Advance Java

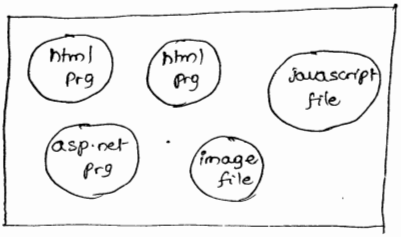
(Natrajz Sir Notes)

www.tutorial4us.com

Servlets

* The logics and data of stand alone, desktop applications are specific to that computer where these applications are running.
* The logics and data of client-server applications, two-tier applications like jdbc applications are specific to one network where they are running. In the above said two tier, client-server applications the server allows only known clients (recognized clients).
* To provide global visibility and accessability to the logics and data of the application use the internet environment based websites or web applications. These applications allow both known and unknown clients having 24x7 access to the resources and logic data.
* When website is under development / testing in a software company then it is called as web application. Once web application is hosted on to the internet network by purchasing domain name (www.citibank.com) or host name and space in the internet network is called as website.
* A web application is a collection of web resource programs which can generate web pages. There are two types of web resource programs based on the web page they generate.
  1) static web resource programs → generates static webpages (Ex: HTML)
  2) dynamic web resource programs → generates dynamic webpages
     Ex: (servlet program, JSP programs, ASP programs, PHP programs)
     ↓
     Personal Home page for Hypertext processing
* static web page contains fixed content forever. The content of dynamic web page changes based on the input values of the request or time of the request generation.

.net Based web Application



* The web resource programs like image file, javascript file can not generate web pages directly but they support other web resource programs to generate web pages.
* Stand alone applications, desktop applications and client-server applications will be executed by programmer manually. But the web resource programs of web application must be executed dynamically when they are requested by clients (Browser windows) so we can't think about manual execution for web resource programs. we can use a special software called web server software to execute the web resource programs dynamically when they are requested by clients.
* A web server software can also manage, execute multiple web applications simultaneously or parallelly.

Examples of web server / Http server Softwares

Tomcat
Resin
JWS (Java web server)
PWS (personal web server)
IIS (Internet Information server)
and etc....

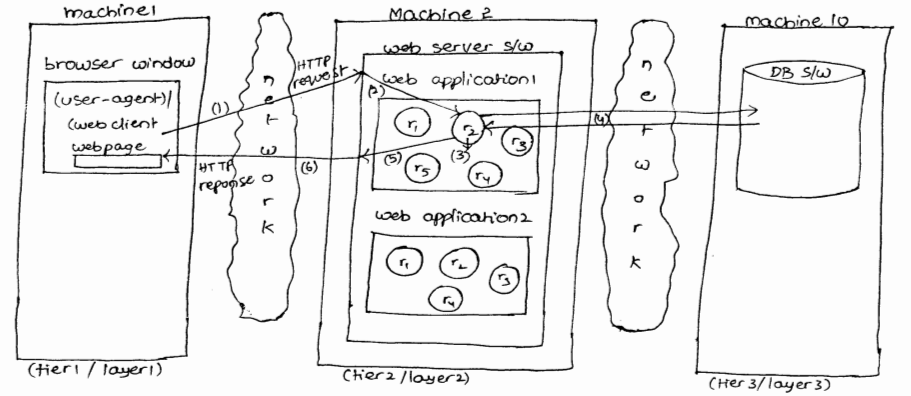
* To develop and execute jdbc application we need the follo

* Web server s/w used to manage and execute web application.

* browser s/w used to request to webapplication.

*java based web servers internally uses jdk s/w

setup required to develope and execute web application



* Each browser window acts as one client to web application

* A web application can be developed as two tier application without database software or three tier application with database software.

* With respect to diagram

(1) Browser window generates http request to web application.

(2) The web server traps and takes the request and passes the request to appropriate web resource program.

(3) The web resource program process the request.

(4) Web resource program interacts with data base software if necessary.

(5) The web resource program generated result goes to web server.

(6) Web server sends these results to browser window as HTTP response in the form of web page.

* In the above diagram $r_1, r_2 \ldots$ are web resource programs.

2) client side web resource program → They come to browser tb window from the web application placed in web server for execution.

Ex: HTML program, JavaScript program, Ajax program and etc...

* Decide whether web resource program is client side or server side based on the place where it executes. not based on the place where it resides.
* A web application looks like thin client-fat server application.
* The process of keeping web application in web server is technically called as deployment and reverse process is called as undeployement.

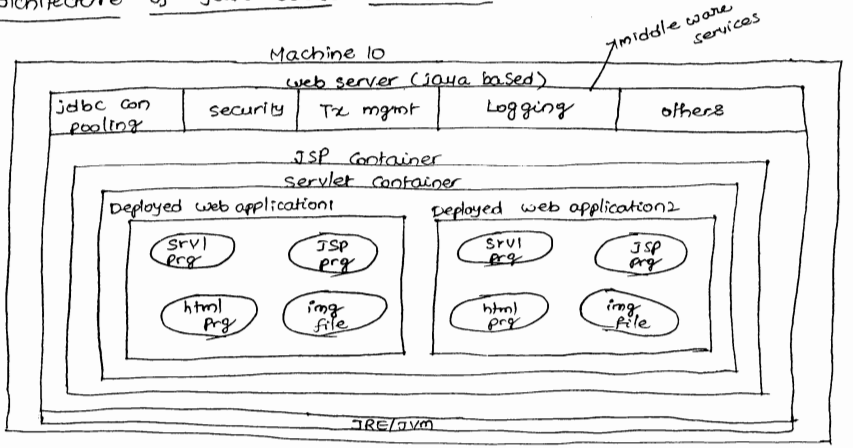
Responsibilities of web server

1) Listens to client request continuously (HTTP request)
2) Traps and takes client generated HTTP request.
3) passes the HTTP request to an appropriate web resource program of web application. (deployed web application)
4) Provides container software to execute server side programs (web resource programs)
5) Gathers output generated by web resource programs.
6) Passes output of web resource programs to browser window as http response in the form of web pages.
7) provides environment to deploy manage and to ~~undeploy~~ undeploy the web application.
8) Gives middle ware services and etc...

* A container is a software or software application that can manage the whole life cycle (object birth to death) of given resource. (like java class).
* A file or program is called as resource of the application.
* servlet container takes care of servlet program life cycle.

* Programmer is not responsible to develop containers and webservers but he is responsible to use them to execute web applications.

Architecture of java based web server



* Once web server is started one daemon process will be started to listen to client's continuously and to trap and take the client generated HTTP request.
* The process that runs continuously is called as daemon process.
* Every java application contains two default threads.
  (1) main thread
  (2) Garbage collector thread (daemon thread).
* JSP container is the enhancement of servlet container and both containers use JRE/JVM supplied by web server.
* middle ware services are configurable additional services on the applicatio to make applications executing perfectly in all the situations.
* Security middle ware service protects the application from unauthorized

* Logging service keeps track of the application execution process through conformation statements / messages / log messages.
* Middle ware services are not minimum logics of application development. They are additional or optional services to apply on applications.
* A web application can be there with or without middle ware services.
* Web server automatically activates servlet container and jsp container to execute servlet, jsp programs when they are requested by clients.
* The client side web resource programs of web application goes to browser window for execution whereas the server side programs will be executed by using the containers of web server.
* In web application executing environment browser software is called as client software and serweb server software is called as server software.

Examples of java based web servers

Tomcat ⟶ from Apache Foundation
Resin ⟶ from Resin soft
JWS ⟶ from Sun microsystem

* HTTP is a application level protocol define in set of rules to get communication between browser window and web server. The text that allows sequential reading is called as normal text.
Ex: notepad text.
* The text that allows non-sequential reading through hyperlinks is called as hyper text.
Ex: any web page content.
* Protocol HTTP is useful to transfer hyper text between browser window and web server, web server and browser window.

chrome —— from Google

opera —— from opera soft

Different client side Technologies (for developing client side web resource programs)

html ⟶ from w3c

Java script ⟶ from netscape

VB script ⟶ from Microsoft

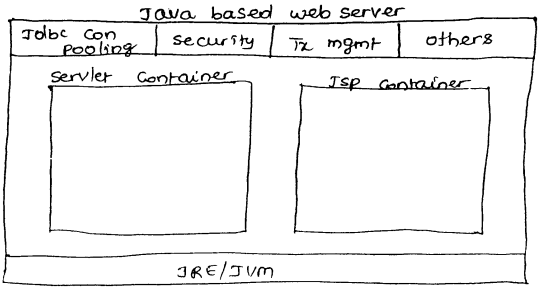
AJAX ⟶ from Adaptive path

NOTE: Java script is no way related with the programming language java.

* The code that can not be executed independently and which must be embedded in other technology based program for execution is called as script code.

* Java script code can not be executed independently and it must be executed by embedding with html code so java script is called as scripting language.

Another diagram that shows Java based web server architecture



Jsp Container is developed based servlet Container

* When java web application is deployed in java

Ex: appletviewer executes our applet program but this applet viewer internally uses (or) take support from JVM.

servlet container executes servlet program but this servlet container internally uses JVM support

Different server side Technologies (to develop server side web resource programs)

- Servlet → from Sun microsystems → java based (2)
- JSP → from Sun microsystems → java based (3)
- asp → from misco microsoft → (non-java based)
- asp.net → from microsoft → (non-java based) (4)
- PHP → from Apache → (non-java based) (5)
- COLDFusion → from Adobe → (non-java based)
- SSJS → from Netscape → (non-java based)

(server side java script)

Different web server softwares

- Tomcat → from Apache → java based (1)
- Resin → from Resin soft → java based (2)
- JWS → from Sun micro systems → java based
- Jetty → from Adobe → java based

} for servlet, JSP programs

- IIS → from microsoft → Non-java based (3)
- PWS → from microsoft → (Non-java based)

} for asp, asp.net programs

- AWS → from Apache → Non-java based (4) (for php programs)

(Apache web server)

Application server = web server + EJB Container + more middleware services

NOTE: EJB container is required to execute EJB components.

→ reusable java class object is called as component.

Jboss ⟶ from Apache / Red Hat (4)

GlassFish ⟶ from Sun micro systems (2)

OlogAS ⟶ from Oracle Corporation (oracle 10g Application server)

Jrun ⟶ from macromedia (Adobe)

*All application server softwares are java based softwares.

Different database softwares

oracle ⟶ oracle corporation (1)

mysql ⟶ from Devx (3)

SQLServer ⟶ from microsoft (2)

DB 2 ⟶ from IBM

Postgresql ⟶ from university of California (4)

* we can use client side technologies like html, java script along with any vendor supplied server side technologies in web application development.

* To develop & execute java based web application

a) choose any browser software

b) choose one or more client side technologies like Html, Java script

c) choose Servlet, JSPs as server side technologies

d) choose any java based web server software or application server software

e) choose any data base software

* To develop and Execute .net based web application.

a), b), e) are same as above

c) choose asp.net as server side technology

d) choose microsoft supplied IIS, PWS server.

* To develop small and medium scale web applications use .net environment.

* To develop small scale web applications use PHP environment.

Tomcat

Type : Java based web server

Version : Tomcat 6.0 (Compatable with Jdk 1.6)

Tomcat (7.0) (Compatable with Jdk 1.6/1.7)

Tomcat 5.0 (Compatable with Jdk 1.5)

Vendor : Apache foundation

open source software (the source code will be exposed)

default port no: 8080 (changable)

To download software: www.apache.org

for docs : www.apache.org

for faqs : www.forum.apache.org

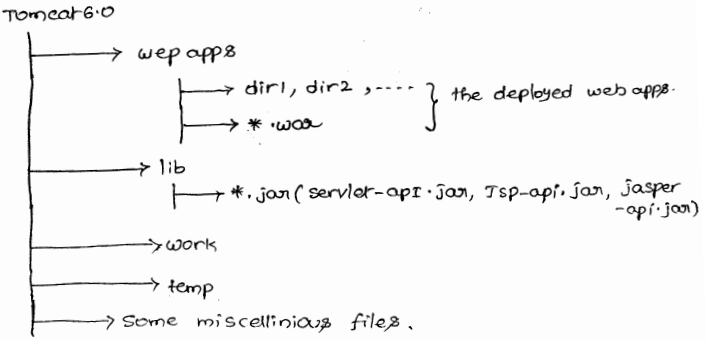
* To install Tomcat 6.0 software use Apache → Tomcat – 6.0.26 set up file and you can change the default port no, default username and password details during installation. If not changed default port no is "8080", default username is "admin", default password is "admin".

* Every software installed in a computer will reside in a logical position called software port and every software port will be identified with its port no. (Communication end point)

After installing tomcat you will get the following folders and files in the installing folder

D:\

⟶ Tomcat 6.0 ← Tomcat_home (the installation folder of tomcat 6.0)



* The installation folder of tomcat is called as <tomcat_home>.
* To start tomcat server use <tomcat_home>/bin/tomcat6.exe file
* To launch home page of tomcat the procedure is

  open browser window → type http://localhost:8080/ in address bar

  (8080 ↑ port no. of tomcat server)

Procedure to change port no. of tomcat server after installation:

Goto <tomcat_home>/conf/server.xml file and modify port attribute value of first <connector> tag → restart the server

* The browser window keeps every web page in the buffer before displaying it for end user.
* A buffer is a temperory memory which can hold the data for temperory period.
* while giving new port no. to any software service use 1025 to 65535 range number because 1 to 1024 range numbers are busy for with OS services.

* A specification is a document or reference that contains set of rules and guidelines to develop the softwares.
* There are two types of specifications.

(1) open specification (Any one can develop softwares based on this specification)
Ex: JDBC specification, servlet specification, JSP specification and etc.

(2) proprietary specification (only specific company which has given specification is allowed to develop the software)
Ex: .net specification.

* servlet, jsp, ejb, jms, java mail and etc are the sub specifications of JEE specification.
* servlet specification contains rules and guidelines to develop servlet container.
* JSP specification contains rules and guidelines to develop Jsp Container.
* EJB specification contains rules and guidelines to develop EJB Container by using various sub specifications of JEE the web server and application server softwares will be developed and these server softwares contains various containers like servlet container, JSP Container and etc...
* JEE and its concepts like servlets, JSP, EJB and etc are not installable softwares because they are just given as specification.
* Working with web server and its containers or application server and its containers is nothing but indirectly working with JEE and its concepts. (like servlet, JSP and etc..)
* Every software specification contains an API representing rules and guidelines. These rules are

* Servlet specification supplied api is the classes and interfaces of javax.servlet package and javax.servlet.http package.

* The methods of interfaces and the abstract methods of abstract classes available in above two packages represents rules of servlet specification whereas the concrete methods defined in classes and abstract classes of above two packages represent guidelines of servlet specification

What is Servlets

* Servlets is an open/open source api specification that contains set of rules and guidelines to develop servlet container software.

* Based on this servlet specification given by Sun micro systems different vendors develops different servlet container softwares and supplies them to programmers along with web server and application server software installation.

* In earlier days servlet container used to call as servlet engine.

* The tomcat serve the main name of servlet container is Catallina

* Since JEE is not a installable software the tomcat server supplies sun micro system's servlet api in the form of <tomcat_home>/lib/servlet-api.jar and it gives its servlet container software in the form of <tomcat_home>\lib\catalina.jar.

* Every software specification supplied api will be used in two angles.

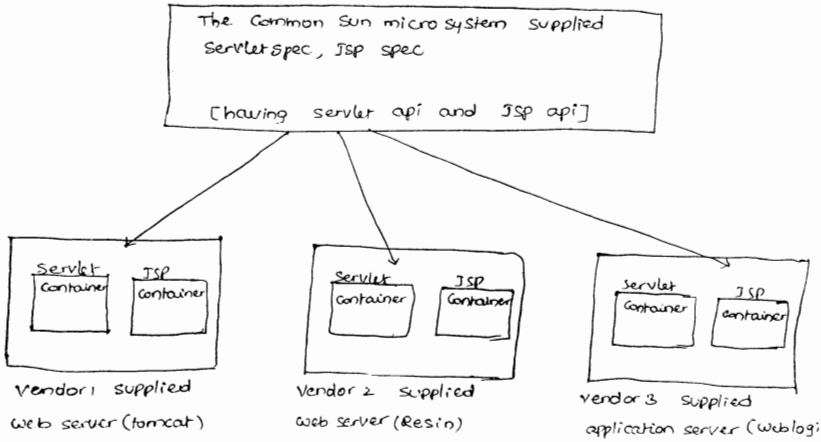
(1) Vernods companies use specifcation api to develop the softwares.

(2) Programmers use specification api to develop programs or applications.

* The servlet api of servlet specification will be used by vendor companies to develop servlet container software. whereas programmers use the same servlet api to develop servlet programs as web resource programs of web application. Due to this servlet container is always portable

* Jsp specification is enhancement of servlet specification so Jsp container is also the enhancement of servlet container.
* In tomcat server Jsp container is called as Jasper.
* The tomcat server supplies sun microsystems Jsp api in the form of <tomcat_home>\lib\ jsp-api.jar and supplies its own Jsp container in the form of jasper.jar.
* The sun microsystems Jsp api contains following packages

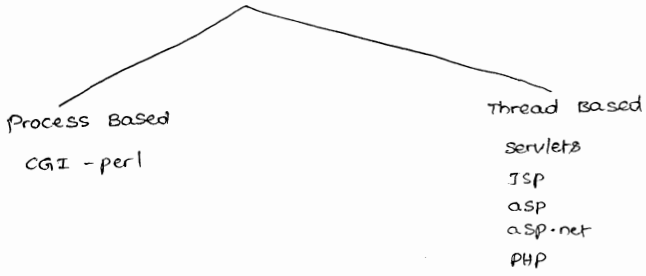
```
javax.servlet.jsp
javax.servlet.jsp.el
javax.servlet.jsp.tagext
```

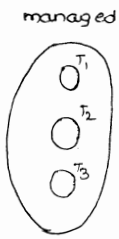


* Since all webserver softwares and their container softwares given by different vendors are developed based on common Sun micro system supplied servlet specification, Jsp specification so the way we work with all these web server softwares and their

Server side Technologies

(required to develope server side ~~web~~ web resource prgs of web apps)





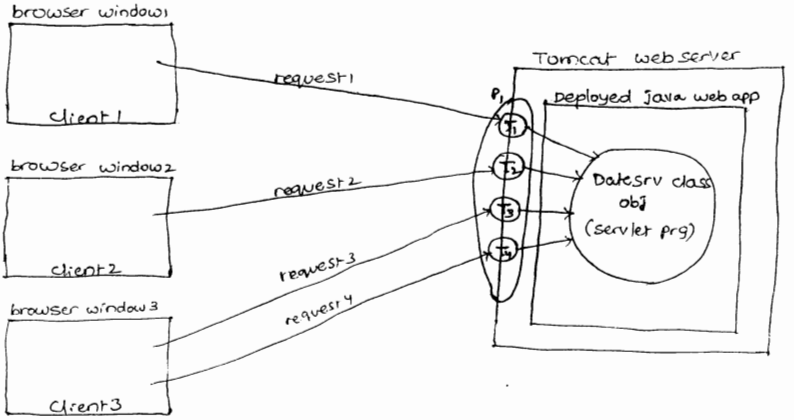
T_1, T_2, T_3 are threads

* A thread is a light weight process in OS managed process.
* Every Java application contains two default threads.
  (1) main thread
  (2) Garbage collector thread
* CGI is a specification to develop server side web resource program so perl programming language will be used to develop the webresource programs based on CGI specification.
* perl → practical extraction reporting language

Understanding Process based serverside technologies. (CGI)

* The procedure of transfering control from one process to another process or from one thread to another thread is called as the scheduling based control jumping or context switching.
* since OS processes are heavy weight processes so they take lot of time for control jumping or context switching.
* Due to this when more requests are given CGI based web application more OS processes will be created on one per request basis and performance of website will be degraded. (That means web application becomes non scalable web application).
* If application is giving same performance irrespective of increase or decrease in number of clients / no. of requests is called as scalable application.
* Every servlet program is a java class using servlet api.

Understanding thread based server side technologies like servlet



P1 → OS managed process representing the webserver startup

performance when compared to process based server side technologies.

* The web application that is developed based on thread based server side technologies is scalable application.
* servlet program is a single instance multiple threads based java component of java web application as shown above. That means if 100 requests are given to single servlet program then the servlet container creates only one object for that servlet program class but starts 100 threads on that object representing 100 requests as shown above.

Definitions of servlet

(1) Servlet is server side technology (basically specification) that allows the programmers to develop dynamic web resource programs or server side web resource programs in java based web application.

(2) Servlet is a software specification given by Sun microsystems that provides set of rules and guidelines for vendor companies to develop the softwares called servlet containers.

(3) servlet is a single instance multiple threads ~~Component~~ based java component in java web application to generate dynamic web pages.

(4) servlet is a server side technology (basically specification) that can enhance functionalities of web server software or application server software.

* servlet program is server independent because one servlet program can be executed in any java based web server or application server software without modifications.
* securing web application is nothing but applying authentication and authorisation on the web application.
* checking the identity of a user is called as authentication.
* checking permissions of the user on particular resources

jee 5 specification

servlets 2.5 spec
JSP 2.0 spec
EJB 3.0 spec
:

jee 6 specification

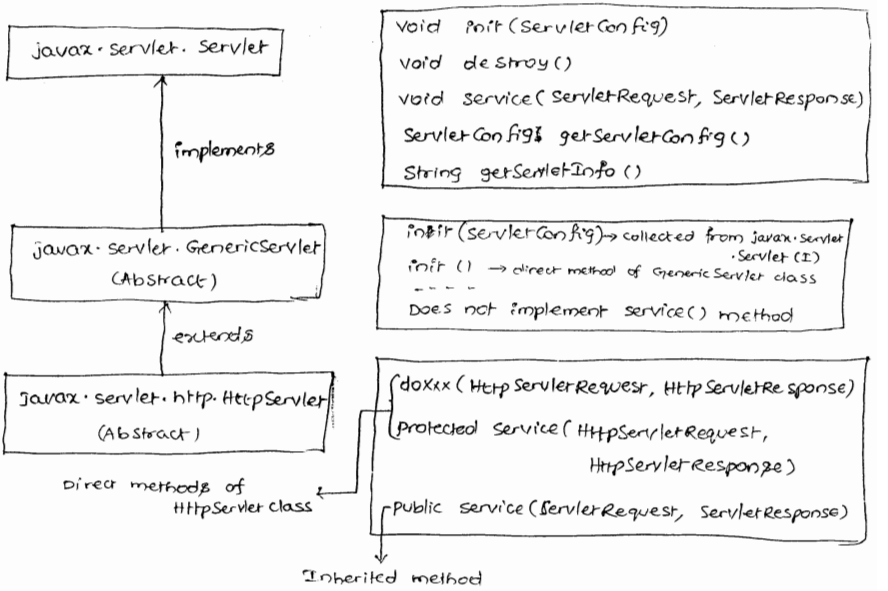
servlets 3.0 spec
JSP 2.1 spec
EJB 3.1 spec
:

* In Jee module of java all are specifications.
* In Jse module of java awt, swing are technologies, JDBC, JNDI are specifications.
* The latest version of the servlet api specification is 3.0 but industry is using servlet 2.5 api specification.
* Tomcat 6.0 supplies servlet container software based on servlet 2.5 specification whereas tomcat 7 use servlet container software based on servlets 3.0 specification.

The 3 important resources of servlet api

javax.servlet.Servlet (I)
javax.servlet.GenericServlet (Abstract class)
javax.servlet.http.HttpServlet (Abstract class)

* In java an abstract class can contain only abstract methods or only concrete methods or mix of both.
* The above give predefined HttpServlet class is an abstract class containing no abstract methods.
* If you want to make [illegible] methods / [illegible]



* Every servlet program is a java class that is developed based on servlet api. There are three ways to develop servlet program.

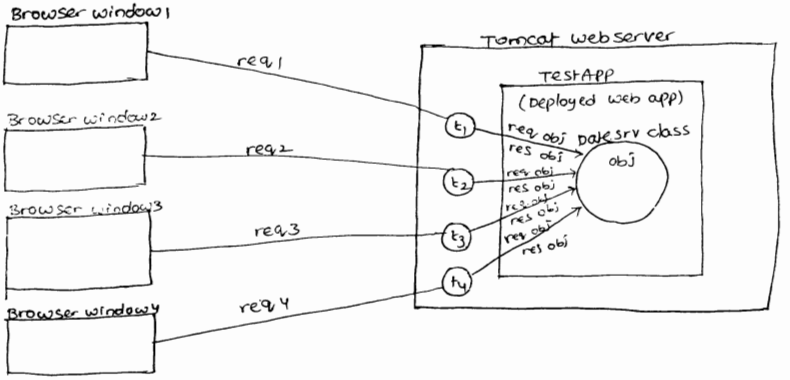
(1) Take a java class implementing javax.servlet.Servlet Interface and provide implementation for all the 5 methods of that interface.

(2) ~~Provide~~ Take java class extending from javax.servlet.GenericServlet class and provide implementation for service() method.

(3) Take java class extending from javax.servlet.http.HttpServlet class and override one of the 7 doXxx() methods or one of the two service(-) methods.

* In the above said three approaches the overridden/implemented

* Programmer just supplies his servlet program related java class to servlet container then onwards servlet container is responsible to manage the whole life cycle of servlet program. (from object birth to death every operation will be taken care by container).
* For all the request given to servlet program the servlet container creates one object but for every request given to servlet program, the servlet container creates one seperate request, response objects and calls service (-,-) method by keeping these requests, response objects as argument values.



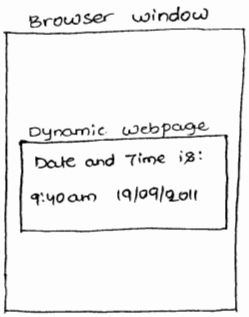
* Servlet Program uses request object to read details from the request like form data.
* servlet program uses response object to send response content to browser window through web server.

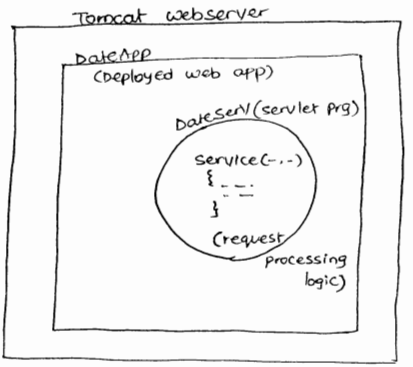
When 10 requests are given to a servlet program from single or different browser windows (clients)

-> Servlet Container creates only one object for servlet program related java

* To make our servlet program java class visible to servlet container the java class must be taken as public class.

Procedure to develop first java web application by taken servlet program as webresource program

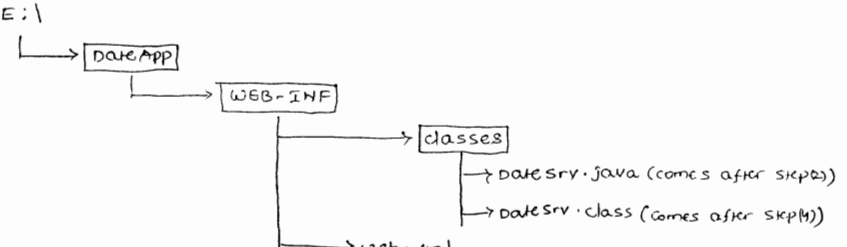




Setup required jdk 1.6
Tomcat 6, IE any version

Step(1): create the following deployment directory structure or packing directory structure to combine multiple webresource programs into single unit.

NOTE: A web application is a directory or war file containing multiple web resource programs. (one or more)



Step(2): Develop servlet program (DateSrv.java) save that one in WEB-INF \classes folder of web application.

```
//DateSrv.java
import javax.servlet.*;
import java.io.*;
public class DateSrv extends GenericServlet
{
    //implement service(-,-)
    public void service(ServletRequest req, ServletResponse res) throws
                                        ServletException, IOException
    {
    //Set response Content type
      res.setContentType("text/html");
     //get Stream obj
      PrintWriter pw = res.getWriter();
     //write req processing logic
      java.util.Date d1 = new java.util.Date();
     //write response Content to browser window through webserver.
      pw.println("Date and time is: "+d1.toString());
     //close Stream object
      pw.close();
    }//service(-,-)
}//class
```

req(1): Represents the servlet Container supplied request object

req(2): Represents the servlet Container supplied response object.

other mime types

* text/html
* application/ms word
* application/ and etc

printwriter pw = res.getWriter();

* Here pw is a stream object pointing to response object getWriter() called on res object returns the printwriter stream object.

NOTE: A stream object can represent either file or object as destination

pw.println("---");

* This method makes the stream object pw writing data to the destination object response (res). This response object passes that data (argument value of println("...") method) to webserver and this webserver writes data to browser window as http response in the form of a web page.

pw.close();

* closes the stream connection with response object.

* Add the tomcat server supplied servlet-api.jar (contains servlet api) to classpath.

my computer → properties → advanced variables → environment variables →

variable name: CLASSPATH

value : D:\Tomcat 6.0\lib\servlet-api.jar ; <other existing jar files>;

→ ok → ok → ok

NOTE: Since servlet-api is not part of jdk software and since our

Step (4): Develop web.xml file having the servlet programs configuration.

NOTE :

(1) A program or file of application is called as resource of the application

(2) servlet program is called as the web resource program of the web application. All servlet programs must be configured in web.xml file.

(3) specifying the details of certain resource program and making underlaying software like container, server and etc recognising the resource programs is called as resource configuration. By configuring servlet programs in web.xml file we make servlet container recognising servlet programs.

web.xml

```
<web-app>
    <servlet>
        <servlet-name> abc </servlet-name>      → logical name/ object name for our servlet class when servlet container creates the object.
        <servlet-class> DateSrv </servlet-class>
    </servlet>                                  → java class that is acting as servlet program
    <servlet-mapping>
        <servlet-name> abc </servlet-name>      → must match above with above logical name
        <servlet-url-pattern> /test </url-pattern>
    </servlet-mapping>                          → url pattern of servlet program
</web-app>
```

* servlet program will be identified in the web.xml file through its logical name (abc) more ever servlet container uses this logical name as the object name when it creates object for our servlet program java class.

* The web server servlet container and the web resource programs of web application and clients identifies the servlet program through its url pattern (/test).

* physical presence of servlet program in WEB-INF/classes folder is not sufficient to make servlet container to recognize servlet program. It must be configured in web.xml file.

NOTE: step(1) to step(4) represents web application development.

Step(5): Start the tomcat server.

Tomcat-home\bin\tomcat6

Step(6): Deploy the above DateApp web application

copy e:\DateApp folder to Tomcat-home\webapps folder.

NOTE: Step(5) and Step(6) performs the deployement of web application.

Step(7): Test the web application

open browser window → type http://localhost:2020/DateApp/test

- http: Protocol
- localhost:2020 → host name & port no. of tomcat server
- DateApp → web application name / Context path / context route
- test → URL pattern of DateSrv servlet program

NOTE:

* URL pattern given to servlet is useful, to hide the servlet related program class name from end users.

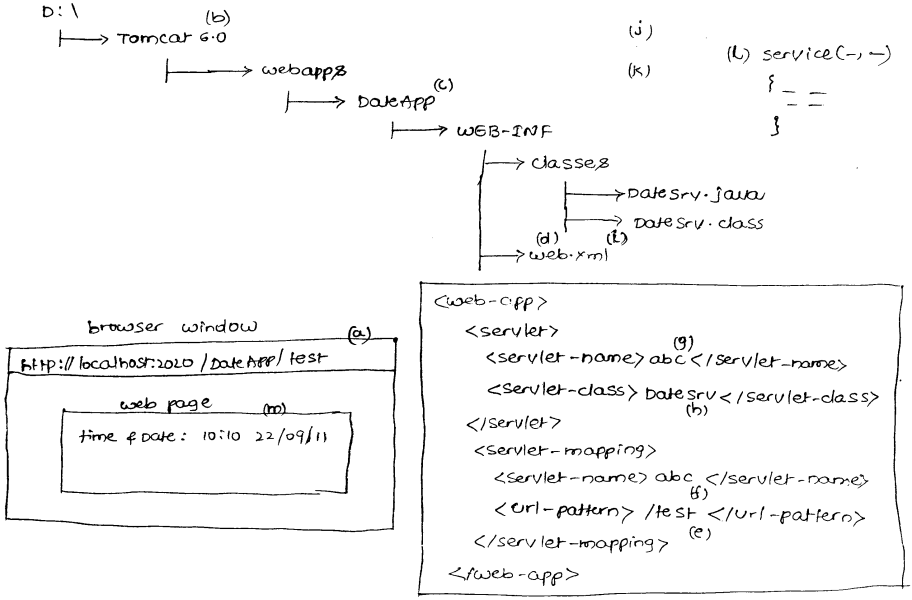
* Java web applications are WODA (write once Deploy Anywhere) applications because

(1) The deployment directory structure is common for all webservers.

(2) The web resource programs like servlet, JSPs are Server independent programs

Can you explain flow of execution from request to response generation with the aid of an example application?

With respect to the given code



deployed DateApp web application of web server.

(d) The servlet Container uses web.xml file file entries to locate the servlet program that is requested.

(e), (f), (g), (h) Based on the url pattern /test the logical name abc the servlet Container gathers the class name of servlet program (DateSrv).

(i), (k) servlet Container loads DateSrv class from WEB-INF\classes folder of web application.

(j) servlet Container creates and locates DateSrv class object. If created the servlet Container finishes initialization process on our servlet class object.

(k) servlet Container creates one set of request, response

(m) This output goes to browser window through webserver as http response in the form of dynamic web page.

```
PrintWriter pw= res.getWriter();
```

* In the above statement we are getting access to PrintWriter stream object that is available as built-in stream object of res object. This stream object points to res object as outputStream object so we can use this stream object to write some output content to response object from servlet program.
* Java I/O stream objects can perform read and write operations on the files/objects.
* The System.out.print statements generated output from servlets will appear on server console whereas the pw.println statements generated output will come on webpage of browser window.
* modifications done in web.xml file of deployed web application will be recognized by server automatically whereas the modifications done in servlet program source code will be reflected only after recompilation of servlet program and reloading of the web application.
* To reload web application in Tomcat web server the procedure is

open Tomcat home page (http://localhost:2020/ → Tomcat manager →

user name : admin
password : admin } choosen during installation

→ DateApp application → Reload.

