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SERVLETS OVERVIEW

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What are Servlets?

Java Servlets are programs that run on a Web or Application server and act as a middle layer between a request coming from a Web browser or other HTTP client and databases or applications on the HTTP server.

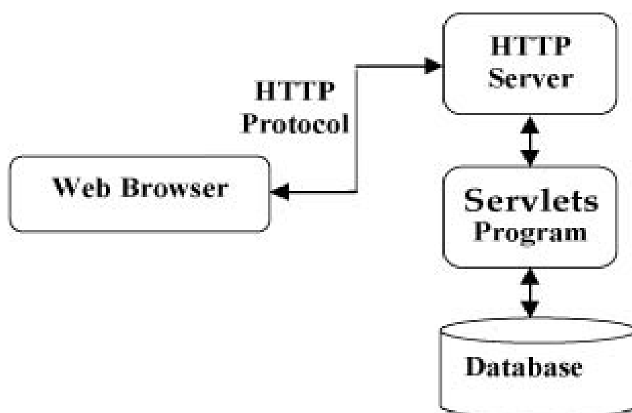
Using Servlets, you can collect input from users through web page forms, present records from a database or another source, and create web pages dynamically.

Java Servlets often serve the same purpose as programs implemented using the Common Gateway Interface (CGI). But Servlets offer several advantages in comparison with the CGI.

- Performance is significantly better.
- Servlets execute within the address space of a Web server. It is not necessary to create a separate process to handle each client request.
- Servlets are platform-independent because they are written in Java.
- Java security manager on the server enforces a set of restrictions to protect the resources on a server machine. So servlets are trusted.
- The full functionality of the Java class libraries is available to a servlet. It can communicate with applets, databases, or other software via the sockets and RMI mechanisms that you have seen already.

Servlets Architecture:

Following diagram shows the position of Servelts in a Web Application.



Servlets Tasks:

Servlets perform the following major tasks:

- Read the explicit data sent by the clients (browsers). This includes an HTML form on a Web page or it could also come from an applet or a custom HTTP client program.
- Read the implicit HTTP request data sent by the clients (browsers). This includes cookies, media types and compression schemes the browser understands, and so forth.
- Process the data and generate the results. This process may require talking to a database, executing an RMI or CORBA call, invoking a Web service, or computing the response directly.
- Send the explicit data (i.e., the document) to the clients (browsers). This document can be sent in a variety of formats, including text (HTML or XML), binary (GIF images), Excel, etc.

- Send the implicit HTTP response to the clients (browsers). This includes telling the browsers or other clients what type of document is being returned (e.g., HTML), setting cookies and caching parameters, and other such tasks.

Servlets Packages:

Java Servlets are Java classes run by a web server that has an interpreter that supports the Java Servlet specification.

Servlets can be created using the **javax.servlet** and **javax.servlet.http** packages, which are a standard part of the Java's enterprise edition, an expanded version of the Java class library that supports large-scale development projects.

These classes implement the Java Servlet and JSP specifications. At the time of writing this tutorial, the versions are Java Servlet 2.5 and JSP 2.1.

Java servlets have been created and compiled just like any other Java class. After you install the servlet packages and add them to your computer's Classpath, you can compile servlets with the JDK's Java compiler or any other current compiler.

What is Next?

I would take you step by step to set up your environment to start with Servlets. So fasten your belt for a nice drive with Servlets. I'm sure you are going to enjoy this tutorial very much.

SERVLETS - LIFE CYCLE

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A servlet life cycle can be defined as the entire process from its creation till the destruction. The following are the paths followed by a servlet

- The servlet is initialized by calling the **init ()** method.
- The servlet calls **service()** method to process a client's request.
- The servlet is terminated by calling the **destroy()** method.
- Finally, servlet is garbage collected by the garbage collector of the JVM.

Now let us discuss the life cycle methods in details.

The init() method :

The init method is designed to be called only once. It is called when the servlet is first created, and not called again for each user request. So, it is used for one-time initializations, just as with the init method of applets.

The servlet is normally created when a user first invokes a URL corresponding to the servlet, but you can also specify that the servlet be loaded when the server is first started.

