp.war) or directory (VoterApp) to
C:\Oracle\Middleware\Oracle_Home\user_projects\domains\WLNTAJ414Domain\autodeploy folder
<Weglogic_home> (Domain directory name)

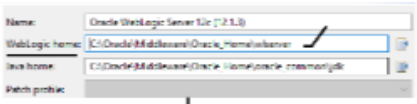
http://localhost:7070/VoterApp/input.html

Procedure to configure weblogic domain server with Eclipse IDE (try with eclipse 2019 versions)
==========

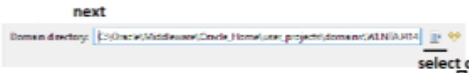
step1) install oracle weblogic server adapter /tool/plugin with eclipse IDE
window menu-->preferences --->server --> runtime env.. ----> add ---> oracle ---> oracle weblogic server tools --->next --> accept terms and condtions ---> restart IDE.

step2) cfg weblogic domain server with eclipse IDE.

window menu-->preferences --->server --> runtime env.. ----> add ---> oracle ---> oracle weblogic server ---> select local server--> next --->



next



select domain server

Finish ----> apply and close

GlassFish
=======
type :: Application server
version :: 5.x (compltable with jdk1.8+)
vendor :: Sun Ms/Oracle corp
allows to create domain servers (Instances of GlassFish server)
Domain port numbers :: http (8080) , admin console (4848)
default domain name :: domain1
domain1 username :: admin
domain1 password : adminadmin
To donwload s/w :: Download s/w as zip file from https://javaee.github.io/glassfish/download
To install GlassFish s/w :: Extract the zip file. (glassfish-5.0.zip)

Procedure to create user-defined domain server GlassFish 5.x
==========

```
E:\glassfish-5.0\glassfish5\glassfish\bin>set path=C:\Program Files\Java\jdk1.8.0_31\bin
E:\glassfish-5.0\glassfish5\glassfish\bin>asadmin create-domain --adminport=4545 --user=testuser GFNTAJ414Domain
Enter the admin password [Enter to accept default of no password]>testuser
Enter the admin password again>testuser
...
...
...
Domain created successfully
```

Procedure to change http port number of GlassFish domain server
---

=>Go to E:\glassfish-5.0\glassfish5\glassfish\domains\GFNTAJ414Domain\config folder domain.xml file
and modify "port" attribute value of first

```
<network-listener port="6677" protocol="http-listener-1" transport="tcp" name="http-listener-1" thread-pool="http-thread-pool">
</network-listener>
```

Procedure to perform console deployment in GlassFish5.x domain server
==========

step1) create war file (make sure all java classes compiled jdk 1.8) (VoterApp.war)
step2) start Glassfish domain Server..

```
E:\glassfish-5.0\glassfish5\glassfish\bin>asadmin start-domain GFNTAJ414Domain
```

step3) Open admin console of GlassFish domain Server

http://localhost: 4545
username:testuser
password:testuser
login

step4) Deploy the war file..

admin console screen ---> applications --->deploy --->select the war file (VoterApp.war) ---> ok.

step5) Test the web application..

http://localhost:6677/VoterApp/input.html
(or)
Admin console --->deployments ---> go to war file (VoterApp) ---> launch

=>For undeployment of web application using admin console
Admin console screen ---> deployments ---> VoterApp -->undeploy.

Procedure to hard deployment of web application in Glassfish Domain server
==========

copy war file (VoterApp.war) or directory (VoterApp) to

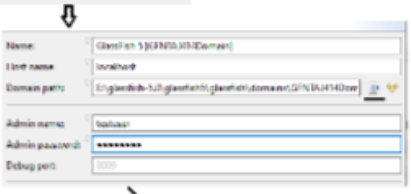
E:\glassfish-5.0\glassfish5\glassfish\domains\GFNTAJ414Domain\autodeploy folder

To testh the web applicalton.

http://localhost:6677/VoterApp/input.html

Procecure to configure GlassFish domain server with Eclipse IDE
==========

window menu ---> preferences ---> server --->run time env--->
add ---> GlassFish ---> Glassfish 5.0 --->



Finish.

Differences between Webserver and Application server?

WebServer	Application Server
a) It is devloped based on Servlet,jsp technologies	a) It is developed based on Servlet,jsp, EJB, Jndi, JTA, Java mail,JMS and etc.. technologies
b) It can be used only to deploy ,manage and execute web applications (war file)	b) It can be used use to deploy ,manage and execute web applications(war file) , EJB comps (jar file), Enterprise AApplications (ear file).
c) Gives only ServletContainer ,jsp Container	c) Gives Servlet container, jsp container, EJB container, JMS server , Mail Server and etc..
d) Understands only protocol http, https	d) Understands multiple protocols like http,https, Iiop, jrmp, and etc..
e) Light weight server	e) Heavy weigtht server
f) does not allow to create domains	f) Allows to ceate domains
g) Suitable for small scale web applications	g) Suitable for medium scale, large scale web applications and also for enterprise Applications ,mailing Apps, JMS Applications
h) eg:: Tomcat , jetty , resin and etc..	h) weblogic ,GlassFish , Wildfly , Oracle10gAS, Jrun and etc..
i) gives less no.of middleware services	j) Gives more no.of middleware services.
j) can handle limit no.of clients/requets at a time	j) can handle huge no.of requests/clients at a time.

ear file = war file +war file +...
ear file = jar file+ jar file +...
ear file = war file + jar file + ..

war --> web application archieve
jar -> java archieve (ejb comp)
ear -> Enterprise Applicatio archieve

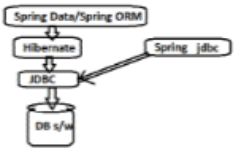
Application Server = webserver + EJB Container + More Middleware services..

=>Upto Tomcat 6.x , It is web server
=> from Tomcat 7.x , It can be called as Application server becoz more facilities are added from 7.x version

Servlet To DB s/w communication

It is required for
=> To save inputs coming to Servlet comp perminently (SignUp activity)
=> To save results/ouputs generated by servlet comp perminently (online shopping)
=> To get data from Db s/w to use in b.logic or to display for enduser (reports)
=> To modify the data of DB s/w as need for Application (Changing items prices during offer period)
=> To perform delete on the data (closing bank account, closing membership and etc..)
note:: Servlet has to perform CURD/CRUD Operations on Db s/w data by using jdbc code.

=>Jdbc code in standalone App makes the standalone App taking to Db s/w
=>Jdbc code in Web comp makes the Web App talking to Db s/w
=>Jdbc code in Spring App makes the Spring App talking to Db s/w
=>Jdbc code in WebService comp makes the Distributed App talking to Db s/w
and etc..



There are 4 approaches of placing jdbc code in servlet comp

In any jdbc code
=> To create jdbc con obj
=> Use jdbc con obj to create other jdbc objs and to develop persistence logic
=> Close jdbc con

Approach1 (Bad Approach)

=> create JDBC con object in the init() method of servlet comp.
=> Use JDBC con object in the service(-,-)/doXxx(-,-) method to create other jdbc objs and to develop persistence logic
=> close jdbc con the in the destroy() method

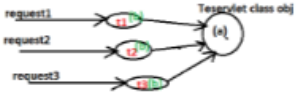
Sample Servlet

```
public class TestServlet extends GS/HS{
   private Connection con;

   public void init(){
     //create jdbc con
       ...
   }
   public void service(-,-)/doXxx(-,-)throws SE,IOE{
       //use jdbc con to create other jdbc objs
         and to develop persistence logic
          ....
          ...
   }
   public void destroy(){
     //close jdbc con
       con.close();
   }
}
```

advntages::
=> All the requests coming to servlet comp will use single jdbc connection to interact with Db s/w So the performence will be good.

disadvantages::
=> Here jdbc con obj must be taken as instance variable of Servlet comp class, So it is not thread safe by default. We need to use Synchronization concepts to make it as thread safe.
=> If any simultaenous request related thread calls con.rollback() method then other threads related persistence operations will be distrubed.

```
public class TestServlet extends GS/HS{
  private int a;

  public void service/doXxx(-,-)throws SE,IOE{
    int b;
     ....
  }
}
```



=>Every Thread gets its own copy of Local variable (b) , So Local variable any method including service(-,-)/doXxx(-,-) method are thread safe by default.
=>All threds acting on Servlet class obj will work on single copy of instance variable (a).. So instanace variable java class like servlet class are not thread safe by default, To make them thread safe in service(-,-) method we need to use synchronisation concepts.

Approach2 :: (good Approach)

=>create jdbc con obj in the service(-,-)/doxxx(-,-) methods
=>use jdbc con obj to create other jdbc objs and to develope persitence logic in service(-,-)/doXxx(-,-) methods
=> close jdbc con obj in service(-,-) /doXxx(-,-) methods

```
public class TestServlet extends HS/GS{

  public void service(-,-)/doXxx(-,-)throws SE,IOE{
     //create jdbc con obj
       ...
     //use jdbc con obj and to create other jdbc objs
       ...
       ..
     //close jdbc con object
       ...
  }
}
```

Advantages::
a) Here jdbc con obj is Local variable to service(-,-)/doXxx(-,-) methods , So it is thread safe by default
b) If any simultaenous request calls con.rollback() method it does not effect other request related persistence operations becoz every request/thread is using its own copy of jdbc con object.

DisAdvantage:
-> Since every request is using seperate jdbc con to interact with Db s/w the performence will be degraded.

JDBC Con pool

=>Jdbc con pool is a factory that contains set of readily available jdbc con objs before actually being used.

Every application server and most of web servers like Tomcat are giving provision to work Server managed jdbc con pools

The advantages of jdbc con pool are ::
a) Reusability of pooled jdbc con objs
b) With minimum jdbc con objs, we can make maximum clients /requests talking to Db s/w
c) Programmer need not worry about creating jdbc con objs, managing jdbc con objs and destroying the jdbc con objs.. all these operations will be taken care by jdbc con pool itself

Approach3::
==========

=> Get jdbc con object from Server managed jdbc con pool being from service(-,-)/doXxx(-,-) method.

=>Use that jdbc con object to create other jdbc objs and to develop persistence logic being from service(-,-)/doXxx(-,-) method

=> close or return jdbc con object back to jdbc con pool being from service(-,-)/doXxx(-,-) method.

Advantages
==========

a) we can take all the advantages of jdbc con pool (end to end)

b) The reference varible that holds server managed jdbc con pool is local variable to service(-,-)/doXxx(-,-) method , So it thread safe variable

disadvantage::

a) We should use that server that supports server managed jdbc con pool

---

DAO class (Data Access Object)
========

=> The java class that seperates persistence logic from other logics and makes that persistence logic as reusable logic and flexible logic to modify is called DAO..

=>DAO class should not have any logic other than persistence logic
even c=a+b is wrong in DAO class

=> if project is having <100 db tables ,then we should take DAO classes on 1 per db table basis

=> if project is having >=100 db tables ,then we should take DAO classes on 1 per related db tables..
(4-5 db tables togather)

note:: Instead of writing peristence logic directly in servlet comp, it is recomanded to write in seperate java class called DAO make servlet comp taking with DAO class

=>DB s/ws like oracle ,mysql, postgreSQL comes under Data storage technologies.

=>The Technologies using which we can develop persistence are called as Data Access Technologies like jdbc,hibernate, iBatis,spring jdbc , spring data and etc..

=> The java class that contains Data Access technologie's persistence logic is called DAO class.

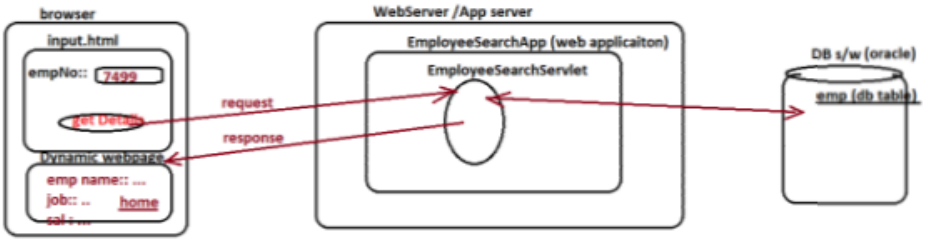
Approach4
========

a) create DAO class having Persistnece logic
(It can use either direct jdbc con obj or pooled jdbc con object)

b) In servlet comp , create DAO class object and invoke methods on it to execute DAO class persistence logic being from servlet comp.

Conclusion:: If the web applicalton is small scale then use
Approch2 (less than <10 web pages)
if the web applicaiton is large scale or medium scale then use
Approch4 (more than >=10 web pages)

Servlet to Db s/w communication using Approch2 (writing jdbc code in service(-,-)/doXxx(-,-) method)
==========




```
EmployeeSearchAp (EDWP)
   |----->java resources
          |--->src
                |--->com.nt.servlet
                        |--->EmployeeSearchServlet.java
   |--->webcontent
          |------>input.html
          |------>WEB-INF
                |--->lib
                      |--->ojdbc6.jar
                |-->web.xml
```

jar fies in classpath /build path
servlet-api.jar , ojdbc6.jar
⇩
(if we choose Tomcat as target run env.. while creating project this jar file will come automatically)

=>The jar files added to CLASSPATH/BUIDPATH of Eclipse Dynamic web project will be used by Eclipse Java Compiler to recognize third party api during the compilation of servlet comp ,where as the jar fiels added WEB-INF/lib folder of java web application will be used by WebContainer to recongnize and use third party api during the execution of web comps like servlet comps, jsp comps.

=> if java web application use third party api (like oracle thin driver) then that third party api related jar files (like ojdbc6.jar) must be added to CLASSPATH/build path and must also added to WEB-INF/lib folder.

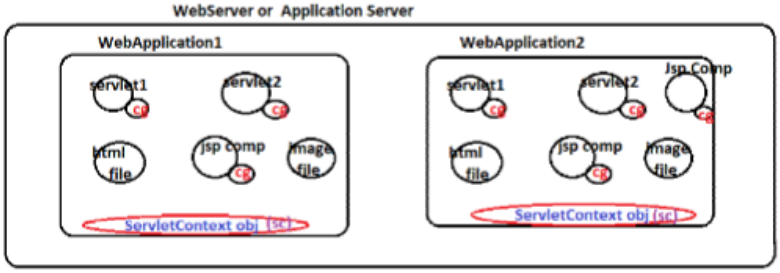
=>The STandalone App/Project of Eclipse IDE uses the jar files added to build path/classpath during the compilation of standalone app and also during the execution of standalone App.

=>Instead of placing jar files to WEB-INF/lib folder manually, we can use Deployment Assembly option of Eclipse IDE's Dynamic web Project to do the same i.e it copies the select jar files of buildpath to WEB-INF/lib folder..

Right click Dynamic Web Project ---> Properties ----> Deployment Assembly ----> add --->
java buildpath entries --> select jar files from Build path ---> ....

What is the difference between ServletConfig and ServletContext objs?

ServletConfig obj ---> It is 1 per Servlet comp /jsp comp class obj
ServletContext ---> It is 1 per web application



cg:: ServletConfig obj
sc :: ServletContext obj

ServletConfig obj

=> It is 1 per servlet class obj/jsp comp.
=>It is right hand object to our servlet class obj becoz Programmer uses this object to gather info about servlet comp and to pass info servlet comp from outside.
=> ServletContainer creates this object during the deployment of web application and assings to respective Servlet class obj as part Servlet initialization by calling init(-) having Servletconfig obj as the argument value.
=> Servletconfig obj means it is the object of underlying Servletcontainer supplied java class that implements javax.servlet.ServletConfig(I) . Its impl class name will change webcontainer to Web container or Server to server.
=> Servletcontainer destroys ServletConfig obj along with Servletclass object
=> Using Servletconfig obj
->we can get logical name (instance name) of Servlet comp
->we can get init param values of Servlet comp that are placed in web.xml file.
usecase:: passing jdbc properties from web.xml as technical input values to servlet comp

note:: Since Servletcontainer creates our servlet class obj using 0-param constructor, So programmer can not pass his choice data/values as part of servlet initialization through contructor.. To overcome this problem init(Servletconfig) method is given as life cycle method ,so programmer can pass init param values throguh Servletconfig obj as initial data/values to servlet comp.

jdbc properties
|->driver class name
|-->jdbc url
|-->db username
|-->db password
(Thse are technical inputs , So only Programmer can give them)

Servletcontext obj

=>It is 1 per web application
=>Servletcontainer creates this object on the deployment of web application and destroys this object when the web application is stopped or reloaded/undeployed
=>It is called global memory of the web application becoz if we keep any data in this object and that data can be accessed in all web comps through out a web application.
=>It is the object of java class given underlying Servletcontainer implementing javax.servlet.ServletContext(I)
=> Using ServletContext obj , we can
-> get underlying server details
-> get all servlet comp names
-> servlet api version supported by underlying server
-> Global init params/context param values kept in web.xml file
(servlet init params are specific to each servlet comp where as global init params/context param are common for all web comps of web applicaiton)

note:: if multiple servlet comps are looking form same jdbc properties from web.xml file then pass them as global init parameter with the support of ServletContet obj

-> get underlying web name/context path
=> perform dynamic registration of servlet comp (cfg servlet comp with url pattern using java code)
and etc..

