

# Course: Web Application Development

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## Lab 3 - Introduction to Servlet Programming

### Content:

- Introduction to Java Servlet Technology
- How to create a servlet on NetBeans IDE
- Practices and Exercises

Duration: 3 hours

### Part 1: Introduction to Servlet and Servlet Life Cycle.

- **What is Servlet?**
  - A *servlet* is a Java programming language class that is used to extend the capabilities of servers that host applications access via a request-response programming model.
  - Although servlets can respond to any type of request, they are commonly used to extend the applications hosted by web servers. For such applications, Java Servlet technology defines HTTP-specific servlet classes.
- **How Java support Servlet Programming**
  - The `javax.servlet` and `javax.servlet.http` packages provide interfaces and classes for writing servlets. All servlets must implement the Servlet interface, which defines servlet life-cycle methods.
  - The **HttpServlet** class provides methods, such as **doGet** and **doPost**, for handling HTTP-specific services.
  - When implementing a generic service, you can use or extend the **GenericServlet** class provided with the Java Servlet API.
- **Tomcat Servlet/JSP container**
  - **Tomcat** can act as a stand-alone Web server and also as a servlet/JSP engine for other Web servers. When you download the Tomcat server, you really get a number of packages. **Catalina** and **Jasper** are the names of the servlet and JSP containers.
  - Tomcat by itself is a web server. This means that you can use Tomcat to service HTTP requests for servlets, as well as static files (HTML, image files, and so on). In practice, however, since it is faster for non-servlet, non-JSP requests, Tomcat normally is used as a module with another more robust web

server, such as Apache web server or Microsoft Internet Information Server (IIS).

- Tomcat is not a J2EE application server. However, as J2EE app servers must themselves contain a servlet container to support the servlet/JSP APIs, J2EE app servers can embed Tomcat into their code to provide support for the Servlet and JSP APIs. One example of just such an application server is the popular open source JBoss J2EE app server (<http://www.jboss.org/>).

## - Servlet Life Cycle

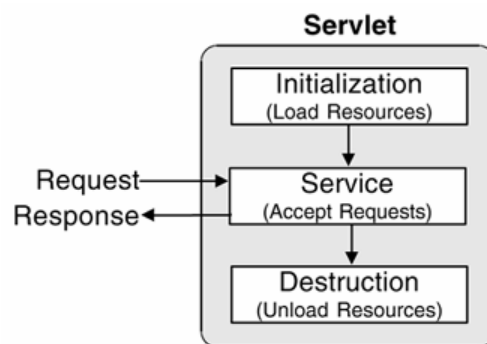
- The `javax.servlet.Servlet` interface defines the methods that all servlets must implement and, among others, three methods that are known as **life-cycle methods**:

```
public void init(ServletConfig config) throws ServletException
```

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

```
public void destroy()
```

- These life-cycle methods are each called at separate times during the life span of a servlet, from the initial creation to the moment it's removed from service and destroyed. These methods are called in the following order:



1. When the servlet is constructed, it is initialized with the `init()` method.

2. Any requests from clients are handled initially by the `service()` method before delegating to the `doXxx()` methods in the case of an `HttpServlet`. The `service()` method is responsible for processing the request and returning the response.

3. When the servlet needs to be removed from service, it's destroyed with the `destroy()` method, then garbage collected and finalized. When the container decides to take a servlet out of service, it first ensures that any `service()` method calls have been completed.