When a user invokes a servlet, a single instance of each servlet gets created, with each user request resulting in a new thread that is handed off to doGet or doPost as appropriate. The init() method simply creates or loads some data that will be used throughout the life of the servlet.

The init method definition looks like this:

```
public void init() throws ServletException {
  // Initialization code...
}
```

The service() method :

The service() method is the main method to perform the actual task. The servlet container (i.e. web server) calls the service() method to handle requests coming from the client(browsers) and to write the formatted response back to the client.

Each time the server receives a request for a servlet, the server spawns a new thread and calls service. The service() method checks the HTTP request type (GET, POST, PUT, DELETE, etc.) and calls doGet, doPost, doPut, doDelete, etc. methods as appropriate.

Here is the signature of this method:

```
public void service(ServletRequest request,
                    ServletResponse response)
      throws ServletException, IOException{
}
```

The service () method is called by the container and service method invokes doGe, doPost, doPut, doDelete, etc. methods as appropriate. So you have nothing to do with service() method but you override either doGet() or doPost() depending on what type of request you receive from the client.

The doGet() and doPost() are most frequently used methods with in each service request. Here are the signature of these two methods.

The doGet() Method

A GET request results from a normal request for a URL or from an HTML form that has no METHOD specified and it should be handled by doGet() method.

```
public void doGet(HttpServletRequest request,
                  HttpServletResponse response)
    throws ServletException, IOException {
    // Servlet code
}
```

The doPost() Method

A POST request results from an HTML form that specifically lists POST as the METHOD and it should be handled by doPost() method.

```
public void doPost(HttpServletRequest request,
                   HttpServletResponse response)
    throws ServletException, IOException {
    // Servlet code
}
```

The destroy() method :

The destroy() method is called only once at the end of the life cycle of a servlet. This method gives your servlet a chance to close database connections, halt background threads, write cookie lists or hit counts to disk, and perform other such cleanup activities.

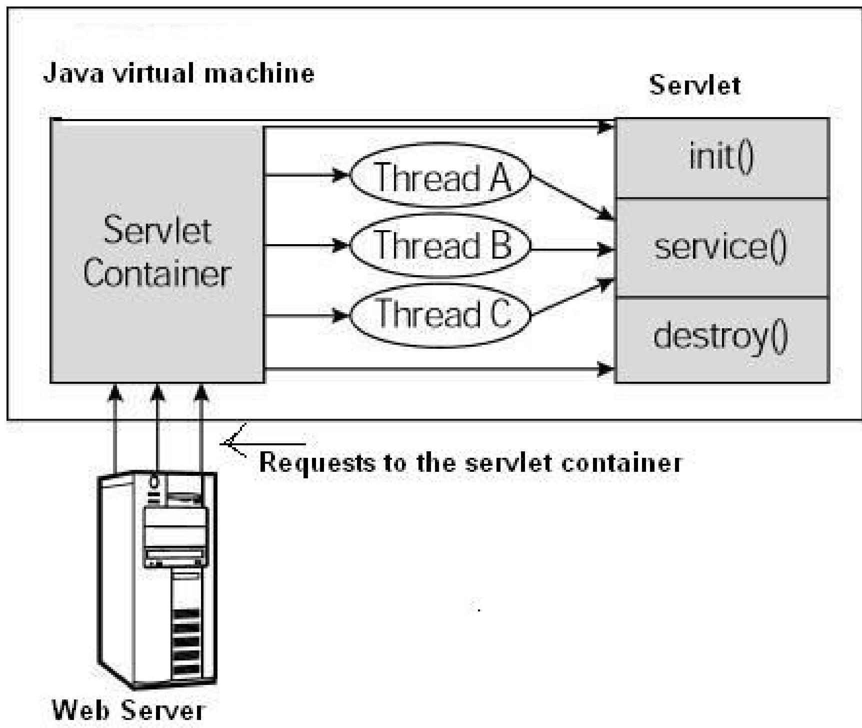
After the destroy() method is called, the servlet object is marked for garbage collection. The destroy method definition looks like this:

```
  public void destroy() {
    // Finalization code...
  }
```

Architecture Digram:

The following figure depicts a typical servlet life-cycle scenario.