* Servlet container uses 0-arg constructor to create object of our servlet class so make sure that our servlet class is having 0-arg

any browser window (client).

javax.servlet.ServletRequest (I)

↑ extends

javax.servlet.http.HttpServletRequest (I)

javax.servlet.ServletResponse (I)

↑ extends

javax.servlet.http.HttpServletResponse (I)

* The req object of service(-,-) method is not the object of javax.servlet.ServletRequest interface, it is the object of servlet Container supplied java class implementing javax.servlet.ServletRequest interface directly or indirectly. But programmer never specifies this class name in servlet program because its classname name changes based on the webserver/servlet container we use. In tomcat server req object class name is "org.apache.catalina.connector.RequestFacade".

* The res object of service(-,-) method is not the object of javax.servlet.ServletRespose interface, it is the object of servlet Container supplied java class implementing javax.servlet.ServletResponse interface directly or indirectly. In Tomcat server the res object class name is "org.apache.catalina.connector.ResponseFacade".

* To know req, res objects class names in any server call getclass() methods on those objects from service(-,-) method of servlet program as shown below.

```
pw.println("<br> req obj class name is:" + req.getClass());
pw.println("<br> res obj class name is:" + res.getClass());
```

* All the request coming to our servlet program will use only one object

```
pw.println("<br> req obj class name is :" + req.getclass());
pw.println("<br> req obj class name is :" + res.getClass());
```

gives seperate values for each request

```
pw.println("<br><br> hash code of req obj : " + req.hashCode());
pw.println("<br><br> hash code of res obj : " + res.hashCode());
```

gives seperate thread name for each request

```
pw.println("<br><br> current req thread name is :" + Thread.currentThread
                                                    ().getName());
```

gives same value for all the requests

```
pw.println("<br><br> hashCode of our servlet class obj :" + this.hashCode());
try
{
Thread.sleep(40000);
}
catch (Exception e)
{
  e.printStackTrace();
}
```

NOTE: once server is down all objects (including our servlet class objects) will be destroyed.

How many types of servlets are there?

* There is a possibility of developing n- types of servlets like http servlet, FTP servlet, SMTP servlet and etc..
* Since the entire internet and all web server softwares are given based on the protocol http the programmers prefer developing their servlet programs as http servlet programs.
* Javax.servlet.GenericServlet is not a seperate type of servlet. Programs It is given as Common super class for all protocol specific servlet classes like http servlet and etc..
* As of now servlet api is giving only one sub class for GenericServlet class that is HttpServlet class because all servers are there supporting

details from that HttpRequest. whereas the servlet program that is developed based on HttpServlet class can gather all the details of HttpRequest.

* Eventhough there are lot of details in servlet program but the servlet program will be identified with its URL pattern.
* we can provide multiple URL patterns for a single servlet program in web.xml file as shown below.

```
<web-app>
    <servlet>
        <servlet-name> abc </servlet-name>
        <servlet-class> DateSrv </servlet-class>
    </servlet>
    <servlet-mapping>
        <servlet-name> abc </servlet-name>
        <url-pattern>/test </url-pattern>
    </servlet-mapping>
    <servlet-mapping>
        <servlet-name> abc </servlet-name>
        <url-pattern>/test1 </url-pattern>
    </web-app>
```

* If web application is having multiple servlet programs then all the servlet programs must be configured in web.xml file having URL patterns.
* By specifying different MIME Types as response content types we can make servlet programs sending web pages to browser window in different formats.
* Every software installed in your computer will provide MIME type or content type for its files, to know them we can use the windows registery editor (regedit) tool

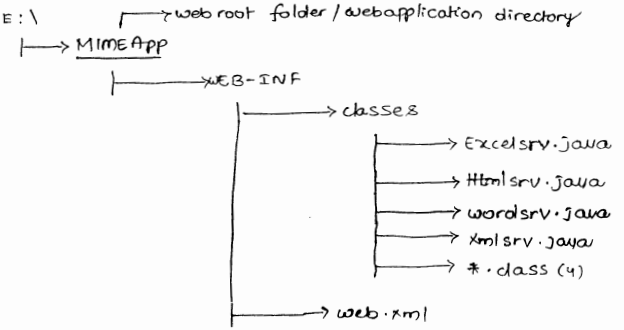
- .doc (ms word) ------ application/msword
- .xls (msexcel) ⟶ application/vnd.ms-excel
- .html ⟶ text/html
- .xml ⟶ text/xml
- .bmp ⟶ image/bmp
- .avi ⟶ video/avi

and etc.

Develop a java web application having multiple servlet programs and each servlet should generate a different format based web page.

(Servlet programs or HtmlSrv, ExcelSrv, WordSrv, XmlSrv)

Step(1): Prepare the deployment directory structure of web application.



Step(2): Develop the source code of above servlet programs.

* For the source code of HtmlSrv.java, WordSrv.java, XmlSrv.java, ExcelSrv.java refer page nos 58 and 59 of the booklet

NOTE: The approach no. (1), (2) based servlet programs work with ServletRequest, ServletResponse objects where as the approach no. (3) based servlet program

step(3): Add servlet-api.jar file to classpath.

step(4): Compile the source files of all the servlets programs.

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

step(5): Configure all the four servlet programs in web.xml file having four different URL patterns.

Refer the web.xml file of page no:s 59 and 60

step(6): Start the server (Tomcat)

step(7): Deploy the web application.

copy E:\MIMEApp folder to Tomcat_home\webapps folder

step(8): Test the web application.

open browser window ⟶ type these URLs

http://localhost:2020/MIMEApp/hturl

http://localhost:2020/MIMEApp/wdurl

http://localhost:2020/MIMEApp/xlsurl

http://localhost:2020/MIMEApp/xmlurl

* A servlet program can generate both static and dynamic web pages. In the above application all the servlet programs are designed to generate static web pages.

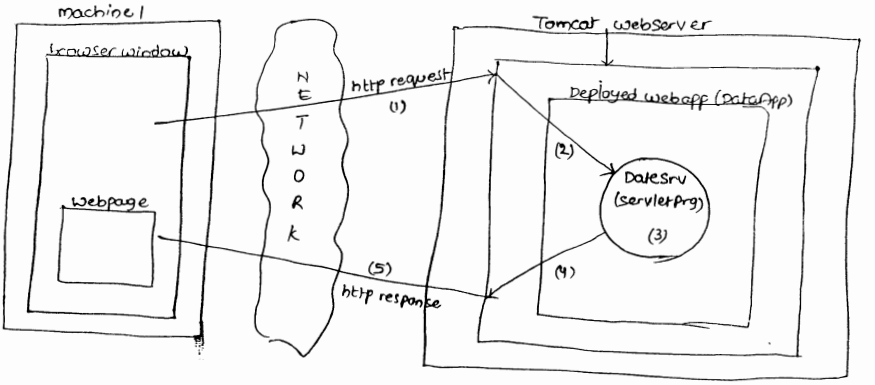
* The WEB-INF folder of java webapplication deployment directory structure is called as private directory because it is not visible outside the web-server and it is visible only to that web server where our java web-application is deployed. more over the web resource programs that are placed in WEB-INF folder or in its sub folders (like classes folder) will be recognized by servlet container only when they are configured

Understanding HTTP

* Protocol defines set of rules that are required to get communication between two parties.
* HTTP is a application level protocol that runs over network level protocol called TCP/IP having set of rules to get communication between browser window and web server.
* Application level protocols defines a set of rules that are required to get communication between two softwares or software applications.

  Ex: HTTP, JDBC:odbc, Jdbc:oracle, SMTP and etc...
* Network level protocol defines set of rules to get communication between two physical computers of network.

  Ex: TCP/IP



Request url:

http://machine10:2020/DateApp/test?sno=101&sname=raju

(query string having req params)

H ----> http request method (GET/POST/DELETE/.....)

H ----> http request headers (like user-agent, accept, accept-language....)

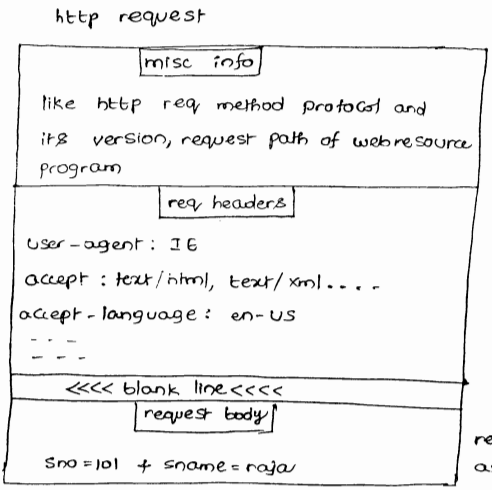
P ----> request path (http://machine IO:2020/DateApp/test)

P ----> request parameters/query string (sno=101 & sname=raja)

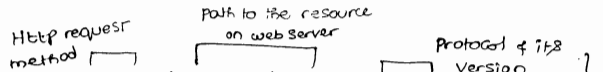
request parameter name — request parameter value

* Browser window is responsible to generate http request having multiple details based on the request URL that is generated.

The structure of http request



An example http request with content



Accept-charset : ISO-6431
keep-Alive : 300
Connection : keep-Alive
} request headers

<<<< blank line >>>>>>

sno = 101 & sname = raja } request body/payload having request parameters.

* "GET" method based request can send limited amount of data along with request (max of 256 kilo bytes).
* "POST" method based request can send unlimited amount of data to server along with the request.

What is the difference between request parameters and request headers of http request ?

* Both are there to send input values to target web resource program like servlet program along with the request. The differences are

Request parameters	Request headers
* Represents end user supplied input values to web resource program.	* Represents the browser window supplied input values to web resource program.
* End user supplies these values either through form page or by appending query string in the URL.	* Browser window internally adds request headers and their values to http request automatically.
* Request parameter names and values are not fixed.	* Request header names are fixed, predefined and their values will be generated by browser window through browser settings.
* Multiple request parameters can have same names.	* Request header names are unique

* To know various details about http request page nos page 46 to 49
* Servlet program can use all the details of http request as input values while processing the request.
* A Simple ServletRequest object can gather only misc info, req param values from http request given by client (browser window).
* A HttpServletRequest object of servlet program can gather all the details from http request (including headers) given by client.

Request URL

http://localhost:2020/DateApp/test?sno=101&sname=raja&sadd=hyd&sadd=vizag
req params

Different approaches of gathering req parameters values/ request body values from Http request being from servlet program

Approach1: (by using req.getParameters(-))

Code in service(-,-) of servlet program

String s1=req.getParameters("sno"); ⟶ gives "101"

String s2=req.getParameters("sname"); ⟶ gives "raja"

String s3=req.getParameters("sadd"); ⟶ gives "hyd"

NOTE: In this approach we must know req parameter name to get its value, if request parameter is having multiple values than it gives only first value.

Approach(2) (by using req.getParameterNames())

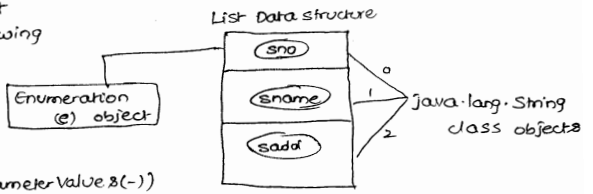
Code in service(-,-) of servlet prg

```
Enumeration e=req.getParameterNames(); // given enumeration obj pointing to
                                          list data structure having req
                                          param names

while(e.hasMoreElements())
{
```

* In this approach we can get req param values without knowing their names.

* If one req param is having multiple values this gives only first value.



Approach(3) (By using req.getParameterValues(-))

```
String s[] = req.getParameter("sadd");
for(int i=0; i<s.length; i++){ pw.println(s[i]+"....."); } //gives hyd...vizag values
String s1 = req.getParameterValues("sadd")[0]; //gives hyd
String s2 = req.getParameterValues("sadd")[1]; //gives vizag
```

* This approach is useful to gather multiple values of single req parameter.
* To read a req param values from http request we can use either ServletRequest obj or HttpServletRequest obj.
* while opening tomcat manager through browser window if username and password related problems are raised, then add following two lines of code in Tomcat_home/user.xml

```
<role rolename="manager"/>
<user username="admin" password="admin" roles="manager"/>
```

* res.setContentType("text/html");

* According to the above statement setContentType is the method that is declared in javax.servlet.ServletResponse Interface and that method is implemented in Container supplied java class implements this ServletResponse interface.
* In case of Tomcat the implementation class name is responseFacade.
* String s1=req.getParameter("sno"); → gives 101
* In the above statement getParameter is the method that is declared in predefined ServletRequest interface and implemented in servlet Container supplied java class that implements ServletRequest interface (In case of tomcat this class name is RequestFacade).

Ex:

```
interface xyz
{
  public void x();
}
class Test implements xyz
{
  public void x()
  {
  }
  public void y()
```

* so when you call method on this reference variable then interface method will not be executed but the method defined in implementation class will be executed.

* Different approaches of gathering request header values from Http request being from servlet program

Approach(1): (by using req.getHeader(-))

Code in service(-,-) of servlet Program

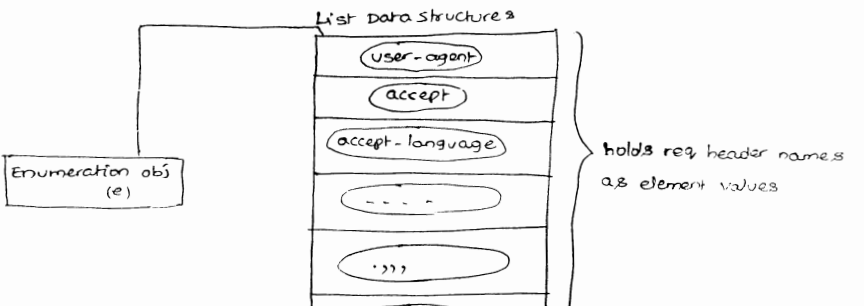
```
String s1 = req.getHeader("User-agent"); //gives browser s/w name
String s2 = req.getHeader("accept"); //gives the mime types supported by browser
                                     window like text/html, text/xml etc...
```

* In this approach we must know request header name to get its header value.

Approach(2): (by using req.getHeaderNames())

Code in service(-,-) of servlet program

```
Enumeration e = req.HeaderNames(); ①
while (e.hasMoreElements())
 {
   String hname = (String) e.nextElement(); ②
   String hvalue = req.getHeader(hname); ③
   pw.println(hname + " ==> " + hvalue);
 }
```



* This code gives all request header names and values.

* The above code must be executed with the support of HttpServletRequest object.

* Through browser language setting we can set or modify accept-language request header value.

  Internet Explorer → tools menu → Internet options → languages → add → choose language.

* In Nestcape Navigator Edit → preferences → Navigator → languages → add → choose language.

How to gather current browser window software name being from servlet program:

(A) use user-agent request header that holds browser software name as shown below.

In service(-) method

```
pw.println("<br><br> the current brower window" + req.getHeader("user-agent"));
                                                              ↓
                                                        request header name
```

---

* The URL pattern of servlet program is technically called as servlet path.

* We can gather the misc info from HttpRequest by calling various getXx methods on request object as shown below.

```
//example request url : http://localhost:2020/DateApp/test?sno=101
pw.println("<br> misc info of http request");

//methods available in javax.servlet.ServletRequest (I)

pw.println("<br> req Content length: " + req.getContentLength());
// gives request data length in bytes like 345 bytes (if not known gives -1)
pw.println("<br> req Content type: " + req.getContentType());
//gives req Content type like text/html (if not known gives null)
pw.println("<br>req protocol: " + req.getProtocol());
//gives http/1.1
```

```
pw.println("<br>browser window machine host name:"+req.getRemoteHost());
// gives current computer name other wise IP address
pw.println("<br>browser window port no:" + req.getRemotePort());
// gives 2922 for Nescape, 2926 for IE
pw.println("<br>server name"+req.getServerName());
//gives the domain name typed in the URL like local host
pw.println("<br>server port"+req.getServerPort());
// gives 2020
//methods available in javax.servlet.HttpServletRequest (I)
pw.println("<br>Context path:"+req.getContextPath());
//gives DateApp
pw.println("<br>req method is:"+req.getmethod());
// GET
pw.println("<br>req path info is:"+req.getPathInfo());
//gives additional information kept in req url (otherwise null)
pw.println("<br>query string is:"+req.getQueryString());
//gives sno=101
pw.println("<br>request uri:"+req.getRequestURI());
// gives /DateApp/test
pw.println("<br>request url:"+req.getRequestURL());
//givest http://localhost:2020/DateApp/test
pw.println("<br>servlet path:"+req.getServletPath());
// givest /test
```

* servlet program can avoid browser dependent tags while generating html tags based response if by knowing browser software name through the request header user-agent.

+ When web resource program (like servlet program) sends response to browser window the generated Http Response contain multiple details including response content. Those details can be remembered as

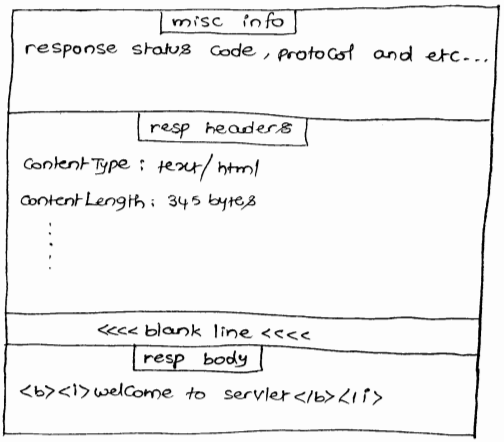
C ——→ Content type (webpage Content)

H ——→ response headers

like ContentType, ContentLength, refresh and etc.

* Response status code indicates the status of generated response to display on the browser window.
* Every generated Http response contains one http status code, default status code is 200.
* If web resource program generates warnings based web page then the status code is 100-199.
* If web resource program generates successful web page then the status code is 200-299.
* If request given to one web site is forwarded to another website then the status code will be 300-399.
* If our web resource program is incomplete or invalid to process the request then the status code will be 400-499.
* If server fails to execute our web application the status code will be 500-599.
* 400-599 are error status codes, using them the programmer can debug the problems related to web application execution and server.
* 100-399 indicates success response status codes that means they display web pages on browser window having output content so these status codes will not appear on the web pages.
* For related information on http response status codes refer page no 49 and 50.
* Response headers provide instructions to browser window through web server towards displaying web pages on the browser windows.

Http Response Structure



resp body also called as resp content/resp payload

Http response with example content

Http/1.1 200 OK → Http status code

→ misc info

Set-Cookie : JSESSIONID = 148937A5EA179EA

Content-Type : text/html

Content-length: 1354

Date : Fri Feb 2008 8:40 34 GMT

Server : Apache-Tomcat /5.0

Connection: close

response Headers

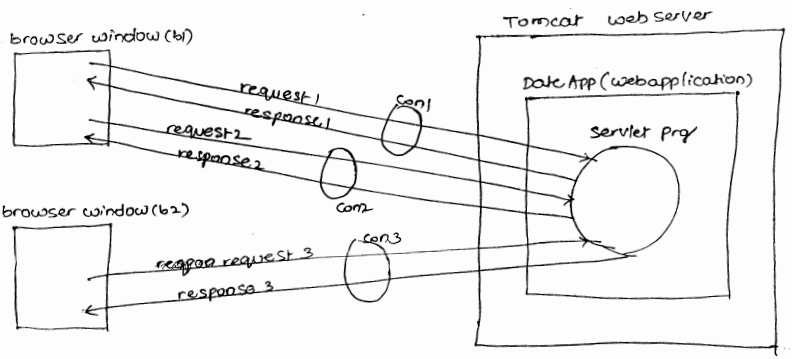
<<<< blank line <<<<

<html> <body> welcome servlet </body> </html> → response body

↓

response Content / response body

* For every request generated by browser window one new connection will be created between browser window and web server and this connection will



* For related information on response headers refer page no.s 50 and 51.

The list of all http request headers

accept, accept-encoding, authorization, connection, cookie, host, if-modified-since, referrer, user-agent, keep-alive, accept-charset and etc..

List of http response headers

Location, refresh, set-cookie, cache-control / pragma, content-encoding, content length, ContentType, last-modified, date, server, connection and etc...

How to make browser window refreshing its web page automatically at regular intervals ?

* Give instructions to browser window from servlet through server by using response header called refresh as shown below.

```
res.setHeader("refresh", "10");
                          ↓
                    time in seconds
```

By default every web resource program generated output / response content

* To solve the above problem instruct browser window for not storing the output in the buffer from web resource program through web server. by using response headers as shown below.

res.setHeader("cache-control", "no-cache"); for Http 1.1 based servers

res.setHeader("pragma", "no-cache"); : for Http 1.0 based servers

* Buffer is a temporary memory which stores the data for temporary period. Buffer is also called as cache.
* For related information on Http request details, Http response details refer page nos 46 - 51
* Every software and non-software objects life cycle (considering all the operations that are taken place from object birth to object death).
* our servlet class object life cycle will be managed by Servlet Container.
* Event is an actionPerformed / raised on the object.
* servlet Container raises the following life cycle events in the life cycle of our servlet program. They are

1) Instantiation Event (raises when servlet Container creates our servlet class object)

2) RequestArrival Event (raises when ~~browser window~~ Servlet Container takes the browser window generated request)

3) Destruction Event (raises when servletContainer is about to destroy our servlet class object)

* when Container raises these events on our servlet class object it looks to call certain methods automatically so these methods are called as

Prototype of servlet life cycle methods

public void service(ServletRequest req, ServletResponse res) throws ServletException, IOException

public void init(ServletConfig cg) throws ServletException

public void destroy()

* For one life cycle event only one life cycle method will be called by ServletContainer ex: init(), protected service(HttpServletRequest, HttpServletResponse), doXxx() methods are not life cycle methods.
* ServletContainer calls init(-) life cycle method for instantiation event.
* ServletContainer calls service(-,-) life cycle method for RequestArrival Event.
* ServletContainer calls destroy() lifecycle method for Destruction Event.
* The method that is called by underlaying container automatically based on the event that is raised on the object is called Container callback methods.
* Programmer never calls life cycle methods manually, they will be called by underlaying container automatically.
* Servlet API ex supplied life cycle methods
  (i) to allow programmer to place his choice logics in the execution of servlet programs.
  (ii) to supply Servlet Container created objects to servlet program (also for programmer as parameters of my lifecycle methods. (like request object, response object, ServletConfig object and etc...)
* While overriding super class method in sub class, the method can have same modifier or excess modifier.
* While overriding protected service() method of predefined HttpServlet class in its sub class we can take either protected or public modifiers for that

service() method - 1

public void service(ServletRequest req, ServletResponse res) throws ServletException, IOException

service() method - 2

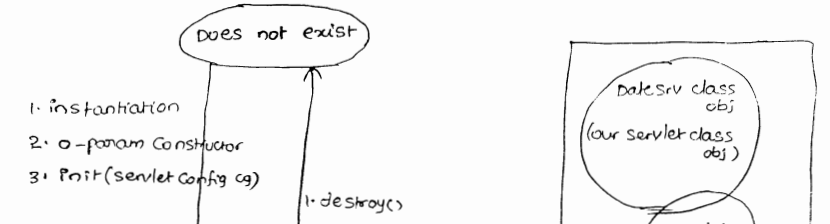
Protected void service(HttpServletRequest req, HttpServletResponse res) throws ServletException, IOException

* servlet container is responsible to raise various life cycle events on our servlet class objects so logics placed in life cycle methods are not responsible to raise these events but they are responsible to process these events by executing programmers supplied logic.

Ex: Code which is written in init() life cycle method never creates our servlet class object but programmer places this code has initialization logic to execute for instantiation event raised by servlet container by creating our servlet class object.

* Life cycle method and its logic are not capable of raising life cycle events on the object but when underlaying container raises life cycle events on the objects it automatically calls a relavent life cycle methods.

Servlet life cycle Diagram :



(1) → Servlet Config object is right hand object to our servlet class object it is one per servlet class object.

(2) → Programmer uses this object to pass additional information to our servlet program and to gather information from our servlet program.

What happens when our servlet program gets 1st request from browser window?

(1) Servlet Container loads our servlet class from WEB-INF\classes folder of deployed web application.

(2) Servlet Container instantiates (object creation) our servlet class object as Class.forName("DateSrv").newInstance();.

* class.forName("DateSrv") → loads our servlet class
* newInstance() → creates object for the loaded class DateSrv

(3) During instantiation process the 0-param constructor of our servlet class executes.

(5) Servlet Container calls init(-) life cycle method having ServletConfig object as argument value on our servlet class object.

(4) Servlet Container creates one servlet Config object for our servlet class object.

* (1) to (5) steps completes instantiation and initialization on our servlet class object.

(6) Servlet Container calls next life cycle method service(-,-) on our servlet class object. This will process the request and generated response goes to browser window as web page through web server.

What happens when our servlet program gets other than first request?

* Servlet Container checks the availability of our servlet class object

Example servlet program to understand the life cycle of servlet

Adding this servlet program to MIMEAPP web application.

Step(1): Add LCTestSrv.java in WEB-INF/classes folder of deployed MIMEAPP web application.

```
//LCTestSrv.java
package P;
import javax.servlet.*;
import javax.servlet.http.*;
import java.io.*;
public class LCTestSrv extends HttpServlet
{
   public LCTestSrv()
    {
      System.out.println("LCTestSrv: 0-param Constructor");
    }
   public void init(ServletConfig cg)
    {
      System.out.println("LCTestSrv: init(-)");
    }
   public void service(ServletRequest req, ServletResponse res) throws
                                          ServletException, IOException
    {
      System.out.println("LCTestSrv: service(-,-)");
      PrintWriter pw = res.getWriter();
      res.setContentType("text/html");
      //write business logic
       pw.println("Date and time is "+new java.util.Date().toString());
      //close stream objects
       pw.close();
```

* Compile the servlet program source code.

D:\Tomcat 6.0\webapps\MIMEApp\WEB-INF\classes> javac -d . LCTestSrv.java

Step(2): Configure the above servlet program in web.xml having url pattern.

In web.xml (already some code is there it is added to that one)

```
<servlet>
    <servlet-name> abc4 </servlet-name>
    <servlet-class> p.LCTestSrv </servlet-class>
</servlet>
    <servlet-mapping>                    Request URL to test App is
      <servlet-name> abc4 </servlet-name>
      <url-pattern> /lck/url-pattern>
    </servlet-mapping>
```

* The servlet program is there in package that must be specified in web.xml while configuring that servlet program.

Step(3): Start the server

* once webServer is down all objects created and managed by that Server will be destroyed automatically (including our servlet class objects).

* init(-) is a one time execution block of servlet program life cycle.

* This method executes when servlet container raises instantiation event on our servlet class so the programmer generally keeps initialization logic like creating JDBC connection in this method.

* service(-,-) method is repeatedly executing block of servlet program life cycle. Servlet Container calls this method for every request given to servlet program. So programmer generally keeps request processing and response generation logics in this method.

When does servlet container creates our servlet class object?

(A) When <load-on-startup> is not enabled on servlet program

(a) when servlet program gets first request from client.

(b) when servlet program gets first request after restarting web application.

(c) when servlet program gets first request after reloading the web application.

(d) when servlet program gets first request after restarting the server.

(e) when servlet program gets first request after redeploying the web application.

When <load-on-startup> is enabled

(a) The servlet container creates our servlet class object either during server startup or during the deployment of the web application.

Example code in web.xml

```
<servlet>
    <servlet-name>abc4</servlet-name>
    <servlet-class>p.LCTestSrv</servlet-class>
    <load-on-startup>5</load-on-startup>
</servlet>                    └─ load-on-startup > priority value
<servlet-mapping>
    <servlet-name>abc4</servlet-name>
    <url-pattern>/lc</urlpattern>
</servlet-mapping>
```

When servlet container destroys our servlet class object through garbage collector

(a) When server is stopped or restarted.

(b) When our webapplication is stopped or reloaded.

(c) When webapplication is undeployed.

(d) When our servlet object sits idle continuously for long time.

than first request coming to servlet program go to service(---) method directly. Due to this the request processing and response generation time of first request will be little bit high when compare to other than first request.

To minimize first request request processing, response generation time and equalise that time with other than first request make servlet container to complete instantiation and initialization operations on servlet program before first request either during server start up or during deployment of web application by enabling <load-on-startup> on servlet program.

NOTE: Don't enable <load-on-startup> on every servlet program. Enable it only on those servlet programs of web application which will be gaurenteely requested by clients immediately after deploying the web applications like the servlet programs which generate home pages or main menus and etc..

* when multiple servlet programs of web application are enabled with <load-on-startup> in which order the servlet container creates those servlet program objects will be decided based on their <load-on-startup> priority values.

* High value indicates low priority. Low value indicates high priority

NOTE: <load-on-startup> with negative value is equal to not enabling <load-on-startup> on servlet.

Servlet prgs of WA1 web application

	<1-o-s>
SrV 1	1 (I)
SrV 2	3 (III)
SrV 3	2 (II)

Servlet prgs of WA2 webapplication

	<1-o-s>
SrV1	11 (III)
Srv2	0 (I)
Srv3	2 (II)

* In Tomcat 5, 5.5 versions "0" is having least priority to world's <load-on-startup> priority values. where as in tomcat 6.0 "0" is having first priority or higher priority as shown above.

* If you keep <load-on-startup> tag with out any priority value then that servlet program gets first / higher priority compare to other servlet programs whose <load-on-startup> tags are there with values.

Ex: <load-on-startup></load-on-startup>

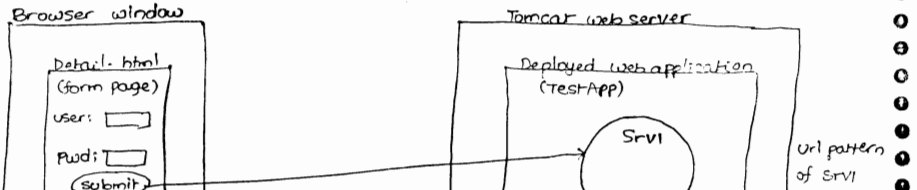
↓

This tag <load-on-startup> priority value is zero.

* when no value is passed explicitly as priority value then the <load-on-startup> tag takes "0" as the priority value.

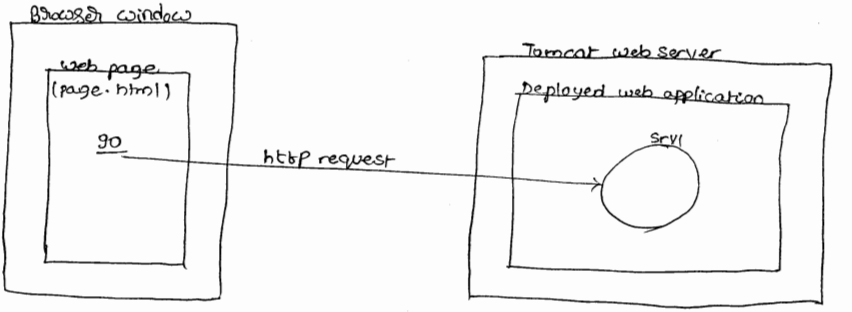
HTML to servlet Communication :

* so far we have sent request to servlet program from browser window by typing request URL in the browser window. In this process to send data along with request we need to add query string to the request URL explicitly. But this work can be done only by technical people. The non technical end users like civil engineers, chemical engineers, kids can't do this work. So they need a graphical user interface to generate request with or with out data. for that purpose we can use either HTML form page or hyperlink to generate request with or with out data.



* The form page generated request carries form data as request parameters along with request.

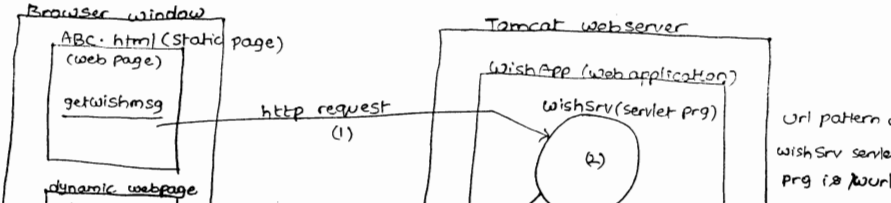
Hyperlink based webpage to servlet communication



Url pattern of Srv1 servlet prg is /sturl

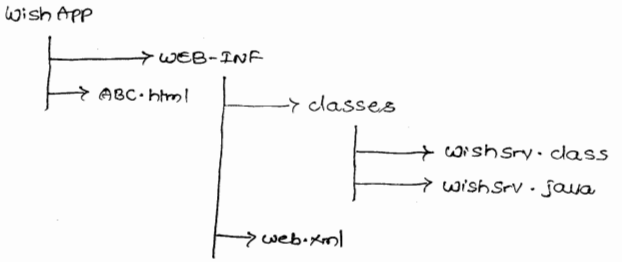
* Generally the hyperlink generated request is blank request that means it can not carry any data along with the request.
* .html files of web application must be placed parallel to WEB-INF folder in deployment directory structure of web application. There is no need of configuring them in web.xml file.

Example application (hyperlink based web page servlet program communication)



* .html based web pages are static pages always, whereas servlet, JSP programs based web pages can be static pages or dynamic pages.

Deployment Directory structure



* place servlet program request URL with URL pattern as the value of h-ref attribute.

↓

in <a> tag to make hyper link generate request communicating with servlet program.