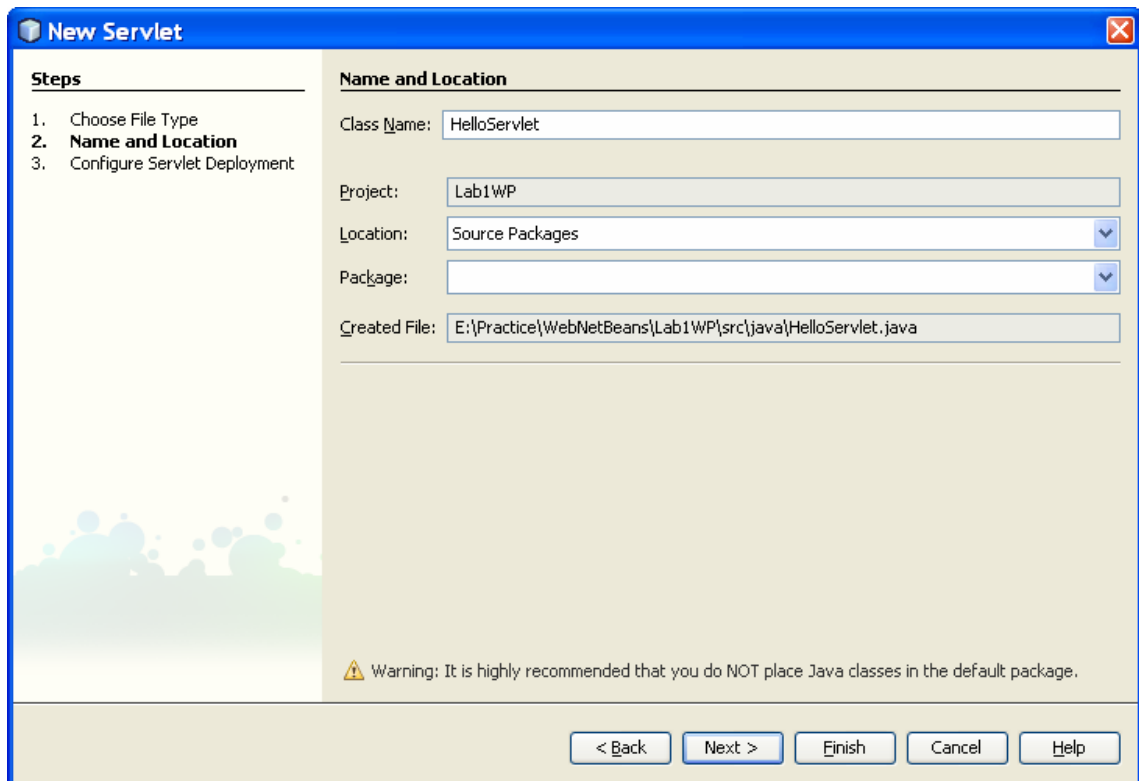
- The `init` method is called by the servlet container after the servlet class has been instantiated. The servlet container calls this method exactly once to indicate to the servlet that the servlet is being placed into service. The `init` method is important also because the servlet container passes a `ServletConfig` object, which contains the configuration values stated in the `web.xml` file for this application.

- The **service** method is called by the servlet container after the servlet's **init** method to allow the servlet to respond to a request. The servlet container passes a `ServletRequest` object and the `ServletResponse` object. The `ServletRequest` object contains the client's request and the `ServletResponse` contains the servlet's response.
- The servlet container calls the **destroy** method before removing a servlet instance from service. This normally happens when the servlet container is shut down or the servlet container needs some free memory.

(More information: refer from textbook: *Core Servlets and JavaServer Pages*)

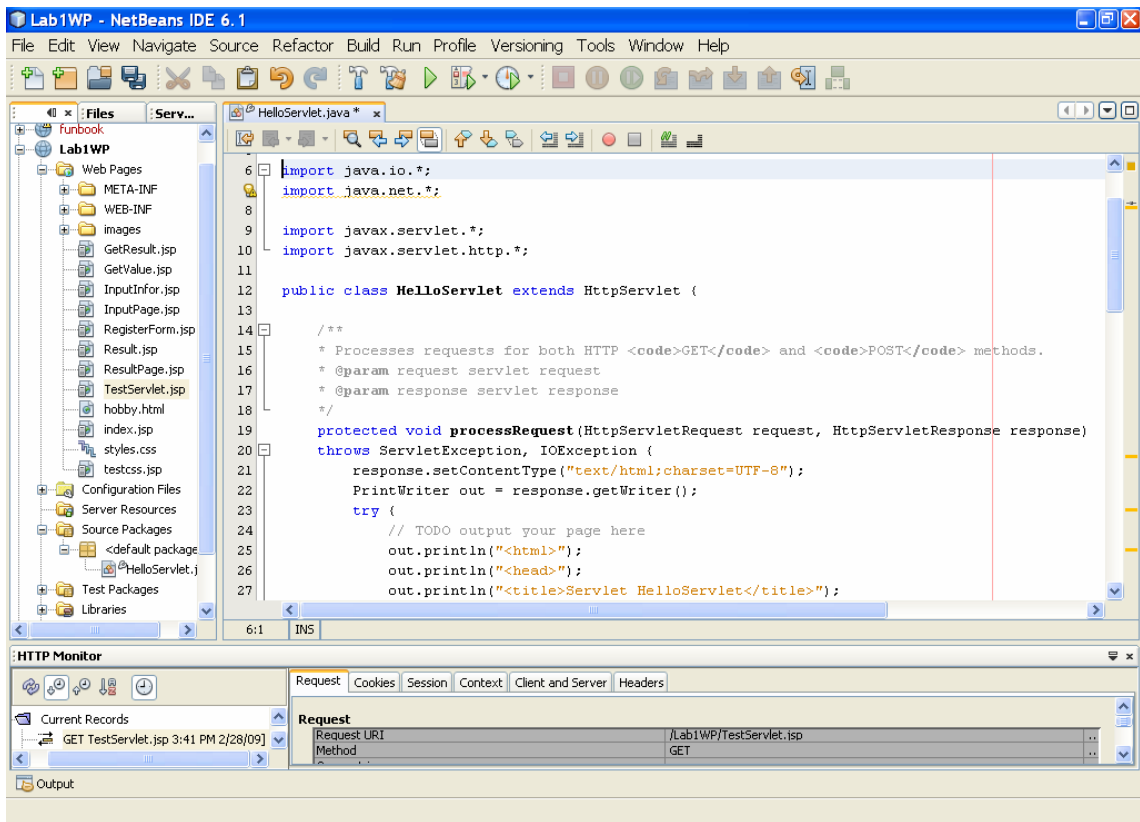
## Part 2: How to create a Servlet on NetBeans IDE.

