

## Essentials of Information Technology

PC-CS-305

Steps to Create a Servlet  
&  
How Servlet Works

### Topic & Structure of the lesson



- In the module we will get to know
  - The steps to create a Servlet.
  - How Servlet works



## Steps to create a Servlet

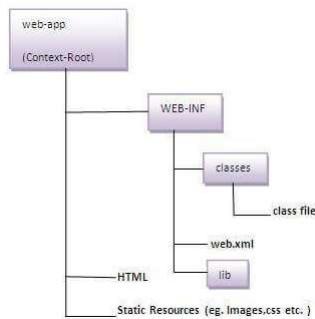
- Create a directory structure
- Create a Servlet
- Compile the Servlet
- Create a deployment descriptor
- Start the server and deploy the project
- Access the servlet

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## Step 1 : Create a Directory Structure

- The **directory structure** defines that where to put the different types of files so that web container may get the information and respond to the client.



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## Step 2 : Create a Servlet



- There are three ways to create the servlet.
  - By implementing the Servlet interface
  - By inheriting the GenericServlet class
  - By inheriting the HttpServlet class
- The HttpServlet class is widely used to create the servlet because it provides methods to handle http requests such as doGet(), doPost, doHead() etc.

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## Step 2 : Create a Servlet



```
import javax.servlet.http.*;
import javax.servlet.*;
import java.io.*;
public class DemoServlet extends HttpServlet{
    public void doGet(HttpServletRequest req,HttpServletResponse res)
        throws ServletException,IOException
    {
        res.setContentType("text/html");//setting the content type
        PrintWriter pw=res.getWriter();//get the stream to write the data

        //writing html in the stream
        pw.println("<html><body>");
        pw.println("Welcome to servlet");
        pw.println("</body></html>");

        pw.close();//closing the stream
    }
}
```

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### Step 3 : Compile the Servlet



- For compiling the Servlet, jar file is required to be loaded. Different servers provide different jar files:

Jar file	Server
servlet-api.jar	Apache Tomcat
weblogic.jar	WebLogic
javaee.jar	Glassfish
javaee.jar	JBoss

- Two ways to load the jar file
  - set classpath
  - paste the jar file in JRE/lib/ext folder

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### Step 3 : Compile the Servlet



- Put the java file in any folder. After compiling the java file, paste the class file of servlet in WEB-INF/classes directory.

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#### Step 4 : Create the deployment descriptor (web.xml file)



- The **deployment descriptor** is an xml file, from which Web Container gets the information about the servlet to be invoked.
- The web container uses the Parser to get the information from the web.xml file. There are many xml parsers such as SAX, DOM and Pull.
- There are many elements in the web.xml file. Here is given some necessary elements to run the simple servlet program.

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#### Step 4 : Create the deployment descriptor (web.xml file)



```
<web-app>
  <servlet>
    <servlet-name>firstservlet</servlet-name>
    <servlet-class>DemoServlet</servlet-class>
  </servlet>

  <servlet-mapping>
    <servlet-name>second servlet</servlet-name>
    <url-pattern>/welcome</url-pattern>
  </servlet-mapping>
</web-app>
```

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## Description of elements of web.xml file

- There are too many elements in the web.xml file. Here is the illustration of some elements that is used in the above web.xml file.

**<web-app>** represents the whole application.

**<servlet>** is sub element of <web-app> and represents the servlet.

**<servlet-name>** is sub element of <servlet> represents the name of the servlet.

**<servlet-class>** is sub element of <servlet> represents the class of the servlet.

**<servlet-mapping>** is sub element of <web-app>. It is used to map the servlet.

**<url-pattern>** is sub element of <servlet-mapping>. This pattern is used at client side to invoke the servlet.

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## Step 5 : Start the Server and deploy the project

- To start Apache Tomcat server, double click on the startup.bat file under apache-tomcat/bin directory.
- Copy the project and paste it in the webapps folder under apache tomcat.

This PC > Windows 7 (C:) > Program Files > Apache Software Foundation > Tomcat 9.0 > webapps >				
	Name	Date modified	Type	Size
ss	docs	19-10-2020 09:18	File folder	
ds	examples	19-10-2020 09:18	File folder	
ts	host-manager	19-10-2020 09:18	File folder	
ts	manager	19-10-2020 09:18	File folder	
	ROOT	19-10-2020 09:18	File folder	

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### Set classpath



- servlet-api.jar file to be put in classpath under Environment variables, in order to compile the servlets.
- servlet-api.jar can be found under C:\Program Files\Apache Software Foundation\Tomcat 9.0\lib;

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### Step 7 : Access the servlet



- Open browser and write
- <http://hostname:portno/contextroot/urlpatternofServlet>.
- Example
- <http://localhost:9999/demo/welcome>

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## How Servlet works



- It is important to learn how servlet works for understanding the servlet well.
- The web server checks if the servlet is requested for the first time.
- If yes, web container does the following tasks:
  - loads the servlet class.
  - instantiates the servlet class.
  - calls the init method passing the ServletConfig object
  - else
  - calls the service method passing request and response objects

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## How Servlet works



- The web container calls the destroy method when it needs to remove the servlet such as at time of stopping server or undeploying the project.

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## How web container handles the servlet request?



- The web container is responsible to handle the request. Let's see how it handles the request.
  - maps the request with the servlet in the web.xml file.
  - creates request and response objects for this request
  - calls the service method on the thread
  - The public service method internally calls the protected service method
  - The protected service method calls the doGet method depending on the type of request.

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## How web container handles the servlet request?



- The doGet method generates the response and it is passed to the client.
- After sending the response, the web container deletes the request and response objects. The thread is contained in the thread pool or deleted depends on the server implementation.

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## What is written inside the public service method?



- The public service method converts the ServletRequest object into the HttpServletRequest type and ServletResponse object into the HttpServletResponse type. Then, calls the service method passing these objects. Let's see the internal code:

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## What is written inside the public service method?



```
public void service(ServletRequest req, ServletResponse res)
    throws ServletException, IOException
{
    HttpServletRequest request;
    HttpServletResponse response;
    try
    {
        request = (HttpServletRequest)req;
        response = (HttpServletResponse)res;
    }
    catch(ClassCastException e)
    {
        throw new ServletException("non-HTTP request or response");
    }
    service(request, response);
}
```

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## What is written inside the protected service method?



- The protected service method checks the type of request, if request type is get, it calls doGet method, if request type is post, it calls doPost method, so on. Let's see the internal code:

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## What is written inside the protected service method?



```
protected void service(HttpServletRequest req, HttpServletResponse resp)
    throws ServletException, IOException
{
    String method = req.getMethod();
    if(method.equals("GET"))
    {
        long lastModified = getLastModified(req);
        if(lastModified == -1L)
        {
            doGet(req, resp);
        }
        ...
        //rest of the code
    }
}
```

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## Summary of Main Teaching Points



- In the module we understood
  - The steps to create a Servlet.
  - How Servlet works

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## References



- <https://www.javatpoint.com/steps-to-create-a-servlet-using-tomcat-server>

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## Question and Answer Session



# Q & A

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