ABC.html

```
<!-- web page having hyper links -->
<a href = "http://localhost:2020/wishApp/wurl"> get wishmsg </a>
```

↓ url pattern of wishSrv servlet program

wishSrv.java

```
//wishSrv.java
import javax.servlet.*;
import javax.servlet.http.*;
import java.io.*; import java.util.*;
public class wishSrv extends HttpServlet
```

```
                //get printWriter obj
                PrintWriter pw = res.getWriter();
                //write request processing logic to generate wish message
                Calender cl = Calender.getInstance(); //gives current date
                                                        and time
                //get current hour of the day
                int h = cl.get(Calender.HOUR_OF_DAY); //in 24hrs format
                //generate wish message
                if (h < 12)
                   pw.println("Good morning");
                else if (h<16)
                   pw.println("Good afternoon");
                else if (h < 20)
                   pw.println("Good evening");
                else
                   pw.println("Good night");
                //close stream obj
                pw.close();
            } // service(-,-)
        } // class
```

web.xml

```
<web-app>
    <servlet>
        <servlet-name>abc</servlet-name>
        <servlet-class>wishSrv</servlet-class>
    </servlet>
    <servlet-mapping>
```

NOTE: Do observe that html program is not configured in web.xml

Request URL to test the application

http://localhost:2020/wishApp/ABC.html

* In absolute request URL all details will be specified including URL pattern or identification name of the target web resource program.

Ex: In ABC.html

http://localhost:2020/wishApp/ABC.html

* In relative request URL either URL pattern or identification name of target web resource program will be specified.

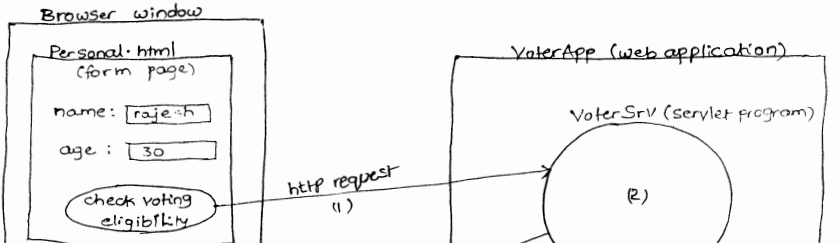
Ex: In ABC.html

getwishmsg

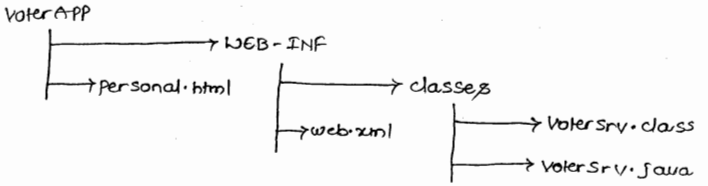
* If source and destination web resource programs are there in the same web application then it is recommanded to relative URL. otherwise it is recommanded to use absolute URL.

* To make web applications as "WODA" applications it is recommanded to use relative URLs.

Example application on form page to servlet communication



Deployment directory structure



personal.html

```
<!-- form page -->
<form action="vturl" method="get">
        (vturl: URL pattern of VoterSrv servlet program (relative URL))
    Name: <input type="text" name="pname"><br>
        (pname: name of the component)
    Age : <input type="text" name="page"><br>
    <input type="submit" value="check Voting Eligibility">
</form>
```

* When form page is submitted the form component names will go to server as request parameter names (pname, page) and the form component values will go to server as request parameter values.
* The "get" method based request generated by form page is recommended to process by using doGet(-,-) method in servlet program. Similarly use doPost(-,-) method to process "post" method based request generated by form page.
* Since doXxx() methods of servlet api are designed based on HTTP standards so it is recommended to override doXxx() methods in our servlet programs to process the request.

VoterSrv.java

```
Public class VoterSrv extends HttpServlet
  {
    public void doGet(HttpServletRequest req, HttpServletResponse res)
                                throws ServletException, IOException
    {
      //get printWriter obj
      PrintWriter pw = res.getWriter();
      //set response content type
      res.setContentType("text/html");
      // read form data from form page as request parameter values
      String s1 = req.getParameter("pname");
      String s2 = req.getParameter("page");   } Form Components acting as request parameter
      //convert age value to numeric value  names
      int age = Integer.parseInt(s2.trim());
      //write logic to generate dynamic web page
      if(age >=18)
        pw.println("<font color='green' size='4'>"+s1+" U r eligible to
                                                    vote </font>");
      else
        pw.println("<font color='green' size='4'>"+s1+" ur not eligible
                                                    to vote </font>");
      //add hyperlink to dynamic web page
      pw.println("<br><br><a href='personal.html'> home </a>");
    }//doGet(-,-)
  }//class
```

relative URL

web.xml

```
<servlet>
  <servlet-name>VoterSrv</servlet-name>
  <servlet-class>VoterSrv</servlet-class>
</servlet>
<servlet-mapping>
  <servlet-name>VoterSrv</servlet-name>
  <url-pattern>/vs</url-pattern>
</servlet-mapping>
```

personal.html

```
<form action="vs">
  Name : <input type="text" name="pname"><br>
  Age : <input type="text" name="page"><br>
  <input type="submit" value="Check Eligibility">
</form>
```

* To make our servlet program as flexible servlet program working for both "get", "post" http request methods we can use one of the following three approaches.

Approach (1) : By keeping service(-,-) method in our servlet program

```
Public class VoterSrv extends HttpServlet
 {
    public void service (HttpServletRequest req, HttpServletResponse res)
                                    throws ServletException, IOException
     {
        _____
        _____  //request processing logic
        _____
     }
 }
```

NOTE: the service(-,-) method of our servlet program can process both "get", "post" methods based request. But keeping request processing logic in service(-,-) method is not industry standard so try to keep request processing logic in doXxx methods.

Approach (2): By overriding both doGet(-,-), doPost(-,-) methods but keep request processing logic in one method and call that method from another method

```
Public class VoterSrv extends HttpServlet
 {
    public void doGet (HttpServletRequest req, HttpServletResponse res)
                                    throws ServletException, IOException
     {
        _____
        _____  //request processing logic
        _____
     }
    public void doPost(HttpServletRequest req, HttpServletResponse res)
                                    throws ServletException, IOException
```

NOTE: Here servlet program can process both Get, Post method based request. Here request processing logic is not duplicated.

Approach (3): keep request processing logic in a user-defined method and call that method from both doGet(-,-), doPost(-,-) methods

```
Public class VolerSrv extends HttpServlet
{
    public void xyz(HttpServletRequest req, HttpServletResponse res)
                                throws ServletException, IOException
    {
        ======  // request processing logic
    }
    Public void doGet(HttpServletRequest req, HttpServletResponse)
                                throws ServletException, IOException
    {
        xyz(req, res);
    }
    Public void doPost(HttpServletRequest req, HttpServletResponse res)
                                throws ServletException, IOException
    {
        xyz(req, res);
    }
}
```

* Here the key benifits are same as approach (2).
* Programmers generally prefer using approach (2) or approach (3) to make their servlet programs as flexible servlet programs against the http request methods "get", "post".

What happens if programmer calls destroy() method explicitly from

the servlet container never raises the life cycle event.

What happens if init(-) method is called explicitly from the service(-,-) method of servlet program?

(A) servlet container never creates new object of our servlet class for the above call but logic of init(-) method executes along with service(-,-) method.

What is the difference between HttpRequest method GET and POST?

GET	POST
* Design to gather data from server by generating request.	* Design to send data to the server along with the request.
* GET send limited amount of data along with the request. (max of 256 kb)	* It can send unlimited amount of data along with the request.
* The form page generated query string will appear in browser's address bar so no data secracy.	* The form page generated query string will not appear in browser's address bar. so data secracy is available
* Not suitable for file uploading operations.	* suitable.
* Can not send data in encrypted format.	* can send.
* use doGet() method or service(-,-) method to process the request	* use doPost() method or service(-,-) method to process the request.
* Get is not idempotent	* Post is not idempotent
* Default request method of HttpRequest.	* is not default and should be applied explicitly.

allowed to generate next request and web application is processing both the request then it is called as double posting problem or idempotent problem.

* when form page submit button is clicked for multiple times this problem may raise. To prevent this problem take request method as post and process that request in doPost(...) method with additional logics. This indicates post is not idempotent because it can prevent double posting by canceling all the requests.
* The first web page of web application that comes automatically when request is given to web application is called as welcome page or home page of web application.
* In java based web applications the html or jsp programs can be configured as welcome pages.

Ex: In web.xml of VoterApp web application

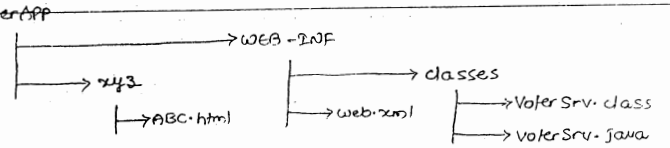
```
<welcome-file-list>  → must be taken as subtag of <web-app> tag
    <welcome-file> Personal.html </welcome-file>
    <welcome-file> Personal.htm </welcome-file>
    <welcome-file> ABC.htm </welcome-file>
    <welcome-file> ABC.jsp </welcome-file>
</welcome-file-list>
```

} only one file will become as welcome file here.

* when no welcome file is explicitly configured the java web application looks to take either index.jsp or index.html as default welcome file.
* If both are available the index.html will be taken as default welcome file.
* If multiple welcome files are configured then the

NOTE: we can not configure a servlet program as welcome file (in Tomcat 5.0, 6.0)

* The html files of web application can be placed in the web directories of web root folder. while configuring these html files as welcome files we must specify that folder name.



In web.xml

```
<welcome-file-list>
        <welcome-file> xyz\ABC.html </welcome-file>
</welcome-file-list>
```

* Tomcat 6.0,5.5 server allows to configure servlet program as welcome file by specifying its URL pattern.

In web.xml

```
<welcome-file-list>
        <welcome-file> test </welcome-file>
</welcome-file-list>
```

test → URL pattern of servlet program

* To make our servlet program related java class visible and accessable to servlet container, the java class must be taken as public class.

What happens if I place main(-) method in our servlet program?

(A) servlet program execution will be taken care by servlet container through life cycle methods. Since main(-) is not the life cycle method of servlet program so it will not called by servlet container, only in

How Servlet Program is executing without main(-) method?

(A) The stand alone application that will be executed by JVM directly needs to have main(-) method to begin the execution. Since servlet program is not stand alone application and it is a web resource program which will be executed by servlet container through life cycle methods so there is no need of main(-) method in servlet program.

* If already running java application wants to create certain other Java class object and wants to call methods of that class then that other class need not have main(-) method.
* ServletContainer is a continuously running java application/software which creates our servlet class object and calls life cycle methods on that object for executing servlet program. So our servlet program need not to have main(-) method.

NOTE: Since we never give our servlet program to JVM directly for execution so there is no need of placing main(-) method in our servlet program.

* Verifying the pattern and format of the form data before it is getting used in business logic as input values is called as form validation, and logic written for this is called as form validation logic.

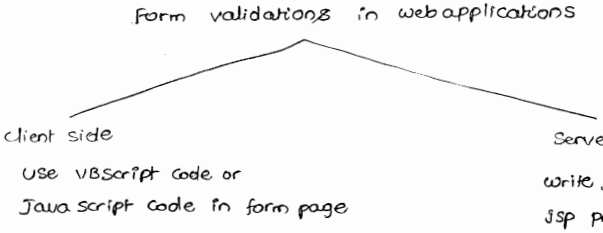
Ex: checking whether required components are filled up with values or not, checking whether age value is given as numeric value or not, checking whether email id is having @, . symbols or not.

What is the difference between form validation logic and business logic?

(A) Business logic uses the form data as input values and generates the results where as form validation logic verifies the pattern and format of the form data.

Ex(2): * checking whether username and password values are typed or not comes under form validation.

* checking given username and password values against db s/w, username and password details comes under business logic.



* Since script code that is embed with form page executes by coming to browser window we can say client side form validations are good compare to server side form validations because the client side form validation reduces network round trips between browser window and web server.

* since there is a chance of disabling script code execution through browser settings it is recommanded to write both client side and server side form validations so that there is a gaurentee of performing server side form validations even though client side form validations are not done.

* To disable script code execution in IE

Tools ⟶ internet options ⟶ Security tab ⟶ custom level ⟶ Scripting ⟶ active scripting ⟶ disable

* In netscap navigator

Edit ⟶ Preferences ⟶ Advanced ⟶ Scripts & plugins ⟶ Enable java

* For example application that performs both client and server side form validations refer supplementary hand out of given on 13-10-2011

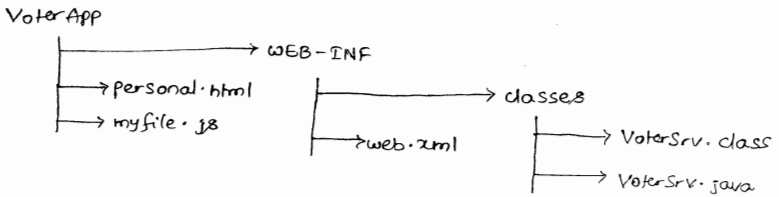
<form action = "vturl" method = "post" onsubmit = "return validate(this)">

* In the above statement the return key word takes the return value of validate function (true or false). If it is true the brows and sends to browser window.

* If that value is true then browser window sends the request to the requested web resource program of web application. If the value is false then the browser window blocks / stops request going to server.
  - true → No validation errors
  - false → validation errors are there.

NOTE: on safe side the software industry writes both client side and server side form validations as shown in the hand out example.

* To hide java script code from end users through view source option. Then and to make javascript code as reusable code for multiple html programs of web application then keep javascript code in .js file and link with html programs as shown below.



Personal.html

```
<!-- form page -->
<html>
    <head>
```

myfile.js

```
function validate(frm)
{
    ---
    ---          //refer hand out code
    ---
}//validate(-)
```

* The code that can not be executed independently and it must be embedded along with other technology based program is called as script code.
* Javascript code can not be executed independently and it must be embedded with HTML program for execution. so the Javascript code is called as script code.

What is the difference between Java and Javascript?

NOTE: Javascript is no way related with java

Java	Javascript
* It is a programming language to develop all kinds of applications.	* It is a scripting language given for form validations and for other operations.
* Java application code can be executed independently.	* JavaScript code must be embedded with html code for execution.
* Needs JRE/JVm for execution.	* Needs Java script engine for execution.
* It is object oriented language.	* It is object based language.

```
Public class Test
 {
    Public void x() {}
```

```
public class Demo extends Test
  {
      public void y()
        { (d)
        }
  }

    Demo d = new Demo();
    d.x(); (a)
```

Understanding init() Vs init(ServletConfig cg) methods

* init(ServletConfig cg) is lifecycle method of servlet program and init() is not lifecycle method and it is convienence method given to programmer to place initialization logic of servlet program.

Scenario (1) :

GenericServlet.java (Pre-defined class)

```
public abstract class GenericServlet implements Servlet
  {
      ServletConfig cg;
      public void init(ServletConfig cg)
        { (4)
          this.cg = cg; //Initialization logic of ServletConfig obj
          init();
        }
      public void init() //empty method
        {
        }
          public ServletConfig getServletConfig() { return cg; }
          // other methods
  }
```

NOTE: In predefined HttpServlet class there are no init() methods

```
public void service(SReq req, SRes res) throws SE, IOE
{
(6)
request processing logic
}
}
```

* When servlet Container raises instantiation event by creating our servlet class object then Container calls init(-) method but not init() method. So init(-) method is called as life cycle method and init() method is not life cycle method.

* With respect to the above Code

(1) End user gives first request to our servlet program.

(2) ServletContainer creates our servlet class object (TestSrv) and also creates one ServletConfig object.

(3) ServletContainer calls init(-) method as life cycle method by keeping ServletConfig object as argument value, on our servlet class object.

(4) Since init(-) is not available in our servlet program the super class (predefined GenericServlet class) init(-) method executes.

(5) The super class init(-) method initializes the received ServletConfig object in GenericServlet class and calls init() method. Since init() method is available in our servlet program that will be executed. Here programmer places his servlet program related initialization logic.

(6) Servlet Container calls next lifecycle method called public void service(-,-) on our servlet class object.

NOTE: In scenario (1) programmer need not to initialise the ServletConfig object explicitly in his servlet program. More ever we can call getServletConfig() method to get access to servletConfig object

```
public abstract class GenericServlet implements Servlet
 {
        ServletConfig cg;
        public void init(ServletConfig cg)
          {
            this.cg = cg;
            init();
          }
        public void init()
          {
          }
        public ServletConfig getServletConfig()
          { return cg;
          }
        // other methods.
 }
```

(1) (2) (3)

TestSrv.java (our servlet prg)

```
public class TestSrv extends GenericServlet/HttpServlet
 {
        ServletConfig cg;
        public void init(ServletConfig cg)
          { (4)
            this.cg = cg;
            ==========
            Programmer choice initialization logic like creating
            ---- jdbc Connection obj
          }
        public void service(SReq req, SRes res) throws SE, IOE
          { (5)
            ==========
            request processing logic
          }
 }
```

* Here (1), (2), (3) are same as scenario (1)

(4) -> init(-) method of servlet program executes having initialization

object from other lifecycle methods (refer above). If programmer forgets to do this ServletConfig object initialization then the service() destroy() lifecycle methods can not get access to ServletConfig object.

NOTE(2): In scenario (2) control did not pass on to init(-) method of super class (predefined GenericServlet class) so our servlet program can not call getServletConfig() method to get ServletConfig object.

Scenario (3)

GenericServlet.java (predefined servlet)

```
Public class GenericServlet implements Servlet
 {
    ServletConfig cg;
    public void init(ServletConfig cg)
     {
        this.cg=cg; (6)
        init();
     }
     public void init()
      { (7)
      }
      public ServletConfig getServletConfig()
       {
          return cg;
       }
 }          ------ //other methods
```

TestSrv.java (our servlet program)

```
(1) (2) (3)
Public class TestSrv extends HttpServlet/GenericServlet
 {
    public void init(ServletConfig cg)
     { (4)
       ---------- // Programmer choice initialization logic like create jdbc
       ----------                                              connection
       super.init(cg); (5)
     }
```

(1), (2), (3) steps of Scenario (3) are same as (1), (2), (3) steps of Scenario (2)

(4) init(-) method of our servlet program executes.

(5) Because of super.init(cg) method call the super class (GenericServlet) init(-) method executes.

(6) init(-) method of GenericServlet class initializes the ServletConfig object Containg servletConfig initialization logic

(7) Since init() method is not available in our servlet init() method of GenericServlet class will execute.

(8) same as step (6) of Scenario (1)

NOTE: In scenario (3)

(i) Programmer should call super.init(cg) method in the definition of init(-) method of our servlet program and he can use getServletConfig() method call to get ServletConfig object.

(ii) If Programmer forgets to call super.init(cg) method the service(-,-), destroy() lifecycle methods can not get access to ServletConfig object even after calling getServletConfig() method.

* The best scenario to keep init() method in our servlet program is scenario (1) (overriding init() method).

* Always give chance to execute init(-) method of pre defined GenericServlet class during our servlet class instantiation and initialization process. Because this method contains servletConfig initialization logic and makes programmer not performing that works explicitly.

Why servlet API has given init() method when it is not lifecycle method ?

=> Refer the 4 paragraphs of init() Vs init(ServletConfig cg) discussion

In any life cycle method of servlet program

```
ServletConfig cg = getServletConfig(); //gives access to ServletConfig obj
```

↓

It is public method of GenericServlet class so it can be called without object in our servlet programs.

Understanding two service(-,-) methods and seven doXxx(-,-) methods of predefined HttpServlet class

* we can use one of the two service(-,-) methods or one of the seven doXxx(-,-) methods to place request processing logic in our servlet program but only public service(-,-) method is life cycle method of servlet program.

HttpServlet.java (predefined class)

```
public abstract class HttpServlet extends GenericServlet
 {
   public void service(ServletRequest req, ServletResponse) throws SE, IOE
    { (4)
      // type casting
       HttpServletRequest hreq = (HttpServletRequest)req;
       HttpServletResponse hres = (HttpServletResponse)res;
      //calls protected service(-,-) method
        service(hreq, hres);
    }
   //protected service(-,-) / service(-,-) method2
   protected void service(HttpServletRequest hreq, HttpServletResponse hres)
                                                        throws SE, IOE
   { (5)
   //reads the request method of given request
     String method = req.getMethod();
   //calls one of 7 doXxx(-,-) methods based req method
```

```
    }
Protected void doGet(HttpServletRequest hreq, HttpServletRequest hres)
                                        throws SE, IOE
    {
        ------
        ------   logic send 405 error response to browser window
        ------
    }
Protected void doPost(HttpServletRequest hreq, HttpServletResponse hres)
                                        throws SE, IOE
    {
        ------
        ------   logic send 405 error response to browser window
        ------
    }
    ------
    ------   // implementation of other doXxx(-,-) methods sending 405
    ------      error response to browser window.

}// class
```

TestSrv.java (our Servlet program)

```
(1) (2) (3)
public class TestSrv extends HttpServlet
{
    public void doGet(HttpServletRequest req, HttpServletResponse res)
    {  (6)
       ------
       ------   our request processing logic
       ------
    }
```

with respect to above code

(1) client gives request to our servlet program having "get" method

class object. keeping ServletRequest, ServletResponse objects as argument values.

(4) Since public service(-,-) method is not available in our servlet program, the super class public service(-,-) method executes (Predefined HttpServlet class). This method converts ServletRequest object to HttpServletRequest object, ServletResponse object to HttpServletResponse object and calls protected service(-,-) method having those objects as arguments.

(5) Since protected service(-,-) method is not available in our servlet program, the protected service(-,-) method of super class (Predefined HttpServlet class) executes. This protected service(-,-) method calls doGet() method based on "get" method of given request.

(6) Since doGet(-,-) method is available in our servlet program that will be executed and generated response goes to browser window.

NOTE: Don't let doXxx(-,-) methods of predefined HttpServlet getting executed directly (or) indirectly because they send "405" error response to browser window indicating that our servlet is incomplete servlet program towards processing request.

* When request arrival event is raised (means request comes to container) servlet container calls public service(-,-) method on our servlet class object and it never calls protected service(-,-) method, doXxx(-,-) methods for that event. So only public service(-,-) method is called as servlet life cycle method, protected service(-,-) and doXxx(-,-) methods are called convenience methods given to programmer to keep request processing logic in our servlet programs.

* For understanding flow of execution in our servlet programs, we always

program to place request processing logics. Because these methods are given based on the http protocol's standard. Moreover the super class (Pre-defined HttpServlet class) version of this methods can generate appropriate error messages like 405 when those methods are really not overridden in our servlet program.

* most of the programmers in real world overrides both doGet(-,-) and doPost(-,-) methods in servlet program, but they place request processing logic only in one method and calls that method from another method.
* In java Abstract class can have only abstract methods (or) only concrete methods (or) mix of both.

In predefined HttpServlet class when all methods are given as Concrete methods. why that class itself is given as abstract class?

(A) Refer the last 3 paragraphs of page no. 56 of booklet.

* Every website that is hosted in the internet will be having one domain name like www.yahoo.com, www.gmail.com and etc..
* These domain names along with home page request URLs will be registered in DNS ~~registe~~ registering.

Procedure to host web application on to the internet having domain name

(2) Purchase domain name from ISP like www.satya.com

(3) Purchase space in web server/application server maintained by ISP in static Ip address based machine.

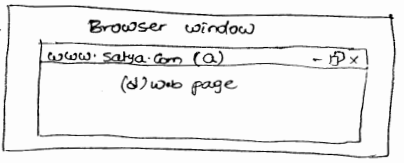
(4)

ISP machine (Ip Address: 180.3.5.7)

(4) move VoterApp app the server of ISP machine

(5) register VoterApp app in DNS registry.

(6) Access the web site →



* Registering web application in DNS registry is nothing but keeping domain name of web application along with home page URL.
* The ISP machine where ever web application hosted will be having static / fixed IP address.
* once we purchase space from the server of ISP machine they supply FTP application along with user name and password (to us) and we can use that FTP application to interact with our space of ISP machine from any place so using this we host or move web applications to the server of IP machine.

Flow of accessing

(a) End user types domain name as URL in browser windows address bar.

(b) Through internet network the request goes to DNS registry, gathers home page request URL of given domain name (like satya.com) from DNS registry.

(c) Based on home page request URL the web resource program of hosted web application in tomcat server of ISP machine will be executed.

http request methods

GET
POST
HEAD
DELETE
PUT
TRACE
OPTIONS

* The regularly used two request methods of real world programming are get, post.

GET:

* Given to gather / to get more data from the server.
* The response of this method based request contains both headers and body. Head

Head:

* same as get but this method based request generated response contains only response headers.
* This method is useful to check the availability of web resource programs.

NOTE: Get() method is useful to gather data from server by sending limited amount of data (upto 256 kb) from the request.

post:

* Design to send unlimited amount of data along with the request

put:

* useful to add new web resource program in web application from client.

delete

* useful to remove web resource program of web application from client.

NOTE: put(), delete are useful in the development of FTP applications.

returns get, Head, Trace, options.

Trace

* A Trace request method based request sends the flow of execution details of certain web resource program like servlet. So these details can be used for debugging operations.

List of form Components in form page

(1) TextBox
(2) Password Box
(3) Select box/ComboBox
(4) List box
(5) TextArea
(6) Radio Buttons
(7) check Box
(8) Button (Standard button, submit button, reset button)
(9) File uploading Component

TextBox

In form page

```
Name: <input type="text" name="pname">
```

In servlet program (to read comp value)

```
String s1 = req.getParameter("pname");
```

Password box

In form page

```
Age: <input type="password" name="page">
```

In servlet program

```
String s1 = req.getParameter("page");
```

In servlet program (to read component value)

```
String s1= req.getParameter("taddress");
```

Select Box / Combo Box (allow us to create select one item a time)

Qualification :

```
<select name="qlfy">
    <option value="engg">B.E/B.Tech</option>
    <option value="medico">MBBS</option>
    <option value="arts">B.A</option>
</select>
```

in servlet program

```
String s1 = req.getParameter("qlfy");
```

* while working with Select Box the selected item will not come to server as request parameter value, the value available in the value attribute of option tag for selected item will come to server as request parameter value.

Ex: From the above select Box if BE/B.Tech is choosen then the value engg will go to server as request parameter value.

List box (allows us to select multiple items at a time)

In form page

```
Courses: <select name="crs" multiple>
    <option value="java">JAVA PKG</option>
    <option value=".net">.NET PKG</option>
    <option value="Oracle">Oracle PKG</option>
</select>
```

In servlet program

```
String s[] = req.getParameterValues("crs");
```

Radio buttons

* By giving same name for multiple radio buttons we can group them into single unit. So only one radio button can be selected at a time.

In form page

```
Gender : <input type="radio" name="g" value="m">Male   
         <input type="radio" name="g" value="f"> Female
```

In servlet program

```
String s1 = req.getParameter("g"); // gives m when male radio is selected
                                   // gives f when female radio is selected.
```

checkBoxes

* When multiple checkBoxes are grouped into single unit by giving same name then we can select multiple checkBoxes at a time.

In form page

```
Hobbies : <input type="checkbox" name="ch1" value="read">Reading
          <input type="checkbox" name="ch1" value="sleep">sleeping
          <input type="checkbox" name="ch1" value="roaming">roaming
```

In servlet program

```
String s[] = req.getParameterValues("ch1");
```

* If reading, roaming checkboxes are selected then the s[] holdes read, roam values

NetBeans

Type: IDE for java environment

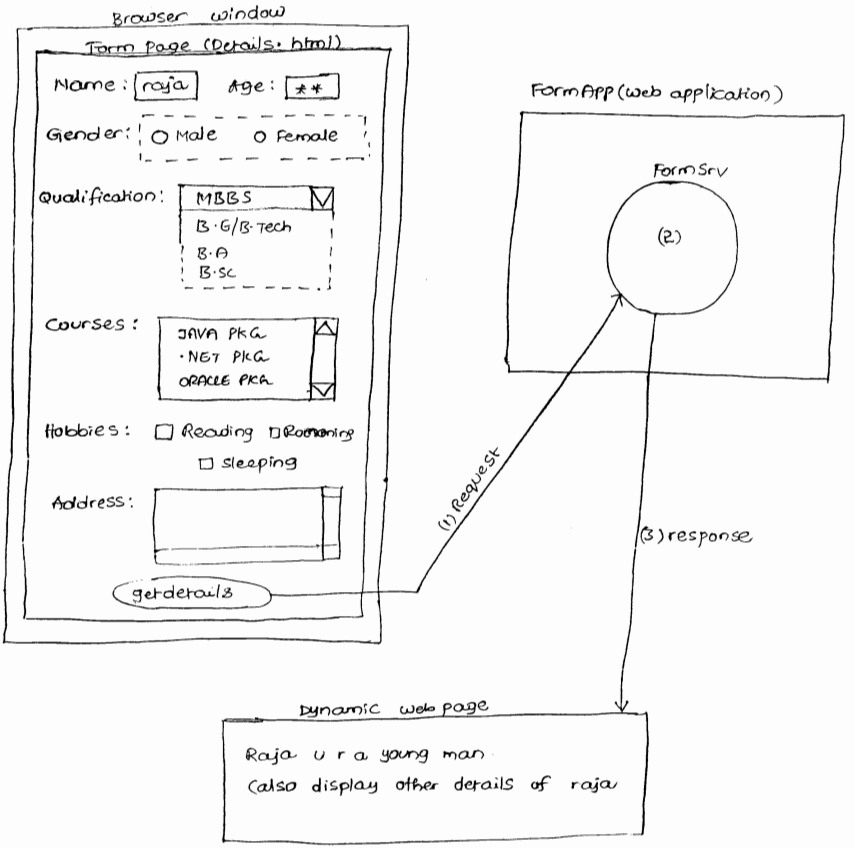
Version: 6.7.1 (compatable with jdk1.6)

Vendor: Sun micro system

gives GlassFish 2.x as Built-in Server

open source s/w

to download s/w: www.netbeans.org



Procedure to develop and execute above application by using NetBeans IDE

Step(1): create java web project having name FormApp.

File menu → new project → java web → web application → next →

Project Name : FormApp

```
<form action="url" method="get">
                    url pattern of FormSrv servlet program
    <table border="1">
        <tr>
            <td> Name: </td>
            <td> <input type="text" name="pname" ></td>
        </tr>
        <tr>
            <td> Age: </td>
            <td> <input type="text" name="page"> </td>
        </tr>
        <tr>
            <td> Gender: </td>
            <td>
                <input type="radio" name="g" value="m" check
                <input type="radio" name="g" value="F"
            </td>
        </tr>
        <tr>
            <td> Qualification </td>
            <td>
                <select name="qlfy">
                    <option value="engg"> java </option>
                    <option value="medico"> .Net </option>
                    <option value="arts"> B.A </option>
                    <option value="Science"> B.Sc </option>
                </select>
            </td>
        </tr>
        <tr>
            <td> Courses </td>
```

```
<tr>
    <td> Hobbies </td>
    <td>
        <input type = " checkbox"  name = "ch1"  value = "read" checked />
                                                    reading    
        <input type = "checkbox"  name = "ch1"  value = "roam" /> Roaming
                                                       
        <input type = "checkbox"  name = "ch1"  value = "sleep" /> sleeping
    </td>
</tr>
<tr>
    <td> Address </td>
    <td>
        <textarea  name = "address"  rows = "4" cols = "20">
        enter address
        </textarea>
    </td>
</tr>
<tr>
    <td  colspan = "2" > < input type = "submit"  value = "getdetails" /> </td>
</tr>
```

(colspan = "2" ↓ merges two cells into single cell)

```
</table>
</form>
```

Step(3): Add FormSrv servlet to Source packages folder of project

Right click on Source packages folder → new → servlet →

class name : FormSrv → next →

url pattern : /url → finish

NOTE: The above IDE generated servlet program gives processRequest(-,-)

Step(4): keep the following request processing logic in processRequest(--,--) method of above servlet program.

```
{
 //general settings
 PrintWriter pw = res.getWriter();
 res.setContentType("text/html");
 //read from form page
 String name = req.getParameter("pname");
 int age = Integer.parseInt(req.getParameter("page"));
 String gen = req.getParameter("g");
 String q/fy = req.getParameter("q/fy");
 String crs[] = req.getParameterValues("crs");
 String hb[] = req.getParameterValues("ch1");
 String address= req.getParameter("taddress");
 if (gen.equals("F"))
   {
      if(age<=5)
          pw.println(name+"ur baby girl");
      else if(age<=12)
          pw.println(name+"ur child girl");
      else if(age<=19)
          pw.println(name+"ur teenage girl");
      else if(age<=30)
          pw.println(name+"ur a young woman");
      else if(age<=45)
          pw.println(name+"ur middle age woman");
      else
          pw.println(name+"ur old lady");
   }
```

```
        //close stream obj
        pw.close();
    } // print form data
    pw.println("<br>name = "+name);
    pw.println("<br>age = "+age);
    pw.println("<br>Address = "+address);
    pw.println("<br>Gender = "+gen);
    pw.println("<br>qualification = "+qlfy);
    pw.println("<br>courses = ");
      for(int i=0; i<crs.length; ++i)
          {
            pw.println(crs[i]+"....");
          }
    pw.println("<br>hobbies = ");
      for(int i=0; i<hb.length; ++i)
          {
            pw.println(hb[i]+"....");
          }
      //close stream obj
        pw.close();
  }
```

Step(4) : Run the project

Right dick on FormApp project → Run

* we can prepare WAR file on deployment directory structure of web application. Each war file represents one web application.

Procedure to prepare war file

e:\
  ⟶ APPS
  ⟶ app.war

To prepare war file

e:\ APPS \ VoterApp> jar cf VtApp.war .

* Gives war file by combining everything of VoterApp folder.

* There are 3 ways to deploy web applications in servers.

(1) Hard deployment (Copy .war or directory of web application to a fixed (or) installation folder of server software }like Tomcat_home\webapps folder).

(2) Console Deployment (use admin console window for deployment)

(3) Tool based deployment (Deployment using tools like Ant, maven, IDE)

* (3) is recommanded process.

Procedure to deploy webapplication in Tomcat server through Console deployment process

Step(1) : Prepare war file (VtApp.war) as shown above

Step(2): Launch Tomcat web application manager window

start tomact server → launch home page → Tomcat manager → Submit user name password

Step(3) : Deploy the war file

Tomcat web application manager window → Select WAR file to upload → browse → select the above VtApp.war file → Deploy

* Test the application by using the following request URL

http://localhost:2020/VtApp/personal.html

↓

war file name as context path

NOTE: In most of the servers when war file is deployed, its file name automatically becomes context path of the web application.