After create a website (lab 1) on NetBeans IDE, right\_click to the name of website -> New -> Servlet...

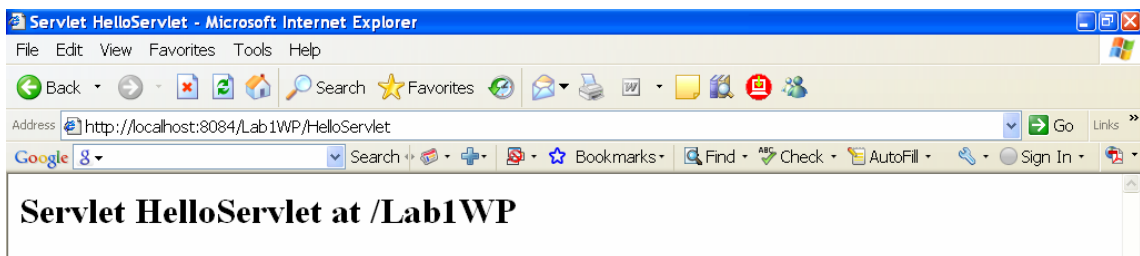


Type a name and click next, then click Finish button, the source codes generate automatically in the file `HelloServlet.java`.

This is source code:

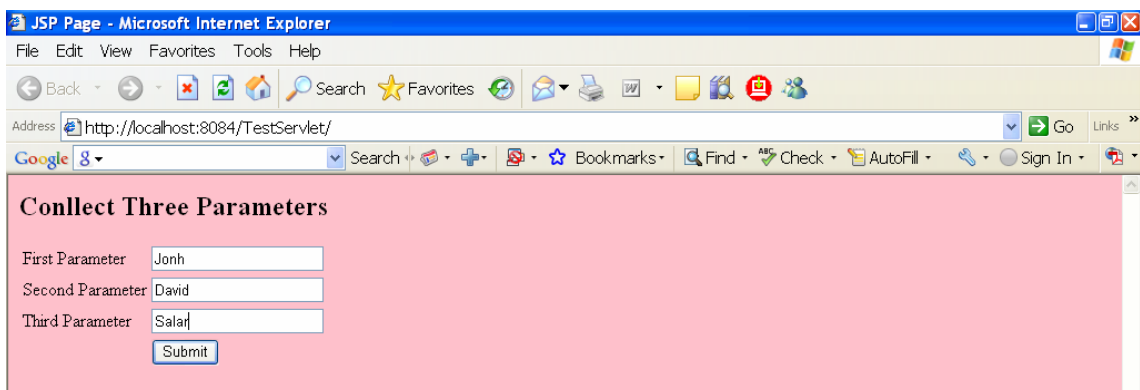


After building and running on the web server, this is the result page.