In a web server 10 java web applicalton are deployed , In that 6 web applications are in running mode and 4 web applicaltons are in stopped mode .. Can u tell me how many Servletcontext objs are currently available in the web server?

a) 10 b) 6 c)1 d)4
correct answer :: (b) (10-4 = 6)

Q) In a web application total 10 servlet comps are there , In that 3 servlet comps are already requested and another 3 servlet comps are enabled with <load-on-startup> , Can you tell me total how may ServletConfig objs are currently avaiable?

a)10 b) 3 c) 6 d) 1

Corrent answer :: (a)

Q) Can i given same name to ServletInit Param and context param (global init param)?

Ans) yes , we can becoz init params allocates memory in Servletconfig obj and context params allocate memory in SerlvetContext obj

Servletcontext obj

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  (servlet init params are specific to each servlet comp where as global init params/context param are common for all web comps of web applicaiton)
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Corrent answer :: (a)

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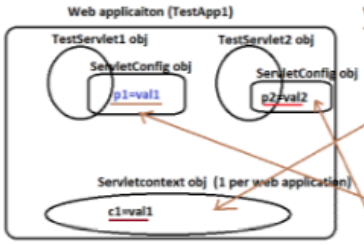

web.xml

```
<web-app>
  <context-param>
    <param-name>c1 </param-name>
    <param-value>val1 </param-value>
  </context-param>
  <servlet>
    <sevlet-name>test1</servlet-name>
    <servlet-class>com.nt.servlet.TestServlet1</servlet-class>
    <init-param>
      <param-name>p1</param-name>
      <param-value>val1 </param-value>
    </init-param>
  </servlet>
  <servlet>
    <sevlet-name>test2</servlet-name>
    <servlet-class>com.nt.servlet.TestServlet2</servlet-class>
    <init-param>
      <param-name>p2</param-name>
      <param-value>val2 </param-value>
    </init-param>
  </servlet>
  ....
  ....
</web-app>
```

During the deployment of web application, the moment SErvletContext obj is created the context params of web application will be stored automatically into Servletcontext obj.. Similary each servlet comp related servlet init params will be stored automatically into that servlet comp related ServletConfig object.

Use Case of ServletInit parameters

=>Instead of hardcoding jdbc properties in directly in Servlet comp, it is recomanded to gather them from web.xml file as servlet init parameter values (Soft coding) with the support of servelt config obj becoz the are technical input values..

Code in web.xml file

```
<servlet>
  <servlet-name>emp</servlet-name>
  <servlet-class>com.nt.servlet.EmployeeSearchServlet</servlet-class>
  <init-param>
    <param-name>driverClass</param-name>
    <param-value>oracle.jdbc.driver.OracleDriver</param-value>
  </init-param>
  <init-param>
    <param-name>jdbcUrl</param-name>
    <param-value>jdbc:oracle:thin:@localhost:1521:xe</param-value>
  </init-param>
  <init-param>
    <param-name>dbuser</param-name>
    <param-value>system</param-value>
  </init-param>
  <init-param>
    <param-name>dbpwd</param-name>
    <param-value>manager</param-value>
  </init-param>
</servlet>
```

Code in Servlet comp

```
//get Access to Servletconfig obj
ServletConfig cg=getServletConfig();
String driver=cg.getInitParameter("driverClass");
String url =cg.getInitParameter("jdbcUrl");
String username=cg.getInitParameter("dbuser");
String pwd=cg.getInitParameter("dbpwd");
//write jdbc code
    Class.forName(driver);
    //establish the connection
con=DriverManager.getConnection(url,username,pwd);
```

Being from one servlet comp, can we read init param values of another servlet comp?

Ans) No .. not possbile .. we get null values.. becoz ServletInit parameters are specific to each Servlet comp as servlet init param allocate Memory in ServletConfig obj (which is specific to each Servlet comp)

Q) Can have same name for two init parameters of two different servlet comps having differernt values?

Ans) Yes , we can have becoz Each Servlet's init parameter allocates memory in respective seperate ServletConfig object.

in web.xml

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Ans) Yes , we can have becoz Each Servlet's init parameter allocates memory in respective seperate ServletConfig object.

in web.xml

==========

```
<servlet>
  <servlet-name>test</servlet-name>
  <servlet-class>com.nt.servlet.TestServlet</servlet-class>
  <init-param>
    <param-name>dbuser</param-name>
    <param-value>mahesh</param-value>
  </init-param>
</servlet>
```

```
<servlet>
  <servlet-name>emp</servlet-name>
  <servlet-class>com.nt.servlet.EmployeeSearchServlet</servlet-class>
  <init-param>
    <param-name>dbuser</param-name>
    <param-value>system</param-value>
  </init-param>
</servlet>
```

Q) What happens ,if two init params of servlet comp are having same name with different values?

Ans) only first value will be taken as the final init param value.

```
<servlet>
  <servlet-name>test</servlet-name>
  <servlet-class>com.nt.servlet.TestServlet</servlet-class>
  <init-param>
    <param-name>dbuser</param-name>
    <param-value>mahesh1</param-value>
  </init-param>
  <init-param>
    <param-name>dbuser</param-name>
    <param-value>mahesh</param-value>
  </init-param>
</servlet>
```

This will be taken as final value

Q) How can we get our Servlet class obj instance name(object name) created by Servlet Container?

Ans) we can get that information with the support of ServletConfig obj by calling cg.getServletName() method .. { the logical name given <servlet-name> tag becoz Servlet instance (object name) internally)

```
pw.println("<br> SErvlet class object name::"+cg.getServletName());
```

---

note: ServletConfig obj is the object of underlying webContainer supplied java class that implements javax.servlet.ServletConfig(I) we can get that class name using cg.getClass(); In tomcat server catalina.jar gives the class name of ServletConfig obj ...

```
pw.println("<br> SErvletConfig object class name::"+cg.getClass());
```

Gives org.apache.catalina.core.StandardWrapperFacade

(This class implements Servletconfig(I) directly or indirectly)

How to pass input values to servlet comp from outside the servlet comp?
==========

=>There are two ways of passing

a) as request parameters (nothing but form data)

[Useful to get non-technical input input values from endusers like name,age,address and etc..]

=>Will be stored in request object automatically, so we can use req.getParameter(-) method to read them being from Servlet comp

=> specific to each reqest (so the scope is request scope)

b) As servlet init parameters/Servletcontext params

[Useful to get technical input values from Programmer like jdbc properites]

=>Servlet init params are specifc each servlet comp and they will be stored in ServletConfig obj , to read init parameter value use cg.getInitParameter(-) method.

=> ServletContext params are common for multiple servlet comps and they will be stored in Servletcontext obj, To read context param values use sc.getInitParameter(-) method.

Multiple Servlet comps of a web application are looking to interact with Db s/w by using same jdbc driver
Then what is best way to get jdbc properties in the all the servlet comps?

a) Hard code jdbc properties in multiple servlet comps (Hard coding bad pratice)
b) get jdbc properites from enduser as request parameters(form data) (enduser can not give technical input values)
c) get jdbc properties from web.xml as servlet init parameters (we need same init params for multiple servlet comps)
d) get jdbc properties from web.xml as servlet context parameters (Ans ::d)

[---> We can jdbc properties as context params only once in web.xml file and they can be used in all servlet comp

getting jdbc properties from web.xml as context param values
==========

code in web.xml file

```
<?xml version="1.0" encoding="UTF-8"?>
<web-app xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns="http://xmlns.jcp.org/xml/ns/javaee"
xsi:schemaLocation="http://xmlns.jcp.org/xml/ns/javaee http://xmlns.jcp.org/xml/ns/javaee/web-app_4_0.xsd"
id="WebApp_ID" version="4.0">
 <display-name>EmployeeSearchApp13</display-name>
 <welcome-file-list>
  <welcome-file>input.html</welcome-file>
 </welcome-file-list>

 <context-param>
   <param-name>driverClass</param-name>
   <param-value>oracle.jdbc.driver.OracleDriver</param-value>
 </context-param>
 <context-param>
  <param-name>jdbcUrl</param-name>
  <param-value>jdbc:oracle:thin:@localhost:1521:xe</param-value>
 </context-param>
 <context-param>
   <param-name>dbuser</param-name>
   <param-value>system</param-value>
 </context-param>
 <context-param>
   <param-name>dbpwd</param-name>
   <param-value>manager</param-value>
 </context-param>
 <servlet>
   ....
 </servlet>
 <servlet-mapping>
   ....
 </servlet-mapping>
```

In Servlet comps
==========

```
//get Access to ServletContext obj
        ServletContext sc=getServletContext();
        String driver=sc.getInitParameter("driverClass");
        String url =sc.getInitParameter("jdbcUrl");
        String username=sc.getInitParameter("dbuser");
        String pwd=sc.getInitParameter("dbpwd");
        //write jdbc code
            Class.forName(driver);
            //establish the connection
        con=DriverManager.getConnection(url,username,pwd);
```

Can i give same to context param and servlet init param ?

Ans) Yes , we can give

note:: Init param allocates memory in ServletConfig obj
and Context param allocates memory in ServletContext obj

What happens if context params are having same name with different values?

Ans) The last value in the list will be taken as final value.

note:: we do not create following objects.. these objects are created by ServletContainer but we can access these objs in our servlet comp by using different techiques

a) our servlet class obj (we can "this" to access our servlet class obj)
b) request obj
c) response obj
d) ServletConfig obj
e) ServletContext obj

[These two objects can be accessed as the parameters of service(-,-)/doXxx(-,-) methods]

Different ways of accessing ServletConfig obj?

Approach1) as init(-) method parameter

```
public class TestServlet extends HttpServlet{
    ServletConfig cg;
    public void init(ServletConfig cg){
        this.cg=cg;
        ... use cg here
    }
    public void service(-,-)/doXxx(-,-) throws SE,IOE{
        //use cg here
        ....
    }
}
```

Bad Approach , we may forget initialize Servletconfig obj

Approach2) Using getServletConfig() method (Best)

```
public class TestServlet extends HttpServlet{

    public void init(){
        ServletConfig cg=getServletConfig();
        //use cg here
    }
    public void service(-,-)/doXxx(-,-)throws SE,IOE{
        ....
        Servletconfig cg=getServletConfig();
        //use cfg here
    }
}
```

Different ways of getting access to ServletContext obj?

Approach1) Using cg.getServletContext();

In any method of servlet comp

```
ServletConfig cg=getServletConfig();
ServletContext sc=cg.getServletContext();
```

Approach2) Using getServletContext() of GenericServlet class (Best)

```
ServletContext sc=getServletContext();
```

|-->This method interlly uses approach1 code
|--> This is called convience method to the programmer

In GenericServlet.java

```
public ServletContext getServletContext() {
    return this.getServletConfig().getServletContext();
}
```

Approach3) Using reg.getServletContext(); method (Servlet api 3.0)

```
// Only from service(-,-)/doXxx(-,-) methods of servlet comp

ServletContext sc=req.getServetContext();
```

What the advantage of writing intialization logic in the init() method of servlet comp rather is writing in the constructor though both are one time executing blocks of servlet comp?

Ans) ServletConfig obj is assigned to Servlet class obj using init(-) method of servlet comp..
With out servletConfig obj or requeest obj we can not access ServletContext object..

note:: The code placed in the constructor of Servlet comp can not get access to Servlet Init param, context param values becoz constructot does not have access to ServletConfig, ServletContext objs.
The code placed in init() method of servlet comp can get access to Servlet Init param, context param values becoz init() is having access to ServletConfig, ServletContext objs

note:: if we place logic to create JDBC con obj in the init() method of servlet comp then we can get jdbc properties from web.xml either as init params or as context params

note:: if we place logic to create JDBC con obj in the constructor of servlet comp then we can not get jdbc properties from web.xml either as init params or as context params

---

=>ServletContext obj means , it is not object javax.servlet.ServletContext(I).. It is the object of java class that implments javax.servlet.ServletContext(I). (It is class org.apache.catalina.core.ApplicationContextFacade in Tomcat server) (see in catalina.jar)

Using ServletContext obj we can gather more info current web applicaition, underlying server and its web comps

```
ServletContext sc=getServletContext();
    pw.println("<br> Server info ::"+sc.getServerInfo());
    pw.println("<br> server api version ::"+sc.getMajorVersion()+"."+sc.getMinorVersion());
    pw.println("<br> Context path of web application::"+sc.getContextPath());
    pw.println("<br> Absolute Path of input.html::"+sc.getRealPath("/input.html"));
    pw.println("<br> Absolute path of web application::"+sc.getRealPath("/"));          /=>Web root folder
    pw.println("<br> MIME type of input.html::"+sc.getMimeType("/input.html"));
```

Two types of jdbc con pools

1.standalone jdbc con pool

=>useful in standalone Apps (The apps that are running outside the server)

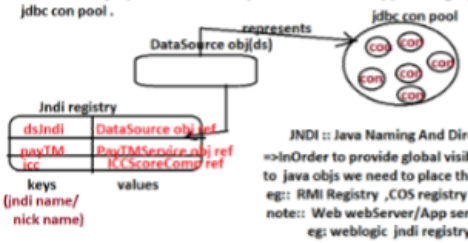
eg:: apacheDBCp, HikariCP and etc..

2. server Managed JDBC con pool

=> This jdbc con pool is created and managed by underlying webServer /Application server..
=> useful for web applications that deployable and executable in webServer/Application server

eg:: Weblogic managed jdbc con pool
Tomcat managed jdbc con pool
Wildfly managed jdbc con pool

DataSouce obj represents Jdbc con pool and acts as entry point to get jdbc con objs from jdbc con pool .



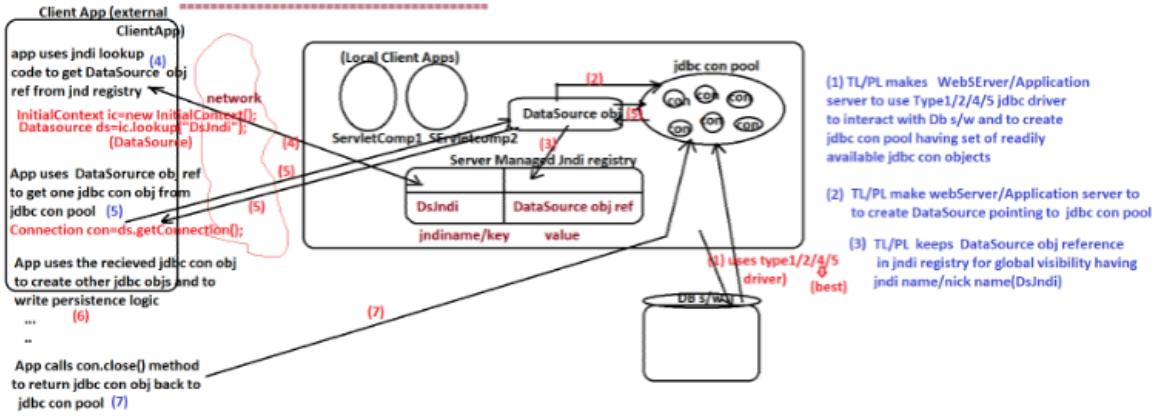
JNDI :: Java Naming And Directory Interface
=>InOrder to provide global visibility and accessbility to java objs we need to place them in Jndi registry
eg:: RMI Registry ,COS registry
note:: Web webServer/App server gives one built-in jndi registry
eg: weblogic jndi registry, Tomcat jndi registry, Wildfly jndi registry...

Java App ----jdbc api (java.sql ,javax.sql and etc..)----> DBS/w (Using jdbc api code , we can perform CURD Operations on DB s/w like insert,update,delete and select operations)

Java app ----Jndi api (javax.naming and sub packages)----> Jndi registry (Using jndi api code , we can perform Jndi operations on Jndi registry like Bind,Unbind,Rebind and lookup operations)

Bind Operation:: keeping obj/obj ref in the Jndi registry having nick name
UnBind Operation:: removing obj/obj ref in the Jndi registry having nick name
Lookup Operation:: Accessing obj/obj ref from Jndi registry
Rebind Operation:: Replacing existing object with new obj in the jndi registry

Understanding Server Managed jdbc con pool

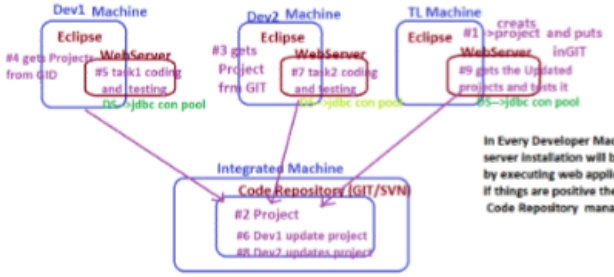


(1) TL/PL makes WebSErver/Application server to use Type1/2/4/5 jdbc driver to interact with Db s/w and to create jdbc con pool having set of readily available jdbc con objects

(2) TL/PL make webServer/Application server to to create DataSource pointing to jdbc con pool

(3) TL/PL keeps DataSource obj reference in jndi registry for global visibility having jndi name/nick name(DsJndi)

=>DataSource obj means it is the obj java class that implements javax.sql.DataSource(I)
=> In One Server we can multiple jdbc con pools either for same Db s/w or for different DB s/ws and representing these multiple jdbc con pools , we need to take multiple Datasource objs
=>All Jdbc con objs in jdbc con pool represents connectivity with same Db s/w..
eg:: jdbc con pool for oracle means all the jdbc con objs in jdbc con pool reprsents connectivity with same oracle DB s/w
eg:: jdbc con pool for mysql means all the jdbc con objs in jdbc con pool reprsents connectivity with same mysql DB s/w



In Every Developer Machine of Team webServer/App server installation will be there to test the code by executing web application after completion of task..
if things are positive then he will commit or push the code
Code Repository managed by GIT/SVN

Procedure to create jdbc DataSource obj pointing jdbc con pool for oracle in the Domain server of Weblogic.

step1) start weblogic domain server (WLNTAJ414domain)

use C:\Oracle\Middleware\Oracle_Home\user_projects\domains \WLNTAJ414Domain\startWeblogic.cmd file

step2) Open Admin console screen weblogic domainser ..

http://localhost:7070/console ---> submit username :: javaboss
password :: javaboss1

step3) Create JDBC dataSource pointing to jdbc con pool for oracle

Admin console ---> sevices --->datasoruces -->new -->generic DataSoruce --->
DSname :: ds1 (logical name)
JndiName :: DsJndi
DB type : oracle --->next ---> choose Oracle Thin driver for service connections --->next

db name: xe , host name: localhost , port number :: 1521 , db username:: system , db pwd ::manager -->next --->
Test DBconfiguration ---> select Admin server ---> finish.. go to jdbc con pool tab and specify con pool properties..