* To perform hard deployment of web application in tomcat server.

weblogic

type : ApplicationServer s/w

Vendor: BEA Systems (OracleCorp)

Version: 10.3 (Comparable with jdk 6)

Commercial s/w

default port no : 7001

jar file that represents whole jee parts api's : weblogic.jar

to download software : www.oracle.com or www.commerce.bea.com

for docs : www.edocs.bea.com or www.oracle.com

allows to create domains. each domain act as one application server.

* If multiple projects of a Company are using then weblogic s/w will be installed only once in a common machine but for multiple projects multiple domains will be created in that s/w.

Procedure to create user define domain server in weblogic 10.3

start → programs → oracle weblogic → Quick start → Get started with weblogic server → create new weblogic domain → next → Gereate a domain .... → next →

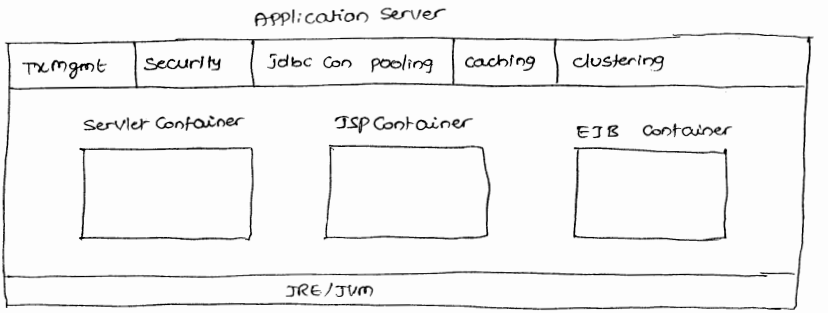
Domain name : Adv.JavaBatchDomain

→ next → User name : javaboss | password : javaboss1 | Conform User password : javaboss1 → next → select Adminstration Server → next → Listen port : 7070 → next → create.

Application Server = web Server + EJB Container + middle ware services

webServer

Tx mgmt	security	- - - -	- - - -	- - - - -



* EJB Container is required to manage and execute EJB component.

* war file ⟶ web application archive (represents web application)

* jar file ⟶ Java archive (represents java api / zip file)

* ear file ⟶ entriprise application archive (jar file + war file + jar file + war file + ---)

* rar file ⟶ resource adaptor archive (represents a Jee application interacting with Siebel / SAP s/w)

What is the difference between webserver and application server ?

webserver	application server
(1) Allows to deploy and execute web applications.	(1) Allows to deploy and execute web applications, EJB Components, Enterprise applications and resource adapter apps.
(2) Developed based on servlet, JSP api specifications.	(2) developed based on all JEE api specifications. (Servlets, JSP, EJB, JMS etc)
(3) Gives servlet Container, JSP Container.	(3) Gives both servlet Container, JSP Container and EJB Container.
(4) Doesn't allow to create domain	(4) Allows to create domain

(7) suitable for small scale and medium scale web applications.

(8) Recognizes .war file as application

(9) Ex: JWS, Tomcat, Resin and etc.

(7) suitable for large scale web applications and for JEE applications.

(8) Recognizes .war, .ear, .jar, .rar files as applications.

(9) Ex: weblogic, websphere, JBoss, Glass_Fish and etc.

Procedure to perform the console deployment of web application Adv:boat Adv:javaBatchDomain

Step(1): Prepare war file representing your web application like VtApp.war ↓ refer previous class

Step(2): Start Adv.javaBatchDomain server of web logic.

Start → Programs → Oracle weblogic → User projects → Adv.javaBatchDomain → start admin server for web logic.

Step(3): open administration Console of the above domain server.

open browser window → type below URL.

http://localhost:7070/Console

username: javaboss

password: javaboss1

Step(4): Deploy the web application through admin Console.

Admin Console → environment → Server Deployments → Install → Upload your files → Deployment archive → Browse and select VtApp.war file → next → next → next → next → finish → save

Step(5): Test the above deployed web application

Admin Console → deployments → launch VtApp.war file → select

* To perform hard deployment in Adv.javaBatchDomain of weblogic server copy webapplications directory (VoterApp) or its war file (VtApp) to oracle weblogic_home\user_projects\domains\autodeploy folder.

* when war file is used for hard deployment (VtApp.war) use the following request URL to test the application.

http://localhost:7070/VtApp/Personal-html

* The web application that is deployed in weblogic server through hard deployment process can not be undeployed from admin console but can be undeployment through hard deployment process itself.

* When wep application is hard deployed in web logic server through directory based hard deployment (copying VoterApp folder to autodeploy folder) then use following request URL to test the application.

http://localhost:7070/VoterApp/personal-html

↓

Directory name as Context path

*In web logic server when you modify the source code of Servlet programs placed in deployed web application, just recompilation is enough to get the effect of modifications and there is no need of performing the reloading of web application.

* The web application and its web resource programs that are having relative URLs is called as WODA applications.

+ Each server supplied seperate implementation classes implementing various interfaces of servlet, JSP apis but we never specify these implementation class names in our servlet programs to make our servlet programs

open source s/w

allows to create domains. default domain is domain1

jar file that represents all jee apis : javaee.jar

default port no: 8001 (for accessing web applications)

4848 (for accessing admin console)

* The GlassFish 2.x software that comes with netBeans 6.7.1 IDE can be used with or without IDE.

Procedure to change the default http protocol service related portno in domain1 server of GlassFish

Go to Glassfish_home\AppServer\domains\domain1\config\domain.xml file and change port attribute value of first <http-listener> tag

Procedure to perform console deployment of web application in domain1 server of GlassFish

Step(1): Preparing war file representing web application like VtApp.war

Step(2): start domain1 server of GlassFish.

start → Programs → Sun Micro Systems → Application Server → start default server

Step(3): open admin console of domain1 server

open browser window → type http://localhost:4848

username : admin

password : admin admin

Step(4): deploy the web application

Admin Console → applications → web applications → deploy →

Type : [web application (.war)]

* The Glassfish server supports only war file based hard deployment and it does not support directory based hard deployment.

Procedure to perform hard deployment of web application in Glassfish 2.x server.

Step(1): create war file representing the web application (like VtApp.war)

Step(2): Start domain1 server of Glassfish.

start → programs → Sun Microsystems → Application Server → start default server.

Step(3): Deploy the web application.

copy the above VtApp.war file to <Glassfish_home>\AppServer\Domains\domain1\autodeploy folder.

Step(4): Test the application.

open browser window → type below URL.

http://localhost:5151/VtApp/personal.html

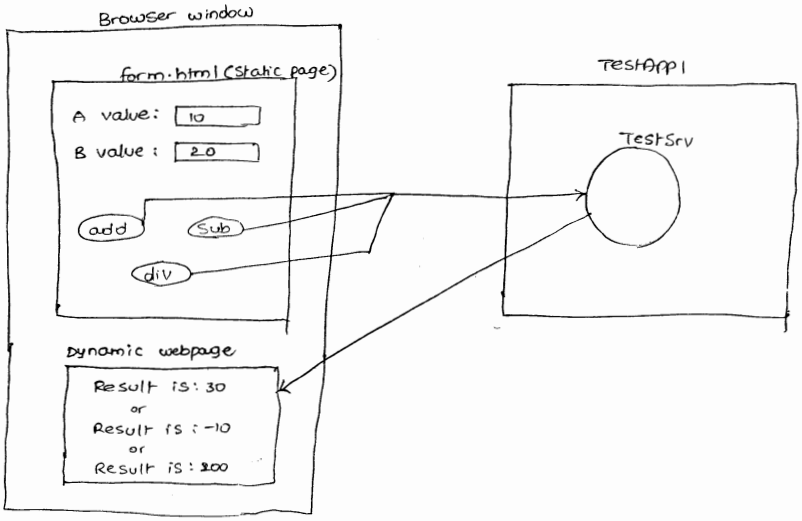
↓ war file name as context path.

* When form page submit button is taken with logical name then the caption of the submit button will go to server as request parameter value. otherwise submit button caption never goes to server as request parameter value.

```
<form action="vturl" method="get">
    ---  ---  ---
    ---  ---  ---
  <input type="submit" name="s1" value="check">
</form>
```

Here s1=check will go to server as request parameter name and value.

```
<form action="vturl" method="get">
```



To handle the above form page related request processing give same name to all the three submit buttons with different captions and use that caption as criteria value in servlet program to differentiate request processing logic for each submit button.

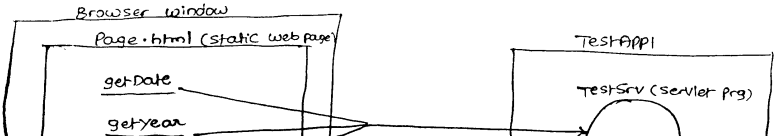
form.html

```
<form action="url" method="get">
    A value: <input type="text" name="t1"><br>
    B value: <input type="text" name="t2"><br>
    <input type="submit" name="s1" value="add">
    <input type="submit" name="s2" value="sub">
    <input type="submit" name="s1" value="div">
</form>
```

```
response.setContentType("text/html");
PrintWriter pw = response.getWriter();
//read form data
 int a = Integer.parseInt(request.getParameter("t1"));
 int b = Integer.parseInt(request.getParameter("t2"));
 //read caption of submit button
 String cap = request.getParameter("s1");
 if(cap.equals("add"))
    {
      pw.println("sum is the result is:" +(a+b));
      pw.println("add btn is clicked");
    }
  else if(cap.equals("sub"))
    {
      pw.println("result is :"+(a-b));
      pw.println("sub btn is clicked");
    }
  else
    {
      pw.println("result is :"+(a/b));
      pw.println("div btn is clicked");
    }
  //close stream object
   pw.close();
}
```

web.xml

Configure TestSrv servlet program with "/turl" pattern



Page.html

```
<form action="">
<a href = "url? p1=link1" >getDate </a>
 <br><br>
<a href = "url ? p1 = link2" > getyear </a>
 <br><br>
 <a href = "url ? p1= link3" > getTime </a>
```

query string

NOTE: The query string that is appended to the URL of href attribute sends request parameter to server along with the request.

TestSrv.java

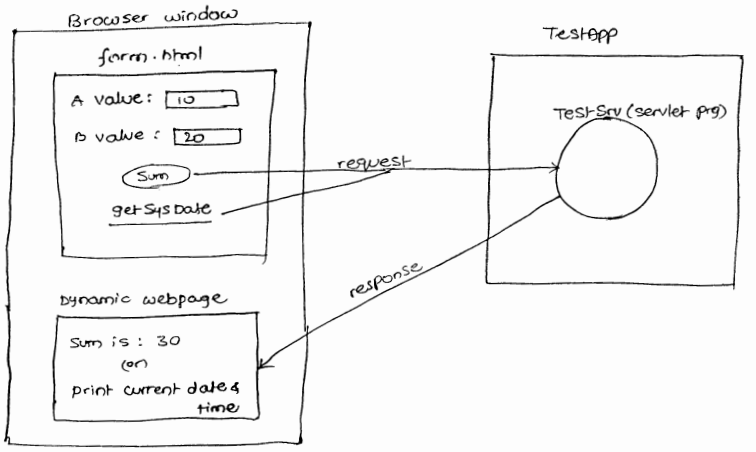
```
public class TestSrv extends HttpServlet
 {
  protected void service( HttpServletRequest request, HttpServletResponse response)
                                        throws ServletException , IOException
   {
      //general settings
       response. setContentType ("text/html");
       printWriter pw = response.getwrite();
       //read p1 request parameter value
       String pval = request. getParameter( "p1");
       //write req processing logic based on hyperlink that is clicked
       Calendar cl = new Calendar .getInstance(); //give sys date
       if (pval.equals ("link1"))
          {
            pw. println ("link1 is clicked");
            pw.println("current day is :"+ cl.get ( Calendar.DATE));
          }
       else if (pval.equals ("link2"))
          {
            pw. println ("link2 is clicked");
```

```
            //close stream object
            pw.close();
        }
    }
```

web.xml

Configure TestSrv servlet program with "/tur" url pattern.

Scenario (3) (Handling both Hyperlink, Submit buttons based form page generated request)



* Give same name for Submit button and hyperlink related additional request parameter having two different values. use that value as criteria value in servlet program to differentiate the logics for submit button, hyperlinks.

*

```
Calendar cl = Calendar.getInstance();
```

This getInstance() is static method of Calendar class returning one

form.html

```
<form action="url" method="get">
        ↳URL pattern of TestSrv servlet program
    A value <input type="text" name="t1"><br>
    B value <input type="text" name="t2"><br>
    <input type="submit" name="s1" value="add">
</form>
<br><br>
<a href="url?s1=link1">getSysDate</a>
```

TestSrv.java

```
public class TestSrv extends HttpServlet
{
  protected void service(HttpServletRequest request, HttpServletResponse response)
                                        throws ServletException, IOException
  {
    //general settings
    response.setContentType("text/html");
    PrintWriter pw = response.getWriter();
    //read s1 req parameter value
    String pval = request.getParameter("s1");
    //write req. processing logic based on hyperlink or submit
    //button on that is clicked
    if (pval.equals("add")) //if add btn is clicked
    {
      //read form data
      int a = Integer.parseInt(request.getParameter("t1"));
      int b = Integer.parseInt(request.getParameter("t2"));
      pw.println("sum is :"+(a+b));
    }
```

web.xml

* same as previous application.
* A servlet program is identified through its URL pattern according to servlet specification given by sun microsystems there is a possibility of giving three types of URL patterns

(1) Exact match
(2) Directory match
(3) Extension Math.

Exact match

* URL pattern begins with "/" symbol and should ~~not~~ contain * symbol
* multiple words can be there in the URL pattern seperated with "/" symbol.

Ex: In web.xml

<url-pattern> /test1 </url-pattern>

request URLs from browser window to request the above servlet program

http://localhost:2020/dateApp/test1 (valid)

http://localhost:2020/dateApp/xyz/test1 (invalid)

/dateApp/test1/abc (invalid)

/dateApp/abc2 (invalid)

other examples

ex(1) <url-pattern> /test1/abc </url-pattern>

ex(2) <url-pattern> /abc/test1/xyz </url-pattern>

ex(3) <url-pattern> /test1.cpp </url-pattern>

* The URL pattern provided for servlet programs can hide the servlet

Directory Match

* The URL pattern must begin with "/" symbol. and must end with * symbol. and can also have multiple words seperated with "/" symbol.

Ex(1) : /test1/xy31/*

request URLs from browser window to request the above servlet program

http://localhost:2020/DateApp/test1/xy31/abc (valid)

/DateApp/xy31/test1/abc (invalid)

/DateApp/test1/xy31/abc.c (valid)

/DateAPP/x/y/test.do (invalid)

/DateApp/test1/xy31 (valid)

/DateAPP/test1 (invalid)

other example directory match URL pattern

Ex(1): <url-pattern> /x/y/* </url-pattern>

Ex(2): <url-pattern> /abc/xy3/* </url-pattern

Ex(3): <url-pattern> /abc/* </url-pattern

Extension Match URL pattern

* URL pattern must begin with * symbol and must end with extension word/letter

Ex. <url-pattern> *.do </url-pattern>

↓

extension word.

request urls from browser window to request the above servlet program

http://localhost:2020/DateApp/abc.do (valid)

/DateApp/abc/xy3/abc1.do (valid)

other example extension match URL patterns

Ex(1): <URL-pattern> *.abc </url-pattern>

Ex(2): <url-pattern> *.a </url-pattern>

* we can not prepare URL pattern of a servlet program by mixing up multiple styles because all servers are designed to just recognize only the above 3 styles of URL patterns.

<url-pattern> /xyz/abc/*.abc </url-pattern>

↓

Invalid URL pattern formation

* If two servlets are configured with two different styles of URL patterns like exact match and extension match if matching same request URL given by browser window then server gives ~~importance~~ priority to exact match url pattern based servlet.

Example scenario

In web.xml

DateSrv ⟶ with /test.do url pattern (exact match)

DateSrv1 ⟶ with /*.do url pattern (extension match)

request from browser window

http://localhost:2020/DateApp/test.do

↓

This test.do matches both DateSrv, DateSrv1 servlet program but priority will be given to DateSrv program with URL pattern exact match.

MyEclipse = Eclipse + Built-plugins to work with advanced technologies

* A plugin is patch software or software application that can ~~extra~~ enhance

what is the difference between Eclipse IDE and MyEclipse IDE?

Eclipse	MyEclipse
(1) open source	(1) Commercial
(2) Provides environment to develop JSE module applications.	(2) Provides environment to develop JSE, JEE and frame software based applications.
(3) Does not provide built-in plug in to work with advanced technologies we must ~~them~~ supply them manually.	(3) It provides built-in plug in to work with advanced technologies and also allows to add more plugins explicitly.
(4) Suitable for small scale companies.	(4) Suitable for medium scale and large scale companies.

Basic information of myEclipse:

Type : IDE Software for java environment.

Version : 8.x (Compatable with Jdk 1.6)

Vendor : Eclipse organization.

Commercial software

Gives tomcat as built-in server. But also allows the programmer to configure other external servers.

To download software : www.myeclipseide.com

for documents : www.myeclipseide.com

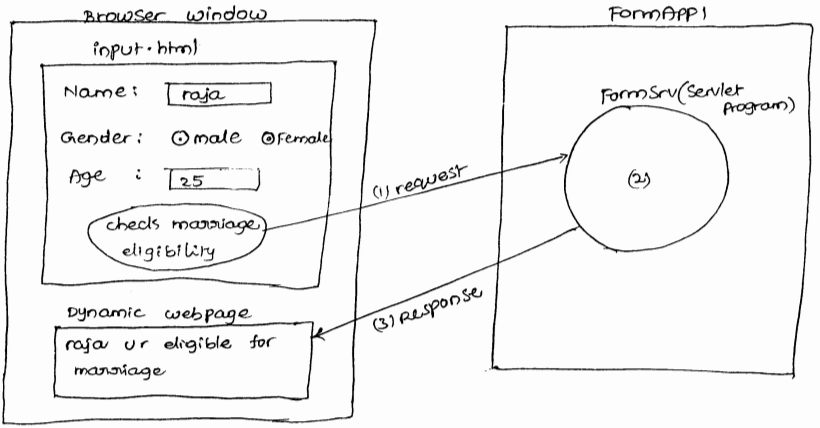
MyEclipse 8.x cheat code:

Subscriber : gocto.cn

Subscription code : ELR8ZC-855444-666653573987614Z

* Eclipse Geleelio, EG Eclipse are alternate IDEs for myEclipse which are

Example application



Step(2): Submit the cheat code

MyEclipse menu → Subscription information →

Subscriber: [ ]

Subscription code: [ ] → Finish

Step(3): create web project in myEclipse IDE.

File menu → New → web project →

project name: FormAPP1

Context root URL: /FormAPP1 → Finish

Step(4): Add form.html to web root folder of the project

Expand project → Right click on web root folder → new → html → Filename

```
Age : <input type="text" name = "page" /> <br/>
    <input type = "submit" value = "checked marriage eligibility" />
</form>
```

* Add servlet program to the src folder of the project.

Right click on src folder → new → servlet

Name : FormSrv → select doGet, doPost methods → next →

servlet/JSP mapping URL : / → Finish

step(5) ; In the generated FormSrv servlet keep the following logic and call that method.

In FormSrv.java

```
public void doGet(-,-) throws SE, IOE
{
  //general settings
    response.setContentType("text/html");
    PrintWriter pw = response.getWriter();
  //read form data
    String name = request.getParameter("pname");
    int age = Integer.parseInt(request.getParameter("page"));
    String gen = request.getParameter("gi");
    if (gen.equals("m"))
     {
       if (age >=21)
        {
         pw.println("mr" +name+" ur eligible to marriage");
        }
       else
        {
         pw.println("mr" +name+" ur not eligible to marriage");
        }
```

```
                else
                  {
                    pw.println("miss"+name+"u r not eligible to marriage");
                  }
              } // else if.
          } // doGet(-,-)
        public void doPost(-,-) throws SE,IOE
          {
            doGet(-,-);
          }
```

Step(6): Configure Tomcat 6.x server with myEclipse IDE

window menu → preferences → myEclipse → servers → Tomcat →

Tomcat 6.x → Tomcat → Tomcat_home directory : D:\Tomcat 6.0

(•) Enable
( ) Disable

→ apply → ok.

Step(7): Start the tomcat server from myEclipse IDE

Go to servers icon in the tool bar → Tomcat 6.x → start.

Step(8): Deploy the above project in Tomcat server.

Go to deploy icon of the tool bar → project FormAppl →

add server Tomcat 6.x [V] → [Finish] → [ok]

Step(9): Test the application.

open browser window → type this URL

http://localhost:2020/FormAppl/form-html ↵

Procedure to configure Adv.JavaBatchDomain server of weblogic 10.3 with MyEclipse IDE:

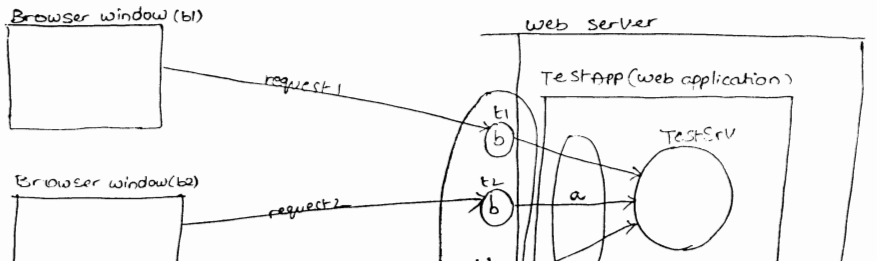
Execution domain root : e:\middleware\user_Projects\domains\
Adv-javaBatchDomain.

→ Apply → ok.

Procedure to configure the domain1 server of "GlassFish 2.x" with myEclipse IDE:

Window menu → preferences → myEclipse → Servers → GlassFish →
GlassFish 2.x → ⊙ Enable → Home_directory : D:\Sun\AppServer →
Apply → ok.

* If multiple threads are acting on single variable (or) object simultaneously (or) concurrently then we say object/variable is not thread safe. Because, there is a chance of data corruption in that situation.
* To make the above said variable/object as thread safe use Synchronization concepts.
* Instance variables of our servlet program are not thread safe by default whereas the local variables declared in the service(-,-) method of servlet program are thread safe by default.



```
public class TestSrv extends HS
  {
     int a;
     public void service(-,-) throws SE,IOE
      { int b;
        - -
        - -
      }
  }
```

t1, t2, t3 are threads representing requests

* In the above diagram the multiple threads representing multiple requests of servlet program will act on single copy of instance variable "a" and every thread gets its own copy of local variable "b" so, we can say variable "a" is not thread safe and variable "b" is thread safe.
* By default our servlet class object and its instance variables are not thread safe. To make them as thread safe, use synchronization Concept.
* To store results, inputs of servlets program in a perminant place like database software (or) to gather input values of servlet program from perminant storage unit we need to make servlet program interacting with database software where by placing JDBC code in servlets program.
* Every JDBC code Contains three important operations
  (1) Create JDBC Connection object
  (2) use JDBC Connection object to create other JDBC objects and to develop persistance logic
  (3) close JDBC Connection object.
* There are three approaches to place JDBC code in our servlet

(c) close JDBC Connection object and other objects in destroy() method.

* In approach(1) the JDBC Connection object must be declared as instance variable so it is not thread safe (it is disadvantage). Programmer must use synchronisation concepts to make the Connection object as thread safe.
* In approach (1) all the requests given to servlet program will use single JDBC connection to interact with database software. This is improve the performance. (It is advantage).

Approach(2):

(a) Create JDBC Connection object in service(-,-) / doXxx(-,-) methods
(b) Use JDBC connection object and other objects in service(-,-) / doXxx(-,-) methods
(c) close JDBC Connection object and other objects in service(-,-) / destroy() method.

* Here JDBC connection object is local variable to service(-,-) method so it is thread safe object (it is advantage).
* Each request given to servlet program will establish one new connection with database software. This kills the performance (It is disadvantage).

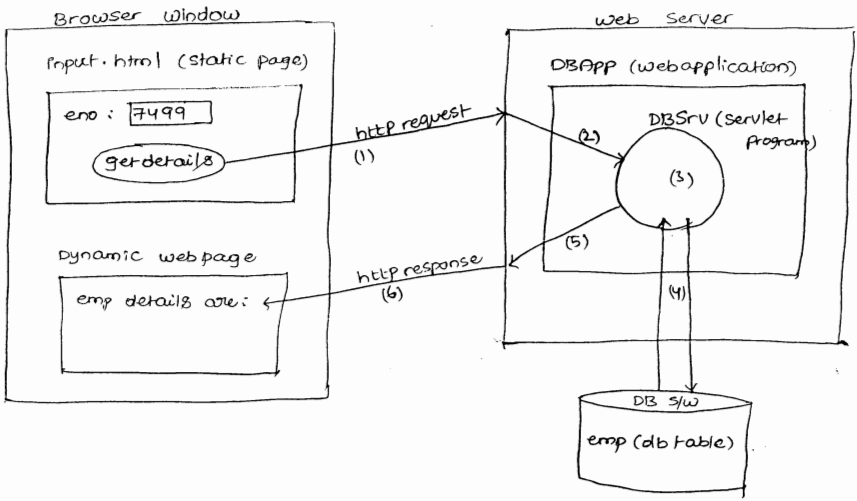
Approach(3):

(a) Get JDBC Connection object from server managed JDBC Connection pool being from service(-,-) method / doXxx(-,-) method.
(b) Use JDBC connection object and other JDBC objects in service(-,-) / doXxx(-,-) methods.
(c) Return JDBC Connection object back to JDBC Connection pool from

servlet programs interacting with database software. This gives better performance (It is also advantage).

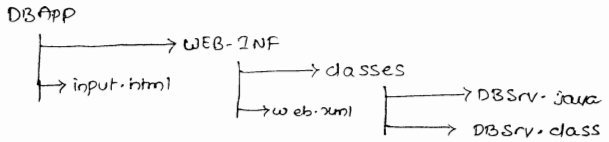
* Approach (3) is the best for servlet to database software communication.

Example application on servlet to database software communication



Deployment structure

When DBSrv program uses type 1 JDBC driver;



When DBSrv program uses type 4 (oracle thin) jdbc driver

* when stand-alone java application uses 3rd party API (other than JDK APIs) then the third party API related jar files must be placed in class path to make java compiler and JRE to recognize and use third party API.
* If java web application uses third party API in its web resource programs (like servlet, JSP Programs) then third party API related jar file should be added to class path and should also be added to WEB-INF\lib folder of web application. Here jar files added to class path will be used by javac to recognize third party API during the compilation of servlet program. Similarly jar files added to WEB-INF\lib folder will be used by servlet container to recognize and use third party API during the execution of servlet program.

Ex: If servlet program uses oracle thin driver then keep ojdbc14.jar file in class path and WEB-INF\lib folder of web application as shown above.

* The jar files added to class-path are not visible in IDE softwares and in container softwares of servers.
* Stand alone java application will be compiled and executed from command prompt. whereas servlet program compilation takes place in servlet container of servlet server/Application server.
* If above web application is created in IDE software then the third party API related jar file must be placed in the libraries folder of the project.

Source code of above diagram based application

input.html

```
<form action="dburl" method="get">
```

DBSrv.java (to interact with DB s/w using type 4 driver and approach (1))

```
import javax.servlet.*;
import javax.servlet.http.*;
import java.io.*;
import java.sql.*;
Public class DBSrv extends HttpServlet
 {
    Connection con=null;
    PreparedStatement ps=null;
     public void init()
     {
       try
        {
          // create jdbc Connection object
            Class.forName ("oracle.jdbc.driver.OracleDriver");
            con = DriverManager.getConnection ("jdbc:oracle:thin:@localhost:1521:
                                                    satya", "scott", "tiger");

            PS = con.PrepareStatement ("select ename, job, sal from Emp
                                                    where empno = ?");
         }// try
         catch(Exception e)
          {
            e.printStackTrace();
          }
     }//init()
    public void doGet (HttpServletRequest req, HttpServletResponse res) throws
                                                    ServletException, IOException
     {
      try
       {
         // read form data
          int no = Integer.parseInt (req.getParameter ("eno"));
         //write business logic
         //set parameter values to SQL query
```

```
        if (rs.next())
         {
           name = rs.getString(1);
           desg= rs.getString(2);
           bsal = rs.getString(3);
         }
        //display emp details as web page content
         PrintWriter  pw= res.getWriter();
         res.setContentType("text/html");
         pw.println("Emp details: <br>");
         pw.println("<br> Emp Name: "+name);
         pw.println("<br> Emp salary: "+bsal);
         pw.println("<br>Emp desg : "+ desg);
        //close stream objects
         pw.close();
         rs.close();
       }// try
       catch(Exception e)
        {
          e.printStackTrace();
        }
    }// doGet(-,-)
public  void  doPost(HttpServletRequest req,HttpServletResponse res) throws
                                    ServletException, IOException.
   {
     doGet(req,res);
   } //doPost(-,-)
 public  void  destroy()
  {
     try{
          if(ps!=null)
              ps.close
        }
       catch(Exception e)
         {
           e.printStackTrace();
```

web.xml

Configure DBSrv servlet program with "/dburl" as url-pattern.

Request URL to test application

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

* If multiple web applications of a server are utilizing same third party API (like oracle thin driver) then instead of keeping the 3rd party API related jar file (like ojdbc14.jar) in WEB-INF\lib folder of every application it is recommended to place only once in common library folder of server software instantiation.

Common library folder in Tomcat 6.0

<Tomcat_home>\lib\ folder

Common library folder in Tomcat 5.0/5.5

<Tomcat_home>\common\lib folder

<Tomcat_home>\server\lib folder

Common library folder in weblogic (Any version)

<BEA_home>\wlserver_<version>\common\lib folder

Common library folder in GlassFish 2.x (any version)

<GlassFish_home>\AppServer\lib folder

* When web resource program of web application uses the third party API class or interface then the servlet container looks for third party API class or interface in the following places and in the following order.

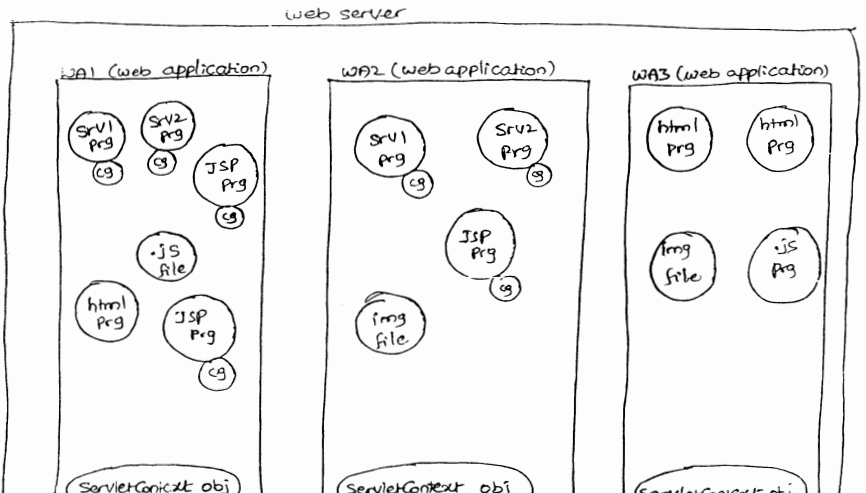
(i) In WEB-INF\classes folder itself (if not available then (ii))

(ii) In the jar files added to WEB-INF\lib folder (if not available then (iii))

(iii) In the jar files added to common library folder of underlaying server. (like Tomcat_home\lib folder) (if here also not comming then class not found exception is occured).

* Every server internally uses one Jdk software so then servlet program uses Type-1 jdbc driver to interact with database software then there is no need of adding any jar files in WEB-INF\lib folder and classpath.

* ServletConfig object means it is the object of servlet container supplied java class (implementing) implementing javax.servlet.ServletConfig interface.
* This object is useful to pass additional data to servlet and to read additional details from servlet.
* This object is useful to read servlet init parameter values from web.xml file of the web application.
* Servlet Container creates the servletConfig object in the instantiation and initialisation process of our servlet class object.
* Servlet Container destroys our servlet class object in the destruction process of our servlet object.



ServletContext object

* It is one per web application. So it is called as the global memory of web application.
* servlet context object means it is the object of a java class (Container supplier) implementing javax.servlet.ServletContext interface.
* servlet container creates this object either during deployment of the web application or during server start up.
* Servlet container destroys this object automatically when web application is undeployed or reloaded or stopped or when server is stopped/re-started.
* using this object we can read global init parameters or context parameters from the web.xml file of the web application.
* using this object we can know the details of underlaying server like server name, version and the servlet-api version supported by the server.
* using this object we can get context path of the current web application and absolute path of the any web resource program in web application.
* The data kept in servletContext object is visible and accessible in all servlet, JSP programs of web application.

In one web server 10 web applications are deployed. In that six web applications are there in running mode and four web applications are there in stopped mode. Can you tell me how many servletContext objects are currently available in that web application? server?

(A) Six

NOTE: ServletContainer creates ServletConfig object for Servlet program only when the class of servlet program is instanciated (object creation).

* our servlet class object, request object, response object, ServletConfig object, ServletContext object can not be created by programmer manually. The servlet container creates all these objects but programmer can get access to these objects in servlet program.

* To get access to our servlet class object use "this" keyword.

* To get access to request, response objects use parameters of service(-,-) doXxx(-,-)

* To get access to ServletConfig obj

approach(1):

```
public class TestSrv extends HS/GS
{
   ServletConfig cg;
   public void service(ServletConfig cg)
     {
        this.cg=cg;
        //use cg here
     }
   public void service(-,-)/doXxx(-,-)
     {
        use cg here
     }
}
```

approach(2):

```
public class TestSrv extends HS/GS
{
    public void init()
    {
```

NOTE: approach(2) is good.