- First the HTTP requests coming to the server are delegated to the servlet container.
- The servlet container loads the servlet before invoking the service() method.
- Then the servlet container handles multiple requests by spawning multiple threads, each thread executing the service() method of a single instance of the servlet.


Java virtual machine
Servlet
Servlet Container
Thread A
Thread B
Thread C
init()
service()
destroy()
Requests to the servlet container
Web Server

JSP - OVERVIEW

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What is JavaServer Pages?

JavaServer Pages (JSP) is a technology for developing web pages that support dynamic content which helps developers insert java code in HTML pages by making use of special JSP tags, most of which start with <% and end with %>.

A JavaServer Pages component is a type of Java servlet that is designed to fulfill the role of a user interface for a Java web application. Web developers write JSPs as text files that combine HTML or XHTML code, XML elements, and embedded JSP actions and commands.

Using JSP, you can collect input from users through web page forms, present records from a database or another source, and create web pages dynamically.

JSP tags can be used for a variety of purposes, such as retrieving information from a database or registering user preferences, accessing JavaBeans components, passing control between pages and sharing information between requests, pages etc.

Why Use JSP?

JavaServer Pages often serve the same purpose as programs implemented using the Common Gateway Interface (CGI). But JSP offer several advantages in comparison with the CGI.

- Performance is significantly better because JSP allows embedding Dynamic Elements in HTML Pages itself instead of having a separate CGI files.
- JSP are always compiled before it's processed by the server unlike CGI/Perl which requires the server to load an interpreter and the target script each time the page is requested.
- JavaServer Pages are built on top of the Java Servlets API, so like Servlets, JSP also has access to all the powerful Enterprise Java APIs, including JDBC, JNDI, EJB, JAXP etc.
- JSP pages can be used in combination with servlets that handle the business logic, the model supported by Java servlet template engines.

Finally, JSP is an integral part of J2EE, a complete platform for enterprise class applications. This means that JSP can play a part in the simplest applications to the most complex and demanding.

Advantages of JSP:

Following is the list of other advantages of using JSP over other technologies:

- **vs. Active Server Pages (ASP):** The advantages of JSP are twofold. First, the dynamic part is written in Java, not Visual Basic or other MS specific language, so it is more powerful and easier to use. Second, it is portable to other operating systems and non-Microsoft Web servers.
- **vs. Pure Servlets:** It is more convenient to write (and to modify!) regular HTML than to have plenty of println statements that generate the HTML.
- **vs. Server-Side Includes (SSI):** SSI is really only intended for simple inclusions, not for "real" programs that use form data, make database connections, and the like.
- **vs. JavaScript:** JavaScript can generate HTML dynamically on the client but can hardly interact with the web

server to perform complex tasks like database access and image processing etc.

- **vs. Static HTML:** Regular HTML, of course, cannot contain dynamic information.

What is Next?

I would take you step by step to set up your environment to start with JSP. I'm assuming you have good hands on with Java Programming to proceed with learning JSP.

If you are not aware of Java Programming Language then I would recommend to go through Java Tutorial to understand Java Programming.

JSP - ARCHITECTURE

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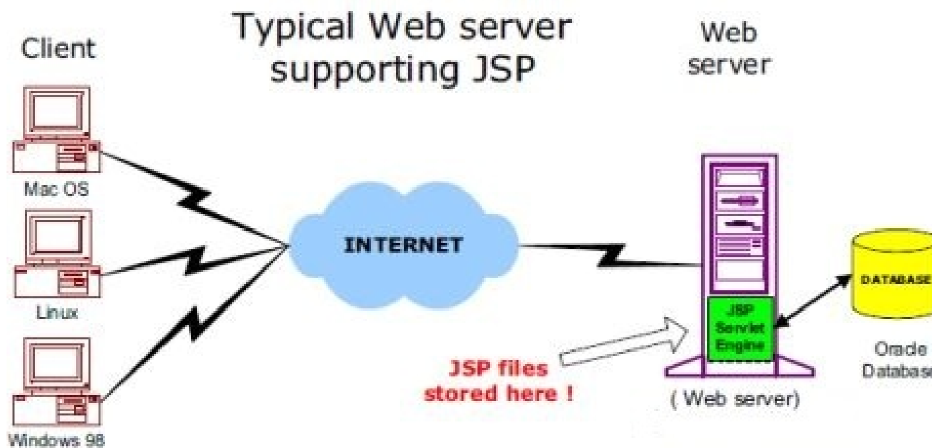
The web server needs a JSP engine ie. container to process JSP pages. The JSP container is responsible for intercepting requests for JSP pages. This tutorial makes use of Apache which has built-in JSP container to support JSP pages development.