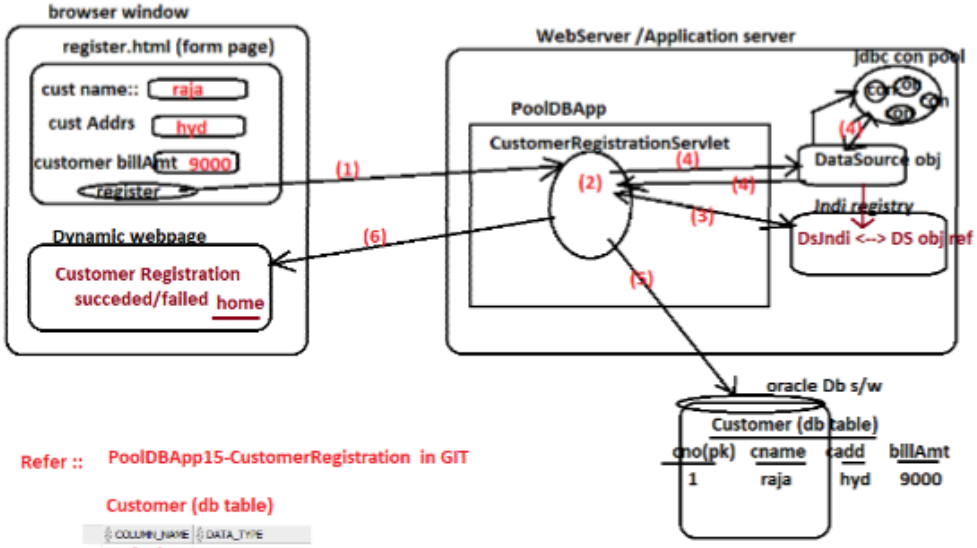
-->save ..

note:: The above process creates Datasource pointing to jdbc con pool for oracle and keeps Datasoruce obj ref in Jndi registry having jndi name : DsJndi

Admin console ---> enviroment ---> servers ---> admin server --->view Jndi Tree --> search for DsJni

---

Example on Servlet to DB s/w communication using Approach3 (Working with JDbc con pool) App



Refer :: PoolDBApp15-CustomerRegistration in GIT

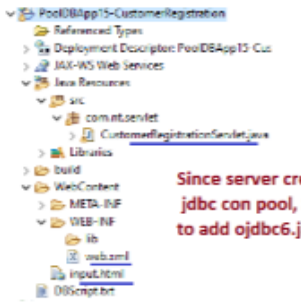
Customer (db table)

	COLUMN_NAME	DATA_TYPE
1	CNO (pk)	NUMBER(10,0)
2	CNAME	VARCHAR2(20 BYTE)
3	CADD	VARCHAR2(20 BYTE)
4	BILLAMOUNT	FLOAT

sequcen in oracle::

CREATE SEQUENCE "SYSTEM"."CNO_SEQ" MINVALUE 1 MAXVALUE 1000 INCREMENT BY 1 START WITH 1

```
CREATE TABLE "SYSTEM"."CUSTOMER"
  (    "CNO" NUMBER(10,0) NOT NULL ENABLE,
       "CNAME" VARCHAR2(20 BYTE),
       "CADD" VARCHAR2(20 BYTE),
       "BILLAMOUNT" FLOAT(126),
       CONSTRAINT "CUSTOMER_PK" PRIMARY KEY ("CNO"));
```



Since server creates con objs in jdbc con pool, So we need not to add ojdbc6.jar file in WEB-INF/lib folder

Procedure to create jdbc con pool for oracle and dataSource in GlassFish domain server

==========

step1) copy odbc6/7/8/9/10.jar to <GlassFish_home>\domains\GFNTAJ414Domain\lib\ext folder

step2) start GlassFish domain server

E:\glassfish-5.0\glassfish5\glassfish\bin>asadmin start-domain GFNTAJ414Domain

step3) Open admin console of Domain server

http://localhost:4545 ---> t

login username:: tesuser

login password :: testuser

-->login

step4) create jdbc con pool for oracle..

admin console --- resources ---->jdbc ---> jdbc con pools --->new ---->

pool name ---> data soruce type :: java.sql.DataSource ----> DB Vendor : oracle --->

pool1

Finish ---> launch pool1 ----> ping --> u should get ping succeded.

step4) create Jdbc DataSource pointing to the the above jdbc con pool

admin console -----> resoruces ---->JDBC ---->JDBC Resources ----->

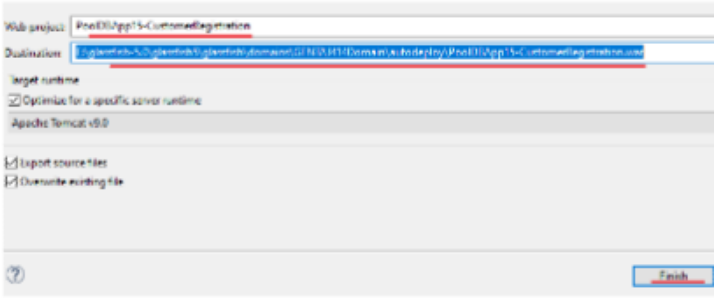
Jndi name:: DsJndi (jdbc data source)

pool name :: pool1

-->ok

step5) Run PoolDBApp15-CustomerRegistration app by exporting its war file GlassFish Domain server

Righ Click on Eclipse Dynamic web Project ---->export ---> war file--->



To test the application::

http://localhost:6677/PoolDBApp15-CustomerRegistration/input.html

Procedure to create JDBC con pool for oracle and JDBC DataSource in Tomcat 9.x server

==========

step1) make sure that tomcat-jdbc.jar and ojdbc6/7/8/9/10.jar files are added to <Tomcat_home>\lib folder

note:: From Tomcat7 tomcat-jdbc.jar file is coming along with Tomcat server installation..

step2) configure Tomcat server eclipse IDE once again through it is already configured..

=>When Tomcat server is configured with Eclipse IDE, Eclipse creates its own copy Tomcat server in workspace.. So to create jdbc con pool, Ds in that Eclipse Tomcat use Project Explorer ---> servers ---> Tomcat --->context.xml file

=>To create jdbc con pool,Ds in external Tomcat server then use <Tomcat_home>\conf\context.xml

note:: When weblogic ,GlassFish servers are configured with Eclipse IDE.. then Eclipse does not its own copy those servers.. It still uses same Orginal Weblogic , GlassFish server..

step3) Collect <Resource> tag from Tomcat docs and place in <Tomcat_home>\conf\context.xml (For extenal Tomcat server jdbc con pool) or place in Eclipse Project Explorer --> servers ---> *(for eclipse tomcat)* Tomcat 9 ---> context .xml file under <context> tag having entries related oracle jdbc driver ..

note:: After developing and testing web application If u remove and add its server in Eclipse IDE .. then we need relink the web applicaiton with server

Right click on webProject ----> build path --->configure build path ---> librarries tab ---> add Library ---> server run time --->select tomcat.

In context.xml (under <context> tag)

```
<Resource name="DsJndi" auth="Container"
        type="javax.sql.DataSource" driverClassName="oracle.jdbc.OracleDriver"
        url="jdbc:oracle:thin:@localhost:1521:xe"
        username="system" password="manager" maxTotal="20" maxIdle="10"
        maxWaitMillis="50000"/>
```

To get sample <Resource> from Tomcat docs

file:///E:/Tomcat%209.0/webapps/docs/jndi-datasource-examples-howto.html

(or)

<Tomcat_home>/webapps/docs/jndi-datasource-examples-howto.html

step4) restart the server..

step5) Run the PoolDBApp15-CustomerRegistration in Tomcat server of Eclipse by Run As -->server -->tomcat 9 optionn

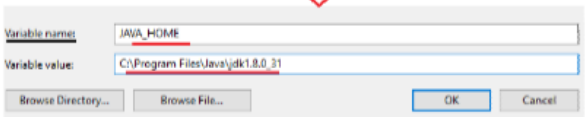
note:: we need to add adtional pre-fixes for the Datasource Jndi name of Tocmat server that is java:/comp/env/DsJndi

Wildfly (Old JBoss server)
=======
type :: Application server
vendor :: RedHat
version :: 21.x (compitable with jdk1.8+)
Open source
To download software :: https://www.wildfly.org/downloads/

default Ports :: 9990 (admin console)
8080 (for http requests) (changable)
=>Does not allow to create domains..
=>Allows only Console and Tools Based Deployment (No HardDeployment support)
To install wildfly server :: extract the zip file..

To change http port number of Wildfly server
==========
Go to E:\WildFly21.0Soft\wildfly-21.0.2.Final\standalone\configuration\standalone.xml file
and modify <socket-binding name="http" port="${jboss.http.port:~~8080~~ 8899}"/>

To add admin user to Wildfly server
==========
step1) make sure JAVA_HOME env.. variable created in my computer pointing to
Java8 installation folder..
This PC /Mycomputer --->proeprties ---> advanced system settings ---->
env.. variables ----> system variables --->new



step2) Add User by <Wildfy_home>\bin\adduser.bat file

```
hat type of user do you wish to add?
a) Management User (mgmt-users.properties)
b) Application User (application-users.properties)
a):

nter the details of the new user to add.
sing realm 'ManagementRealm' as discovered from the existing property files.
sernamе : testuser1
assword recommendations are listed below. To modify these restrictions edit the a

- The password should be different from the username
- The password should not be one of the following restricted values {root, admin,
- The password should contain at least 8 characters, 1 alphabetic character(s), 1

assword : testuser1*
e-enter Password : testuser1*
```

...
...
...

Procedure to create JDBC DataSource pointing to JDBC con pool for oracle in Wildfly server

step1) make sure JAVA_HOME env.. variable created in my computer pointing to
Java8 installation folder.. (refer above)

step2) start Wildfly server..
use E:\WildFly21.0Soft\wildfly-21.0.2.Final\bin\standalone.bat file

step3) open admin console of wildfly server..
http://localhost:9990/ ---> submit username :: testuser1
password :: testuser1*

step4) Deploy ojdbc6/7/8/9/10.jar to wildfly server to make it avaiable in server..
Admin console -->Deployments ---> (+)add ---> upload deployment ---> browser and select
ojdbc6/7/8/9/10.jar file ---> next ---> finish --->close.

step5) Create DataSource pointing to jdbc con pool for oracle
Admin console --->configuration --->Datasoruce ---> start ---> subsystems --->
datasources & drivers ----> data soruces ---> (+)->add data soruce ---> select oracle --->next-->
DataSoruce name:: oracleDs , jndi name:: java:/DsJndi1 ---> enter jdbc properties
jdbc url:: jdbc:oracle:thin:@localhost:1521:xe
db username:: system
db password :: manager
next --> testConnection ---> next --->Finish .

Procedure to deploy Java web application in Widfly server

==========

step1) Keep PoolDBApp15-CustomerRegistration App ready with modified jndi name:

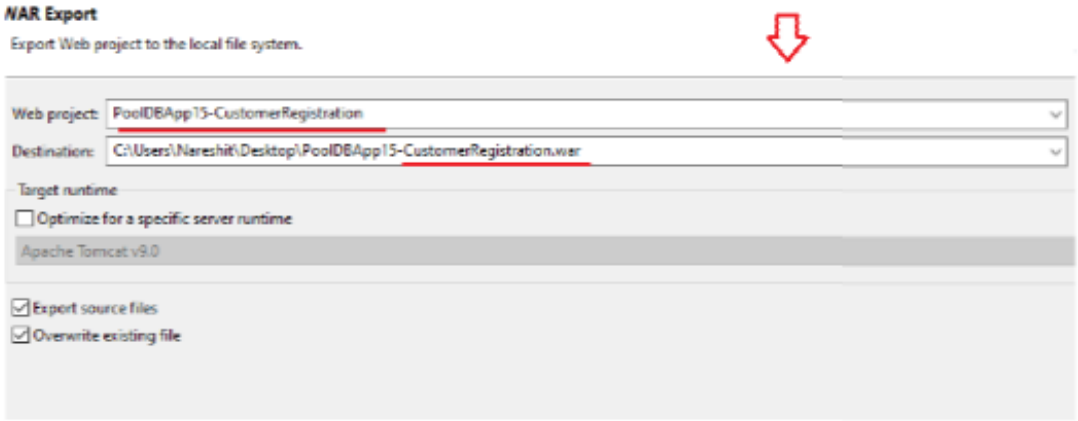
java:/DsJndi1

fixed prefix

step2) make sure that java version of project is changed to jdk1.8

step3) prepare war file representing the web application..

Right click on the Project ---> export --->war file --->



step4) Open admin console of server and deploy the war file..

Admin console ----> deployments --start ----> (+)add -->upload deployment --->
browse and select the war file ---> finish..

step5) Test the web applicaiton..

http://localhost:8899/PoolDBApp15-CustomerRegistration

Java Bean And usage::
https://www.youtube.com/watch?v=io2TciOcF2Y

VO class , DTO class and BO class
==========
https://www.youtube.com/watch?v=GOvak6awDrI

HttpUnit :: 11am to 12:30 noon
(old meeting id)
pre-requisites :: Junit5 and servlet basics

Java Bean

=> The java class that is developed by following some standards is called java bean.

The standards are

=>The java Class must taken as public class

=> It is recomanded to implement Serializable(I)

=> All member variables must be taken as private and non-static (bean properties)

=> Every bean property must have 1 setter method and 1 getter method

=> we must have 0-param constructor directly(given by programmer) or indirectly(generated by javac)

note:: Java bean class should always be used as helper class to pass multiple values from 1 main class another main class.

class1 ----more thatn 3 values----->class2
(java bean class obj)

Based on the kind of data we place in java bean , there are 3 types of java beans

a) VO class (Value object class)
-->Carries inputs or outputs

b) DTO class (Data transfer object class)
--> Carries data to transfer between two classes same project and between two classes of two different projects.

c) BO Class (Business object class)
---> Carries /holds persistable data (To be inserted to the db table as record) or Persistent data (collected from db table record)
--> it will be taken as 1 per Db table basis, So there must be compitable b/w BO class properties and Db table cols...

Limitation of placing multiple logics in single java class (single Servlet comp class)

=> since we mixup multiple logics by placing them in single comp.. Code becomes clumzy and clean seperation b/w the logics will be missed.

=> The modifications done in one kind of logics will effect other kind of logics..

=> The maintainance(Bug fixing) and enhacement(new features) of the Project/App becomes very complex.

=> Parellel development is not possible .. So the productivity is very poor.

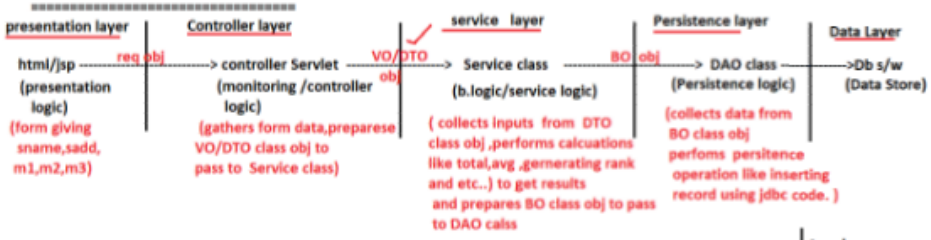
=> It is not industry standard approach to develop the s/w Applications..

and etc..

=>To overcome these problems , take support of layered applications .. Which seperate different logics in different layers.

A Layer is logical partiation of the App/project that contains one or more classes representing certain logic .

A typical web based layered Application



DAO class (Data Access Object class) (Inventory Manager)

=> That java class that contains only Persinstece logic and makes that logic resusable and flexible logic to modify is called DAO class.

=>DAO class must contain only Persistence logic.. even c=a+b is not allowed here
|--->CURD Operations code , logic to establish the connectoon or close the connection

=> if Project/App is having <100 db tables then take 1 DAO calss per 1 db table

=> if Project/App is having >=100 db tables then take 1 DAO calss per 4/5 related db tables

Java bean::
https://www.youtube.com/c/NareshIT/search?query=Java%20bean%20and%20its%20

VO -DTO-BO class::
https://www.youtube.com/watch?v=GOvak6awDrI

=> This contains two parts

a) query Part

=>All SQL Queries will be declared at top of class as private static final String variable values(String constants) in uper case letters for easy identification and modification.

b) Code Part

=> Multiple methods representing multiple persistence logics (CURD Operations)

=> Generally gets input values from Service class in the form of BO class obj (More than 3 values)

=>We can write Persistence logic by any Persistnece technology or framework like JDBC, Spring JDBC, Hibernate , spring ORM , Spring data and etc..