NOTE: self class methods and super class public, protected methods can be called in the sub class with out object.

* To get access to ServletContext object

approach(1):

```
public class TestSrv extends HS/GS
 {
    Public void init()
     {
       ServletConfig cg = getServletConfig();
       ServletContext sc = cg.getServletContext();
       // use sc here
     }
    public void service(-,-) / doXxx(-,-)
     {
       ServletConfig cg = getServletConfig();
       ServletContext sc = cg.getServletContext();
       //use sc here
     }
 }
```

→ method belongs to ServletConfig (I)

approach(2):

```
Public class TestSrv extends HS/GS
 {
      Public void init()
       {
         ServletContext sc = getServletContext();
         // use sc here
       }
      public void service(-,-) /doXxx(-,-)
       {
         ServletContext sc = getServletContext();
         // use sc here
```

→ public method of predefined Generic Servlet class

* getServletContext() method definition of predefined GenericServlet class internally uses servletConfig object to give servletContext object.

* To make JDBC code of servlet program as flexible code to modify it is recommended to gather the following four details of JDBC code from outside the servlet program. They are
  (i) JDBC driver class name
  (ii) JDBC URL
  (iii) DB username
  (iv) DB password.

* There are two ways to pass input values to servlet program from outside the servlet program.
  (1) request parameters / form data.
    → end user / visitor of web application sends these values through browser window (from client side)
    → since end user is non-technical person this data will be non-technical data like name, age, address of end user.
    → servlet program uses request object to read request parameter values.
  (2) Servlet init parameters
    → programmer passes this data to servlet program from web.xml (server side).
    → since programmer is technical person, this data can be technical data like jdbc driver, URL and etc details.
    → servlet program uses servletConfig object to read init parameter values of web.xml.

* To make the JDBC code of servlet program as flexible code to modify it is recommended to gather the above said JDBC details

* For revised DBApp application that uses servlet init parameter to make jdbc code of DBSrv servlet as flexible code to modify refer application (4) of the page nos 63-65.

* Send technical input values to servlet program from web.xml file as init parameter values. Send non-technical input values to servlet program as request parameter values / form data.

Different ways of reading servlet init parameter values

```
ServletConfig cg = getServletConfig();
```

approach(1)

```
String s1 = cg.getInitParameter("driver");
```

here we must know init parameter name to get the value

approach(2)

```
Enumeration e = cg.getInitParameterNames();
while (e.hasMoreElements())
  {
    String name = (String)e.nextElement();
    String val = cg.getInitParameter(name);
  }
```

//gives all init parameter names and values.

* When you configure multiple init parameters in web.xml file having same logical name then the last value will be effected as that init parameter value.

* Using ServletConfig object we can gather the container created object name of our servlet class.

```
S.O.P("current servlet logical name/ instance name" + cg.getServletName());
```

↓ gives <servlet-name> tag value from

object in all servlet/JSP programs to read these context parameter values.

*If multiple servlet/JSP programs of a web application are talking with DB software by using same JDBC driver to make their JDBC code as flexible code instead of specifying JDBC driver details as init parameters in every servlet program configuration it is recommended to place JDBC driver details only once in web.xml as context parameters as shown below.

In web.xml of DBApp web application

```
<web-app>
    <context-param>
        <param-name> driver </param-name>
        <param-value> oracle.jdbc.driver.OracleDriver </param-value>
    </context-param>
    <C-P>
        <P-n> dburl </p-n>
        <P-v> jdbc:oracle:thin:@localhost:1521:orcl </p-v>
    </C-P>
    <C-P>
        <P-n> dbuser </p-n>
        <P-v> scott </p-v>
    </C-P>
    <C-P>
        <P-n> dbpwd </p-n>
        <P-v> tiger </p-v>
    </C-P>
    <servlet>
        <servlet-name> db </servlet-name>
        <servlet-class> DBSrv </servlet-class>
```

Context parameters of web application

```
        <servlet>
            <servlet-name> t </servlet-name>
            <servlet-class> TestSrv </servlet-class>
        </servlet>
        <s-m>
            <s-n> t </s-n>
            <u-p> /testurl </u-p>
        </s-m>
    </web-app>
```

In init() method of DBSrv servlet program belonging to DBApp webapplication

```
public void init()
{
   try
   {
     //read init param values from web.xml
     ServletContext sc = getServletContext();
     String s1 = sc.getInitParameter("driver");
                                  → Context Parameter name
     String s2 = sc.getInitParameter("dburl");
     String s3 = sc.getInitParameter("dbuser");
     String s4 = sc.getInitParameter("dbpwd");
     ==
     ==
   }          //same as previous application code
   ==
}
```

NOTE: init parameters are specific to that servlet/JSP program for which they are configured. Context parameters are visible in all web resource programs (java based) of web application.

Different ways of reading context parameter values

approach (2)

```
Enumeration e = sc.getInitParameterNames();
while (e.hasMoreElements())
   {
      String name = (String)e.nextElement();
      String val = sc.getInitParameter(name);
   }
```

//gives all context parameter names and values.

* we can use same name for both init parameter of servlet program and for context parameter. we can access both these parameter values in our servlet program using servletConfig, ServletContext objects respectively.

* To gather misc info about underlaying server use servlet context object as shown below.

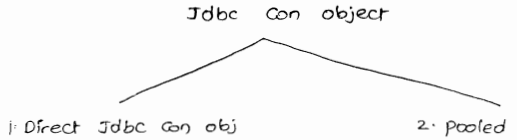
```
// gathering misc info using ServletContext obj
pw.println("Server info is:" +sc.getServerInfo()); // gives Apache Tomcat 6.0
pw.println("servlet api spec version impl by underlaying server:"+
                    sc.getMajorVersion()+"."+sc.getMinorVersion());
                    gives 2.5
pw.println("Context path of current web application:"+sc.getContextPath());
                                                    gives /DBApp
pw.println("absolute path of input.html on server:"+sc.getRealPath(
                                                "/input.html"));
                                                    ↓
                                    gives Tomcat installation
                                    path and input.html
```

* Tomcat 5.x ⟶ given based on servlet api 2.4 spec
* Tomcat 6.x ⟶ given based on servlet api 2.5 spec
* Tomcat 7.x ⟶ given based on servlet api 3.0 spec

and initialisation process of servlet program so ServletConfig object is not visible in constructor but visible and accessable in the init() method.

Since ServletContext object can not be accessed without ServletConfig object so the ServletContext object is not accessable in the constructor but ServletContext object is accessable in the init() method.

The code placed in the constructor of servlet program can not work with init parameters and context parameters where as the code placed in init() method can utilize those parameters so it is always recommanded to place the initialisation logic only in init() method.



To create direct Jdbc Con obj

```
class.forName("oracle.jdbc.driver.OracleDriver");
Connection con = DriverManager.getConnection(url, uname, pwd);
```

* The Jdbc connection object that is created by programmer manually is called as direct Jdbc Connection object.
* The Jdbc connection object that is collected from Jdbc Connection pool is called as pooled Jdbc connection object.

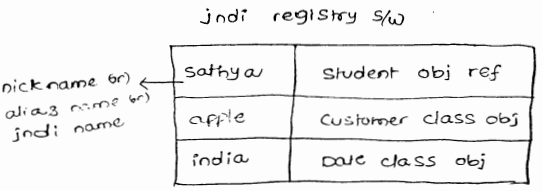
3 types of Jdbc Con pools:

(1) Driver managed jdbc con pool

(2) Third party s/w managed Jdbc Connection pool (like Apache DBCP,

pool. use (1), (2) type Jdbc Connection pools in stand alone applications. use (3) type connection pool in those applications that are deployable in the server like web applications, EJB Components and etc..

* In Drivermanaged, third party s/w managed jdbc Connection pool environment we need to use type1/ type2 / type 3 jdbc drivers.
* In server managed Jdbc connection pool environment we need to use type 3 with type1/ type2/ type4 jdbc drivers.
* Each Jdbc Data source object represents one Jdbc Connection pool to get each Connection object from Connection pool we need to depend upon this data source object.
* Jdbc DataSource object means it is the object of a java class that implements javax.sql.DataSource interface.
* All Jdbc connection objects of Connection pool represents Connectivity with same database software. Jdbc Connection pool for oracle means all jdbc Connection objects in that Connection pool represents Connectivity with oracle database software.
* The advantage of Jdbc Connection pool is by using minimum no. of Jdbc Connection objects we can make more clients talking with DB software.



* The registry s/w can maintain objects / object references having

* The process of getting object / object reference from registry based on its nickname or alias name is called as look-up operation

* jndi api means working with javax.naming and its sub packages.

* jndi registry s/w are

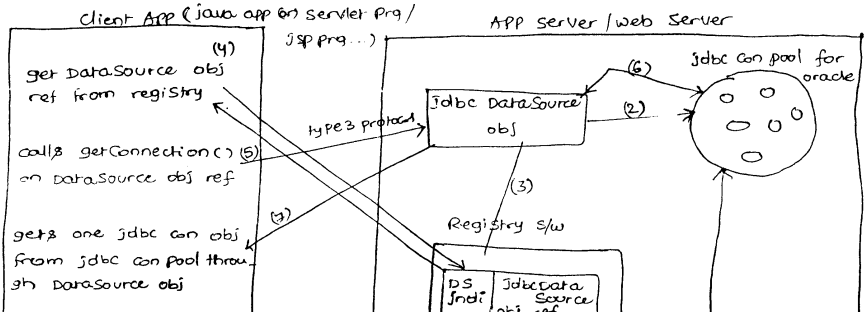
  Rmi registry
  cos registry
  weblogic registry
  Jnp registry and etc...

* Every application server software comes with one built-in registry s/w

  Jboss ——→ Jnp registry
  weblogic ——→ weblogic registry
  websphere ——→ cos registry

* The connection object of jdbc application represents connectivity between java application and database software. Similarly the initial context object of jndi programming represents connectivity between java application and registry software.

Understanding the server managed jdbc connection pool environment



* In server managed Jdbc Connection pool environment type3 with type4 jdbc drivers will be utilized. Here type4 will be utilized as a driver to interact with database software and to create Connection objects in the Connection pool where as type 3 will be used as a protocol by client to get one jdbc Connection object from jdbc Connection pool.

with respect to diagram

(1) T.L or P.L makes application server to interact with DB s/w using type1 or type2 or type4 drivers and creates jdbc Connection pool having jdbc Connection objects.

(2), (3) → T.L (or) P.L creates dataSource object representing the above Jdbc Connection pool and also keeps that dataSource object reference in registry software having nickname for global visibility.

(4) → client application gets DataSource object reference from registry software through look-up operation.

(5), (6), (7) → client application calls getConnection() on dDataSource object reference this call uses type3 protocol to get one jdbc Connection object from Connection pool.

(8) → refer diagram

(9) → refer diagram.

NOTE: The released Connection object in jdbc Connection pool becomes ready to give service to next request or next client.

Procedure to create jdbc Connection pool for mysql Oracle and jdbc DataSource in GlassFish 2.x server

step1): place ojdbc14.jar file in (SJAP-home)\appserver\domains\domain1\lib

Step(2): Start Glassfish server and open its admin console (domain1 server)

Step(3): create jdbc connection pool for mysql.

Admin Console → resources → jdbc → Connection pools → new →

Name : mypool1

Resource type : javax.sql.DataSource

Database vendor : mysql

→ next → initial and minimum pool size : 2 (initial capacity)

max pool size : 20

Pool resize quantity : 2

idle time out : 300

☑ Database name : dbl

☑ Password : root

☑ Port : 3306

☑ Port number : 3306

☑ Servername : localhost

☑ URL : jdbc:mysql://localhost:3306/dbl

☑ url : jdbc:mysql://localhost:3306/dbl

☑ user : root

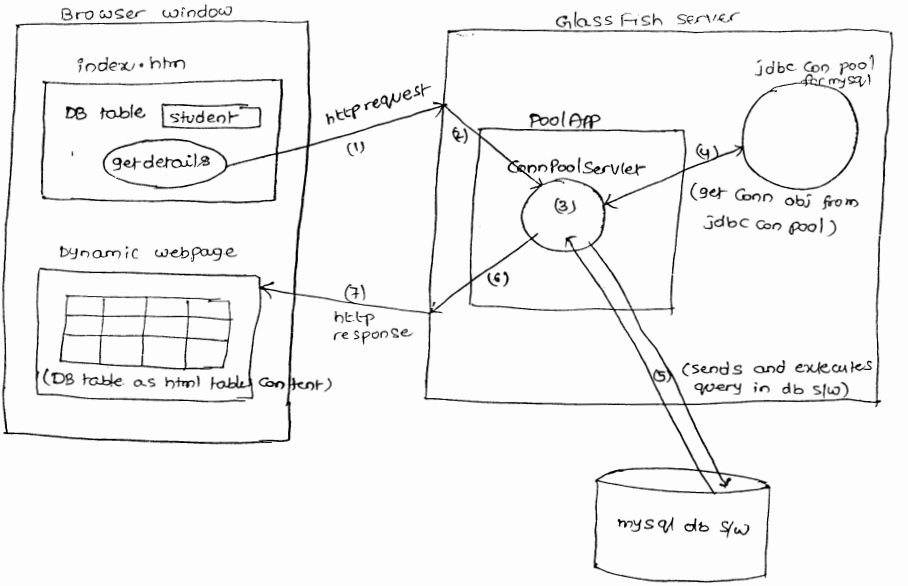
→ Finish → Launch mypool1 (click on mypool1) → Ping

Step(4): create jdbc Datasource representing the above jdbc connection pool

Admin console → resources → jdbc → jdbc resources → new →

NOTE: once ok button is clicked the above created DataSource object will be registered with registry software of GlassFish server automatically with JNDI name "DsJndi"

Ex: Example web application where servlet program uses the Connection object of jdbc Connection pool to interact with DB s/w



E:\APP8

- PoolApp
  - WEB-INF
    - index.htm
    - classes
      - ConnPoolServlet.java
      - ConnpoolServlet.class
    - web.xml

Request URL to test the application

(http://localhost:5151/PoolApp/index.html)

* For above diagram based example application refer application 5 of the page nos 65-67.
* Always develop web applications by keeping non-technical naive end-users in mind for that when exception is raised in web resource programs instead of displaying the exception related technical messages on browser window it is recommanded to display those messages as non-technical guiding messages for end user. For this we need to write some presentation logic in the catch blocks of servlet programs.
* Jndi api is part of java JSE module so we need not to add any jar files to classpath while working with Jndi api.

Procedure to create JDBC Connection pool for oracle Data source in oracle-weblogic 10.3

Step(1): Start Adv.javaBatchDomain Server of weblogic and open its admin console

start → programs → oracle weblogic → user_projects → Adv.javaBatch Domain → start Admin server for weblogic server domain

step(2): open browser window the following URL

http://localhost:7001/console ↵

username: javaboss

password: javaboss1

Step(3): Create JDBC Data source pointing to the JDBC Connection pool for oracle

Admin console → services → JDBC → Data Sources → New →

Name: mydsl (logical name)

JNDI Name: DSJndi (Required for client while performing lookup operation)

port no : 1521

Database username : scott

Database password : tiger

Conform password : tiger

→ Test Configuration → next → select admin server → finish

NOTE: when finish button is clicked the data source object that represents JDBC connection pool for oracle will be registered with registry software with jndi name "DSJndi".

Step(4): specify the JDBC connection pool additional properties.

Admin Console → Services → JDBC → Data sources → mydsl → Connection pool tab

→ Initial Capacity [1]

maximum capacity [30]

capacity increment [2] // specifies the no. of new JDBC connection objects that should be created at a time if there a need of creating new JDBC connection objects in the connection pool

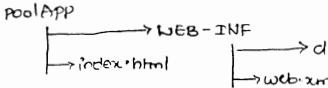
→ save → Advanced → shrink frequency : [1000] seconds → [save]

* For utilizing the above server managed connection pool we can run the application ⑤ of the booklet. For that

Step(i) : make sure that the Adv. javaBatchDomain server is in running mode

Step(ii): make sure that DSJndi is specified as the argument value of ic.lookup(-) method in line no. 612.

Step(iii): Prepare the deployment directory structure or war file representing the web application.



Step(v): Test the application

http://localhost:7001/poolApp/index.html

Jboss Server

Type : Application Server software

version : 5.x (Compatable with jdk 1.6)

vendor : Apache / RedHat

Open Source software

Default port no: 8080

Allows to create domains and also gives 5 built-in domains. they are

(1) default
(2) web
(3) standard
(4) all
(5) minimal

To download software: download s/w as zip file from www.apache.org website.

Installation process

* Extract Jboss-5.1.0.GA-JDK6.zip file to a folder.
* Jar file that represents all JEE APIs : jboss-javaee.jar (<jboss_home>\client)

Procedure to change the port no. of "default" domain server of Jboss 5.x

Go to Jboss_Home\server\default\deploy\jbossweb.jar\server.xml file and modify the post attribute of first <Connector> tag.

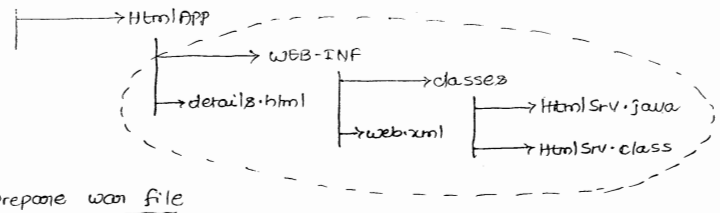
To start jboss server ("default" domain)

use jboss_home\bin\run.batch file.

* In Jboss server there is no console deployment. But hard deployment is available (only war file based hard deployment is supported).

Procedure to deploy Java web application in 'default' domain of Jboss 5.x server

Step(1): create .war file on the deployment directory structure of web application.



to prepare war file

E:\Apps\HtmlApp> jar cf HtmlApp.war .

Step(2): start 'default' domain server of Jboss

Step(3): Deploy the web application in Jboss server

copy the above "HtmlApp.war" file to Jboss-home\server\default\deploy folder.

Step(4): Test the web application

open the browser window and type this url

http://localhost:5151/htmlApp/detail8.html

Common library folder: The common library folder of 'default' domain of Jboss is: Jboss-home\server\default\lib folder

Procedure to Configure Jboss with myEclipse IDE:

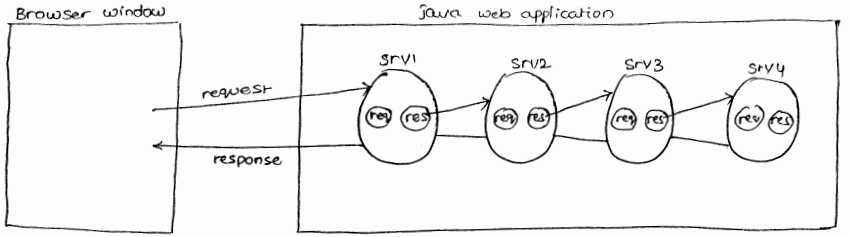
window menu → preferences → myEclipse → servers →

Jboss 5.x → Enable Jboss_home directory: E:\Jboss 5.x soft\Jboss-5.1.0.GA

31/10/11

Servlet chaining

* Taking request from a browser window and processing that request by using multiple servlets as a chain is called as Servlet chaining. In servlet chaining we perform communication between servlet programs to process the request given by a client.

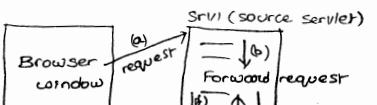


Servlet chaining based webapplication

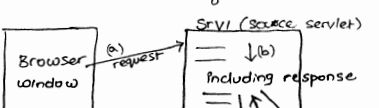
* All servlet programs that participate in a servlet chaining will use same request and response objects because they process the same request that is given by client
* To perform servlet chaining we need RequestDispatcher object. RequestDispatcher object means it is the object of a container supplied java class implementing javax.servlet.RequestDispatcher interface.

Servlet chaining

1. Forwarding Request mode of servlet chaining



2. including Response mode of servlet chaining.



* In any mode of servlet chaining all the servlet programs / web resource programs will use same request and response objects. If Srv1, Srv2, Srv3, Srv4 servlet programs are there in forwarding request mode of servlet chaining then the html o/p of Srv1, Srv2, Srv3 programs will be discarded and only the o/p of srv4 servlet program goes to browser window.

* If Srv1, Srv2, Srv3, Srv4 servlet programs are there in including response mode of servlet chaining then the html o/p of all servlet programs together goes to browser window as response.

* The source servlet program uses RequestDispatcher object to perform servlet chaining with destination web resource program (like servlet program, JSP program html program and etc...)

There are 3 approaches to create RequestDispatcher object in source servlet program pointing to destination webresource program.

Approach(1) (by using req obj)

Ex: In Srv1 source code

```
RequestDispatcher rd = req.getRequestDispatcher("/s2Url");
                                                  ↑ optional
rd.forward(req, res);
```

↳ URL pattern of destination servlet program (Srv2)

(or)

```
rd.include(req, res);
```

Ex(2): In Source Srv1 Program

```
RequestDispatcher rd = req.getRequestDispatcher("/abc.html");
```

(or)

```
RequestDispatcher rd = req.getRequestDispatcher("/abc.jsp");
rd.forward(req, res);
```

(or)

```
rd.include(req, res);
```

```
rd.include(req,res);
```

Ex(2): In source srv1 program

```
ServletContext sc = getServletContext();
RequestDispatcher rd = sc.getRequestDispatcher("/abc.html");   → mandatory
                    (or)
RequestDispatcher rd = sc.getRequestDispatcher("/abc.jsp");
rd.forward(req,res);
      (or)
rd.include(req,res);
```

Approach (3) (by using ServletContext obj)

Ex(1): In src srv1 program

```
ServletContext sc = getServletContext();
RequestDispatcher rd = sc.getNamedDispatcher("s2");
```
↳ logical name of destination servlet program (like srv2) given in web.xml file

```
rd.forward(req,res);
    (or)
rd.include(req,res);
```

Ex(2): In src srv1 program

```
RequestDispatcher rd = sc.getNamedDispatcher("j1");
```
↳ logical name of destination JSP Program like abc.jsp

```
rd.forward(req,res);
    (or)
rd.include(req,res);
```

NOTE (1): If source servlet program calls rd.forward(req,res) method then it performs forwarding request mode of servlet chaining with destination web resource program.

NOTE (2): In source servlet program calls rd.include(req,res) method then it performs including response mode of servlet chaining with destination

Program in web.xml file.

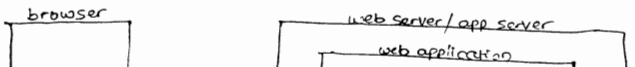
What is the difference between getRequestDispatcher( ) and getNamedDispatcher(-) methods ?

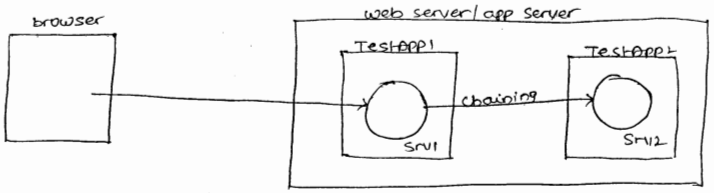
getRequestDispatcher( )	getNamedDispatcher( )
(1) Invokable on both request, servletContext objects.	(1) Invokable only on ServletContext object.
(2) Expects URL pattern of destination Servlet program or file names of destination JSP or html programs as argument value	(2) Expects logical name of the destination servlet/JSP program as argument value.
(3) This method generated RequestDispatcher object can point only the destination servlet, JSP program and html program.	(3) This method generated RequestDispatcher object can point only the destination servlet, JSP programs.

What is the difference between the RequestDispatcher object that is created based on RequestObject and ServletContext object ?

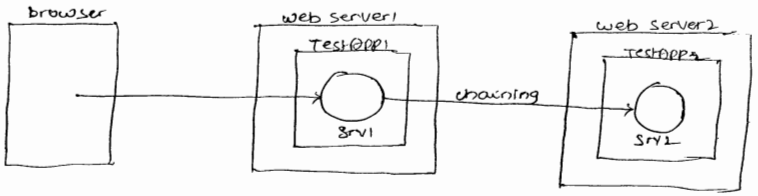
(A) The Request object based RequestDispatcher object expects that source servlet program and destination web resource program in a same web application.

* The ServletContext object based RequestDispatcher object allows to keep the source servlet program and destination web resource program either in the same web application or in two different web applications of same server but they can not be there in two different web applications of two different servers.





Here Srv1 should use ServletContext obj based RequestDispatcher obj



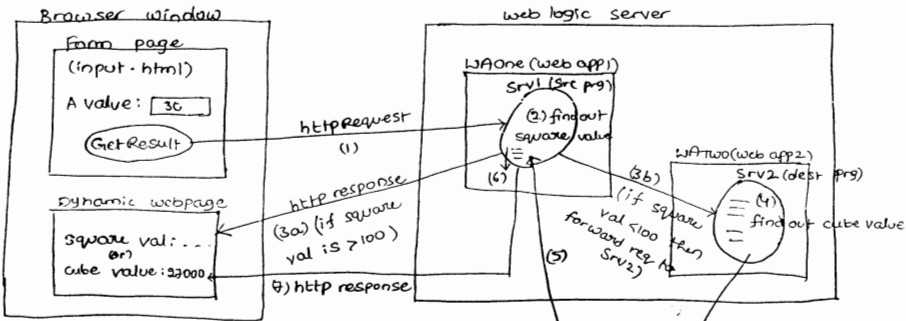
This kind of servlet chaining is not possible with RequestDispatcher obj

use send redirection Concept

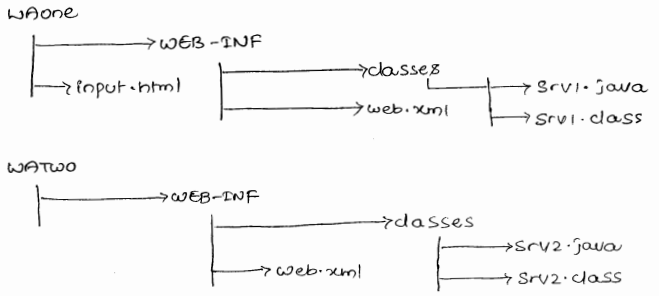
3/11/11:

* Servlet chaining is all about performing servlet-servlet Communication.

performing servlet chaining between two servlet programs of two different web applications which reside in the same server



deployment directory structure



Deploy both these webapplications in web logic server (Adv. javaBatchDomain).

Copy WAOne, WATWO web applications to <oracle weblogic_home>\user_projects\domains\Adv. javaBatchDomain\autodeploy folder.

* In Srv1 servlet program of the above WAOne webapplication we must create RequestDispatcher object based on ServletContext object.

Source Code (WAOne)

input.html

```
<form action="s1url" method="get">
                  └→ url pattern of Srv1 servlet program
      A value: <input type="text" name="t1"><br>
      <input type="submit" value="getResult">
</form>
```

Srv1.java

```
/*Srv1.java
import javax.servlet.*;
import javax.servlet.http.*;
import java.io.*;
public class Srv1 extends HttpServlet
```

```
            //read form data
            int no = Integer.parseInt (req.getParameter("ti"));
            //find out square value
            int resl= no * no;
            if (resl>=100)    //display square value on browser window
             {
               pw.println("srv1: square val is:"+resl);
             }
            else
             {
                //forward the request to srv2 program of wATwo web application
                //get Access to servlet Context obj of wAone web application
                 ServletContext  sc1 = getServletContext();
                //get Access to servlet Context obj of wATwo webapplication
                 ServletContext  sc2 = sc1.getContext("wATwo");
                //Create RequestDispatcher obj pointing to srv2 program of
                                                    wATwo web application
                 RequestDispatcher  rd= sc2.getRequestDispatcher("/s2url");
                //forward the req to srv2 program from srv1 program
                 rd.forward (req, res);
             }//else
        }// service(--)
    }//class
```

web.xml

Configure srv1 program with /s1url as URL pattern.

Source code (wATwo)

srv2.java

```
import  javax.servlet.*;
import  javax.servlet.http.*;
import  java.io.*;
```

```
        res.setContentType("text/html");
        //read form data
        int no = Integer.parseInt(req.getParameter("t1"));
        //find out cube value
        int res2 = no * no * no;
        //display cube value
        pw.println("srv2: cube value is:"+res2);
    }//service(--,--)
}//class
```

web.xml

Configure srv2 program with the URL pattern /s2url

URL to test the application

http://localhost:7070/wfone/input.html

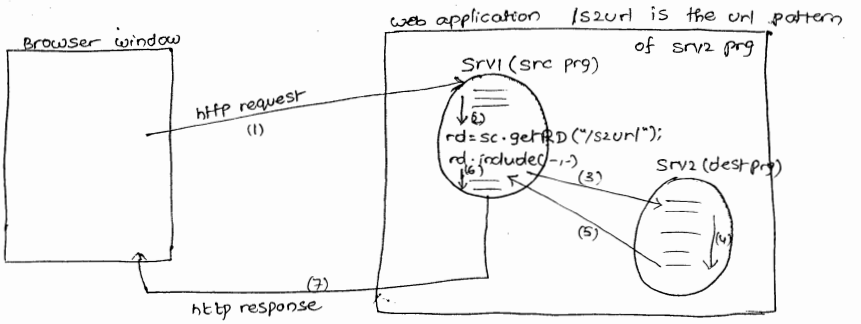
* In most of the servers the getContext() method of javax.servlet.ServletContext interface is not implemented so when that method is called in those servers we will get java.lang.NullPointerException. Due to this servlet chaining between two different servlet programs of two different web applications is not possible in most of the servers. (like weblogic 10.3, Tomcat all versions, JBoss versions, Glassfish all version) but the above said chaining can be achieved in weblogic 8.x and 9.x servers.

* Since getContext() method of servlet Context interface is not implemented properly in all servers so we can say the RequestDispatcher object based servlet chaining is good only when both source servlet program and destination web resource program resides in same web application. In remaining situations it is recommanded to use send redirection concept.

What is the difference between rd.include(), rd.forward() methods?

2/11/11

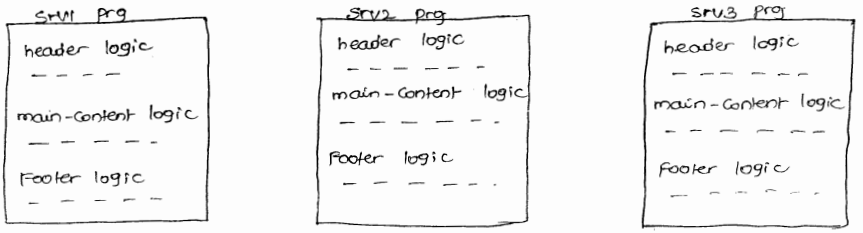
understanding rd.include(-,-)



Here Srv1 program (src prg), html o/p will not be discarded. moreover Srv1, Srv2 servlet programs html outputs together goes to browser window as response.

* rd.include(-,-) method performs including response mode of servlet chaining.
* Both Srv1 and Srv2 programs will use same request and response object so the request data coming to Srv1 is visible and accessable in Srv2. To pass additional data between Srv1 and Srv2 use request attributes.
* Browser window gets response from Srv1 program by having the html o/p of both Srv1 and Srv2 programs
* Srv2 html o/p can be included any where in the html o/p of Srv1 by calling rd.include(-,-) method in the required place.
* Srv1 and Srv2 can be there in the same web application (or) can be there in two different web applications of same server.

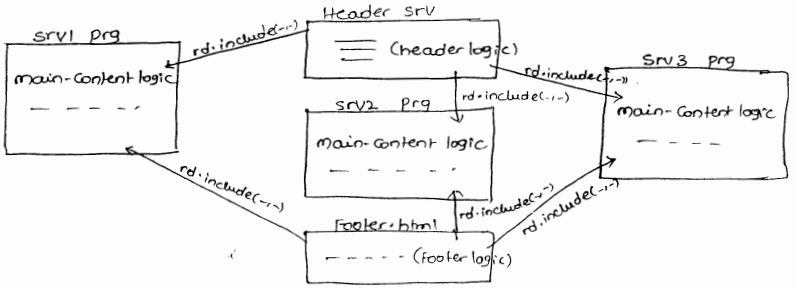
Problem :



(Generates web page1) (Generates web page2) (Generates web page 3)

* All web pages of web site generally contains same header and footer contents but the main content will be changed in every web page.
* In the above diagram header and footer logics are not reusable because they are placed in all the three servlet programs eventhough they are same for all the three servlet programs.

Solution :



+ In solution diagram header and footer logics are seperated from main servlet programs of web application and they are placed in two seperate web resource programs but their total all

Sample code based on solution diagram

HeaderSrv.java (having header logic)

```
public class HeaderSrv extends HS
 {
    public void service(-,-) throws ServletException, IOException
     {
        ------
        ------      PrintWriter pw = res.getWriter();
        ------      res.SetContentType("text/html");
                    pw.println("<font color=red size=6> S A T H Y A </font>");
                    pw.println("<br><br><br><hr>"); //Don't place pw.close() in
     }                                                HeaderSrv.
 } //headurl is the HeaderSrv servlet program
```

Footer.html (having footer logic)

```
<hr>
<br><br><br>
<b><i> &copy; All rights reserved 2101-11 </b></i>
```

MainServlet prgs

```
Public class TestSrv 1/2/3... In extends HS
 {
    public void service(-,-) throws SE, IOE
     {
       RequestDispatcher rd1=null, rd2=null;
       try
        {
          //include header content from HeaderSrv
          rd1 = req.getRequestDispatcher("/headerurl");
          rd1.include(req,res);
          ------
          ------      //logic to generate main content of web page
          //include footer content from Footer.html
          rd2 = req.getRequestDispatcher("/footerurl");
```

* once the rd.forward(-,-) method executed in source servlet program then the effect of rd.include(-,-) method call will not be there in that servlet program that means rd.forward(-,-) method call discards both directed and included html outputs of source servlet program.

* For example application on both rd.forward(-,-), rd.include(-,-) method calls refer app (6) of the page no. 67-70.