A JSP container works with the Web server to provide the runtime environment and other services a JSP needs. It knows how to understand the special elements that are part of JSPs.

Following diagram shows the position of JSP container and JSP files in a Web Application.

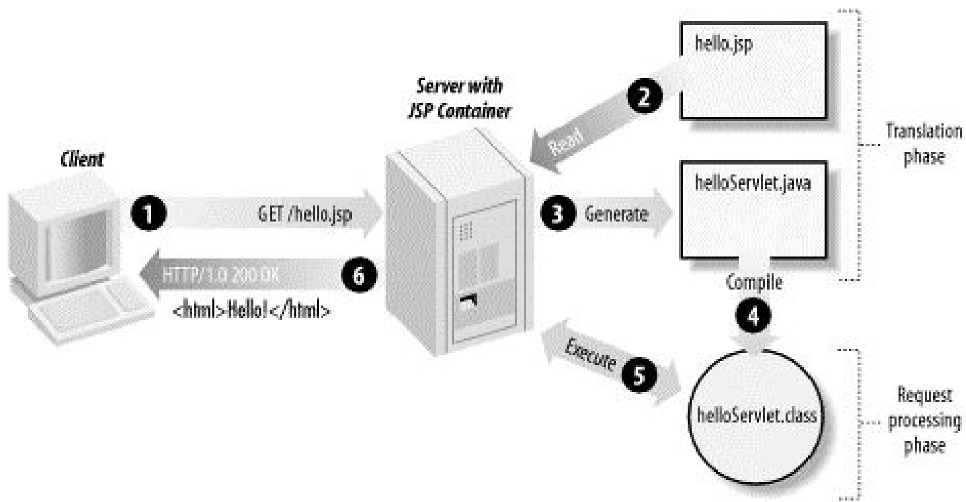


JSP Processing:

The following steps explain how the web server creates the web page using JSP:

- As with a normal page, your browser sends an HTTP request to the web server.
- The web server recognizes that the HTTP request is for a JSP page and forwards it to a JSP engine. This is done by using the URL or JSP page which ends with **.jsp** instead of .html.
- The JSP engine loads the JSP page from disk and converts it into a servlet content. This conversion is very simple in which all template text is converted to println( ) statements and all JSP elements are converted to Java code that implements the corresponding dynamic behavior of the page.
- The JSP engine compiles the servlet into an executable class and forwards the original request to a servlet engine.
- A part of the web server called the servlet engine loads the Servlet class and executes it. During execution, the servlet produces an output in HTML format, which the servlet engine passes to the web server inside an HTTP response.
- The web server forwards the HTTP response to your browser in terms of static HTML content.
- Finally web browser handles the dynamically generated HTML page inside the HTTP response exactly as if it were a static page.

All the above mentioned steps can be shown below in the following diagram:



Typically, the JSP engine checks to see whether a servlet for a JSP file already exists and whether the modification date on the JSP is older than the servlet. If the JSP is older than its generated servlet, the JSP container assumes that the JSP hasn't changed and that the generated servlet still matches the JSP's contents. This makes the process more efficient than with other scripting languages (such as PHP) and therefore faster.