Service class (Accountant)

=> It is a java class that contains only b.logic /service logic (calculations, analyzations and etc...)

=> It is generally 1 per module

=> It also maintains additional services like TransactionManagment ,Security ,Logging and etc..

=> gets inputs from Controller class in the form VO /DTO class obj (more than 3 values)

Hospital Project (1 constroller servlet/class)

|--->InPatient (module1)
|--->OutPatient (module2)
|--> Payroll and Finance (module3)
|--> Pathology(Labs) (module4)
|--> Medicine (module5)
|--> BloodBank (module6)
|--> OT services (module7)

7 service classes

Controller class (Super viser)

=> In web application env.. it is servlet comp .. having monitoring /supervising logics

=> Contains logics to map /link certain html/jsp requests to certain service class and vice-versa.

=> It is generally 1 per Project controlling or monitoring all the activities of the web application

=> gathers inputs from html/jsp comps and passes them to Service class as VO /DTO class obj

htm/jsp comps (Beautician)

=> These comps contains presnetation logic (logic to gather inputs from enduser and logic to display outputs to enduser)

=> These can mulitple in numbers (as per the need having forms ,hyperlinks to generate the requests to display the recieved outputs)

=>While Layer developing apps , we need to take

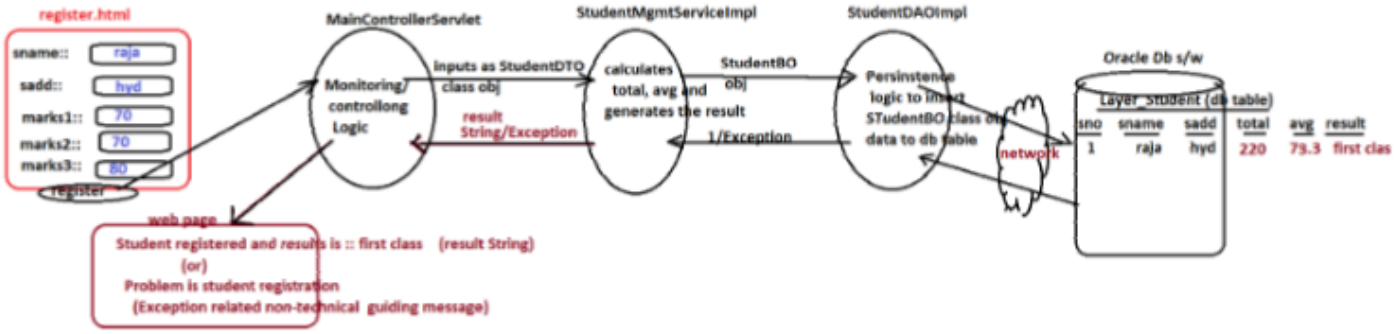
a) DAO Interface and Impl class , So that we can write diffrent logics in different impl classes
|--->DAO Impl class1 having JDBC persistence logic
|--->DAO Impl class2 having Hibernate Persinstence logic
|--->DAO Impl class3 having spring JDBC Persinstence logic

b) Service Interface and Impl class , So that we can write different logics in different impl classes
|---> service Impl class1 having b.logic by using algorithm1
|---> service Impl class1 having b.logic by sing algorithm2

Based on Core Java's run time polymorphism or Loose coupling concept.

c) Controller Servlet is already implementing javax.servlet.Servlet(I) indirectly and it is one per Project , So there is no need of taking seperate interface ..

Example Application
==========



How do u pass/propagate the exception raised in DAO class to ControllerServlet/browser?

Ans) Do not just catch and handle exception in DAO class usin try /catch block becoz when exception is raised the controller goes catch block and the exception will be eaten/suppressed there..

DAO class

```
public int insert (-) {
 try{
   ---
   --- //jdbc code to insert the record
   ---
 }
 catch(Exception e){
   --
 }
}//insert(-) method
```

In DAO ,service classes do not catch and handle exception using try/catch.. always prefer declaring the exception to be thrown using "throws" clause , so the exception raised in DAO class method will be passed to Service class method and will be passed Controller Servlet .. then controller Servlet comp catches and handles the eception using try /catch and displays exception related non-technical messages to enduser using pw.println(-) method. (note:: PrintWriter (pw) is not visible /creatable in Service,DAO calss.. it can be used only used in servlet comp throguh response obj. PrintWriter pw=res.getWriter())

Exception propagation

DAO class code

```
p int insert(-) throws Exception{
  --- //jdbc code
  ---
}
```

service class code

```
public String generateResults(-)throws Exception{

  int count=dao.insert(-);
    ----
}
```

controller sevlet code

```
public v doGet/doPost(-,-)throws SE,IOE{
  ----
 try{
  String result=service.generateResults(-)
   pw.println(result);
  }
  catch(Exception e){
    pw.println("Problem in student registration");
  }
}
```

DAO and service classs are ordinary java classes , So they do not have response obj to create PrintWriter i.e they can not write messages to browser directly.

Stroy board of our Layed applicaton (Persistnece laeyer)

==========

IStudentDAO.java

```
public interface IStudentDAO{
  public   int insert(StudentBO bo)throws Exception;
 }
```

StudentDAOImpl.java

```
public   class StudentDAOImpl implements  IStudentDAO{

   public   int insert(StudentBO bo)throws Exception{
     ....  //read data from BO class obj
     ....  // and write that data to Db table
     ....  // as record  using JDBC code
     ....
   return 1/0;
   }
}
```

Service layer

IStudentMgmtService.java

```
public  Interface IStudentMgmtService{

   public String generateResult(StudentDTO dto)throws Exception

 }
```

note:: if class is not having state (no member variables) or read only (Fixed) then it is recomanded to create only 1 object for that class and use it for multiple times to avoid memory wastage..

=>Generally DAO ,Service classes contain either no state or fixed state .. So we prefer creating only one object for those java classes.

StudentMgmtServiceImpl.java

```
public    class    StudentMgmtServiceImpl implements  IStudentMgmtService{
   private  IStudentDAO dao;
   public   StudentMgmtServiceImpl(){
      dao=new  StudentDAOImpl();
   }
   public   String  generateResult(StudentDTO dto)throws Exception{
     int total=dto.getM1()+dto.getM2()+dto.getM3();
     float  avg=total/3.0f
     String result=null;
      if(avg<35)
         result="fail";
      else if(avg<50)
        result="third Grade";
      else  if(avg<60)
         result="Second Grade";
      else
         result="First Grade";
      //prepare StudentBO class obj having  sname,sadd , total,avg,result
         StudentBO bo=new StudentBO();
         bo.setSname(dto.getSname());
         bo.setSadd(dto.getSadd());
         bo.setTotal(total); bo.setAvg(avg); bo.setResult(result);
      //use DAO
      int count=dao.insert(bo);
      if(count==0)
         return "studnet registration failed";
      else
         return "studnet registration succeded";
      }
   }
```

b.logic

Controler Servlet (Controller layer)

```
                    #4
public  class  MainControllerServlet extends  HttpServlet{

  private  IStudentMgmtService service;
   public void init(){
      service=new  StudentMgmtServiceImpl();
   }
                    #7
   public void  doGet(req,res)throws  SE,IOE{

     //read form data
       ...
     //create StudentDTO class obj having form data or inputs
       ...
     try{
      // use  service            #8
#1 5    String result=service.generateResult(dto);
        pw.println("RESULT::"+result);  #16
      }
      catch(Exception e){
        e.printStackTrace();
         pw.println("Problem is  student registration");
        }
   }//doGet(-,-)
                    #5
    public void doPost(req,res)throws SE,IOE{
       doGet(req,res);  #6
     }
}//class
```

Form page (student_register.jsp)

```
========
                #2
<form action="controller"  method="POST">
   ....
   ....  //form comps
   ....
  <input type="submit" value="register"/>
</form>                #1
```

web.xml

```
=======
=> cfg  MainControllerServlet with url pattern /controller
   by enabling <load-on-startup>      #3
```

=>The code placed in static block of the class is one-time executing block having the following limitations

a) we can use only static variables in the static block

b) Exception is not possible from static block

=>if web.xml is not coming along with dynamic web project creation.. then we can generate it seperately by using Eclipse Options..

Right click on project --> JEE tools --->Generate Deployment Descriptor Stub.

=>No Sequences in support in mysql.. In order generate PK col dynamically , we need to take the support of auto increment constraint.

```
CREATE TABLE `ntaj414db`.`layered_student` (
  `sno` INT NOT NULL AUTO_INCREMENT,
  `sname` VARCHAR(20) NULL,
  `sadd` VARCHAR(20) NULL,
  `total` INT NULL,
  `avg` FLOAT NULL,
  `result` VARCHAR(20) NULL,
  PRIMARY KEY (`sno`),
  UNIQUE INDEX `sno_UNIQUE` (`sno` ASC) VISIBLE;
```

=>To create JDBC Data Source pointing to JDBC con pool for mysql in tomcat server, we need to add the following <Resource> tag in Context.xml file

```
<Resource name="DsJndi-mysql" auth="Container"
        type="javax.sql.DataSource" driverClassName="com.mysql.cj.jdbc.Driver"
        url="jdbc:mysql:///localhost:3306/NTAJ414db"
        username="root" password="root" maxTotal="20" maxIdle="10"
        maxWaitMillis="50000"/>
```

=>jar files added to <Tomcat_home>\lib folder (external Tomcat server) will reflect to Eclipse Tomcat server automatically if they were added befor configuring Tomcat server with Eclipse otherwise they will not reflect. In that situation , we need to add jars files to the Project's WEB-INF/lib folder seperately..

In Layered Apps, it is recomanded to enable <load-on-startup> on servlet comp.. to perform eager instantiation on Servlet comp class ,service class and DAO class.

Assignment ::Employee Registration Layered app to calculate gross,netSalaries based on the given ename,eadd,basicslary details..

Annotation driven servlet mapping
==========

```
//@WebServlet(value="/testurl")
//@WebServlet(value={"/testurl1","/testurl2"})
//@WebServlet({"/testurl1","/testurl2"})
//@WebServlet(urlPatterns={"/testurl1","/testurl2"})
//@WebServlet(name="test", value="/testurl", loadOnStartup=1)
@WebServlet(name="test", value={"/testurl1","/testurl2"}, loadOnStartup=1)
public class TesServlet extends  HttpServlet{
   ----
   ---
}
```

If we configure Servlet comp having both annotation driven and xml driven servlet mappings then what happens?

Ans)=> if annotation driven and xml driven servlet mappings are taken with the same logical name
then xml driven servlet mapping url pattern will dominate annotation driven mappings related url pattern.

=> if annotation driven and xml driven servlet mappings are taken with two different logical names
then that Servlet comp can requested using both annotation driven and xml driven mappings related url patterns.

=>In annotation driven servlet mapping, if do not provide logical name then the fully quallfied class name of servlet comp class will be become default logical name..
=>In xml driven servlet mapping, if do not provide logical name in <servlet-name> tag then we get errors..

note:: the logical name of servlet internally becomes object name (refer variable name)
when Servlet container creates object for servlet comps..

```
@WebServlet(urlPatterns={"/testurl1","/testurl2"},name="test1",loadOnStartup = 1)
public class TestServlet extends HttpServlet  { ... }
```

⇩

```
Class c=Class.forName("com.nt.servlet.TestServlet");
TestServlet test1=(TestServlet)c.newInstance();
```

object name(reference variable name)

To know Servlet comp class obj name (logical name) dynamically being from servlet comp class then we can use.

```
Servletconfig cg=getServletConfig();
pw.println("<br><b> logical name of servlet comp is ::"+cg.getServletName()+"</b>");
```

note: if we configure Servlet comp having both xml driven and annotation driven different url pattterns
the settings done in web.xml for servlet comp takes place if we give the request using xml driven url pattern,
Similarly the settings done in annotations for servlet comp takes place , if we give the request using annotation driven url patterns..

Q)What happens if we give same url pattern in xml driven cfgs and annotation driven cfgs?
ans) if logical name is same in both places then annotation driven cfgs takes place otherwise error will be raised.

=>Using @WebInitParam annotation, we can pass input values to Servlet comp as servlet init param values.. But we do not the flexibility of modifications becoz we are placing then directly in the source code of servlet comp...

```
@WebServlet(name="test1",urlPatterns = "/testurl1",initParams = {@WebInitParam(name="p1",value="val1"),
                                                                 @WebInitParam(name="p2",value="val2")
                                                                 })

public class TestServlet extends HttpServlet {
   ....
   ....
}
```

---

note:: if want overirde or modify the Annotation driven cfgs , with out touching the source code of servlet comp then we can write same cfgs with different values by using web.xml entries.

Can we avoid web.xml in servlet based web application development?

Ans) yes we can avoid.. in few situations.. but not recomanded becoz the still web.xml is required for following cfgs as annotation are not given for the same cfgs.

a) context params
b) welcome cfgs
c) Security cfgs
d) Session Mgmt cfgs
and etc..

(still we need to use web.xml for all these cfgs)

=>Thumb rule in servlet programming
=> First prefer configure things by using Annotations.., if not possible then go for web.xml based cfgs.

Servlet 3.0+ onworsds we are having supports for annotations
The List of annotations are
a) @WebServlet
b) @WebFilter
c)@WebListener
d) @WebInitParam
e) @ MultipartConfig
f) @HttpMethodConstaint
g) @HttpConstraint
h) @HandleTypes

related security cfgs.

File Uploading and File Downloading

=>The Process of selecting file from client machine file system and sending that file to server machine file system is called file uploading and reverse is called file downloading..

note:: In real web applications, the uploaded files will not be saved in Db s/w table directly..
They will be saved in Server machine File System (HDD) and their address paths will be collected and will be saved in Db table cols as string values.

File uploading usecases :: matrimony apps , job portal apps, profile mgmt apps, social networking Apps and etc.

File downloading usecases :: software downloading, audio/video files downloading and etc..
report downloading ..

=> To select and upload file from the form page .. we need to take special comp called "file uploading" comp. <input type="file" name="file1">([ ] browse)

=> To recived the file content ,we need to use req.getInputStream("file1"); method as shown below,

```
InputStream is=req.getInputStream("file1");      //"is" represents the content of the uploaded file
OutputStream os=new FileOutputStream("file1.txt"); // "os" represents and empty destination file
IOUtils.copy(is,os);      //Writes "is" content" to "os" file (destination file)
```

=>Instead of doing this complex work for each file seperately , we can use , third party api called javazoom api to simplify the process.

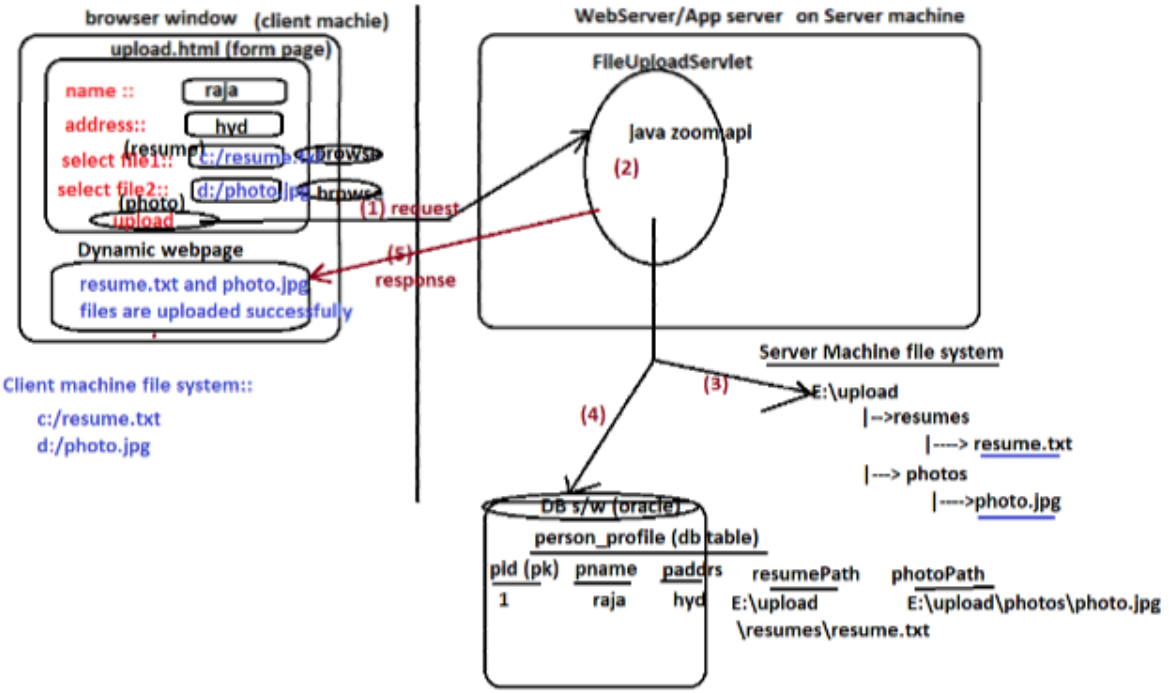
donwload javazoom api from the internet as zip file using the following url::
=> http://www.javazoom.net/jzservlets/uploadbean/uploadbean.html#download

Exact the zip file (uploadbean.zip) to get following jar files..

uploadbean.jar (main jar file)
cos.jar
struts.jar
fileupload.jar
(Dependent jar files)

=>The classes of uploadbean.jar are using the classes of cos.jar, struts.jar , fileupload.jar file
So if Servlet comp is using uploadbean.jar file classes then we need to add both main jar uploadbean.jar and its dependent jar files (cos.jar,struts.jar, fileupload.jar) to the WEB-INF/lib folder..

note:: If the servlet comp uses third party api, the that third party api related both main and dependent jar files must be added to CLASSPATH and WEB-INF/lib folder.