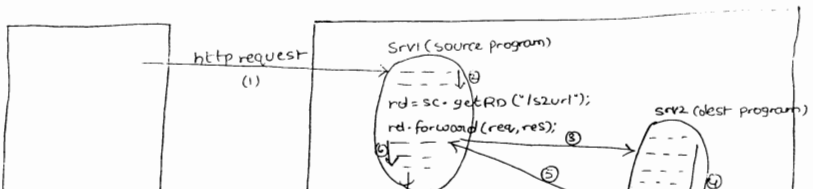
* Note: For example application on rd.forward() and rd.include() also refer app (8) of material.

* while working with rd.include(-,-) method don't commit the response in destination web source program by calling pw.close() method because it won't allow us to add further output generated by source servlet program and other destination programs. But we can do this work while working with rd.forward(-,-) method.

* Don't commit the response in source servlet program by calling pw.close() method before rd.forward(-,-) method call because this process throws java.lang.IllegalStateException (Can't forward after response has been committed)

NOTE: pw.close() commit the response of web resource program that means it does not allow to add further content to response.

01/11/11 Understanding rd.forward(-,-) method



Key points :

* rd.forward(-,-) method is there to perform forwarding request mode of servlet chaining.
* Both SrV1 and SrV2 servlet programs will use same request and response objects so the request data coming to SrV1 (like request parameters, headers are visible and accessable in SrV2 program.
* To pass additional data between SrV1 and SrV2 programs use "request" attributes.
* All the statements placed in SrV1 program before and after rd.forward method will be executed but the entire html output of SrV1 program will be discarded.
* Both SrV1 and SrV2 can be there either in the same webapplication (or) two different webapplications of same server.
* SrV2 can be a servlet program (or) JSP program (or) html program.
* rd.forward(-,-) is very useful to configure Error Servlet for other main servlet programs of the web application.

What is Error servlet?

(A) The servlet program that executes only when exceptions are raised in other servlet program is called as Error servlet. This servlet is useful to display exception related messages as non-technical guiding messages on browser window when exceptions are raised in other servlet programs of web application.

Sample code to Configure Error Servlet

ErrSrV.java

```
public class ErrSrV extends HS/GS
 {
```

```
        pw.println("<br> Go to <a href='input.html'> Home </a>");
    } // service(-,-)
} // class
```

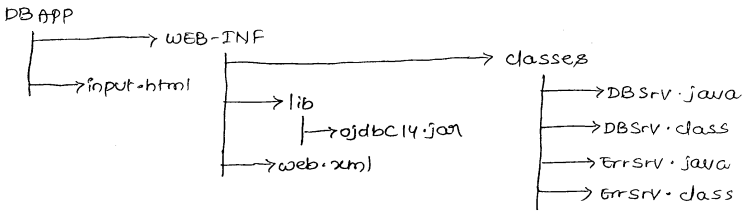
// "/eurl" is the url pattern of ErrSrv program (in web.xml).

DBSrv.java (main servlet program of web application)

```
public class DBSrv extends HS
{
    public void init()
    {
        — — —
        — — —
        — — — —   Same as previous application
        — — — —   (JDBC code)
        — — — —
        — — — —
    }
    public void doGet(-,-) throws SE, IOE
    {
        try
        {
            — — —
            — — — —   Same as previous application
            — — —     (JDBC code)
            — — — —
        }
        catch(Exception e)
        {
            try
            {
                RequestDispatcher rd = req.getRequestDispatcher("/eurl");
```

```
    public void doPost(-,-) throws SE, IOE
      {
        doGet(req,res);
      }
    public void destroy()
      {
        - - -
        - - -
      }
}
```

* In the above sample code when exception is raised in the doGet(-,-) method of DBSrv servlet program the Error servlet (ErSrv) program will be executed automatically because of the rd.forward(-,-) method call.
* If servlet program contains rd.forward(-,-) method call then that servlet program html output will be discarded but their s.op("-") statements output will not be discarded.
* Always keep rd.forward(-,-) method call in source servlet program with condition statement show that the html output of that source servlet program will be discarded only when that condition is satisfied otherwise the html output will not be discarded.
* In real time projects rd.forward(-,-) useful to we configured Error servlet and to make web applications as more end user friendly web applications.

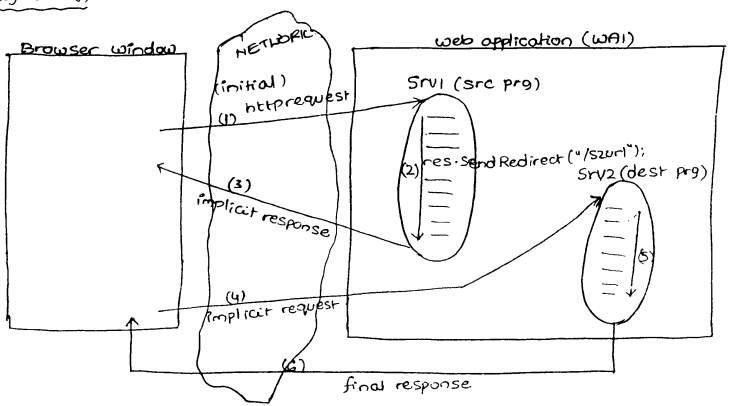


* Develop the above web application resources based on above sample code and application (4) of the booklet.

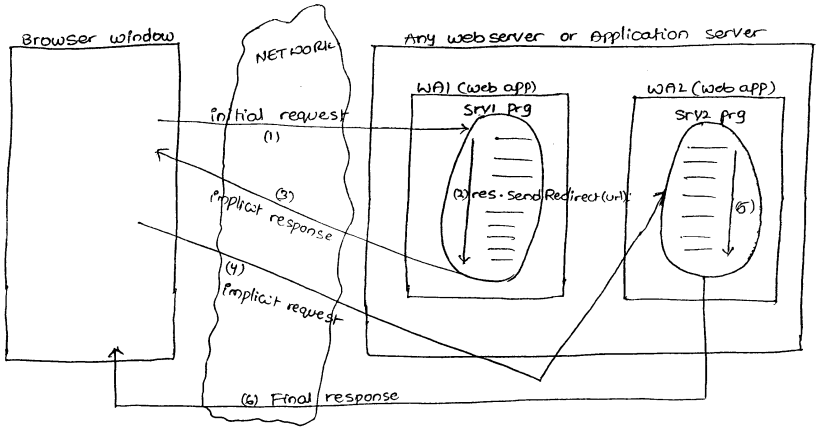
* The limitation with RequestDispatcher object based servlet chaining is it can not be used when source servlet program and destination web resource program are placed in two different web applications of same server (very few servers are supporting this)(or) in two different web applications of two different servers. To overcome this problem use send redirection concept of response.sendRedirect(-) method.

Understanding sendRedirection

Diagram (1)

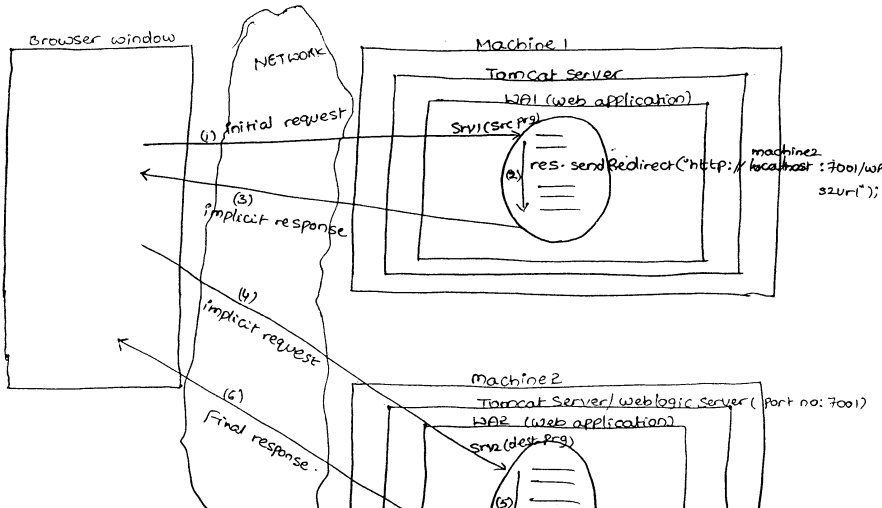


Diagram(2)



url : http://localhost:2020/WA2/s2url (Request url of Srv2 program)

Diagram(3)



* Using send redirection concept we can not perform response inclusion but we can forward request from one servlet program to destination web resource program.

* With respect to the diagrams

(1) Browser window gives initial request to srv1 servlet program.

(2) All the statements of srv1 servlet program executes including res.sendRedirect(-) method.

(3) Srv1 program generates implicit response to browser window having the URL placed in sendRedirect(-) method as argument value. The response status code of this implicit response is 300-399 (indicates redirection).

(4) Browser window uses the URL coming from implicit response (because of 300-399 status code) and generates implicit request to srv2 program.

(5) All the statements of srv2 program executes.

(6) The output of srv1 program will be discarded and only the html output of srv2 program goes to browser window as final response.

Key points

* srv1 and srv2 will not use same request and response objects. they use different sets of req, res objects. so the request data coming to srv1 program is not visible and accessible in srv2 program.

* To send additional data from srv1 program srv2 program append query string to the URL of res.sendRedirect(-) method in srv1 program and read those values in srv2 program as request parameter values.

In srv1 prg

```
res.sendRedirect("/s2url?p1=val1&p2=val2");
```

* Srv1 and Srv2 can be there in the same web application or can be there in two different web applications of same server or two different servers (these two servers can be there in the same machine or in two different machines).

* If Srv1 and Srv2 resides in the same web application we can pass relative path in sendRedirect(-) method otherwise we must pass absolute URL.

* Srv2 can be a servlet program or JSP program or html program or ASP program or ASP.net program or php program etc...

* The movement res.sendRedirect(-) method executes in srv1 program the entire html output of Srv1 program will be discarded.

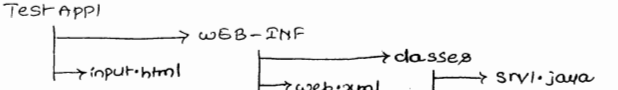
* In real time to pass the request of one website to another website without worrying about their technology environment we can use send Redirection.

Ex: IBM has acquired rational.com so the request given to rational.com will be redirected to certain web resource program of ibm.com.
Oracle Corporation has acquired Sun microsystems so the request given to sun.com will be redirected to a webresource program of oracle.com.

Example application on send Redirection

NOTE: In the below application Srv1 program is sending three values to Srv2 program by appending query string to the url of response.send Redirection() method. Those values are form data, sum result.

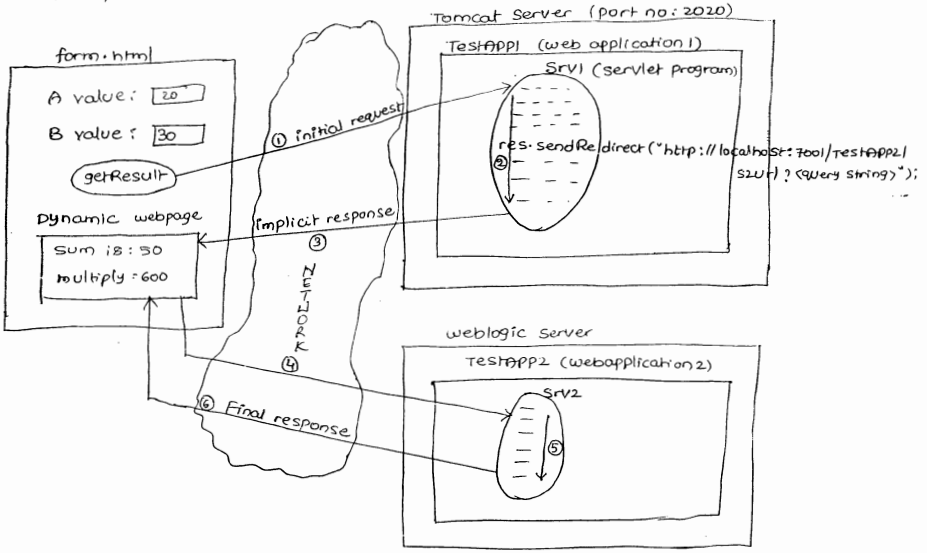
Directory structure



TestApp1 (web application)

input.html

```
<form action = "s1url">
    A value : <input type = "text" name = "t1"> <br>
    B value : <input type = "text" name = "t2"> <br>
              <input type = "submit" value = "getResult">
</form>
```



Srv1.java

```
import javax.servlet.*;
import javax.servlet.http.*;
import java.io.*;
public class Srv1 extends HttpServlet
{
   Public void service (-,-) throws SE, IOE
    {
```

```
            int val2 = Integer.parseInt(req.getParameter("t2"));
            //find sum value
                int sum = val1+val2;
            pw.println("<b> srv1 : sum is </b>"+sum);
          //redirect the request to srv2 program of testapp2
            s.o.p("srv1 : before res.sendRedirect(-)");
            res.sendRedirect("http://localhost:7001/testapp2/s2url?p1="+val1+"&p2="
                +val2+"&p3="+sum);
            s.o.p("srv2 : after res.sendRedirect(-)");
          //close stream obj
            pw.close();
        }//service(-,-)
    }//class
```

query string having data to send data to srv2 program.

web.xml

Configure Srv1 servlet program with "/s1url" url-pattern.

TestApp2 source code (web application2 of different server)

Srv2.java

```
import javax.servlet.*;
import javax.servlet.http.*;
import java.io.*;
public class srv2 extends HttpServlet
 {
    public void service(-,-) throws SE, IOE
      {
        //general services
         PrintWriter pw = res.getWriter();
         res.setContentType("text/html");
        //read request param values send srv1 program
          int val1 = Integer.parseInt(req.getParameter("p1"));
          int val2 = Integer.parseInt(req.getParameter("p2"));
          int sum = Integer.parseInt(req.getParameter("p3"));
        //find out multiply value
          int mul = val1*val2;
```

web.xml

Configure Srv2 program with "/s2url" url-pattern.

Request URL to test the application

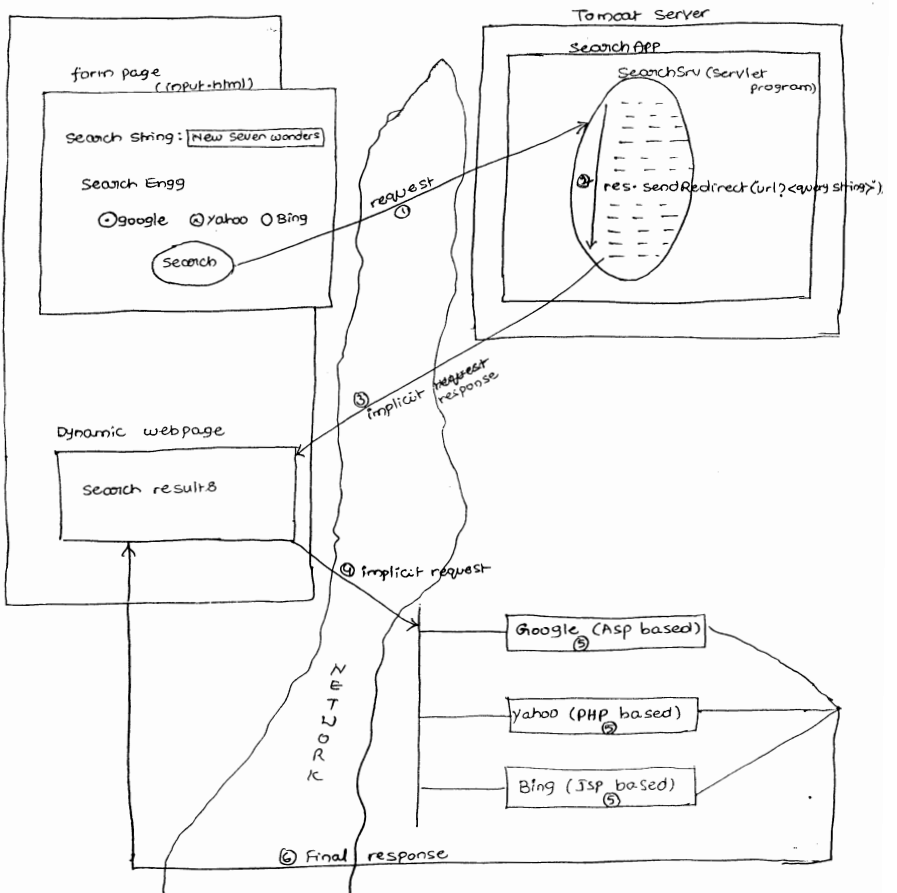
http://localhost:2020/TESTAPP1/form.html

what is the difference between rd.forward() and res.sendRedirect() ?

rd.forward(-,-)	res.sendRedirect(-,-)
* perform forward mode of servlet chaining.	* performs sendRedirection mode of communication.
* The source servlet program communicates with destination webresource program directly.	* The source servlet program communicates with destination servlet program by having network round trip with browser window.
* The source servlet program and destination web resource program uses same request and response objects so request data coming to source servlet program is visible and accessable in destination webresource program.	* The source servlet program and destination web resource program will not use same request and response object so the request data coming to source servlet program is not visible and accessable in destination program.
* Source servlet program can use request attributes to send additional data to destination program.	* Append query string to the url of response.sendRedirect() method to send additional data from source servlet program to destination program.
* Source servlet and destination programs can be there in same web application (any server) (or) can be there in two different web applications of same server (only in few servers).	* The source servlet program and destination program can be there in same web application (or) in two different web applications of same server (or) different servers.
* Destination program can be a servlet (or) JSP (or) html program.	* Destination program can be a servlet (or) JSP (or) html (or) ASP (or) ASP.net (or) PHP programs etc...

Example on sendRedirection :

servlet program redirects the request to non java web resource programs of internet websites.



* To work with above application gather the web resource program names and request parameter names of different search engines as shown below.

For google

http://www.google.co.in/search?q=new+seven+wonders

request parameter value

For yahoo

http://in.search.yahoo.com/search?p=new+seven+wonders

request parameter name

For bing

http://www.bing.com/search?q=new+seven+wonders

web resource program name

* For exam source code of above diagram refer application (9) of the page numbers 73-75.

How many ways are there to pass data between the source servlet program and destination web resource program?

(A) If source servlet program and destination web resource program resides in same web application then use

(1) request attributes

(2) session attributes

(3) servletContext attributes

If source servlet program and destination web resource program resides in two different web applications of same/different server(s).

(1) append query string to URL of res.sendRedirect(-) method

```
res.sendRedirect("url?<query string>");
```

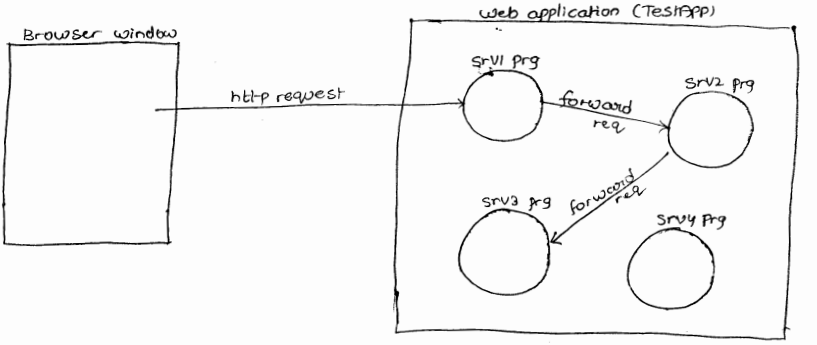
Ex.

```
res.sendRedirect("http://localhost:7001/TestApp2/S2Url?p1=10&p2=20");
```

* Attribute is a special logical name that can hold java object as an value.

Request attributes

* These attributes allocates memory in request object and they are visible through out request cycle.



* Request attributes that are created in one servlet program of servlet chaining are visible in other servlet programs of same servlet chaining because all the servlet programs of a servlet chaining will use same request and response objects.
* In the above diagram the request attribute created in Srv1 program is visible and accessable in srv2, srv3 program but not visible in srv4 program. because Srv1, srv2, Srv3 programs are using same request and response objects by participating in servlet chaining and srv4 program is not participating in that servlet chaining.

To create request attribute

```
req.setAttribute("name", "raja");
                  attribute name  └─ attribute value
req.setAttribute("age", new Integer(50));
req.setAttribute("total", 600);
                  attribute value will be converted into wrapper class object Integer
                  through autoboxing.
```

NOTE: The method setAttribute(-,-) can create new request attribute or can modify existing request attribute value.

To read values from request attributes

```
String S1= (String)req.getAttribute("name");
Integer S2 = (Integer)req.getAttribute("age");
int S3 = req.getAttribute("total");
```

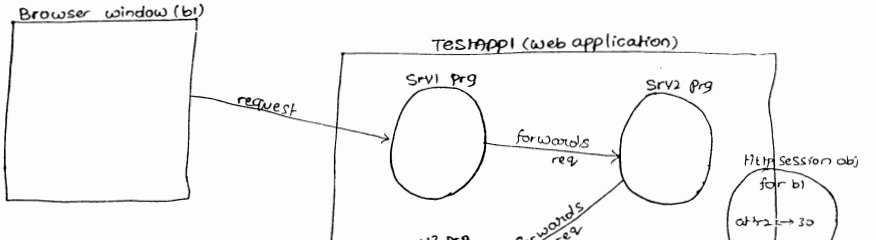
↓ Converts wrapper class object Integer to simple int through auto unboxing concept.

To delete/remove request attribute

```
req.removeAttribute("name");
req.removeAttribute("age");
req.removeAttribute("total");
```

Session Attribute

* Session attributes allocates memory in http session object. So The http session object allocates memory on the server and it is one per browser window so the session attributes of http session object are visible and accessable in all web resource programs of web application irrespective of their request and response objects but they must get request from that browser window for which http session object and its attributes are created.



* The session attribute created in srv1 servlet program by getting request from browser window b1 is visible and accessable in all other servlet programs of web application but they must get request from same browser window b1.

* session attributes are global attributes in the web application but they are specific to a browser window (client).

To create/access HttpSession object for browser window on servlet

```
HttpSession ses = req.getSession();
```

↓ creates or locates HttpSession object

NOTE: This req.getSession() method checks the availability of session object on server for browser window, if available it provides access to that session object otherwise (if not available) it creates new session object (HttpSession object) for browser window on the servlet.

Session attributes

To create ses attribute or to modify ses attribute value

```
ses.setAttribute("attr2", new Integer(30));
```

To read ses attribute value

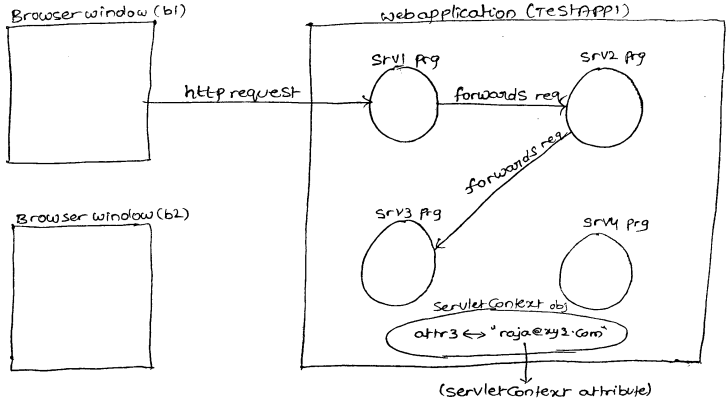
```
String/Integer s1 = (String/Integer) ses.getAttribute("attr2");
```

To remove ses attribute

```
ses.removeAttribute("attr2");
```

ServletContext attributes

* ServletContext attributes allocate memory in servletContext object. Since servlet context object is one per web application and global memory of web application so the servletContext attributes are visible and accessable in all web-resource programs of web application irrespective of request and response objects they are using and irrespective of the browser window from which



To create or modify servletContext attribute

```
ServletContext sc = getServletContext(); // gives access to servletContext object
sc.setAttribute("attr3", "raja@xyz.com");
```

To read servletContext attribute value

```
String s1 = (String) sc.getAttribute("attr3");
```

To remove servletContext attribute

```
sc.removeAttribute("attr3");
```

What is the difference between request parameters and request attributes?

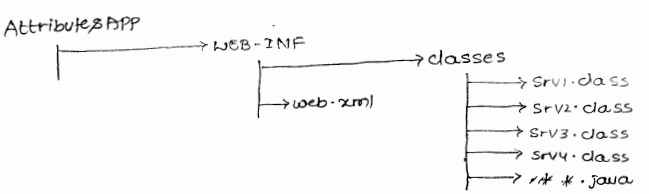
(A) Request parameters are client supplied input values to web resource program (form data). Request attributes are programmer created additional data to pass from one web resource program to another web resource program when they are participating in chaining (like servlet chaining).

Conclusion

* If source servlet program and destination program resides in the use

* If source servlet program and destination webresource program can not satisfy above two Conditions then use ServletContext attributes for sending data.

Example application on to understand the scope of various attributes



Srv1.java

```
Public class Srv1 extends HttpServlet
{
   public void service (HttpServletRequest req, HttpServletResponse res) throws SE, IOE
    {
      //general settings
       res.SetContentType("text/html");
       PrintWriter pw = res.getWriter();
       //creating request attribute
        req.setAttribute("attr1","raja");
       //creating session attribute
        HttpSession ses = req.getSession(); // creates session obj
        ses.setAttribute("attr2", new Integer(30)); // creates session attribute
       //creating servletContext attribute
        ServletContext sc = getServletContext(); //creates session obj
        sc.setAttribute("attr3", "raja@xyz.com"); // creates servletContext attribute
       // forward req to Srv2 prg
        RequestDispatcher rd = req.getRequestDispatcher("/Srv2");
        rd.forward(req,res);
```

Srv2.java

```
public class srv2 extends HttpServlet
{
    public void service(-,-) throws SE,IOE
    {
        //general settings
         res.setContentType("text/html");
         PrintWriter pw = res.getWriter();
        //reading req attribute value
         pw.println("srv2: attr1(request) attribute value:" + req.getAttribute("attr1"));
        //reading session attribute value
         HttpSession ses=req.getSession(); // gives access to session obj
         pw.println("srv2: attr2(session) attribute value:"+ ses.getAttribute("attr2"));
        //reading servletContext attribute value
         ServletContext sc = getServletContext();
         pw.println("srv2: attr3 (servletContext) attribute value:"+ sc.getAttribute("attr3"));
        // forward req to srv3 prg
         RequestDispatcher rd = req.getRequestDispatcher("/srv3");
         rd.forward(req, res);
    } // service(-,-)
} // class
```

Srv3.java

same as srv2.java and don't forward request to any other servlet.

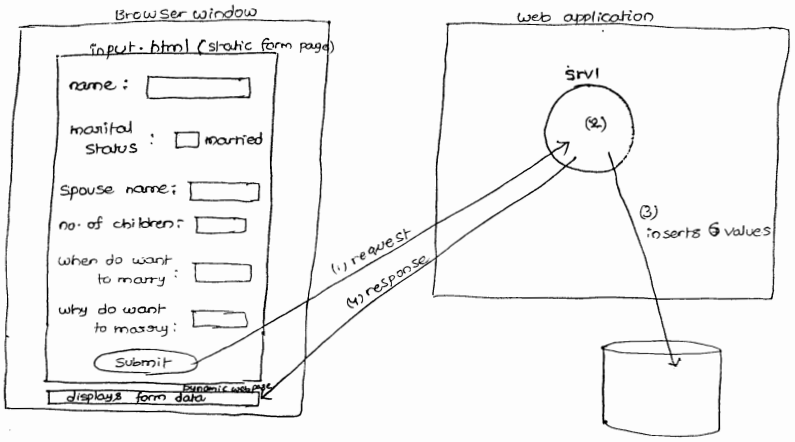
Srv4.java

same as srv3.java

To test the above application give first request to srv1 program and give other than first request from to other than srv1 program from same or different browser windows and check the visibility of attributes.

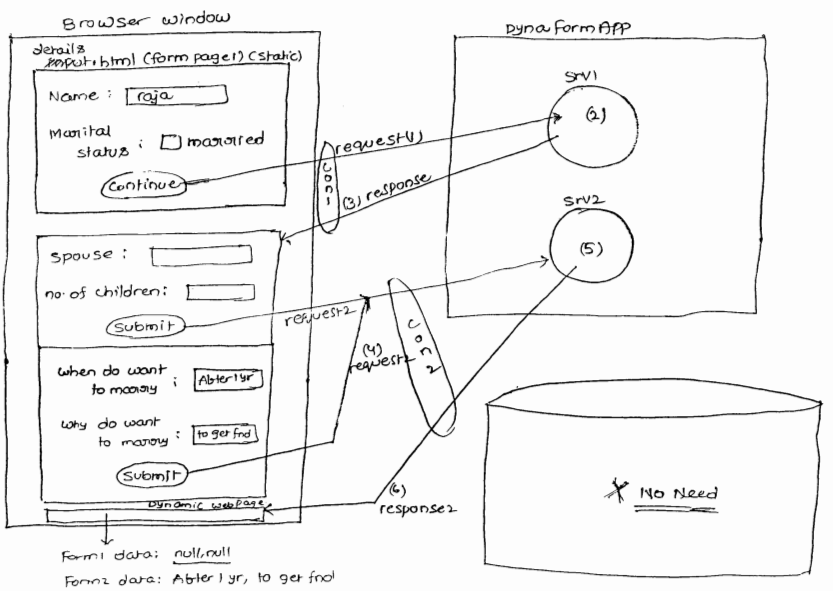
http://localhost:2020/Attributes3App/srv1

* The form page that is prepared through .html file is called as static form page (fixed content).
* The form page that comes as response generated by servlet or JSP program is called as dynamic form page (dynamic content).
* Instead of asking all the details of end user in a single form page it is recommanded to ask those details in multiple form pages having the support of dynamic form pages.



Bad designing of form page

* In the above static form page the end user needs to read and answer some unnecessary questions when he selects or deselects the marital status check box. To overcome that problem work with dynamic form page as shown below.
* In the below diagram the content of form page 2 is dynamic and is dec. generated by Srv1 program based on the marital status value of form1 or request data.



Good form Designing but web application is stateless here that means while processing request2 in srv2 program we can't use request1 data (form1 data).

* The stateless behaviour is of web application is nothing but while processing current request in any web resource program we can't use previous request data that means while processing request2 we can't use request1 data similarly while processing request3 we can't use request1 and request2 data as shown in the above diagram.

* web applications are stateless because the protocol http is given as stateless protocol. According to this one new connection will be created between browser window and web server for every request and this connection will be closed automatically once request related response goes to browser

* For the above diagram based application refer application(10) of page no:s 74 - 76

* By placing <form> tag, <input> tag in pw.println( ) statements of servlet program we can generate dynamic form page from that servlet program. (refer Srv1.java of page no. 75).

* In Naukari.com registration process multiple forms will be there. In that first form page is static form page and other form pages are dynamic form pages. In that based on the data given in form page1 the questions in form page2 will be rendered. Similarly base on data in form page2 the question the questions in form page 3 will be rendered.

* web applications are stateless because they are using a stateless protocol called Http.

Why HTTP is designed as stateless protocol. what is the problem if http comes as statefull protocol ?

(A) If HTTP is statefull protocol for multiple requests given by client to web application single connection will be used between browser window and web server across the multiple requests. This may make clients to engage connections with web server for long time even though the connections are idle. Due to this the web server may reach to maximum connections even though most of its connections are idle.

To overcome that problem HTTP is given as stateless so no client can engage connection with webserver for long time. more ever the connection will be closed automatically at the end of each request related response generation. In internet environment since there is a chance of having huge amount of clients for each web site it is recommanded to have stateless behaviour for http.

request2 it can use request1 data and etc...

* Even though http is stateless protocol we need to make our web applications as stateful web applications. For this we need to work with the following session tracking or session management techniques.

(1) Hidden Form Fields

(2) Http Cookies

(3) Http Session with Cookies

(4) Http session with URL rewriting (recommanded)

* Session tracking / session management is all about making web application as stateful web application by remembering client data across the multiple requests during a session.

Real Time implementations of this session tracking / session management

(1) Remembering email id and password during gmail.com email operations

(2) Remembering username and password during online shopping operations in websites.

(3) Remembering previous forms data until last form data arrives in online applications / registrations

(4) while customizing webpage look in website as required for enduser.

(5) while rendering direct advertisements in websites.

and etc...

* If advertisements are rendered based on the kind of content surfing / browsing done by end user then that advertisement is called as direct advertisement.

Ex: In google.com when you search for the results of seven wonders we will get advertisement related to tours and travels.

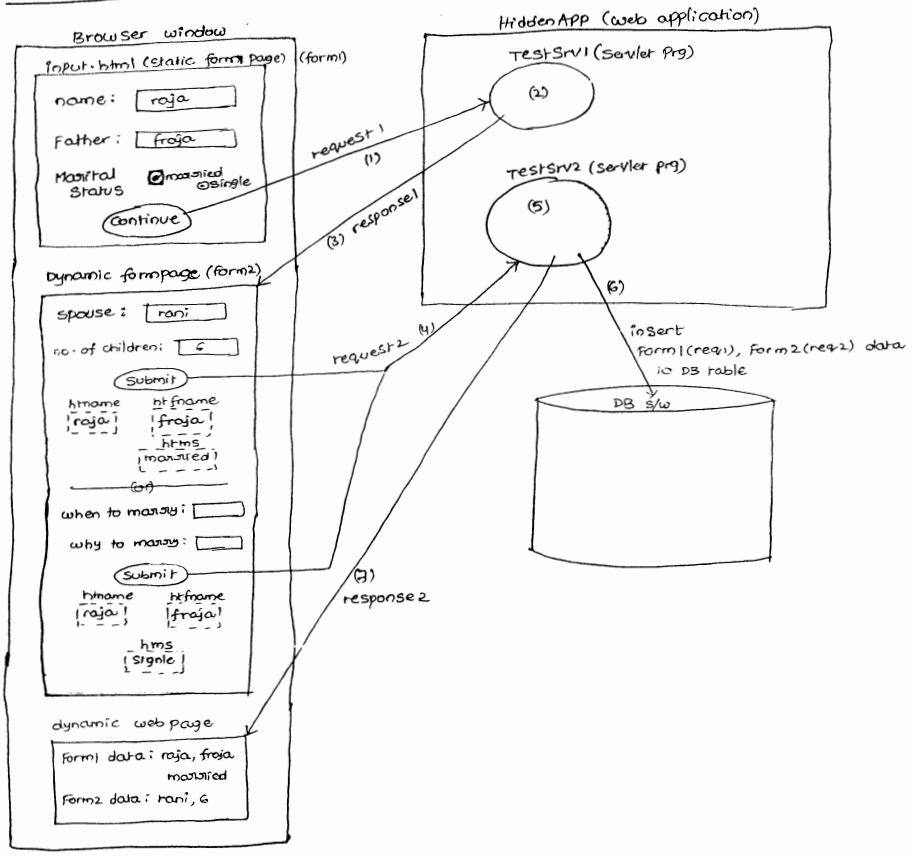
Working with Hidden Form fields based session tracking technique

In servlet program

String s1 = request.getParameter("ti");

gives "hello" to s1 variable

Making web application as stateful with the support of hidden boxes (hidden form fields)



* The above diagram based web application is stateful because TestSrv2 is able to use request1 data while processing request2.