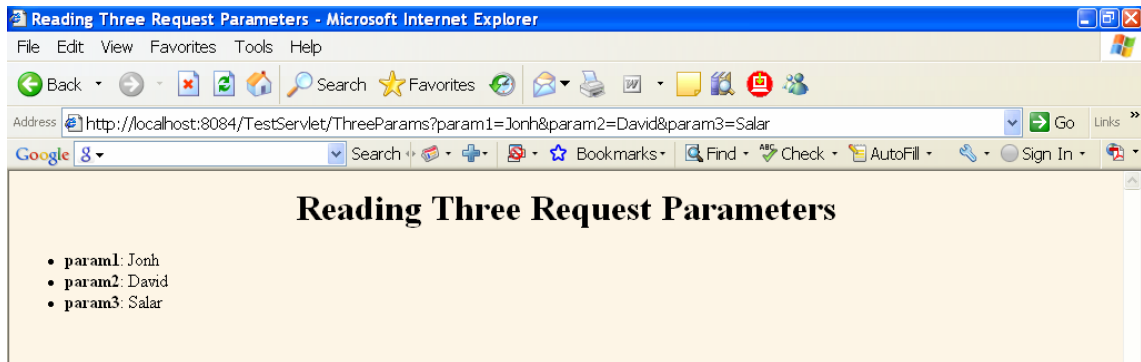


## Part 3: Practices and Exercises.

**Exercise1:** design a form (ThreeParams.JSP) as below:



After input three values in the textbox -> click Submit button, it call result page GetThreeParam.class (this file is built from GetThreeParam.java)



## Exercise 2: Design form Personal Information (PersonalInfor.jsp)

Personal Information

ID: IT090078

Name: Nguyen Thi Kieu Linh

Email: ntkl@yahoo.com.vn

Gender: ☐ Male ☒ Female

Major: Business Administration

Interesting Field: Reading books, Swimming, etc.

The result from GetInfor.java

Reading Personal Information

ID	IT090078
Name	Nguyen Thi Kieu Linh
Email	ntkl@yahoo.com.vn
Gerder	Female
Major	Business Administration
Interesting Field	Reading books, Swimming, etc.

### Exercise 3: Design a register form

The screenshot shows a web browser window titled 'JSP Page - Microsoft Internet Explorer'. The address bar shows 'http://localhost:8084/Lab1WP/RegisterForm.jsp'. The page has a pink background and a title 'School of Computer Science & Engineering'. Below the title is a 'Register Form' with the following fields:

- Full Name:
- ID:
- Email:
- Gender: ☒ Male ☐ Female
- Fiel of study:  (dropdown menu)
- List of subjects: ☐ Principle of EE 1, ☐ Computer Network, ☐ Web Application Development, ☐ Object Oriented Programming, ☐ Computer Graphics
- Comments:

At the bottom of the form are two buttons: 'Submit' and 'Reset'.

The result show parameter Servlet (RegisterCourse.java)

### Exercise 4: Refer example 5.1 ShowRequestHeaders.java from text-book

The screenshot shows a web browser window titled 'Servlet Example: Showing Request Headers - Microsoft Internet Explorer'. The address bar shows 'http://localhost:8084/TestServlet/RequestHeader?Submit=Submit'. The page has a light orange background and a title 'Servlet Example: Showing Request Headers'. Below the title, the following information is displayed:

Request Method: GET  
Request URL: /TestServlet/RequestHeader  
Request Protocol: HTTP/1.1

Header Name	Header Value
accept	image/gif, image/x-xbitmap, image/jpeg, image/pjpeg, application/x-shockwave-flash, application/vnd.ms-excel, application/vnd.ms-powerpoint, application/msword, application/x-silverlight, application/x-silverlight-2-b2, */*
referer	http://localhost:8084/TestServlet/RequestHeader.jsp
accept-language	en-us
accept-encoding	gzip, deflate
user-agent	Mozilla/4.0 (compatible; MSIE 6.0; Windows NT 5.1; SV1; GTB5; .NET CLR 1.1.4322; .NET CLR 2.0.50727)
host	localhost:8084
connection	Keep-Alive
cookie	JSESSIONID=16F575DDF1B318B9A0E7D52291160B00

**Exercise 5:** Design a register form with raw object (CSS will be applied next session)

The screenshot shows a Mozilla Firefox browser window with the address bar displaying `http://localhost:8080/TestServlet/application_Register.jsp`. The page title is "Application for Dormitory". The form is structured as follows:

Application ID	<input type="text"/>	Referee name	<input type="text"/>
App Name	<input type="text"/>		
Student Info	ID :	<input type="text"/>	<input type="button" value="Choose owner"/>
	Name :	<input type="text"/>	
Classification	<input type="text" value="Select Value"/>	Date Of Filling	<input type="text"/>
Notes	<div>{abstract}</div>		
Details	<input type="text"/>		<input type="button" value="Browse..."/>
List of Roommates	<div></div>		<input type="checkbox" value="Delete"/>
		<div><input type="button" value="More"/> <input type="button" value="Less"/></div>	
<div><input type="button" value="Register"/> <input type="button" value="Cancel"/> <input type="button" value="Back"/></div>			