Important classes of javazoom api

1) UploadBean :: To select destionation folder on server machine file system to shave the uploaded files
2) UploadFile :: Represents multiple details about the each uploaded file like file name, file type ,length and etc..
3)MultipartFormDataRequest :: It is wrapper around request object hold normal data and uploded files content.

=>While designing form page having file upload comps , we need to take

a) request method/mode as POST

b) enctype as "multipart/form-data" (This alerts the server that this form page is sending multiple MIME types(parts) based form data and makes the server to recieve it"

This form page generated request contains the multiple parts like text content ,audio file, video file and etc..

default value for "enctype" is :: *application/x-www-form-urlencoded*

(indicates only text content is allowed)

Map Collection (Hashtable)

Hashtable ht=nreq.getFiles();

keys	values
resume	*UploadFile obj (hold resume file info)*
photo	*UploadFile obj (holding Photo file info)*

Vector obj

Vector vector=upb.getHistory();

0	*UploadParameters obj (resume file info)*
1	*UploadParameters obj (photo file info)*

Code in Servlet comp

```
@Resource(name="DsJndi")
private  DataSource ds;
```

@Resource(name="DsJndi") annotation makes the underlying Servletcontainer to search "DsJndi" based DataSource obj in the Server's Jndi Registry and gets that object and assigns/injects to "ds" property dynamically (Dependency Injection)

Dependency Management (giving Dependent to target) (Like Giving DataSource obj(dependent) to Servlet obj(target))

1.Using Dependency Lookup

=>Here taget class writes some logic and spends some time to search and get Dependent class obj ..

eg1: Student (target) gettting Course Material (dependent) from office by requestisng/asking for it

eg2:: Servlet comp/DAO class getting DataSource object from Jndi registry through lookup code.

In servlet comp/DAO class

```
InitialContext ic=new InitialContext();
DataSource ds=(DataSource)ic.looup("java:/comp/env/DsJndi");
```

pros

=> target can get only the required Depedent objs

cons

=> target needs spend some amount time and logic to search and get Dependent class obj

2 . Dependency Injection

=> Here the underlying Server/container/Framework/RuntimeEnv.. dyamically assigns/injects Dependent class obj to target class object..

eg1:: Student(target)is injected with Course material(Dependent) by office staff(container) ,the moment student registered for the course.

eg2:: The way Servletconfig is assigned to Servlet comp class obj the moment our servlet class obj is created. by Servlet container

eg3:: The way DataSource object is assingned our Servlet comp class obj's property by ServletContainer when @Resource is used.

```
@Resource(name="DsJndi")
private  DataSource ds;
```

pros

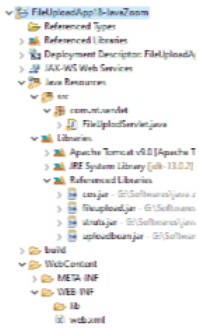
=> Underlying container/server/ framwork/ ... - takes care of every process

cons

=> The underlying container/server/framework may inject/assign both neccessary and unneccessary.

Example App

(refer GIT for the source code)



File Downloading
==========

=>It is the process of getting file from the Server Machine File System to Client machine file system

File Downloading
|----> Response Downloading
(It is all about making the output of web comp (servlet/jsp) as the downloadable)
|---->Resource Downloading (Popular)
(It is all about selecting file of server machine system and making it as downloadable file)
eg:: software downing , audio file/video file downloading ande tc..

Response Downloading
==========

=> Add the following two lines of code to make the any output any web comp(servlet/jsp) as the downloadable file

in Servlet/jsp comp

```
res.setContentType("application/ms-word");
res.addHeader("Content-Disposition","attachment;fileName=abc.doc");
```

(Becoz of these two lines the output of servlet or jsp comp will be downloaded to client machine as abc.doc file through browser software)

"Content-Dispostion" is a the response header like "refresh" which gives instruction to browser to display the recieved output from web comp either "inline" (on browser itself) or as an attachment (as seperate downloadable file) ; default value is "inline"

eg1:

```
res.setContentType("text/html");
res.addHeader("Content-Disposition","inline");
```

Displays the output directly in the browser

eg2:

```
res.setContentType("text/html");
res.addHeader("Content-Disposition","attachment");
```

Gives the output as downloadable file having <urlpattern>.html as the file name

eg3:

```
res.setContentType("text/html");
res.addHeader("Content-Disposition","attachment;fileName=abc.txt");
```

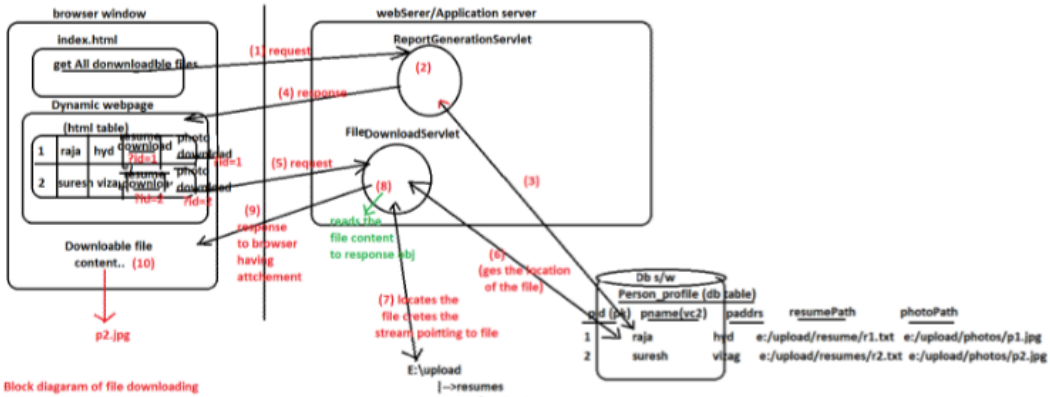
Gives the output as downloadable file having abc.txt as the file name

---

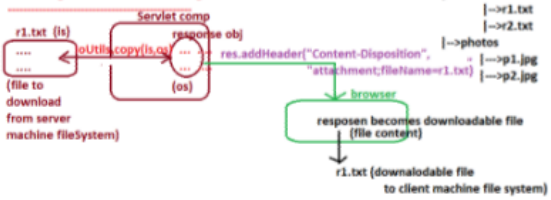
Resource Downloading
==========

=>Here the uploaded files to Server machine file system will be downloaded as seperate resources..

usecases1:: downloading the uploaded resume files
downloading the uploaded matrimony profiles
downloading the uploaded video files
downloading the uploaded software setup/zip/rar files
and etc..



Block diagaram of file downloading



Steps to perform File Downaloding being from servlet comp
==========

```
//create java.io.File object pointing to Destination file to be downloaded
File file=new File(<location>); // E:/upload/resumes/r1.txt is location
// Get the length of the file and make it as respnse content Length
res.setContentLength(file.length());
//get the MIME type of the file to be downloaded and make It as
response content type
ServletContext sc=getServletContext();
String mimeType=sc.getMimeType(<location>);
mimeType= (mimeType==null)?"application/octet-stream":mimeType;
                 for true
                 for false
res.setContentType(mimeType);
// create InputStream pointing destination (file to be downloaded)
InputStream is=new FileInputStream(file);
// create OutputStream pointing response object.
ServletOutputStream sos=res.getServletOutputStream();
// set respnse header "Content-Disposition" to the value "attachment"
res.addHeader("Content-Disposition","attachment;fileName="+file.getName());
// copy content of the file to be downloaded to the response object
IOUtils.copy(is,sos);   //add commons-io.jar file
// close the streams
is.close();
sos.close();
```

(cond)?<true>:<false>
(ternary operator)

=>Using Character stream we can write only text content to Destination file/object

=>Using Byte Streams we can write both text and binary content to destionation file /oject

=>PrintWriter is a character stream having response object as the destination ..so using this we can write only character/text content to response object

```
PrintWriter pw=res.getWriter();
```

=> ServletOutputStream is a bystream having response obj as the destination
So using this ,we can write both text and binary content to destination response obj.

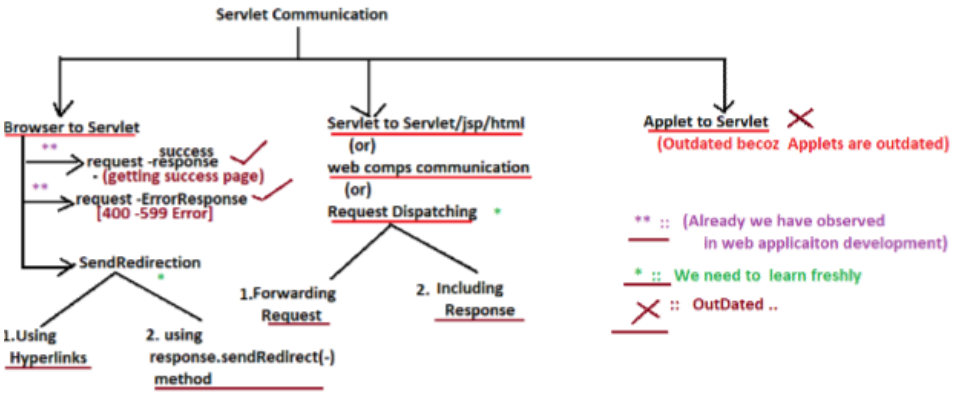
```
ServletOutputStream
sos=res.getServletOutputStream();
```

note:: On response object we can not create both streams at a time.i.e if res.getWriter() is called first then res.getServletOutputSteam() will give error and vice-versa.

Servlet Communication
==========

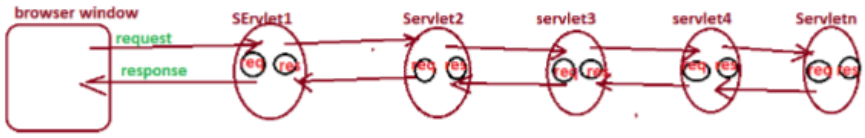
=> It all about making servlet comp talking to web web comp(s) to process the request or making Servlet comp taking request from other web comp(s).

=> This is process is also called called Inter Servlet Communicaiton or web comps communication or servlet chaining.



Request Dispatching or Servlet to Servlet/jsp/html Communication or Web comps communication
==========

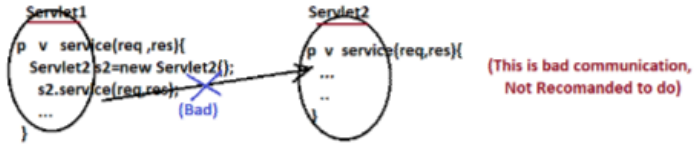
=>So far we are giving request to a web comp(servlet) and getting response from that web comp(Servlet). In order to see the request given to one web comp going to another comp or to process the request by using multiple comps that are there in chaining , we need go for this RequestDispatching.

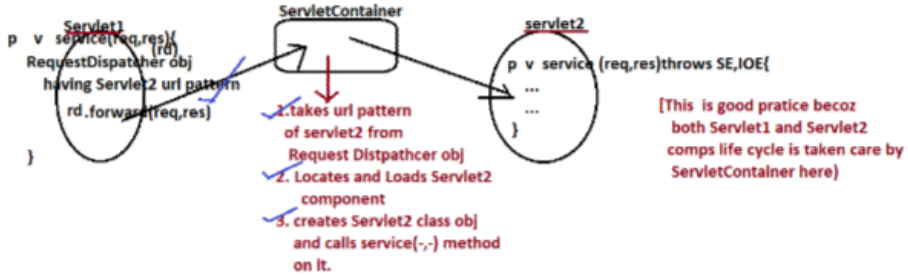


note:: In above diagram , while processing a request all the servlet comps use same req,res objs , So request data /form data coming to servlet1 is visible and accessible in all web comps/Servlet comps that are there in chaining/Communication.

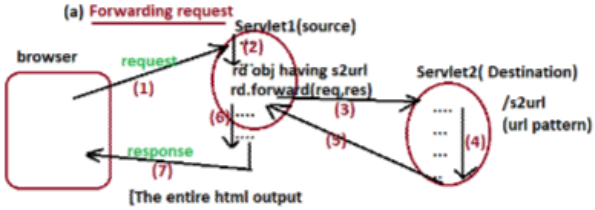
=>Servlet1 should interact Servlet2 through Servlet container then only the life cycle both object will be maintained by Servletcontainer. So do not think about creating Servlet2 class obj in Servlet1 class service(-,-) and calling service(-,-) method of servlet2.

=> In Servelt to Servlet/jsp/html comunication the sorurce servlet comp should locate and interact with Destination Servlet comp/ jsp comp/html file throruhg Servletcontainer by taking the support of RequestDispatcher object.





Two ways of Servlet to servet/jsp/html communication or Dispatching Request or web comps communication
==========

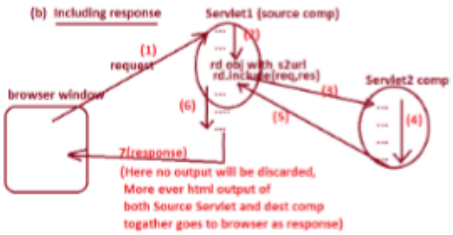


[The entire html output of servlet1 comp(source) will be discarded and only the html output of destination comp(Servlet2) comp goes to browser as response through the source Servlet1 comp)

=>In Servelt1 if we call forward(-,-) on "rd" obj then servlet1 interacts with servlet2 in "forwarding request mode".

=>In Servelt1 if we call include(-,-) on "rd" obj then servlet1 interacts with servlet2 in "includingresponsemode".

(b) Including response



=>RequestDispacher obj means it is the object of
java class that implements javax.servlet.RequestDispatcher(I)

Different Approaches of creating RequestDispatcher obj

Approach1) Using request object

In Servlet1 comp (source)

```
RequestDispatcher rd=req.getRequestDispatcher("/s2url");
rd.forward(req,res);
   (or)
rd.include(req,res);
```

optional

url pattern of destination
servlet comp/jsp comp/html file

=>if the destination comp is servlet comp then we need to pass its url pattern as argument value
=>if the destination comp is jsp comp then we need to pass its file name or url pattern as argument value
=>if the destination comp is html file then we need to pass its file name or url pattern as argument value

note:: we can also cfg html files and jsp file in web.xml file having logical name and url pattern

Approach2) Using Servletcontext object

In Servlet1 comp (source)

```
ServletContext sc=getServletContext();
RequestDispatcher rd=sc.getRequestDispatcher("/s2url");
rd.forward(req,res); (or) rd.include(req,res);
```

mandatory

same as above

Approach3) Using ServletContext obj

In Servlet1 comp (source)

```
ServletContext sc=getServletContext();
RequestDispatcher rd=sc.getNamedDispatcher("s2");
rd.forward(req,res); (or)
rd.include(req,res)
```

Logical name of
Dest Servlet comp/jsp file/html file
(collectied <servlet-name> tag)

What is the difference between getRequestDisatpcher(-) and getNamedDispatcher(-) methods?

getRequestDispatcher(-)	getNamedDispatcher(-)
(a) Invokable on both ServletContext, request objs	(a) Invokable only on ServletContext obj
(b) expects url pattern of Destination servlet comp as the argument value.	(b) expects the logical name of Destination servlet comp as the argument value.
(c) expects the url pattern or file name of Destination jsp file as the argument value	(c) expects the logical name of Destination jsp file as the argument value
(d) expects the url pattern or file name of Destination html file as the argument value.	(d) expects the the logical name of Destination html file as the argument value.
(e) To take html file or jsp file as the destination comp their cfg in web.xml file is optional becoz we can pass their file names as the argument values	e) To take html file or jsp file as the destination comp their cfg in web.xml file is mandatory becoz we need to pass their logical anme given in the web.xml as the argument values

TestProject
|--->webcontent
|--->a1.jsp
|--->b1.html
|--->WEB-INF
|--->web.xml

=>Servlet comps are always placed
in private area(inside WEB-INF) so their cfg in
web.xml file mapping with url pattern
is mandatory , So Servlet comp is always
identified with its url pattern.

=>jsp,html files are always placed
in public area(outside of WEB-INF) so their cfg in
web.xml file mapping with url pattern is optional , So these files
are always identified either with file names or with url patterns

web.xml

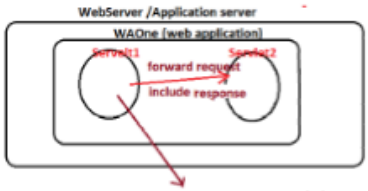
```
<web-app>
  <servlet>
     <servlet-name>a1 </servlet-name>
     <jsp-file>/a1.jsp </jsp-file>
  </servlet>
  <servlet-mapping>
    <servlet-name>a1 </servlet-name>
    <url-pattern>/a1url </url-pattern>
  </servlet-mapping>

  <servlet>
       <servlet-name>b1 </servlet-name>
       <jsp-file>/b1.html </jsp-file>
    </servlet>
    <servlet-mapping>
      <servlet-name>a1 </servlet-name>
      <url-pattern>/b1url </url-pattern>
    </servlet-mapping>
</web-app>
```

jsp file configuration

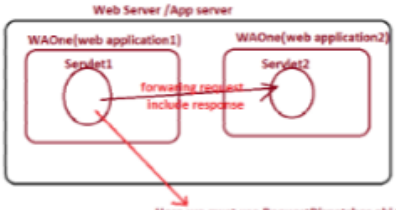
html file configuration

What is the difference b/w createing RequestDispatcher using request obj and using ServletContext obj?