* For above diagram based application refer application(11) of the page nos 76-78

Advantages of Hidden form fields based session tracking technique

* Basic knowledge of HTML is enough to work with this technique.
* Hidden boxes resides in web pages of browser window so they do not provide burden to the server.
* This technique can be used along with all kinds of server side technologies and all kinds of web servers and application servers

Disadvantages

* Hiddden form fields can not store java objects as values. They can just store text values.
* Hidden boxes doesn't provide data secracy because their data can be viewed through view source option
* Hidden boxes data travels over the network along with request and response. so we can say network trabbic will be increased.
* while creating each dynamic form page we need to add the previous form pages data as hidden box values. This increases burden on the programmer.

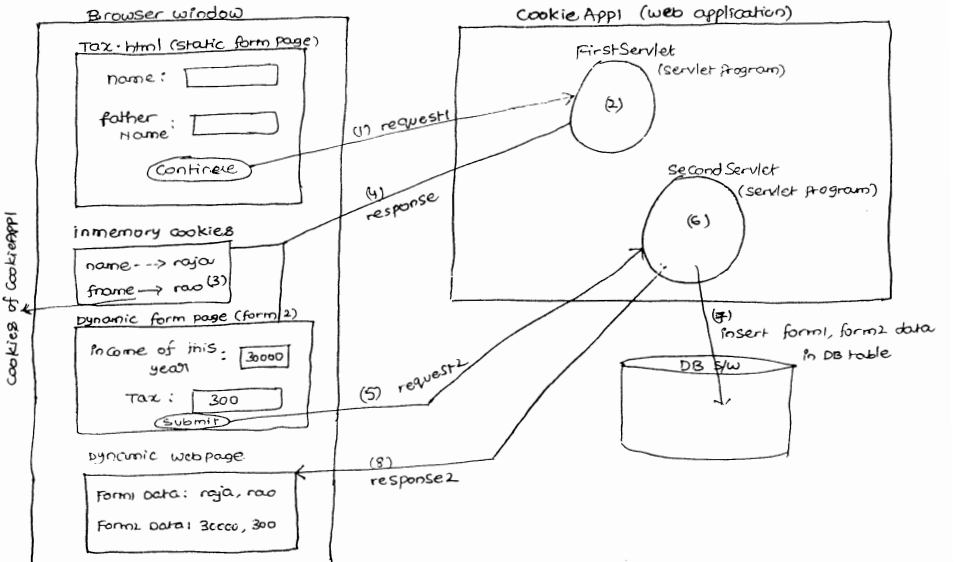
Http Cookies

* Cookies are the small textual informations which allocate memory at client side by remembering client data across the multiple request during a session.
* The web resource programs of web application create cookies at server side but these cookies comes to client side along with the response and allocates memory at client side.

(1) → allocates memory in browser window having "-1" has the expiry time (no expiry time). These cookies will be destroyed automatically once browser window is closed.

(2) → These cookies allocates memory in the files of client machine hard disk having positive number as expiry time. These cookies will not be destroyed when browser window is closed but they will be destroyed when their expiry time is completed / reached.

* The cookie that is created without expiry time is called as in memory cookie. The cookie that is created with the expiry time is called as persistent cookie.
* To work with cookies we must deal with pre defined http servlet class based servlet programs.



* Cookies of one web application that are there at client side will go to their web application along with the request then browser window gives request back to that web application.

with respect to the diagram

(1) The form page1 Tax.html gives request1 to FirstServlet program of CookieAppl web application.

(2) FirstServlet program reads form1 data, creates two in memory cookies having that form1 data.

(3), (4) → FirstServlet program generates response to browser window adding the cookies & having dynamic form page. These cookies allocate memory on browser window as in memory cookies.

(5) The dynamic form page (form2) generates request to second servlet program of CookieAppl application so the two cookies of CookieAppl will go to SecondServlet program along with the request.

(6) SecondServlet program reads form2 data normally but reads form1 request1 data from the cookies of request2. This indicates SecondServlet is able to use form1/request1 data while processing form2 request/request2. (which is nothing but session tracking).

(7) SecondServlet writes both form1, form2 data to db table.

(8) SecondServlet program generates dynamic web page having form1 and form2 data.

* The web resource programs of web application send cookies to client machine along with the response as 'set-cookie' response header values.

* The browser window sends the cookies of back to web application along with the request given to web resource programs as 'request Cookies' request header value

```
resp.addCookie(ck1); //adding Cookie to response
```

Here ck1 Cookie is in memory cookie (because no expiry time is set)

```
Cookie ck2 = new Cookie("mh", "mumbai");
ck2.setMaxAge(1800); ⟶ setting expiry time for cookie
resp.addCookie(ck2); ⟶ adding Cookie to response
```

Here ck2 Cookie is persistent Cookie having 1800 seconds as expiry time

to know max Age (Expiry time) of Cookie

```
int time = ck1.getMaxAge(); ⟶ gives -1 (for in memory Cookie)
int time = ck2.getMaxAge(); ⟶ give 1800 seconds
```

to modify Cookie value

```
ck1.setValue("new hyd");
ck2.setValue("navi mumbai");
```

To know domain name / web application name of the cookie

```
String d1 = ck1.getDomain();
String d2 = ck2.getDomain();
```

To set Comment to Cookie

```
ck1.setComment("holds ap's capital city");
ck2.setComment("holds mh's capital city");
```

to get Comment of Cookie

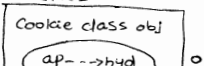
```
String c1 = ck1.getComment();
String c2 = ck2.getComment();
```

to read Cookie values

```
String ck[] = req.getCookies();
```

reads all the cookies from the current http request

ck[] Cookie class obj array




```
if (ck != null)
{
for (int i=0; i<ck.length; i++)
```

To delete Cookies

* Cookies can not be deleted ~~manually~~ programatically.
* In memory Cookies will be destroyed automatically once their browser window is closed. where as persistent cookies will be destroyed if their expiry time is reached / completed.
* for example application to know the basics and behaviour of Cookies refer application (12) of the page nos (48) and (49).
* In windows xp while working with internet explorer the persistant cookies of web application will be stored in the files created in c:\documents and settings\administrator\cookies folder and the notation of the file is :

<windows user> @ <web application name> [<Cookies count>] . txt

Ex : administrator @ CookieApp [2] . txt

Writing HTML code in servlet program with attribute values of html tags

```
pw.println("<table border=\"1\" align=\"center\">");
pw.println("<table border=1 align=center>");   (or)
pw.println("<table border='1' align='center'>");   (or)
```

* If we try to modify the content of the files where persistant cookies are stored then persistant cookies including that file will be destroyed.
* Internet explorer allocates the memory for in memory cookies on browser window where as the memory for persistant cookies will be allocated as files on the client machine hard disk.
* In netscape navigator both in memory and persistant cookies allocate memory on browser window but persistant cookies will be there with expiry time.

NOTE:

* Every Cookie remembers the domain name or web application name to which it belongs to.
* Cookies belonging to yahoo.com website will go to yahoo.com website only when browser window or client gives request back to that yahoo.com web site.
* In yahoomail.com, gmail.com website related login page ☑ remember me on this computer option stores the given login details (username, password) as persistent cookies on client machine hard disk. That means by using persistent cookies we can remember client data during session and after session.

Advantages of Http Cookies :

(1) Cookies allocates memory at client side so they do not give any burden to server.
(2) All server side technologies and all web servers, application servers support Cookies.
(3) Persistent Cookies can remember client data during session and after session with expiry time.

Disadvantages

(1) Cookies can not store java objects as values. They can store only strings.
(2) Cookies data can be viewed through browser setting or through the files of file system. so they do not provide data secracy,
(3) Cookies can be deleted explicitly through browser settings it may fail session tracking
(4) There is a restriction on no. of Cookies that can be there in browser window. Per browser window and per web application max of 20 cookies. All together max of 300 Cookies per browser window.
(5) Cookies can be blocked / restricted coming to browser window. This fails session tracking.

IE ⟶ to block cookies

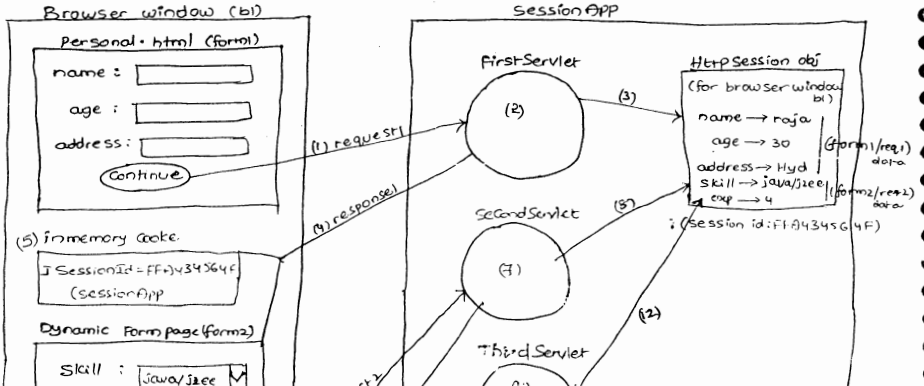
Tools ⟶ Internet options ⟶ privacy ⟶ use slider

Netscape ⟶ to block cookies

Tools ⟶ Cookie manager ⟶ Block Cookies from this site

Http Session with Cookies :

* Http Session object allocates memory on the server and remembers client data across the multiple requests in the form of session attribute values.
* Http Session object is one per browser window (client) so each Http Session object can be used to remember client data during a session.
* Http Session object means it is the object of a servlet container supplied java class implementing javax.servlet.http.HttpSession interface.
* Every HttpSession object contains session id and this session id goes to browser window from web application and comes back to browser web application from browser window in the form of in memory cookie value so this technique is called HttpSession with Cookies technique.



with respect to the diagram

(1) Browser window b1 launches personal-html (form1) and sends the request to FirstServlet of SessionApp application.

(2) FirstServlet reads form1 data / request1 data.

(3) FirstServlet creates HttpSession object on the server for browser window b1 and writes form1/ request1 data to that session object as session attribute values.

(4) FirstServlet generates form2 as dynamic form page and sends the session id of HttpSession object to browser window as in memory cookie value.

(5) The in memory cookie having session id of HttpSession object (b1) allocates memory on the browser window. That cookie also remembers its web application name SessionApp.

(6) End user fills up the form page (form2) and sends the request2 to Second servlet of SessionApp. Along with the request the session id will go as Coolcie value.

(7) SecondServlet reads form2 data.

(8) SecondServlet uses the session id read from the cookie to get access to the HttpSession object of browser window b1 and writes form2 /request2 data to that HttpSession object as session attribute values.

(9) SecondServlet generates form3 as dynamic form page.

(10) form3 generates request3 to third servlet of sessionApp application. Along with this request session id goes to third servlet as cookie value.

(11) ThirdServlet reads form3 data and session id from the cookie

(12) ThirdServlet uses session id collected from the Coolcie to get access to HttpSession object of browser window b1 and reads form1/request1, form2/ request2 data from the session attributes of that HttpSession attributes. This indicates ThirdServlet is able to use request1/ form1 data and

* When HttpSession object is created the session id of that session object automatically goes to browser window as in memory cookie value.
* In HttpSession with Cookies session tracking technique based web application the browser window (client) will be identified across the multiple request during a session based on the session id sent by the browser window along with the request.

Session API (working with javax.servlet.http.HttpSession interface)

To create/locate HttpSession object

a) HttpSession ses = req.getSession();

* This method creates new HttpSesion object on server for browser window if HttpSession object is not already available for browser window otherwise this method provides access to existing HttpSession object of that browser window.
* this method can create the new session between browserwindow and web application if session is not already between them otherwise this method makes current request to join in the existing session.
* If this method is called in FirstServlet program of above diagram then it makes request1 of browser window b1 begining new Session between browser window b1 and web application session app. If same method is called SecondServlet, ThirdServlet then it makes request2, requests of browser window b1 participating in existing session.

b) HttpSession ses = req.getSession(false);

* This method creates gives access to existing HttpSession object of browser window, if not available this method returns null (indicating new HttpSession object can not be created)
* when this method is called the request can always join in existing

c) HttpSession ses = req.getSession(true);

"same as (a)"

Conclusion:

to create new session/to locate existing session → use (a), (c) options only to locate existing session ⟶ use (b) option.

to know Session ID

```
String id = ses.getID();
```

TO know session object creation time / session started time

```
long ms = ses.getCreationTime();
Date d1 = new Date(ms);
```

* In the above code ms represents milli seconds that are elapsed from 1970 Jan 1st 00:00 hours to the date and time of HttpSession object creation. Epoch standard

* TO know the last accessed time of HttpSession object

```
long ms = ses.getLastAccessedTime();
Date d2 = new Date(ms);
```

* The above code gives the last accessed date and time of HttpSession object.

TO get access to ServletContext object

```
ServletContext sc = ses.getServletContext();
```

TO know whether session is new or not

```
boolean b = ses.isNew();
```

* this method returns true when ses object is new object and just created object and its session id still yet to be delivered (sent) to client (browser window) otherwise this method returns false. (when session object is old object) and its session id is already there with client).

To invalidate the session

* Invalidating the session is nothing but closing the session between browser window and web application. In this process the entire data from session object will be removed and makes session object inactive object, ready for garbage collection.

a) when ses.invalidate() method is called

b) when browser window is closed

NOTE: since session id will be stored as in memory cookie value of browser window and that in memory cookie will be destroyed once browser window is closed so the session will be invalidated once browser window is closed.

c) when MaxInactiveInterval / SessionIdleTimeout period is completed/reached

* If session object is continuously idle for certain amount of time then it will be invalidated automatically. The default session idle timeout period is 30 minutes (in most of the servers). But this can be changed explicitly either by using programatic approach or declarative approach.

(I) Programatic approach (Java code)

In servlet prg/ JSP prg

```
ses.setMaxInactiveInterval(1500);
                           ↓
                        seconds
```

(II) Declarative approach (xml code)

In web.xml

```
<web-app>
  <session-config>
    <session-timeout>20</session-timeout>
  </session-config>
</web-app>
          ↓
       minutes
```

* once session idle timeout period or maxInactiveInterval period is completed the underlaying webServer automatically expires the session (invalidates the

If you set sessionIdleTimeout period in both programatic and declarative approaches with two different values, can you tell me which value will be effected finally ?

(A) Since the code of servlet program executes after web.xml code so the time specified through programatic approach will be effected by overriding the time specified through declarative approach.

* In HttpSession object the client data will be preserved in the form of session attribute values.
* HttpSession object and its session attributes are visible and accessable in all web resource programs of web application but they must get request from that particular browser window (client) for which this session attribute, and session objects are created.

TO create/modify session attribute

```
ses.serSetAttribute("age", new Integer(30));
```

ses.putValue(-,-) is deprecated method of setAttribute(-,-)

TO read session attribute value

```
Integer I1= (Integer)ses.getAttribute("age");
```

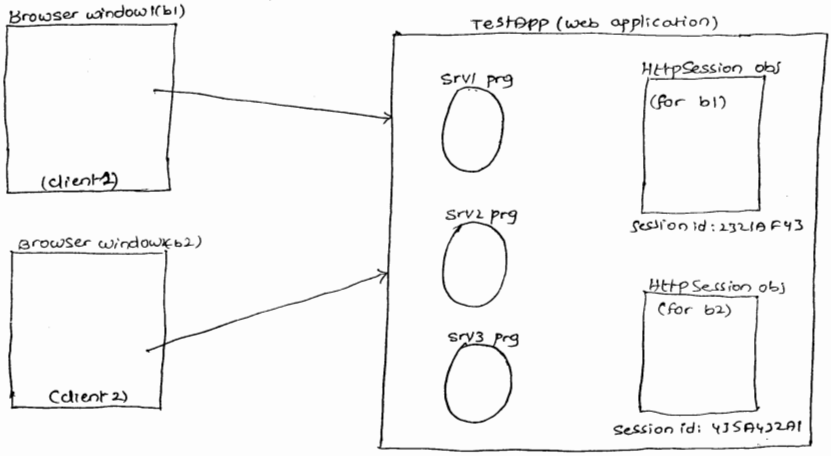
ses.getValue(-,-) is deprecated method of getAttribute(-,-)

TO remove session attribute

```
ses.removeAttribute("age");
```

ses.removeValue(-,-) is deprecated method of removeAttribute(-,-)

* For example application on HttpSession with cookies based on previous diagram refer page nos 85-88 81-85
+ If multiple clients (browser windows) are giving request to a webapplication in which HttpSession object based session tracking is enabled then for every browser window one HttpSession object will be created on the



* In HttpSession with Cookies session tracking enabled web application the movement HttpSession object is created on server for browser window the servlet Container automatically creates one in memory cookie having Session id and adds that Cookies to the response to send to the browser window (no need of performing manual work).

* while working HttpSession object based web application if browser window is closed in the middle of the session then the existing session will be invalidated and that session will not be continued with new browser window.

* while working with HttpSession object based application what happens if underlaying server is restarted in the middle of the session ?

=> The session will be continued.

Sever collects the data of Httpsession objects and writes to files through serialization process having session ids when programmer shutdown the server. When server is restarted HttpSession object will be created having old data.

during session as session attribute values. So there will be data secracy for client's session data.

(2) client data during session will not travel along with request and response over the network so this reduces network traffic between client and web server.

(3) The session attributes of HttpSession objects can take java objects as values.

(4) All java based web servers and application servers support this technique.

(5) This technique allows the programmer to specify session idle timeout period to invalidate inactive session objects.

Dis advantages:

(1) HttpSession objects allocates memory on the server. This increases burden on the server.

(2) If Cookies are restricted coming to browser window this technique fails to perform session tracking.

Http Session with url rewriting

* The limitation with third technique is if Cookies are restricted to coming to browser window then third technique fails to perform session tracking because it uses in memory Cookie to send session id to browser from web application along with response and to bring session id back to web application from browser window along with request.

To overcome that problem work with HttpSession with URL rewriting which doesnot use Cookies to send and receive session id. More ever this technique appends session id to a url that goes to browser window from web application along with the response and that comes back to web application from browser window along with the request. Generally we append session id to the action url (the action attribute of form tag) of dynamic form page generation code.

* By taking above kind of URL as action URL of dynamic form page we can perform http session with URL rewriting based session tracking.

In Servlet program

```
pw.println("<form action=" + res.encodeURL("surl") + " method=get>");
pw.println("- - - - - -");
pw.println("- - - - - -");
pw.println("</form>");
```

*** ↓ keeps the url appended with sessionid as the action attribute value of <form> tag

* For example application on HttpSession with URL rewriting refer application (15) of the page nos 85-88

Advantages and disadvantages of HttpSession with URL rewriting

same as HttpSession with Cookies technique but this technique also works even though cookies are restricted coming to browser window.

Conclusion on Session tracking technique

* while developing large scale and commercial web site which contains huge customer base take the support of Http Cookies technique.

Ex: www.gmail.com, www.yahoomail.com

* while developing medium scale and certain organization based website which contains limited amount of customers use http session with URL rewriting technique.

Ex: www.citibank.com, www.satyatechnology.it.com

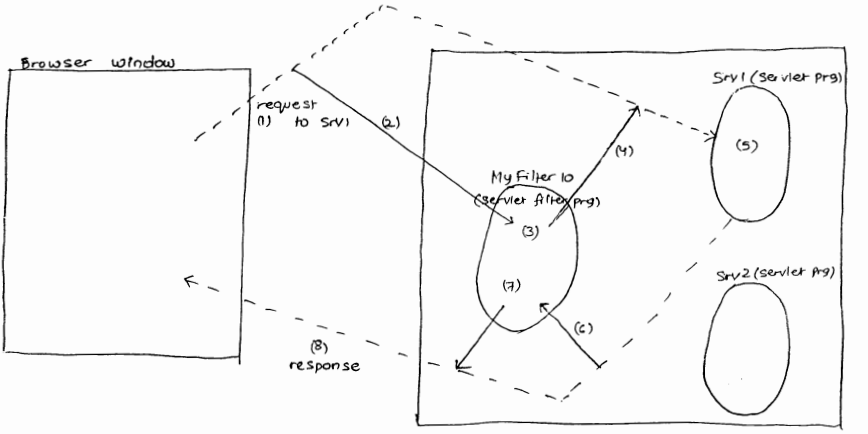
* we can use multiple session tracking techniques in a single web application development. For example the online shopping websites like www.yebhi.com uses both http Cookies, http session with URL rewriting techniques.

↓ for holding shopping cart information

↓ for holding login details (username, password)

Servlet Filters :

* A servlet filter is a special web resource program of java web application that is capable of trapping and taking request and response of other web resource programs of that web applications.
* In Servlet filter program we can keep the common and global pre request processing logic and post response generation logic
* To add new functionalities to web application without changing the source code of existing web resource programs we can take the support of servlet filter programs.



with respect to the above diagram

(1) Browser window generates request to Srv1 servlet program.

(2) The servlet filter program traps and takes that request.

(3) Servlet filter program executes the common and global pre requesting process logic (like authentication logic)

(4) Servlet filter program forwards the request to actual Srv1 servlet program.

(5) The main request processing logic of Srv1 servlet program executes.

Servlet filter basics

* Servlet filter program is a java class that implements javax.servlet.Filter interface.
* Every servlet filter program must be configured in web.xml file using filter, filter mapping tags.
* To link servlet filter program with servlet program of web application the url pattern of servlet program must be taken as the url pattern of servlet filter program.
* Servlet container creates our servlet filter class object either during server start up (or) during the deployment of the web application.
* We can map servlet filter program with one servlet program, multiple servlet programs (or) all servlet programs of web application.
* There are 3 lifecycle methods in servlet filter program

(1) public void init(FilterConfig fg)

(2) public void doFilter(ServletRequest req, ServletResponse res, FilterChain fc)

(3) public void destroy()

This object points to the target mapped servlet programs of filter program.

(1) → executes during instantiation and initialization process of our servlet filter program.

(2) → executes for every request trapping and response trapping

(3) → Executes when ServletContainer is about to destroy our servlet filter class object

There are 3 types of filter programs.

(1) request Filter (Contains only pre request processing logics)

(2) response Filter (Contains only post response generation logics)

(3) request - response Filter (Contains both pre-request processing and post response generation logics)

Examples of request Filters

Compression Filter (reduces the size of the response content)

Examples of request-response Filter

PerformanceTestFilter (This filter holds request traping time and response traping time of certain servlet program and calculates difference between both timings to decide the performance of the servlet program).

* FilterConfig object is right hand object of our servlet Filter class object and it can be used to read init parameter values of filter program in web.xml file.
* init(-) method of Servlet Filter program Contains initialization logic.
* doFilter(-,-,-) of Servlet Filter program Contains pre-request processing logic and post response generation logics.
* destroy() of ServletFilter program contains uninitialization logic.

understanding flow of execution for servlet filter program when it is mapped with a servlet program.

① TestAP

MyFilter.java ②

Public class myFilter implements javax.servlet.Filter
{ ↳ contains all three lifecycle
public void init(FilterConfig cg)

```
        public void destroy()
          {
            ==== //unInitialization logic
          }
    }
```

MySrv.java (servlet program)

```
public class MySrv extends HttpServlet
 {
   public void service(-,-) throws SE, IOE
    {
      ====  (15)
      ====
      ====
    }
 }
```

web.xml

```
<servlet>
   <servlet-name> abc </servlet-name>   (13)
   <servlet-class> MySrv </servlet-class>   (14)
</servlet>

<servlet-mapping>
   <servlet-name> abc </servlet-name>   (12)
   <url-pattern> /test1 </url-pattern>   (11)
</servlet-mapping>

<filter>
   <filter-name> xyz </filter-name>   (9)
   <filter-class> MyFilter </filter-class>   (8)
</filter>

<filter-mapping>
      <filter-name> xyz </filter-name>   (6)
      <url-pattern> /test1 </url-pattern>
</filter-mapping>   (5) matching with servlet program (mySrv) url pattern
</web-app>.
```

Browser window

http://localhost:2020/TestApp/test1 (4)

(1) response will be displayed on browser window

(3) Servlet Container completes initialization process on filter by executing the logic of init(-) method.

(4) End user gives request to servlet program mySrv from browser window (having /test1 in the request url).

(5), (6), (7), (8) → since MyFilter program is configured with MySrv program the servlet Filter traps and takes the above request that is given to mySrv program. In this process servlet Container locates MyFilter class object.

(9) Servlet Container calls life cycle method doFilter(-,-,-) and executes pre request processing logic.

(10) The fc.doFilter(-,-) method call forwards the request to the target web resource program (mySrv).

(11), (12), (13), (14) → Servlet Container completes instantiation and initialization of MySrv program based on its configuration done in web.xml file.

(15) Servlet Container calls service method of MySrv program to process the request and to generate the response.

(16) The filter program (MyFilter) traps the response of mySrv program (servlet program) and executes post response generation logic that is placed after fc.doFilter(-,-) method.

(17) The filter program MyFilter sends the response to browser window.

Sample web application

Srv1, Srv2, Srv3 are servlet programs

F1 is Servlet Filter program

to configure filter with all the servlet programs of web application

Configure F1 filter having url pattern /*

to configure F1 filter with Srv1, Srv2 programs of web application

Srv1 program url pattern : /x/y/s1url

What is the difference between doFilter(-,-,-) of javax.servlet.Filter interface and doFilter(-,-) method of javax.servlet.FilterChain interface?

(A) doFilter(-,-,-) method of Filter interface is life cycle method of servlet filter program so programmer uses this method to place prerequest processing and post response generation logics.

doFilter(-,-) method of FilterChain is not life cycle method so programmer uses this method to invoke next filter in the chain or to invoke the mapped servlet program or JSP program of current servlet filter program.

—— o ——

Sample web application

Srv1, Srv2, Srv3 are Servlet Programs
F1, F2 are Servlet Filter Programs

To Configure F1, F2 filter programs with Srv1 program

Url pattern of Srv1 program : /s1url
url pattern of F1 filter program : /s1url
Url pattern of F2 filter program : /s1url

To Configure F1, F2 filter programs with Srv1, srv2 programs

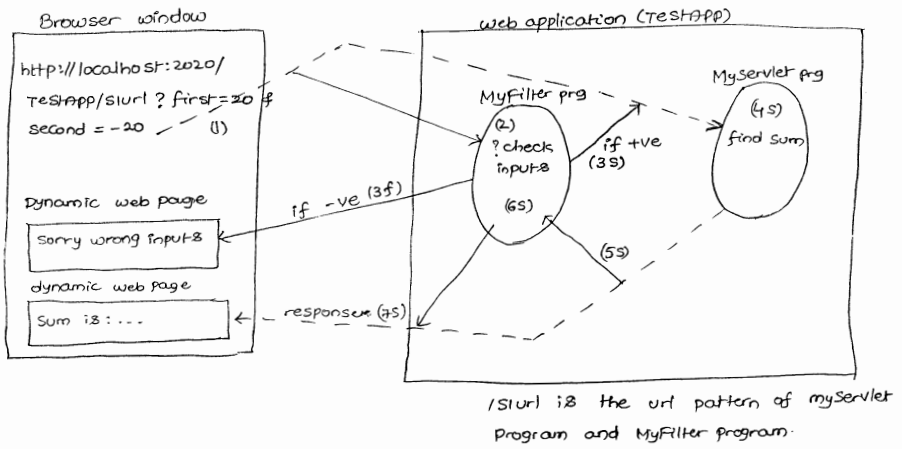
Url pattern of Srv1 program : /x/y/s1url
Url pattern of Srv2 program : /x/y/s2url
Url pattern of F1 filter program : /x/y/*
Url pattern of F2 filter program : /x/y/*

To Configure F1, F2 filter programs with all servlet programs of web application

Url pattern of Srv F1 filter program : /*
Url pattern of F2 filter program : /*

* When filter is configured with servlet program then filter can trap the request and response of servlet program.

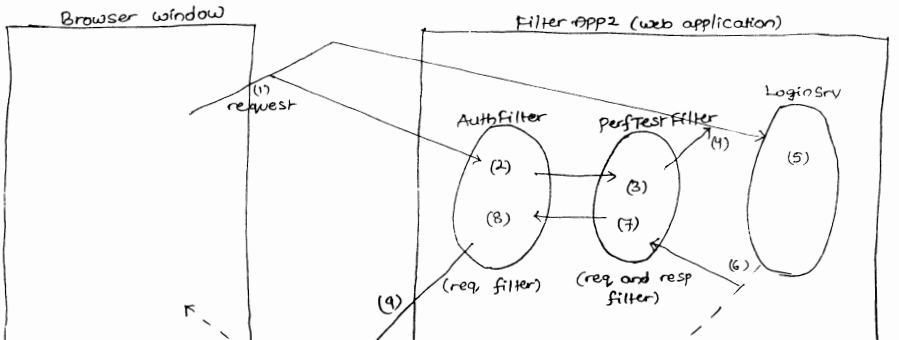
Example application



/sIurl is the url pattern of myServlet Program and MyFilter program.

* In the above diagram MyFilter also traps the response of MyServlet program but does not contain post response generation logic so the above filter is called as request filter.
* For above diagram based application refer application (16) of page nos (89 to 90)

Example application on filter



* The tomcat server maintains log files in Tomcat_home\logs folder on one per day basis having date in the file name.

* Instead of using S.o.p(-) statements which writes log messages to server console it is recommanded to use log(-) method of ServletContext object which writes the log messages to current day's log file of <tomcat_home>\log folder.

```
ServletContext sc = getServletContext();
sc.log("hello");
```

* JDBC code to perform username and password based authentication

```
PreparedStatement ps = Con.prepareStatement("select * from userlist where
                                              username=? and password=?");
ps.setString(1, "raja");
ps.setString(2, "hyd");
ResultSet rs = ps.executeQuery();
if (rs.next())
  {
    ==========  //Authentication successful
  }
else
  {
    ==========  //Authentication failed
  }
```

Userlist (db table)

username	password
raja	hyd
ravi	Vizag
ramesh	Delhi

* For above diagram based web application's source code refer application (17)

To count no. of requests (hits) coming to web application when webapplication is in active mode we can develop filter program as shown below.

step(1): Develop the servlet filter program as shown below in WEB-INF\classes folder of web application (like URLAPP) having the logic of counting request.

```
//CountFilter.java
import javax.servlet.*;
import javax.servlet.http.*;
public class CountFilter implements Filter
   {
    FilterConfig fg;
    public void init(FilterConfig fg)
      {this.fg=fg;
      } int cnt=0;
    public void doFilter(ServletRequest req, ServletResponse res, FilterChain fc)
                                                    throws ServletException, IoException
      {
        cnt++;
        ServletContext sc=fg.getServletContext();
         sc.setAttribute("hitcnt",cnt);
         fc.doFilter(req,res);
      }
    public void destroy()
      {
      }
  }//class
```

step(2): Configure above filter in web.xml file with url pattern "/*"

step(3): Read and display servletContext attribute value in every web resource program of web application.

In personal.jsp

```
<%. out.println("Request Count:"+application.getAttribute("hitcnt")); %>
```

In First servlet.java, Second servlet.java, Third servlet.java

Request url

http://localhost:2020/URLAPP/personal.jsp

* Use application (IS) as base application to develop this application.

Applet to servlet communication

* In web applications we need form pages to submit the request to web resource programs by having enduser supplied data. These form pages provide Giraphical user interface to end user to submit the request to web resource programs having data. There are two ways to develop form pages.
  1) As html form page (using <form>, <input> and etc... tags)
  2) As java applet based form page.
* there are two types of applets
  a) Trusted applet
  b) untrusted applet
* An applet is a compiled java class that can be sent over the network as web page.
* when untrusted applet is launched in the browser window by gathering it from network it can't interact with the files of file system so untrusted applets can not write virus to the computer (that means provides security)
* Trusted applets that are launched in the browser window can interact with file system and can write virus to file system (that means no security).
* while designing form page if performance is important (should be launched very fastly) then use html form pages. If security is important that take untrusted applet as form page.

What are the differences between Applet and servlet?