So in a way, a JSP page is really just another way to write a servlet without having to be a Java programming wiz. Except for the translation phase, a JSP page is handled exactly like a regular servlet

JSP - LIFE CYCLE

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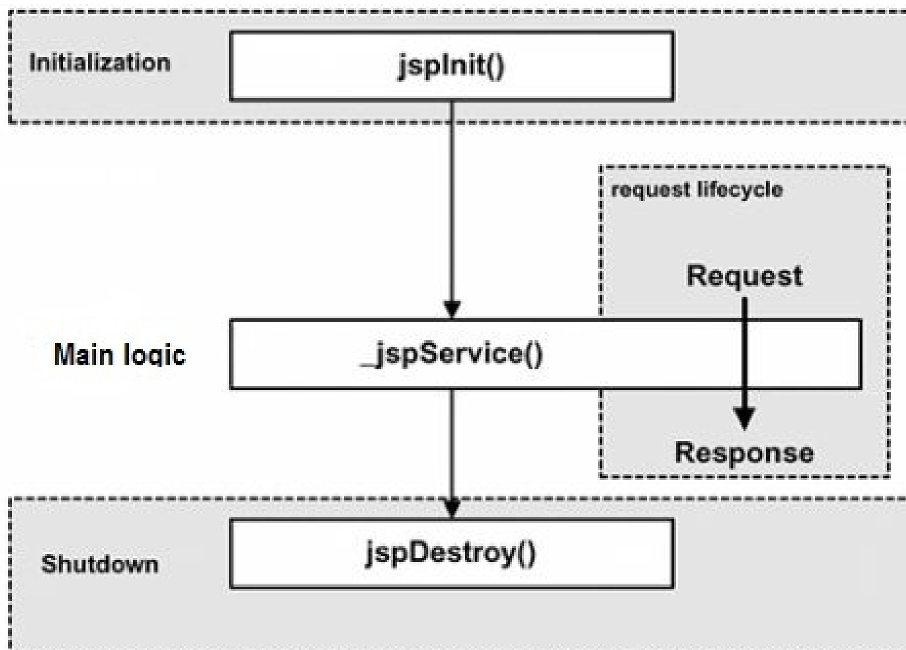
The key to understanding the low-level functionality of JSP is to understand the simple life cycle they follow.

A JSP life cycle can be defined as the entire process from its creation till the destruction which is similar to a servlet life cycle with an additional step which is required to compile a JSP into servlet.

The following are the paths followed by a JSP

- Compilation
- Initialization
- Execution
- Cleanup

The four major phases of JSP life cycle are very similar to Servlet Life Cycle and they are as follows:



JSP Compilation:

When a browser asks for a JSP, the JSP engine first checks to see whether it needs to compile the page. If the page has never been compiled, or if the JSP has been modified since it was last compiled, the JSP engine compiles the page.

The compilation process involves three steps:

- Parsing the JSP.
- Turning the JSP into a servlet.
- Compiling the servlet.

JSP Initialization:

When a container loads a JSP it invokes the jspInit() method before servicing any requests. If you need to perform JSP-specific initialization, override the jspInit() method:

```
public void jspInit(){
  // Initialization code...
}
```

Typically initialization is performed only once and as with the servlet init method, you generally initialize database connections, open files, and create lookup tables in the jspInit method.

JSP Execution:

This phase of the JSP life cycle represents all interactions with requests until the JSP is destroyed.

Whenever a browser requests a JSP and the page has been loaded and initialized, the JSP engine invokes the **_jspService()** method in the JSP.

The _jspService() method takes an **HttpServletRequest** and an **HttpServletResponse** as its parameters as follows:

```
void _jspService(HttpServletRequest request,
                 HttpServletResponse response)
{
   // Service handling code...
}
```

The _jspService() method of a JSP is invoked once per a request and is responsible for generating the response for that request and this method is also responsible for generating responses to all seven of the HTTP methods ie. GET, POST, DELETE etc.

JSP Cleanup:

The destruction phase of the JSP life cycle represents when a JSP is being removed from use by a container.

The **jspDestroy()** method is the JSP equivalent of the destroy method for servlets. Override jspDestroy when you need to perform any cleanup, such as releasing database connections or closing open files.