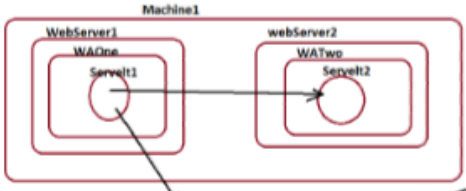
Ans) The "request" object based RequestDispetcher obj allows to place the source servlet comp and Destination web comp in the same web application , where as the "ServletContext" obj based "RequestDispather obj" allows to place the Source Servlet comp and destination web comp either in same web applicalton or in two web applications of same server... but not in two web applications of two different servers belonging either same machine or different machines(for this we need go for sendRedirection)



Here RequestDispatcher obj(rd) can be created
either using "sc" obj or using "req" obj



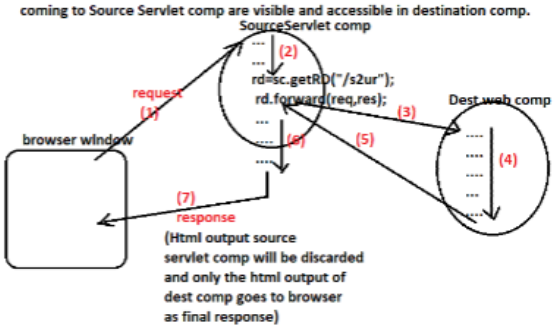
Here we must use RequestDispatcher obj that is created
by using SErvletContext obj



use
Here we can not "RequestDispatcher obj for communication"
we must go sendRedirection

rd.forward(req,res)
==========

=>performs the forwarding request mode of servlet communication
=>Source Servlet and dest comp use same req, res objects,So the request data (req param values) coming to Source Servlet comp are visible and accessible in destination comp.



=> Dest comp can be Servlet comp /jsp comp / html file
=> Source servlet comp and dest comp can be there either in the same web application or in the two different web applications of same server.
=> If Source servlet comp wants to pass addtional data to dest comp , then we need to pass that addtional data in the form of request attributes.

=> All the statements placed in Source servlet comp before and after rd.forward(req,res) will execute but their html output will be discarded.
note:: once the rd.forward(req,res) in source servlet comp is called the html outoput stored in response obj will be discarded and control goes to destination comp , the html output of destination comp stores in the response obj and the output to response obj will be committed So further output generated Servlet1 comp statement will not be written to response obj.. due to this only the html output of Destination comp goes to browser as final response.

=> It is recomanded to place rd.forward(-,-) in source servlet comp as conditional statement So that the output of source servlet comp will be discarded only for the condition.

=> useCase:: rd.forward(-,-) is useful while configuring ErrorServlet other servlet comps of the web application.

What is ErrorServlet ?

Ans) The Servlet comp that executes only when exception is raised in main/source servlet comp is called ErrorServlet .. This is useful to display exception related messages as the non-technical guiding messages to endusers (Becoz displaying Technical error messages on the browser window as ugly messages is always costly affair and edusers do not understan those messages)

ErrorServlet.java (Error Servlet)

```
public class ErrorServlet extends HttpServlet{

  public void doGet(req,res)throws SE,IOE{
    //get PrintWriter
     PrintWriter pw=res.getWriter();
     //set reponse content type
        res.setContentType("text/html");
      //write non-technical message
     pw.println("<h1 style='color:red;text-align:center'>Internal Problem -Try Again </h1>");
     pw.println("<br> <a href='input.html'> home </a>");

      //close stream
      pw.close();
    }
   public void doPost(req,res)throws SE,IOE{
     doGet(req,res);
    }
 }
```

Main Servlet comp
==========

```
public class EmployeeSearchServlet extends HttpServlet{

  public void doGet(req,res)throws SE,IOE{

    try{
      ...
      ... //jdbc code and main logic
      ...
      ...
      ...
    }
    catch(Exception e){
      RequestDispatcher rd=req.getRequestDispatcher("/errorurl");
       rd.forward(req,res);
      }
    }//doGet(-,-)
   public void doPost(req,res)throws SE,IOE{
     doGet(req,res);
    }
 }//class
```

=>rd.forward(-,-) executed in the source servlet comp does not discard the System.out.println(-) output given by source servlet comp becoz it will not written response obj. they will be written Server console as log messages.. but it discadrds pw.println(-) generated outputs of source servlet comp becoz they will be written to response object.

=>we can not cfg jsp ,html files/comps using annotations to map them with request urls , so we need to use web.xml to do the same.

In web.xml file
==========

```
<!-- Cfg jsp file with url pattern -->
<servlet>
   <servlet-name>errJsp</servlet-name>
   <jsp-file>/error.jsp</jsp-file>
</servlet>
<servlet-mapping>
  <servlet-name>errJsp</servlet-name>
  <url-pattern>/errJspurl</url-pattern>
</servlet-mapping>

<!-- Cfg html file with url pattern -->
<servlet>
   <servlet-name>errHtml</servlet-name>
   <jsp-file>/my_error.html</jsp-file>
</servlet>
<servlet-mapping>
  <servlet-name>errHtml</servlet-name>
  <url-pattern>/errHtmlUrl</url-pattern>
</servlet-mapping>
```

Using Servlet/jsp/html comps as the destination comp while working rd.forward(-,-) and passing their info in different modes

```
//------------- servlet as error servlet -----------------
    RequestDispatcher rd=req.getRequestDispatcher("errorurl"); (or)   //servlet url pattern
     ServletContext sc=getServletContext();
     RequestDispatcher rd=sc.getRequestDispatcher("/errorurl"); (or)   //servlet url pattern
    RequestDispatcher rd=sc.getNamedDispatcher("err");   // servlet logical name
     rd.forward(req, res);
//-------------jsp file as error page ---------------
    RequestDispatcher rd=sc.getRequestDispatcher("/error.jsp");  (or) // jsp file name
    RequestDispatcher rd=sc.getRequestDispatcher("/errJspurl");  (or)   //jsp url pattern given in web.xml
    RequestDispatcher rd=sc.getNamedDispatcher("errJsp");   //jsp logical name given in web.xml
   rd.forward(req, res);

  //--------------html file as error page ----------------------
    RequestDispatcher  rd=sc.getRequestDispatcher("/my_error.html");  (or)   //html file name
    RequestDispatcher  rd=sc.getRequestDispatcher("/errHtmlUrl");   (or) //html url pattern given in web.xml
    RequestDispatcher  rd=sc.getNamedDispatcher("errHtml");  //html logical name given in web.xml
     rd.forward(req, res);
```

What is the advantage of mapping/linking html/jsp comps with url pattern?

Ans) we can hide file names or extensions of web comps from endusers /vistitors .. Indirectly this helps to hide the technology of web comps in which they are being developed , Overall it improves secrurity of the web application and given protection hackers and jackers..

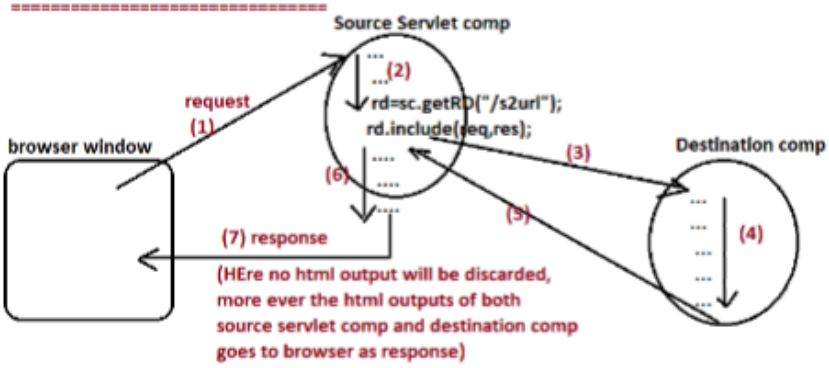
What happens if call multiple rd.forward(-,-) methods pointing to multiple destination servlet comps in single source servlet comp ?

Ans) First rd.forward(-,-) related destination comp will execute as part of forwaring request process.. only that destination comp output goes to browser as final response by discarding entire output of source servlet comp.. more over the second rd.forward(-,-) method call raises ::java.lang.IllegalStateException: Cannot forward after response has been committed

In Source Servlet comp

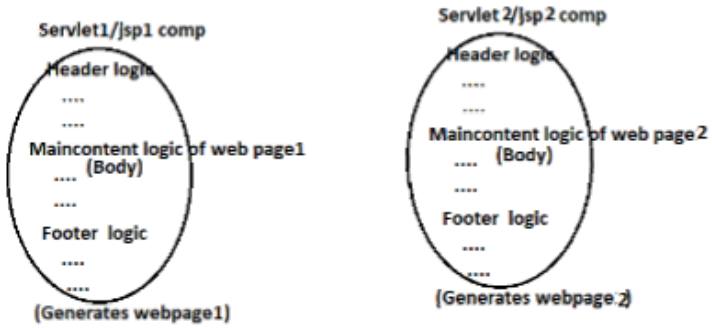
```
RequestDispatcher rd=sc.getNamedDispatcher("err");   // servlet logical name
 rd.forward(req, res);   => This destination comp's output is commited and goes to browser  as final response

RequestDispatcher  rd=sc.getNamedDispatcher("errHtml");  //html logical name given in web.xml
 rd.forward(req, res);  // Throws IllegalStateException
```

understanding rd.include(-,-) method
==========



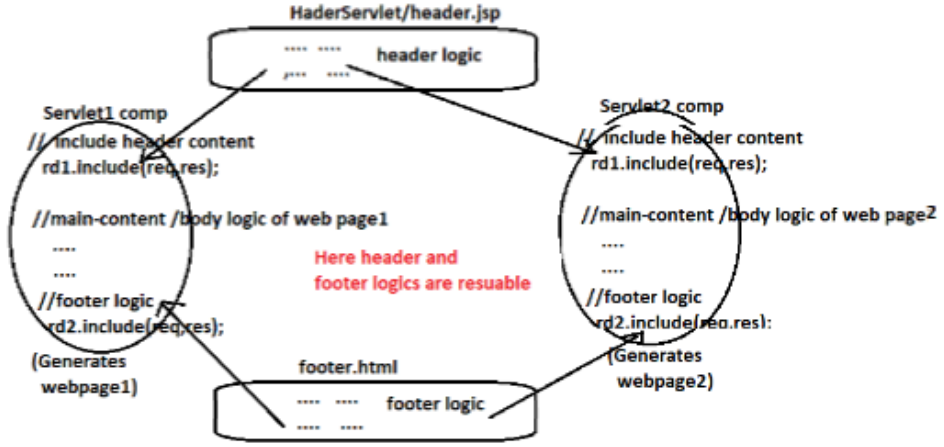
=> rd.include(-,-) performs including response mode of servlet comp
=> Here Source servlet comp and dest comp uses same req,res objs , So the request data coming to source servlet comp is visible and accessible in destination comp
=> Source servlet comp can pass addtional data to destination comp using the support request attributes
=> Destination comp can be a servlet comp or jsp comp or html file
=>Soruce servlet comp and destination comp can be there either in same web application or in two different web applications of same server.
=>The Destination web comp's output will be included with soruce servlet comp's output and togather goes to browser as final response.
=> Servlet comp can inlcude the output multiple destionation web comps by using multiple rd.include(-,-) method calls (No Exception will be generated)
=> Usecase:: implementation of Composite -View Design pattern.
(Nothing writing commong logics like header,footer logics in seperate web comps and including their outputs in main web comps)

Problem::
========



note:: All web pages in website generally contains same header ,footer content and different body content(maincontent) . Accoring to that here header ,footer logics are not reusable.

Solution:: Composite view Design pattern
place header ,footer logics in seperate web comps and include their outputs to main web comps.
using rd.include(req,res)



=>Here every web page content comes as the output given by multiple web comps ..So this view(webpage) is called Composite view

Sample code implementing compisite view Design pattern

HeaderServlet.java

```
@WebServlet("/headurl")
public class HeaderServelt extends HttpServlet{

 public void doGet(req,res)throws SE,IOE{
  //getPrintWriter
   PrintWriter pw=res.getWriter();
  //set response content type
   res.setContentType("text/html");
  //add header content
   pw.println("<marquee><h1> N A R E S H Technologies "+new Date()+" </h1></marquee>");
  //do not close stream (i.e do not commit response)
    //pw.close();

  }

  public void doPost(req,res)throws SE,IOE{
    doGet(req,res);
  }
}
```

=>pw.close() not only closes PrintWiter stream
it also commits the output to response obj i.e
we can not write further output to response object.

footer.html

```
<br><br>
 <b><i> all copy &copy; rights reserved </i> </b>
```

MainServlet comp

```
public class EmployeeSearchServlet extends HttpServlet{

   public void doGet(req,res)throws SE,IOE{

    try{
      RequestDispatcher rd1=req.getRequestDispatcher("/headerurl");
       rd1.include(req,res);
      ...
       .... //jdbc code //generated body content
       ....
       ....
       ....
      RequestDispatcher rd2=req.getRequestDispatcher("/footer.html");
       rd2.include(req,res);
      }
     catch(Exception se){
         RequestDispatcher rd=req.getRequestDispatcher("/errorurl");
         rd.forward(req,res);
      }
   }//doGet(-,-)
   public void doPost(req,res)throws SE,IOE{
     doGet(req,res);
   }
  }
```

Includes header content from HeaderServelt

includes footer content from footer.html

Forwards the request to ErrorServlet for exception raising

what is happens if we place multiple rd.include(-,-) methods ponting to multiple destinations in Source servlet comp?

Ans) *The outputs of multiple destination comps will be included with the source servlet comp*

what happends If we place both rd.include(-,-) and rd.forward(-,-) in one servlet comp?

Ans) The effect rd.include(-,-) will not be there becoz rd.forward(-,-) not only discards the source servlet comp and it also discards included outputs coming from other destination web comps

What happens , If we close the stream in the destination web comp while workig with rd.include(req,res)?

Ans) since the pw.close() method commits output to response object, so only the output of Destination comp will be stored in response obj and further output generated by the source servlet comp will not written to response object.

note:: do not commit the response by calling pw.close() method before calling rd.forward(-,-) and rd.include(-,-) methods becoz after commiting response forwarding to other comp and discarding existing output is not possible , Similary after commiting response including the output of Destination comp is not possible. (If we try to do , we will get IllegalStateException)

What that is the different b/w rd.include(-,-) and rd.forward(-,-)?

rd.forward(req,res)	rd.include(req,res)
a) Performs forwarding request mode Servlet communication	a) Performs including response mode of servlet communication
b) The entire html output source servlet comp will be discarded and only the output of dest comp goes to browser as final response	b) No html output will be discarded , More over the html outputs of both source servlet comp and destination comps goes browser togather
c) rd.forward(-,-) commits the response once it gets the output from Destination web comp	c) rd.include(-,-) does not commit the response once it gets the output from Destination web comp
d)If we palce multiple rd.forward(-,-) method calls in source servlet comp then last rd.forward(-,-) method calls raises IllegalStateException.	d) if we place multiple rd.include(-,-) method calls in source servlet comp , the outputs of multiple destination comps will be included.
e) usecases :: 1) Error Servlet configuration 2) In Layered Apps the data comming to controller servlet from service class will be passed to jsp comps using rd.forward(-,-)	e) usecases :: Composite -view Design Pattern

Cross Context communication
==========

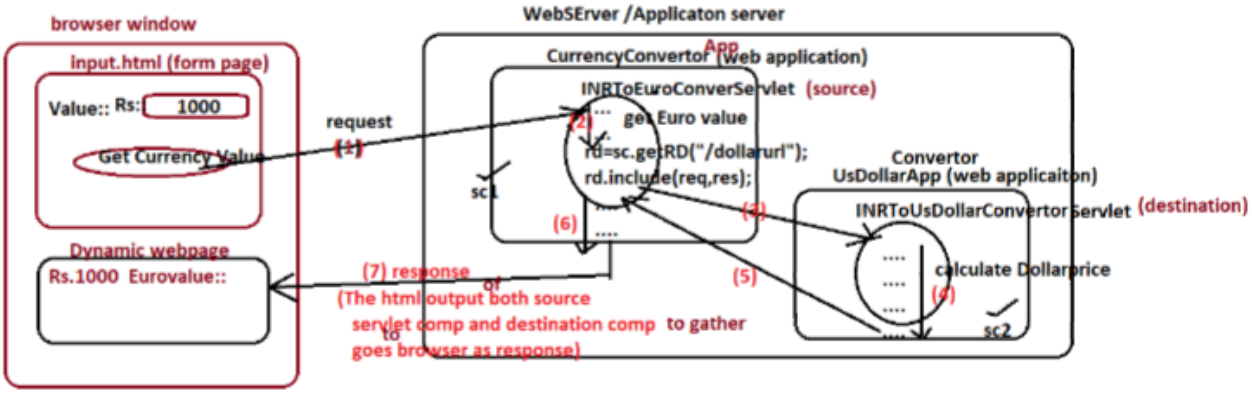
Context = web application

=>Cross Context means communication b/w two web comps of the two different web application that are there in the same server.

=>For this we need to use ServletContext obj based RequestDispatcher object.