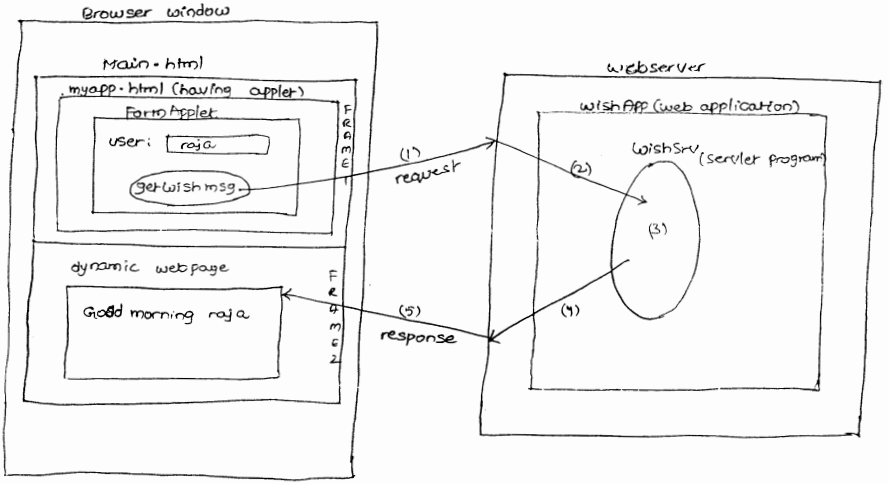
Applet	Servlet
* client side technology to develop client side web resource programs	* server side technology to develop server side web resource programs

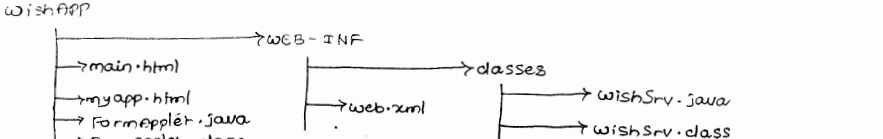
* Uses life cycle methods for execution. They are init(), start(), stop(), destroy(), paint()

* Executes through life cycle methods. They are init(-), ~~start~~ service(-,-), destroy().

* Applet to servlet communication means making the applet based form page sending request to servlet program having data.

* In html form page to servlet communication the html tags automatically prepares request URL by having form data as query string values where as in applet to servlet communication all these operations should be performed by the programmer manually





wishSrv.java

```
import javax.servlet.*;
import javax.servlet.http.*;
import java.io.*;
import java.util.*;
public class wishSrv extends HttpServlet
 {
    public void service(HttpServletRequest req, HttpServletResponse res) throws
                                                    ServletException, IOException
     {
         PrintWriter pw = res.getWriter();
          res.setContentType("text/html");
         //read form data (applet data)
          String uname = req.getParameter("user");
         //write b.logic
          Calendar cl = Calendar.getInstance();  //gives current date and time.
          int h = cl.get(Calendar.HOUR_OF_DAY); //gives current day hour of day
          if (h<12)
             pw.println("Good morning"+uname);
          else if (h<=16)
              pw.println("Good afternoon"+uname);
          else if (h<=20)
               pw.println("Good evening"+uname);
          else
               pw.println("Good night"+uname);
         //close the stream object
          pw.close();
       }
   }
```

main.html

```
<frameset rows="40%",*">
   <frame name="f1" src="myapp.html"/>
   <frame name="f2"/>
</frameset>
```

FormApplet.java

```
import java.applet.*;
import java.awt.*;
import java.awt.event.*;
import java.net.*;
public class FormApplet extends Applet implements ActionListener
  {
      Label l1;
      TextField tf1;
      Button b1;
      public void init()
       {
          l1 = new Label("User:");
          add(l1);
          tf1 = new TextField(10);
          add(tf1);
          b1 = new Button("Get wish");
          b1.addActionListener(this);
          add(b1);
       }
      public void actionPerformed(ActionEvent ae)
        {
          try{
              //example req url : http://localhost:2020/wishApp/wurl?user=raja+++rao
              String qrystr = "?user="+tf1.getText().replace(' ','+'); //gives ?user=
                                                                        raja+++rao
              String requrl = "http://localhost:2020/wishApp/wurl"+qrystr;
              //prepare req url as URL class obj.
              URL url=new URL(requrl);
              //get Access to AppletContext obj
              AppletContext apc = getAppletContext(); //public method of Applet class
             //send request to servlet program
              apc.showDocument(url,"f2"); //sends the req to wishsrv prg and
                                          //displays the generated webpage in
            }                             //a frame window whose name is "f2"
          catch(Exception e)
            {
              e.printStackTrace();
            }
        }
```

```
    <s-m>
      <s-n> xyz </s-n>
      <u-p> /wurl </u-p>
    </s-m>
</web-app>
```

* use following request url to test the application

  http://localhost:2020/wisApp/main.html

* AppletContext object represents the current executing environment of applet programming so it can be used to make current applet talking with another applet or another web resource program of web application. To get this AppletContext object we can use getAppletContext() predefined java.applet.Applet class

File downloading :

* selecting file from the client machine file system and sending that file to server machine file system through network is called as file uploading and reverse is called as file downloading.
* All the files of a computer managed by operating system together is called as file system of computer.
* Servlet api gives built-in support for file uploading. since it is complex we generally prefer working with third party api called java 3oom api perform this file uploading.
* java 3oom api comes in the form of jar files and we can download them from www.java3oom.net website. The jar files are

  uploadbean.jar (main jar file)

  struts.jar, cos.jar } dependent jar files to uploadbean.jar

* The classes and interfaces of uploadbean.jar files uses the classes

Ex: If servlet, JSP programs of java web application uses third party api called java zoom api then add the java zoom api related main jar file uploadbean.jar file to classpath. similarly the java zoom api related main and dependent jar files uploadbean.jar, struts.jar, cos.jar to WEB-INF\lib folder of web application.

* To select a file from client machine file system the form page of client machine web application should have file uploading component. For that we take <input> tag as shown below.

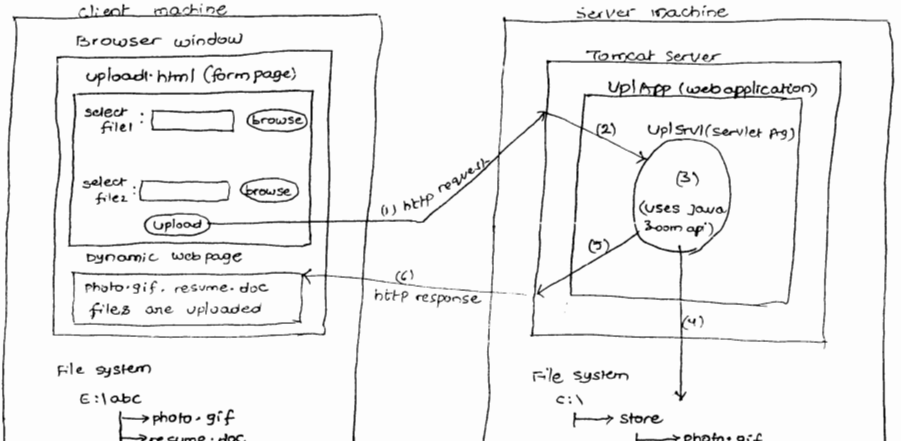
In form page

```
select file: <input type="file" name="fi"/>
```

select file: [ ] Browse

file uploading component

* The form page that contains file uploading component is recommanded to generate "post" method based http request.



* we can see file uploading and downloading applications in email account applications (to send & receive attachments), job portal websites like naukari.com (Job seeker uploads the resume, HR dept. of company downloads the resume) and matrymoni website

* we can perform file downloading operations in two modes.

(1) making the response of web resource program as downloadable file

(2) making downloading resources of the web application (img file, audio file, video file and etc..) as downloadable file through hyperlinks (or) buttons.

* write the following two lines of content in web resource program like servlet, Jsp to make that response of that web resource program as downloadable file.

```
res.addHeader("Content-Disposition", "attachment; filename=abc.html");
res.setContentType("text/html");
```

"Content-Disposition" → response header

"attachment; filename=abc.html" → name of the downloadable file that holds response of the web resource program

"text/html" → response content type

* An action performed on java object or component is called as an Event.

* Executing some logics when event is raised is called as Event handling.

* To perform event handling we use event Listeners.

* The reusable java object is called as Component. we use AWT, Swing concepts of JSE module to perform event handling.

* To perform event handling we need four important details.

(1) Source object on which the event will be raised (like Button Component)

(2) Event class name (like java.awt.event.ActionEvent)

(3) Event Listener (like java.awt.event.ActionListener)

(4) Event handling method (like public void actionPerformed(-) {...})

- From Servlet api 2.4 onwards we can perform event handling on request, session and ServletContext object from ...

Details that are required to perform event handling on request object:

Source object : request object
Event class : javax.servlet.ServletRequestEvent
Event listener : java.servlet.ServletRequestListener
Event handling methods : (1) requestInitialized(-)
(2) requestDestroyed(-)

} For Event handling on request object

Source object : request object
Event class : javax.servlet.servletRequestAttributeEvent
Event Listener : java.servlet.ServletRequestAttributeListener
Event handling methods : (1) attributeAdded(-)
(2) attributeRemoved(-)
(3) attributeReplaced(-)

} For event handling on request attributes.

* Event handling on ServletContext object helps us to keep track of when ServletContext object is created and destroyed. Based on this we can keep track of timings of web application deployment and undeployment or reloading or stop operations.
* This Eventhandling can also be used to keep track of creation, modification, destruction of ServletContext attributes.

Details that are required to perform eventhandling on ServletContext object

Source object : ServletContext object
Event class : javax.servlet.ServletContextEvent
Listeners : javax.servlet.ServletContextListener (I)
Event handling methods : (1) contextInitialized(-)
(2) contextDestroyed(-)

} For event handling on ServletContext object.

Source object : ServletContext object
Event class : java.servlet.ServletContextAttributeEvent

} For event handling on

User is there in the session. we can also use this event handling to keep track of when each session attribute is created or modified or destroyed.

Details that are required to perform event handling on HttpSession object

source object : HttpSession object
Event class : javax.servlet.http.HttpSessionEvent
Listener : javax.servlet.http.HttpSessionListener
event handling methods : (1) sessionCreated(-)
(2) sessionDestroyed(-)

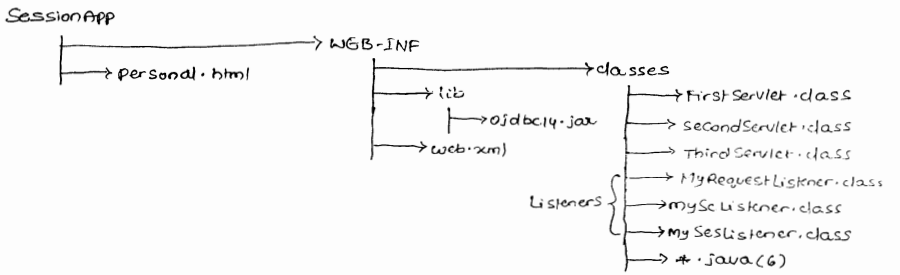
} For event handling on HttpSession object

source object : HttpSession object
Event class : javax.servlet.http.HttpSessionBindingEvent
Listener : javax.servlet.http.HttpSessionAttributeListener
event handling methods : attributeAdded(-)
attributeRemoved(-)
attributeReplaced(-)

} For event handling on HttpSession attribute

* Through Servlet Listeners we can perform event handling on request, Servlet Context, Session objects being from outside the servlet, JSP programs.

Example application (with respect to SessionApp application)



Every ServletListener class must be configured in web.xml file using <listener>,

```
public class MyReqListener implements ServletRequestListener
{
  Long sttime, endtime;
  public void requestInitialized(ServletRequestEvent sre) //executes when
                                                          //req obj is created
  {
    sttime = System.currentTimeMillis();
  }
  //executes when req obj is destroyed
  public void requestDestroyed(ServletRequestEvent sre)
  {
    endtime = System.currentTimeMillis();
    ServletContext sc = sre.getServletContext();
    sc.log("Request is processed for "+(endtime-sttime)+"ms");
    System.out.println("request is processed for"+(endtime-sttime)+"ms");
  }
}
```

MyScListener.java

```
import javax.servlet.*;
import javax.servlet.http.*;
import java.io.*;
public class MyScListener implements ServletContextListener
{
  Long sttime=0;
  long endtime=0;
  public void contextInitialized(ServletContextEvent sce)
  {
    sttime=System.currentTimeMillis(); ServletContext sc=sce.getServletContext();
    sc.log("web application is deployed at"+new Date());
  }
  public void contextDestroyed(ServletContextEvent sce)
  {
    endtime = System.currentTimeMillis();
    sc.log("web application is undeployed/reloaded/stopped at"+new Date());
    sc.log("web application is there in running continuosly for"+(endtime-sttime));
```

MySesListener.java

```
import javax.servlet.*;
import javax.servlet.http.*;
import java.util.*;
import java.io.*;
public class MySesListener implements HttpSessionListener.
{  long sttime, endtime;
   public void sessionCreated(HttpSessionEvent se)
    {
        sttime = System.currentTimeMillis();
    }
    //execute when HttpSession obj is destroyed
    public void sessionDestroyed (HttpSessionEvent se)
    {
       endtime = System.currentTimeMillis();
       HttpSession ses = se.getServletContext().getSession();
       //get access to servletContext obj
        ServletContext sc=ses.getServletContext();
        sc.log (ses.getAttribute("name")+" is there in the session for"+
                                                (endtime-sttime)+"ms");
        s.o.p (ses.getAttribute("name")+" is there in the session for"+
                                                (endtime-sttime)+"ms");
    }
}
```

Step (2): Compile all the listener classes

```
>javac *.java
```

Step (3): Configure all the three listener classes in web.xml file

In web.xml

```
<listener>
    <listener-class> MyReqListener </listener-class>
</listener>
```

step(4): Test the application and also observe the log file (D:\Tomcat6.0\logs\localhost.2011-12-04 file)
current Date

* In our java web applications no servlet listener acts as default listener. That means every listener configuration is mandatory in web.xml file.
* Servlet listeners are useful to keep track of various operations related to request, session, ServletContext objects without disturbing the existing code of web application.
* To make the java class as servlet listener class the class must implement Xxx Listener interface.

Procedure to Configure Jboss 5.x servers with NetBeans IDE

step(1):

Tools → Servers → add server → Jboss application server → next →

Server location: E:\Jboss5.x Soft\jboss-5.1.0.GA → next →

Domain: default → finish → close

* In servlet programming we can use servletOutputStream class object pointing to response object to write the o/p of the servlet program to browser window as web page through webserver and it is alternate for printWriter stream object.

Ex:
```
res.SetContentType("text/html");
ServletOutputStream sos = res.getOutputStream();
sos.println("welcome to servlets");
sos.println("hello");
```

* In one servlet program we can not use both stream objects (ServletOutputStream, PrintWriter) at a time pointing to res object.

less text data to write to browser window.

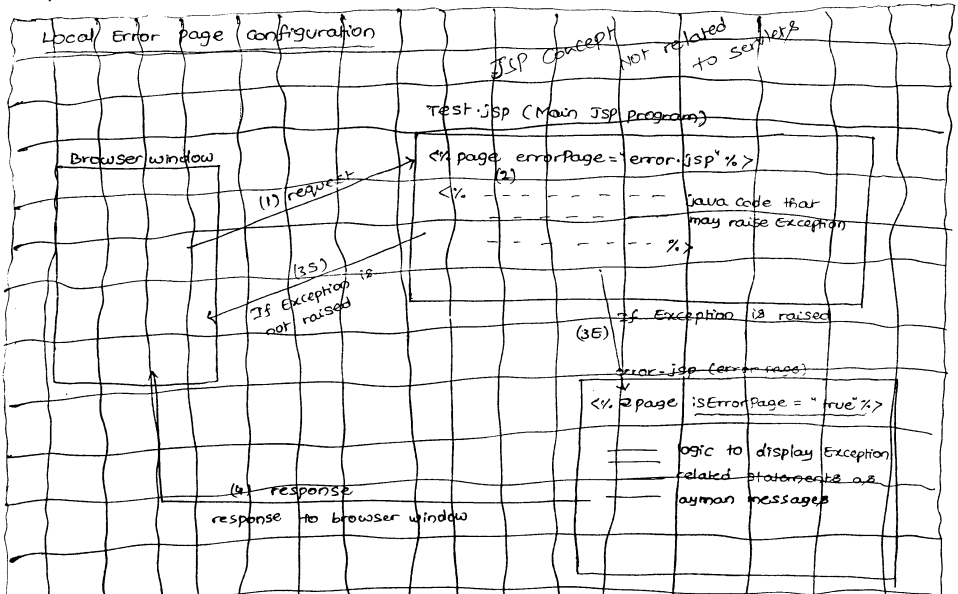
* For better performance of servlet and to reduce one method call use pw.print() method in servlet program instead of pw.println() method because this pw.println() method internally calls pw.print() method to complete the requirement.

* We can also apply this recommendation while working with ServletOutputStream.

Local Error page configuration

JSP Concept — Not related to servlets

Test.jsp (Main JSP program)



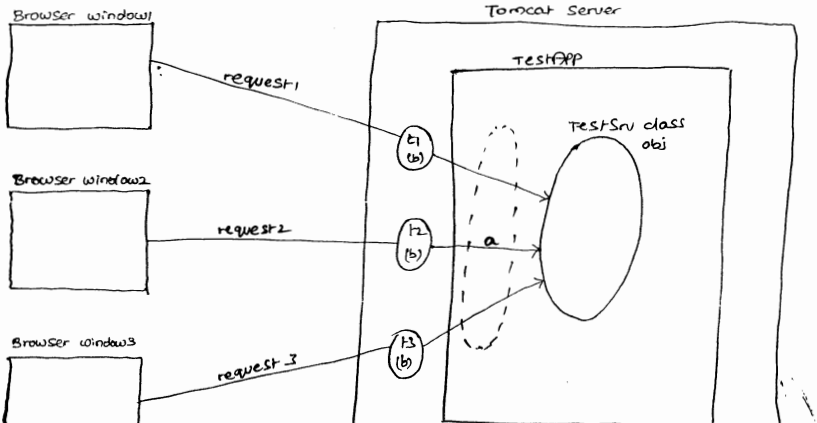
* isErrorPage = "true" attribute of page directive tag can make a jsp program of web application as error page

* The implicit object exception is visible only in that jsp program that acts as error page and we can use this object to know the details of exception that are raised in main jsp programs.

Thread safety

* If multiple threads are running on single object or variable simultaneously or concurrently then data of the object may corrupt. This says our object is not thread safe object.
* To make object/variable as thread safe apply lock on object or variable through synchronization and allow only one thread at a time to manipulate object/variable data. The instance variables of our servlet class are not thread safe by default where as the local variables declared in service(-,-) or doXxx(-,-) methods of our servlet class are thread safe by default.

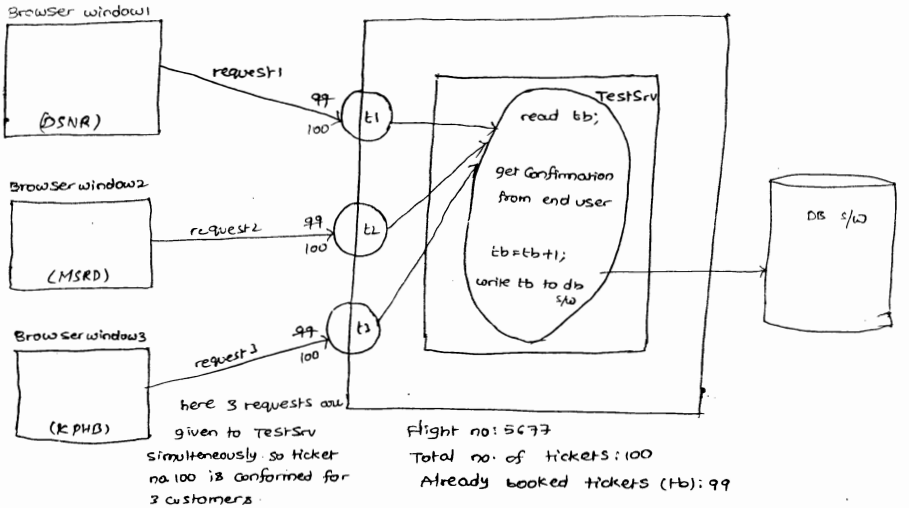
```
public class TestSrv extends HS/GS
 {
    int a;
    public void service(-,-)/doXxx(-,-) throws SE,IOE
     {
        int b;
     }
 }
```



* By default every servlet program is a single instance multiple threads component so by default no servlet program is thread safe.

* Making servlet program as thread safe program is nothing but making the instance variables of servlet class as thread safe through synchronizations and other concepts.

understanding the problems related to working with non thread safe servlets (regular servlets)



* Simultaneous request or concurrent request in servlet execution is nothing but servlet program is allowing another request from clients to execute the logic before completion of existing request processing. In such situations servlet program may generate wrong results like booking same ticket number for multiple pessangers as shown in the above diagram.

(4) make your servlet class implementing javax.servlet.SingleThreadModel (I).

(1) working with only local variables

```
public class TestSrv extends HS/GS
 {
   ---   no instance variables
   ---
  public void service(-,-)/doXxx(-,-) throws SE,IOE
   {
     int a,b,c;
     Connection con;
     ------------  //write entire using local variables
     ------------
   }
 }
```

* Local variables of service(-,-)/doXxx(-,-) methods are thread safe variables by default. So the above servlet becomes thread safe servlet. Because it does not have instance variables and working with just local variables.

NOTE: This technique is not recommended to use because it is practically impossible to develop servlet classes without instance variables.

(2) working with synchronized service(-,-)/doXxx(-,-)

```
public class TestSrv extends HS/GS
 {
    Connection con;
    int a,b,c;          } Instance variables

    public synchronized void service(-,-)/doXxx(-,-)
     {
       ------------  //write logic using instance variables
       ------------
     }
 }
```

* All requests that are given to servlet starts threads on our servlet class object and execute service(-,-)/doXxx(-,-).

* In the above code multiple threads started on our servlet class object will act on single copy of instance variables but only one thread is allowed

(3) Working with synchronized blocks in service(-,-)/doXxx(-,-)

```
public class TestSrv extends GS/HS
 {
    Connection con;
    int a,b,c;
    public void service(-,-)/doXxx(-,-)
     {
       ====
       ====
       ====
       synchronized(con obj)
        {
          ======
          ======  logic related to con obj
          ======
        }
       synchronized(session obj)
        {
          ======  logic related to HttpSession obj
          ======  (creating, modifying, reading and writing, moving attribute values)
        }
       synchronized(ServletContext obj)
        {
          ======  logic related to ServletContext obj
          ======  (creating, modifying, reading and moving attribute values)
        }
     }//
 }
```

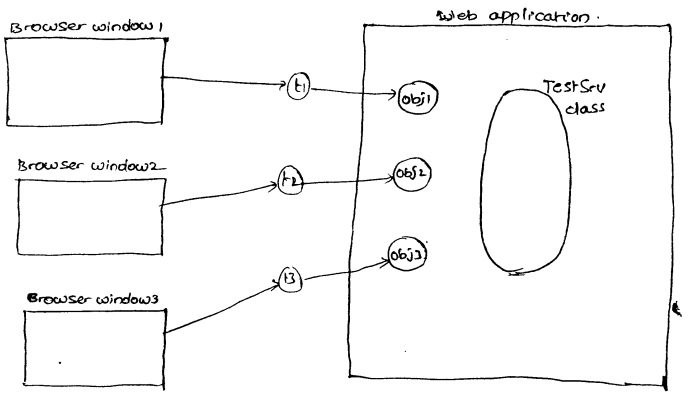
* Working with these synchronized blocks is the most popular technique of real world to make servlet programs as thread safe.
* Since HttpSession object and ServletContext objects are sharable objects in multiple web resource programs of web application it is recommended to use them in synchronized blocks as shown above.

(4) Making our servlet class implementing javax.servlet.SingleThreadModel (I)

```
public class TestSrv extends HttpServlet implements SingleThreadModel
 {
    int a,b;
    Connection con;
```

* By seeing the implementation of SingleThreadModel interface the underlaying Server automatically makes our servlet as thread safe. But the technique of thread safety that is used by server will vary server to server.

* This interface has been depricated from servlet api 2.4 because different Servers are using different mechanisms while implementing this interface and to make the servlet as thread safe some servers are even creating multiple objects for servlet class for multiple requests on one per request basis. This is violation of servlet specification that says a servlet is a single instance multiple threads component.



obj1, obj2, obj3 are the objects of TestSrv class

* Every Jsp program is not thread safe by default because the jsp equalent servlet is not automatically implements SingleThreadModel interface and not automatically generates the necessary synchronized blocks in _jspService(--) method.

* TO make Jsp program as thread safe program use <%@ page isThreadSafe = "false" %> tag in Jsp program. The default value of isThreadSafe attribute is "true".

File downloading

1. Making the output of web resource program as downloadable file (approach 1)

2. Making the resource (file) of server machine file system as downloadable file (approach 2)

* In approach1 web resource program will not be downloaded. The output of the web resource program as downloadable file through browser window. place the following the two lines of code in servlet/jsp program to make its response as downloadable file according to approach (1).

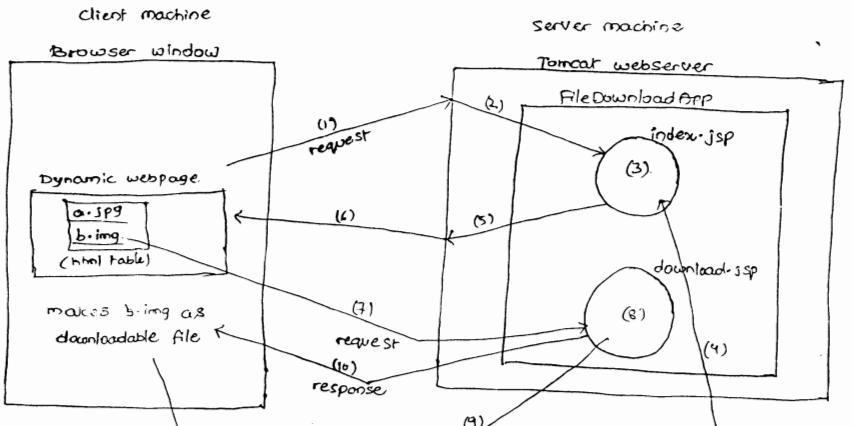
```
response.addHeader("Content-Disposition", "attachment;filename=abc.html");   *1
response.setContentType("text/html")
```

MIME type

filename that holds response of current web resource program.

*1 → special response header to guide webserver towards sending the response of the web resource program to client.

approach (2) based file downloading application

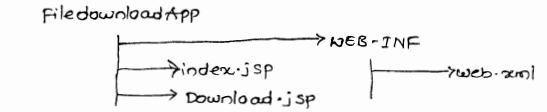


* The above application makes all the files of c:/store folder as downloadable files. Here index.jsp responsibility is to render all the files of c:/store folder as hyperlinks to client and download.jsp responsibility is to download specific file of c:/store folder to client machine file system.

* java.io.File class object can represent a file or directory of file system.

* The listFiles() method of java.io.File class gives all the files and sub directories of crertain folder in the form of java.io.File class object array. [File[]]

Deployement directory structure



Request URL to test the application

http://localhost:2020/FileDownloadApp/index.jsp

Source code

index.jsp

```
<%@ page import="java.io.File,java.util.*"%>
<H1> List of All files under c:\store </H1>
<%
    //locate folder on server machine file system
     File dir = new File ("c:\\store");
     File[] lf = dir.listFiles(); //gives all files and subdirectories of c:\store
     //add all the file names of c:\store to al obj (ArrayList obj)
     ArrayList al = new ArrayList();
```

```
//logic to display the file names of c:\\store folder as downloadable
                                                    files (hyperlinks based)
if (al.size()!=0)
{
 %>
   <table border=1><tr><th><b>Filename</b></th></tr>
 <%
   String fname=null;
   for (int i=0; i<al.size(); i++)
    {
      fname=(String)al.get(i);
    %>
     <tr>
       <td><a href="Download.jsp?filename=<%=fname%>">
                          <%=fname%></a></td></tr>
   <%} //for
 }//if
 %>
</table>
```

web.xml

```
<web-app/>
```

Download.jsp

```
<%@page import="java.io.*"%>
<%
    //reading req param value (file name)
    String filename=request.getParameter("filename");
    //locate the file to be downloaded
    File f=new File("c:\\store\\"+filename);
    //get ServletOutputStream object
    ServletOutputStream op=response.getOutputStream();
    //get mime type of the file to be downloaded
```

```
//set response content length
response.setContentLength((int)f.length());
//work with special header to make file as downloadable file.
response.setHeader("Content-Disposition", "attachement; filename=" +
                                                    fileName);
//Stream and buffer based logic to download the file
byte[] buf = new byte[1024];
int length=0;
DataInputStream dis=new DataInputStream(new FileInputStream(f));
while((dis!=null) && (length=dis.read(buf))!=-1)
 {
   op.write(buf,0,length);
 }//while
dis.close();
op.flush();
op.close();
%>
```

Security in servlets :

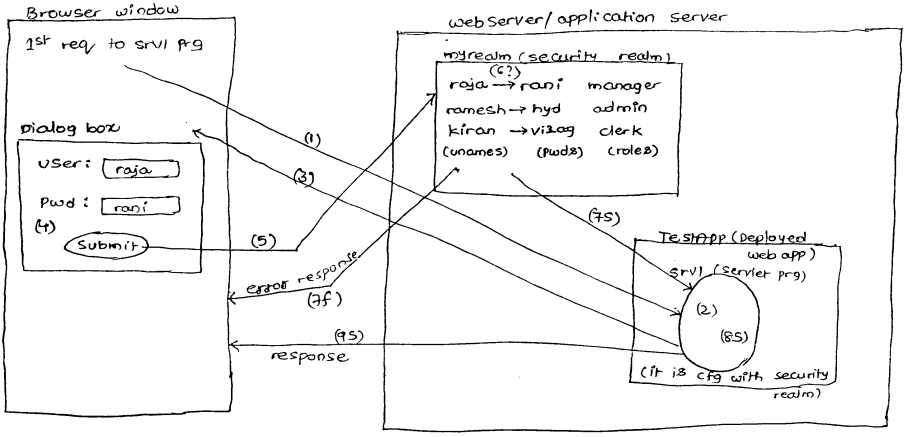
* Security = Authentication + Authorization
* Security means authentication + authorization.
* checking the identity of a user is called as authentication.
* checking the access permissions of a user to use certain resources of the application is called as authorization.

Ex : Every employee must be authenticated to use banking project. But only cashier is authorized to use cash module. Adminstrator is authorized to use every module.

* Programmers are not responsible to perform network security. These operations will be taken care by network adminstrator through firewalls.

service.

* In server managed security the logical context where users, passwords and roles are defined is called as security realm and every server comes with one default security realm called myrealm.
* In tomcat server this default realm related configurations can be done in <tomcat_home>\conf\tomcat-users.xml file.



srv1 servlet program url pattern is /s1url

* A role defines access permissions (set of access permissions) instead of specifying access permission for each user seperately define a role specifying access permissions and assign that role to users.

with respect to diagram

(1) End user gives direct request to srv1 program

(2)(3)Since no user name and password is coming along with the request and since srv1 is configured with security realm the srv1 sends 401 response status code based response having one dialog box.

(4)(5)End user submits dialog box having user name and password to server

(8S)(8S) Srvl program executes and generated response goes to browser windaw.

* We can configure server managed security authentication on our webresource program in four modes.

(1) BASIC
(2) ~~DEST~~ DIGEST
(3) FORM
(4) CLIENT-CERT

BASIC → uses base 64 algorithm internally.

* does not encrypt given username and password.
* Generates built-in dialog box for end user to submit username and password.

DIGEST :

* uses MD5 hashing algorithm internally.
* It is stronger than base-64 algorithm.
* Remaining all are same as BASIC, but it encrypts given username and password.

FORM :

* same as BASIC but allows programmer to design his own form page, error page instead of ready made dialog box, ready made errors message.

CLIENT-CERT :

* works with digital certificates using some algorithms like RSA
* use https and SSL concepts to implement this.
* To configure security realm and authentication models in the webresource programs of java web application use various configurations in web.xml file.
* For example code on, BASIC, DIGEST, FORM based authentication refer supplymentary hand out given on 25-12-2011.

Procedure to create users and roles in default security realm (myrealm) of Tomcat server

* Uncomment existing roles and users
* This server managed security can be used as outer layer security for web application even though web application contains application level security. This is very useful in milatory based, NASA based, ISRO based webapplications.
* The client-cert authentication model sends digital certificates to browser window as the response of initial request and that digital certificate will be installed at client side with users permission. Now onwards browser window and server communicates with each other having encrypted data based that is generated the algorithm that is used to generate digital certificate. In this browser window (client) and server should communicate with each other by using HTTPS protocol (HTTP over SSL).
* In CLIENT-CERT authentication model server allows only those clients which send request having digital certificate.
* To make server sending digital certificate to browser as the response of initial request, the programmers must develop and configure digital certificate with server
* In java on built-in tool "keytool" is given to generate digital certificates using different algorithms.

Procedure to create digital certificate, to concate digital certificate with server and to work with CLIENT-CERT authentication model using HTTPS protocol

step(1): Generate digital certificate using "keytool" by specifying RSA algorithm

```
>keytool -genkey -alias tomcat1 -keyalg RSA
```

(tomcat1 ↓ any name (logical name of digital certificate))

```
Enter key store password: sathya1
Re-enter new password : sathya1
```

Step(3): Configure the above generated digital certificate with Tomcat Server by enabling HTTPS protocol.

Go to <Tomcat-home>\conf\server.xml file → un comment that <Connector> tag that points to SSL HTTP/1.1 protocol (line no. 66) → make sure that the <Connector> tag at line 66 (3rd <Connector> tag) is having following content

```
<Connector port="8443" protocol="HTTP/1.1" SSLEnabled="true"
    maxThreads="150" scheme="https" secure="true" clientAuth="false"
    sslProtocol="TLS" keystoreFile="c:\Documents and Settings\welcome\.keystore"
    keystorePass="satyal" />
```

keystoreFile: The above generated digital certificate file

keystorePass: The above choosen password

Step(4): Restart the server.

Step(5): Give request to tomcat server from browser window.

https://localhost:8443

https://localhost:8443/wa0ne/input.html

Protocol — 8443: protocol port no of Http with SSL environment

* For related information on SSL refer the SSL chapter of tomcat documentation

NOTE: Industry prefers working with either form based or CLIENT-CERT models for securing web applications.

When CLIENT-CERT is enabled we can even also enable Basic or DIGEST or FORM authentication models.