=>Usecase1 :: The request given amazon.in's web comp is communicating with amazon.com's web comps.
(note: We need to assume both amazon.in and amazon.com websites are there in the same web Server /App server)

=>UseCase :: The value given to currencyConverter.com websiste we talk to USDollar.com website for getting dollar price.
(note: currencyConverter.com and UsDollar.com websites are ther in the same web server)



=>By using request obj we can not get info about other web applications that are there in the same server where as by using SErvletcontext obj we can know info about current web applicaiton and other web applications of same server..

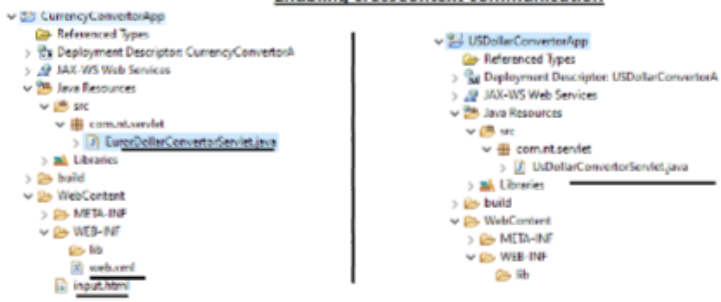
In source servlet comp (INRToEuroConvertServlet)
==========

```
//get access to ServletContext obj of current web application
   ServletContext sc1=getServletContext();   //Local Context obj

//get foreignContext obj (ServletContext obj of neighbour web applicaiton)
                                                    of webServer/App server)
   ServletContext sc2=sc1.getContext("/USDollarConvertApp");   //ForeignContext obj

//create RequestDisatpather object
      RequestDispatcher rd=sc2.getRequestDispatcher("/dollarurl");
      //include response
      rd.include(req,res);
```

note:: weblogic , GlassFish , wildfly server give direct support of Corss Context communication..
Where as in tomcat server , we need to extract settings in "context.xml" file for enabling "cross context communication".
(ProjectExplorer --> Servers ---> Tomcat server ---> context.xml file)

```
<Context crossContext="true">
```

Enabling crossContext communication



CurrencyConvertorApp USDollarConvertorApp

Refer from GIT URL

(Deploy and execute both web applications at a time)

=> we can configure Servlet comp with Servlet container and we map that servlet comp with url pattern by using 3 approaches

a) Declarative Approach (using web.xml) (from servlet 1.x)
b) Annotation approach (using @WebServlet) (from servlet 3.x)
c) Programatic/java config/ Dynamic Registration Approach (using sc.addServlet(-,-)) (servlet 3.x) ServletContext obj

=>if the servlet comp is user-defined servlet comp then go for Annotation approach of configuration

=>if the Servlet comp is pre-defined servlet comp and xml configuration are allowed in that web application then configure that servlet comp using web.xml file (Declarative approach)
eg:: if u r developing spring MVC web application using xml driven configurations then configure the ready made Servlet "DispatcherServlet" as controller servlet comp using declarative approach (web.xml)

=>if the Servlet comp is pre-defined servlet comp and xml configuration are strictly not allowed in that web application then configure that servlet comp using programatic/java config/dynamic registration approach.
eg:: if u r developing spring boot MVC web application where xml configurations are not allowed then configure the ready made Servlet "DispatcherServlet" as controller servlet comp using programatic/java config/dynamic registration.

=>All web frameworks give readymade servlet classes as controller comps, but their configuration with ServletContainer is mandatory either using promatic approach or declarative approach

=>Struts framework gives "ActionServlet" as pre-defined controlle servlet
=>JSF framework gives "FacesServlet" as pre-defined controlle servlet
=>SpringMVC framework gives "DispatcherServlet" as pre-defined controlle servlet
but their with Servlet container using declarative or programatic approach is quite mandatory..

Steps to develop java web applicaiton having dynamic registration/java config/progrmatic approach of servlet confiuration

=>In servlet api we do not have ready made servlet comp classes.

=> GenericSevlet, HttpServlet classes are readymade classes but they are abstract classes.

=>Only Web applicaiton frameworks are giving ready Servlet comps and contrllelr class

step1) keep any web application ready.. (MarriageApp)

step2) take form page as index.html instead of other name ..
note:: In some server like Tomcat index.html/index.jsp will be taken as default welcome file.

step3) Delete web.xml file from the web application

step4) Develop ServletCotainer Initializer class by implementing javax.servlet.ServletContainerInitializer(I)
place javaconfig/programic /dynamic registration approach of servlet comp configuration code by implementing onStartup(-,-) method.

MyWebApplicationIntlalizer.java

note:: ServletContainer loads this initializer class, creates object and calls onStartup(-,-) having ServletContext obj automcatically during the deployment of web applicaiton .. but we need to tell its package name and class name in META-INF/services/javax.servlet.ServletContainerInitializer file belonging to jar file added to the WEB-INF/lib folder

```
package com.nt.initializer;
import java.util.Set;
import javax.servlet.ServletContainerInitializer;
import javax.servlet.ServletContext;
import javax.servlet.ServletException;
import javax.servlet.ServletRegistration;
import com.nt.servlet.MarriageServlet;
public class MyWebApplicaitonInitializer implements ServletContainerInitializer {
```

```
@Override
public void onStartup(Set<Class<?>> set, ServletContext sc) throws ServletException {
        System.out.println("MyWebApplicaitonInitializer.onStartup(-.-)");
        //create object Servlet comp class
        MarriageServlet  servlet=new MarriageServlet();
        //register with ServletContaienr using sc.addServlet(-,-)
        //sc.addServlet(-,-) method returns  ServletRegistration.Dynamic (I) impl class obj and that obj can be used
        //to provide further configurations to servlet comp like url pattern , enabling <l-o-s> and etc..
        ServletRegistration.Dynamic dyna=sc.addServlet("ms", servlet);
        //map with url pattern
        dyna.addMapping("/marriageurl");
        //enable load-on-startup
        dyna.setLoadOnStartup(1);

}

}
```

we have other methods like sc.addListener(-) and sc.addFilter(-,-) to register ServeltListener , filter comps dynamically

tep5) create jar file (any name) having META-INF/services/javax.servlet.ServletContainerInitializer file mentoning the the above WebApplicationInitializer class name and package name

```
E:\
 |--->dyna
      |--->META-INF
           |---services
                |--->javax.servlet.ServletContainerInitiazer   (fixed file name)
                        com.nt.initiazer.MyWebApplicationInitializer
```

dyna.jar

E:/dyna>jar cf dyna.jar .

c--->create archive (jar)
f--->specify archieve file name(jar file)

tep6) Add the above dyna.jar file file WEB-INF/lib folder of the web applicaiton

ep7) run web applicaiton to Test the web application..

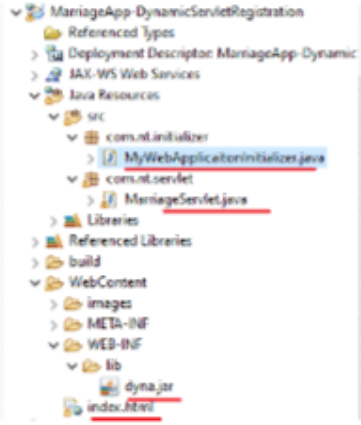
(from Tomcat7.0+ , we have support for Annotation, dynamic registration of servelt comp)

---

low of execution upto servlet registration

==========

=>Deployment of web application --> WebContainer noticates there is no web.xml --> creates ServletContext object ---> notices that there are no classes with @HandleTypes --> searches for META-INF/services/javax.servlet.ServletContainerInitialzer file in all the jar files that are added to WEB-INF/lib folder of the web application and finds in dyna.jar (we added) --> gets Web application Initializer class name (like com.nt.initializer.MyWebApplicationInitializer) from the above file ---> loads and creates the object of initializer class and calls onStartup(-,-) having Empty Setcollection and Servletcontext object as the argument values --> the logic of onStartup(-,-) method registers Servlet comp with servletContainer by calling sc.addServlet(-,-) method.



Limitations of RequestDispatcher in Servlet communication
==========

a) Source Servlet and Dest web comp can not there in two different web applications of two different servers belonging to same machine or different machines.

b) For Cross context Communication (communication between two different web applications of same server) we need extra settings while working in certains servers (like entries in Context.xml file in Tomcat server)

```
<Context crossContext="true">
  ...
</Context>
```

In weblogic , glassfish, Wildfly servers crossContext communication is possible directly .. with out having any extra settings...

c) The Destination web comp can not be asp.net, php and etc.. technology web comp. It must be only java based servlet , jsp or html comp.

=>To overcome these problems , take the support of sendRedirection

In sendRedirection , the source Servlet comp interacts with destination comp through browser, So the destination comp can be there in any location having any technology.

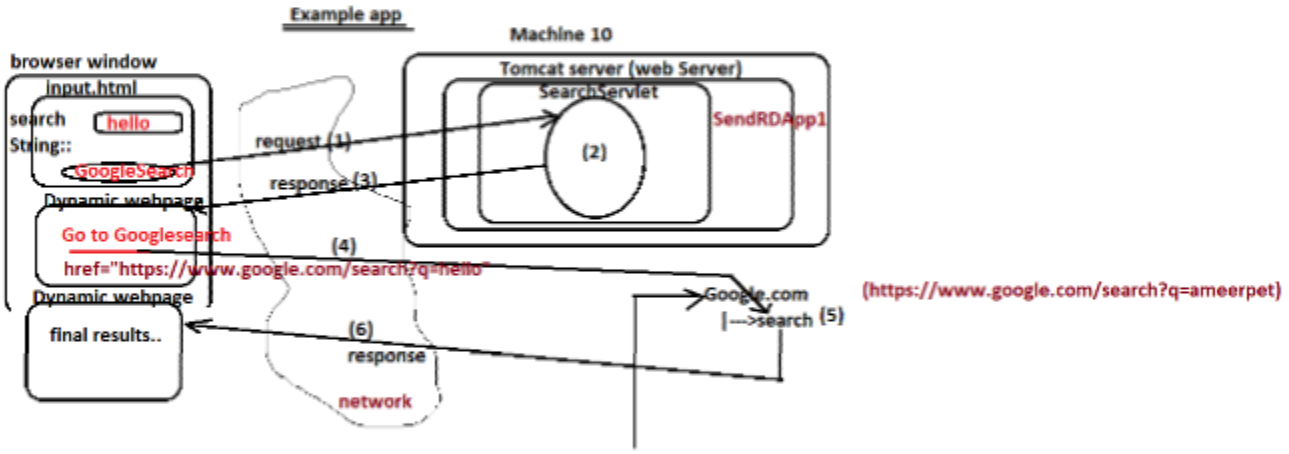
note:: Using browser/Through browser , we can send request to any technology or any location web comp.

Two modes of SendRedirection
==========

a) Using hyperlinks
b) Using res.sendRedirect(-) method.

SEndRedirection using hyperlinks
==========

=>Here source servlet comp sends dynamic web page to the browser having hyperlink pointing to the destination web comp. So when enduser clicks on the hyperlink tthe request to goes destination comp which can be there in any location with any technology.



SendRDApp1-UsingHyperlinks

```
|
|--->javaresources
        |--->src
              |--->com.nt.servlet
                    |---->SearchServlet.java

|--->webcontent
        |---->input.html
        |--->WEB-INF
              |--->web.xml
```

Limications of sendRedirection using hyperlinks
==========

=> we must click on hyperlink in order to complete the sendRedirection process.

(Refer GIT for complete source code)

usecases of sendRedirection ::

1) To use the services of one website being from another website
   (adding search box in website that internally redirects google search engine)
2) if company A aquiries company B then the request given company B website will be redirected to company A website.

   eg:: sun Ms is aquired by Oracle corp.. So the request given to sun.com will be redirected to the webpage of oracle.com

   eg:: Rational company is acquired by IBM .. so the request given to rational.com will be redireted to IBM.com .

ıendRedirection using res.sendRedirect(-) method

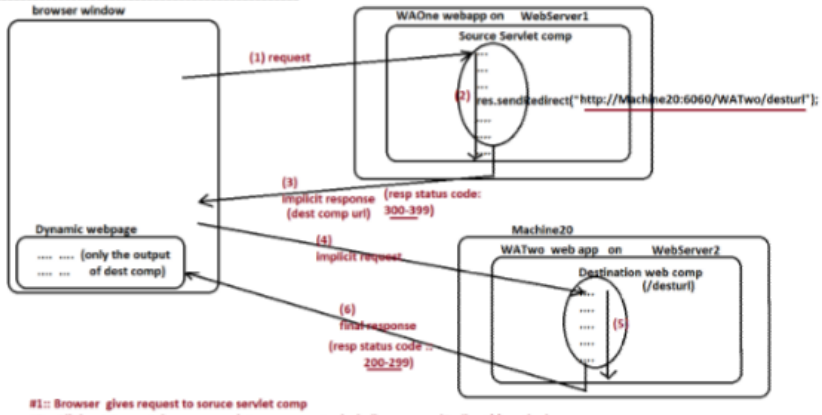
=>Here Source Servlet comp interacts with dest comp through browser with out involving any hyperlinks..

Response status codes

-->these status codes indicates the status of the response given by the WebServer

- 100- 199 :: Information (Some guding message)
- 200- 299 :: success (Default response status code is 200)
- 300-399 :: SendRedirection (indicates after recieving the response the browser should give implicit request another website)
- 400-499 :: Incomplete | Error status codes
- 500-599 :: server Problem | Error status codes

res.sendRedirect(-) method based sendRedirection flow



#1:: Browser gives request to soruce servlet comp

#2:: All the statements in source servlet comp executes including res.sendRedirect(-) method.
since the res.sendRedirect(-) method is executed, the entire html output of soruce servlet comp will be discarded and only the url kept res.sendReredirect(-) method goes to browser along with response having respons status code: 300-399

#3 :: Implicit response comes to browser having the dest comp url with the status code 300-399

#4 :: browser gives implicit request by using the recieved dest comp's url becoz the of statius code 300-399

#5 :: All the stattemes of dest comp executes..

#6 :: The output generated by dest comp goes to browser as final response.

key points

#a) res.sendRedirect(-) method performs sendRedirection

#b) no hyperlinks are required to complete sendRedirection activity

#c) Source Servlet comp and dest comp can be there in same web application or in two different web applications of same or different servers belonging either same machine of different machine.

#d) Dest comp can be there in any web technology like servlet,jsp,html,asp.net ,php, js and etc...

#f) Source Servlet comp and destination comp will not use same request ,response objs

#g) If Source servelt comp wants to pass additional data to destination comp then we need to append query String to the url of res.sendRedirect(-) method.

In source servlet comp::

```
res.sendRedirect("http://Machine20:3030/WATwo/desturl?sno=101&sname=raja");
```

In Destination comp::

```
int no=Integer.parseInt(req.getParameter("sno"));  //gives 101
String sname=req.getParameter("sname");  //gives raja
```

#h) If source servlet comp and the dest comp resides in the same web application , then we can pass relative url in res.sendRedirect(-) method .. otherwise we need to pass absolute url in resp.sendRedirect(-) method

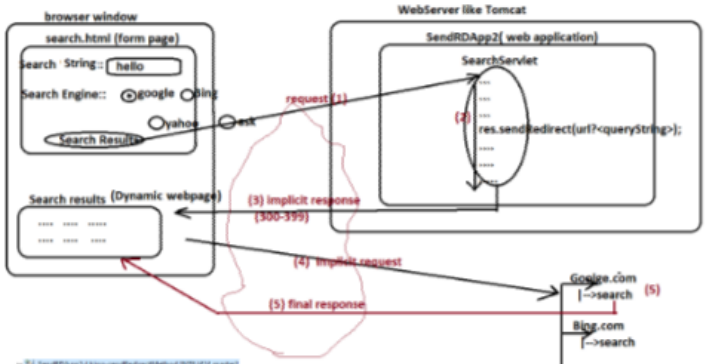
#i) Though all statements in soruce servlet comp executes.. but their html output will be discarded.. becoz res.sendRedirect(-) method execution.

#j) usecases::

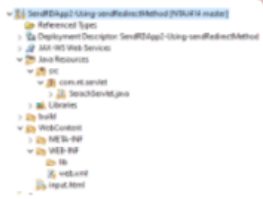
a) To use one website services being from other website
->using google search , google maps in any websiste

b) if company A aquires company B ..then the request given to company B website will be redirected to company A website.

Example App (Making our web application as HUB to use multiple search engines)



=>https://www.google.com/search?q=hello
=>https://www.bing.com/search?q=hello
=>https://www.ask.com/web?q=hello
=>https://in.search.yahoo.com/search?p=hello



What is the difference b/w rd.forward(-,-) and res.sendRedirect(-) method?

rd.forward(-,-)	res.sendRedirect(-)
1) It performs forwarding request mode servlet communication	1) It performs sendRedirection mode of servlet communication
2) Source Servlet comp and dest comp uses the same request ,response objects	2) Source servlet comp and dest comp will not use the same request,response objs
3) Source servlet comp and dest comp must be there either in the same web application or in two different web applications of same server	3) Source servlet comp and dest comp can be there in same web application or in two different web applications of same server or different servers belonging to same machine or different machines
4) To pass additional data from source servlet comp to Dest comp we need to use request attributes	4) To pass additional data from source servlet comp to Dest comp we need to append query string to the url of res.sendRedirect(-) method
5) The Source servlet comp interacts with Destination comp directly	5) The source servlet comp interacts with destination comp through browser
6) Dest must be servlet comp or jsp comp or html file	6) Dest comp can be there in any technology like servlet , jsp html , php, asp.net ,python and etc..
7) While performing forwaring request operation the url in the browser address bar will not be changed	7) will be changed..
8) usecases:: Error Servlet cfg communication servlet to jsp /html in layered applications	8)usecases :: a) To use one websiste services in other websites b) To redirect old company web site requests newly acquired company website requests..

What happens if we place multiple res.sendRedirect(-) methods in one source servlet comp?

Ans) The second res.sendRedirct(-) throws

java.lang.IllegalStateException: Cannot call sendRedirect() after the response has been committed

becoz the first res.sendRedirect(-) method discards the output and commits the response.. but the second res.sendRedirect(-) method again tries discacards output..but commited outpug can not be discarded.. So exception will be raised..

What happends if we place res.sendRedirect(-) and rd.forward(-,-) method in source servlet comp?

ans) The IllegalStateException will be raised..

What happens if we place res.sendRedirect(-) and rd.include(-,-) method in source servlet comp?

and) The effect of rd.include(-,-) will be Nullified.. and only the effect of res.sendRedirect(-) method will be there..

How to pass data from Soruce servlet comp to dest web comp?

If Source Servlet comp and dest comp are there either in same web application or in two different web applications of same server?

a)request attributes
(if the source servlet comp and dest comp are using same req,res objs)

b) session attributes
(if the source servlet comp and dest comp are getting request from same browser window)

c) application attributes/ServletContext attributes
(if the source servlet comp and dest comp are not using same req,res objs and not getting request from same browser s/w)

If source servlet comp and dest comp are there in two different web applications of two different servers beloning to either same machine or different machines

d) Append querystring to the url of res.sendRedirect(-) method

res.sendRedirect(<url>?<param1>=<val1>&<param2>=<val2>)

=>Servlet attributes are no way related to xml tag or html tag attributes, These are the names/variables hodling data having scopes. request attributes scope is request scope (i.e specific to each request)
session attributes scope is session scope (i.e specific to each browser s/w)
application attributes scope is application scope(i.e specific to each web application)

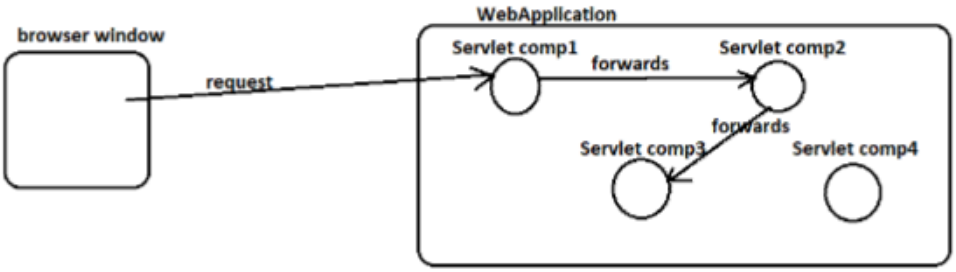
In standalone App we can keep data in 4 scopes
==========
a) Local scope (specific to each method)
b) instance scope (specific to each object)
c) class scope (specific to each class) (static variables)
d) Thread scope (specific to each thread)

In web application we can keep data in 4 scopes
---
a) page scope (specific each servlet comp/jsp comp)
b) request scope
c) session scope
d) application scope

(note:: request scope = thread scope
page scope =instance scope)

note:: along with the above web related scopes , we can also work local scope, class scope as needed.

request attibutes (keeping data in request scope)
==========
=>keeps the data in request object having request scope i.e data is specific to each request and visible through request.
if mutliple web comps are processing same request then use same request obj i.e request scope data is visible in all these web comps through out request.



=>The request attribute created in servlet comp1 is visible and accessible in servlet comp2 & servlet comp3 when they are processing same request beoz they are going to use same req,res objs.. but not visible in servlet comp..

To create request attribute
---
req.setAttribute("age",20);
attribute name
attribute value
autoboxing is taking place here.
req.setAttribute("name","raja");

=>all servlet attributes internally maintains their values objects.. if u pass simple values then they will be internally converted as wrapper objs.

jdk1.5 feature
autoboxing:: converting simple value to wrapper obj automatically
10(int) ---> Interger (10)

autounboxing :: converting wrapper obj to simple value
Integer(10) --> 10 (int)

To modify request attribute values
---
req.setAttribute("age",30);
req.setAttribute("name","rajesh");

setAttribute(-,-) creates the new attribute if the attribute is not already avaliable otherwise it will modify the already avaialble attribute value.

To read request attribute value
---
int age=(Integer)req.getAttribute("age");
String name=(String) req.getAttribute("name");

Here auto unboxing is taking place.

To remove request attribute
---
req.removeAttribute("age");
req.removeAttribute("name")

What is difference request parameteers(form data) and request attributes?

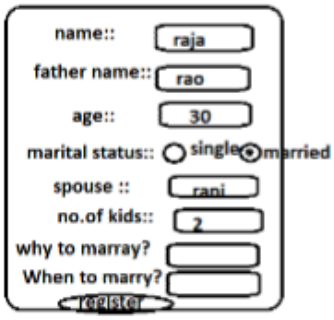
request parameters	request attributes
=>these parameters will carry form data/ enduser supplied data through browser	=> these attribute represents addtional data generated by source servletcomp inorder to pass to destination comp
=>will be stored in to request obj automatically	=> must be stored explicitly by calling req.setAttribute(-,-) method
=> Once stored in request obj we can not modify req param values	=> we can modify req attribute values.
=>To read req param values in serlvet comp use req.getParameter(-) method	=> To read attribute value use req.getAttribute(-) method
=> we can not delete req params from request	=> we can delete req attributes from request obj using req.removeAttribute(-,-)

Session Tracking
==========

Need to session tracking

There are two types of form pages
a)Static form page
b) Dynamic form page

form.html (static form page)



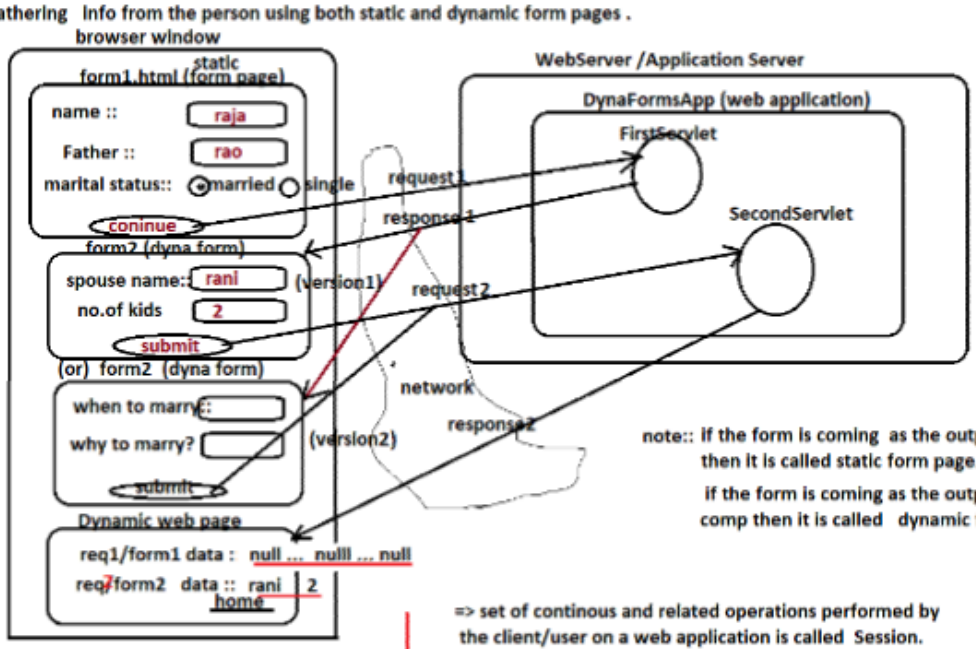
=>If u make ask info from enduser with the support static form page..then he will be forced to supply both known and unknown information.. like single person answering questions related to spouse name, no.of kids and etc..

=>Solutin is work with both static and dynaic form pages i.e ask common info through static form page and based on the common info that is passed by enduser raise questions in second, third form pages by taking them dynamic form pages..

=>To create static form page place all the info in .html files..
=>To create dynamic form page place <form>,<inpu> tags in pw.println(-) statements of servlet comp.

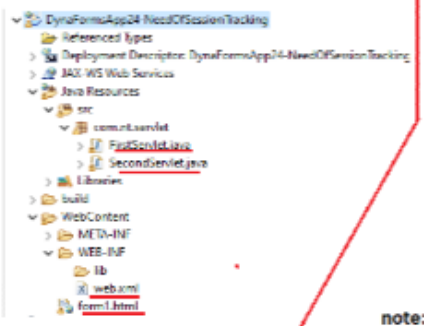
```
pw.println("<form action='....' method='...'>");
pw.println("<input  .... >");
pw.println("...........");
pw.println("</form>");
```

Gathering Info from the person using both static and dynamic form pages .



note:: if the form is coming as the output given by .html file then it is called static form page.

if the form is coming as the output given by servlet/jsp comp then it is called dynamic form page.



=> set of continous and related operations performed by the client/user on a web application is called Session.

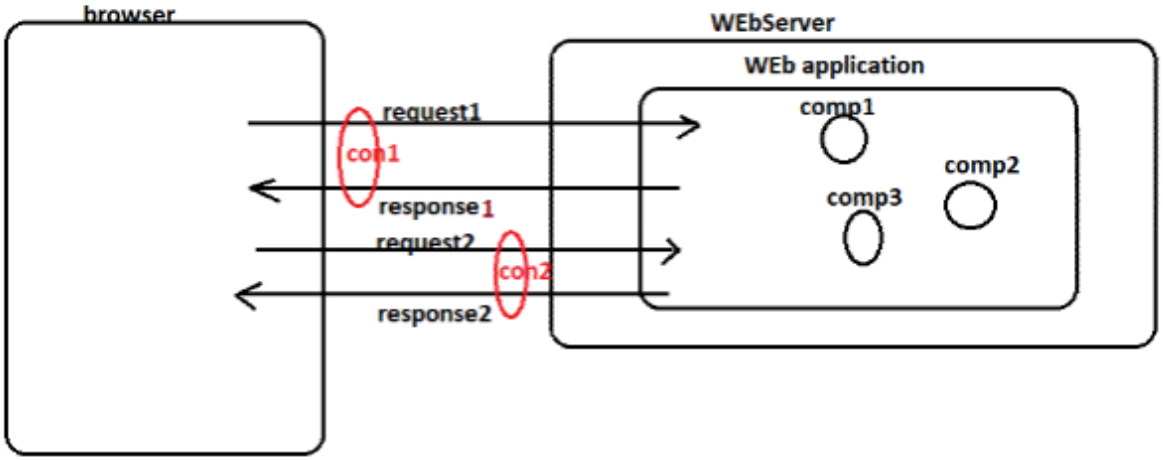
eg:: Login to Logout
eg:: start of payment to end of payment

If the web application is able to remember client/user data across the multiple requests during a Session then it is called stateful web application.. otherwise it is called stateless web applicaton.

=Stateful web application means while processing every request , we can use previous request data.. i.e while processing 3rd request we can use 1st ,2nd requests data.
=Stateless web application means while processing every request , we can not use previous request data.. i.e while processing 3rd request we can not use 1st ,2nd requests data.

note:: To make statless web application as steful web application we need to use one or another session tracking/ session management technique.

=>By default web applications are stateless becoz the protocol HTTP is stateless i.e for every request it creates new connection b/w browser and web server and that con will be closed automatically once the request related response sent back to browser.. Due to this one request data can not used in another request. It is like while proessing any request we can not use previous request data..



why the protocol "HTTP" is given as stateless protocol?

Ans) if the protocol "http" is given as statetul protocol then all the requests given by browser to web applicaiton will same http connection across the multiple requests..More over that connection will be only when browser is closed. This given gives chance to clients and browsers to hold the connection for long time and this may lead to wrong business praticess like compitetor enagaging connection with servers for long time by opening browsers , Due to this web SErvers may reach max connections.. though most of connections idle..

To overcome this problem .. the protocol "HTTP" is given as stateless ,So that no Client can can engage connection with server for long time becoz every request related con will be closed automatically once its response is generated.

=>Though protocol "HTTP" stateless we want to see web application statful web application for that we need to one or another session tracking technique.

Session tracking techniques are
a) Hidden form fields (unofficial technique)
b) Http Cookies
c) Http Session with cookies
d) Http Session with URL Rewriting

official techniques

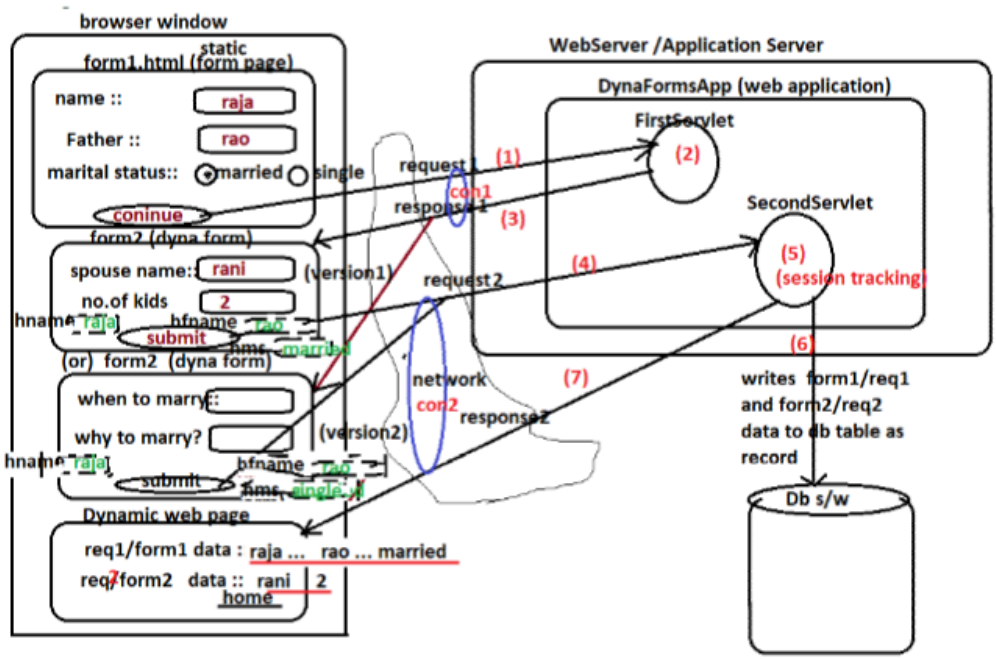
Hidden Form Fields (Hidden Boxes)

In form page

```
<input type="text" name="t1" value="hello"/>
```

In Servelt comp

```
String s1=req.getParameter("t1"); //gives hello
```



(2) :: First servlet reads form1/req1 data and gnerate form2 dyanmically based on marital status having form1/req1 as hidden box values..

(5) SecondServlet gets request2 from form2 reads both form2 data(directly from text tox boxes) and form1 data (from hidden boxes) . this indicates while processing Second request we are able to use first request data.. nothing but session tracking.

Procedure to create logical Db having db table in mysql with the support mysql workbench

==========

step1) launch mysql workbench and connet to mysql

step2) Create new Logical DB

Schemas tab ---> new Logical Db --> name :: NTAJ414DB1 ---> apply --> apply.

step3) create db table in the above logical DB .

Right click on db tables -->new --->

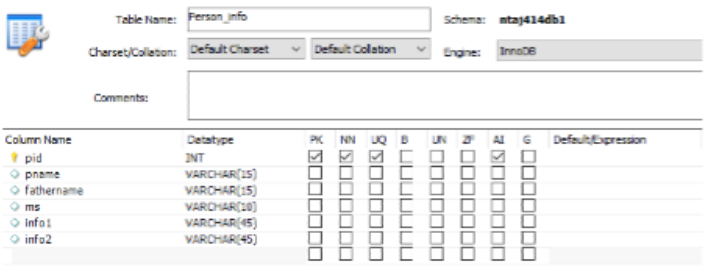


Table Name: Person_info Schema: ntaj414db1

Charset/Collation: Default Charset / Default Collation Engine: InnoDB

Comments:

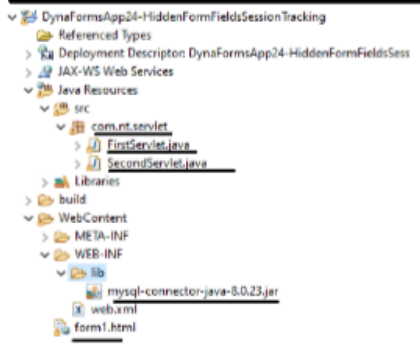
Column Name	Datatype	PK	NN	UQ	B	UN	ZF	AI	G	Default/Expression
pid	INT	☑	☑	☑	☐	☐	☐	☑	☐	
pname	VARCHAR(15)	☐	☐	☐	☐	☐	☐	☐	☐	
fathername	VARCHAR(15)	☐	☐	☐	☐	☐	☐	☐	☐	
ms	VARCHAR(10)	☐	☐	☐	☐	☐	☐	☐	☐	
info1	VARCHAR(45)	☐	☐	☐	☐	☐	☐	☐	☐	
info2	VARCHAR(45)	☐	☐	☐	☐	☐	☐	☐	☐	
		☐	☐	☐	☐	☐	☐	☐	☐	

-->apply ---> apply.

download mysql connector/j JDBC driver jar file from ::

https://mvnrepository.com/artifact/mysql/mysql-connector-java/8.0.23

Example App HiddenForm fields based Session tracking..



till 23rd january advanced java till 4:00pm