The jspDestroy() method has the following form:

```
public void jspDestroy()
{
   // Your cleanup code goes here.
}
```

JSP - SYNTAX

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This tutorial will give basic idea on simple syntax (ie. elements) involved with JSP development:

The Scriptlet:

A scriptlet can contain any number of JAVA language statements, variable or method declarations, or expressions that are valid in the page scripting language.

Following is the syntax of Scriptlet:

```
<% code fragment %>
```

You can write XML equivalent of the above syntax as follows:

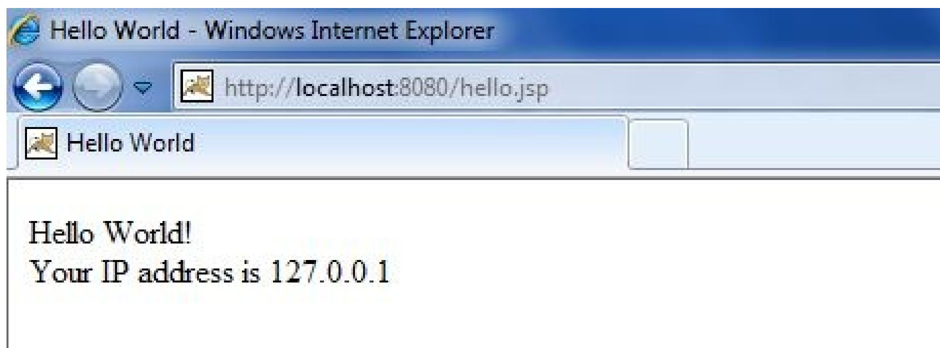
```
<jsp:scriptlet>
   code fragment
</jsp:scriptlet>
```

Any text, HTML tags, or JSP elements you write must be outside the scriptlet. Following is the simple and first example for JSP:

```
<html>
<head><title>Hello World</title></head>
<body>
Hello World!<br/>
<%
out.println("Your IP address is " + request.getRemoteAddr());
%>
</body>
</html>
```

NOTE: Assuming that Apache Tomcat is installed in C:\apache-tomcat-7.0.2 and your environment is setup as per environment setup tutorial.

Let us keep above code in JSP file hello.jsp and put this file in **C:\apache-tomcat-7.0.2\webapps\ROOT** directory and try to browse it by giving URL http://localhost:8080/hello.jsp. This would generate following result:



JSP Declarations:

A declaration declares one or more variables or methods that you can use in Java code later in the JSP file. You must declare the variable or method before you use it in the JSP file.

Following is the syntax of JSP Declarations:

```
<%! declaration; [ declaration; ]+ ... %>
```

You can write XML equivalent of the above syntax as follows:

```
<jsp:declaration>
   code fragment
</jsp:declaration>
```

Following is the simple example for JSP Comments:

```
<%! int i = 0; %>
<%! int a, b, c; %>
<%! Circle a = new Circle(2.0); %>
```

JSP Expression:

A JSP expression element contains a scripting language expression that is evaluated, converted to a String, and inserted where the expression appears in the JSP file.

Because the value of an expression is converted to a String, you can use an expression within a line of text, whether or not it is tagged with HTML, in a JSP file.

The expression element can contain any expression that is valid according to the Java Language Specification but you cannot use a semicolon to end an expression.

Following is the syntax of JSP Expression:

```
<%= expression %>
```

You can write XML equivalent of the above syntax as follows:

```
<jsp:expression>
   expression
</jsp:expression>
```

Following is the simple example for JSP Expression:

```
<html>
<head><title>A Comment Test</title></head>
<body>
<p>
   Today's date: <%= (new java.util.Date()).toLocaleString()%>
</p>
</body>
</html>
```

This would generate following result:

Today's date: 11-Sep-2010 21:24:25

JSP Comments:

JSP comment marks text or statements that the JSP container should ignore. A JSP comment is useful when you want to hide or "comment out" part of your JSP page.

Following is the syntax of JSP comments:

```
<%-- This is JSP comment --%>
```

Following is the simple example for JSP Comments:

```
<html>
<head><title>A Comment Test</title></head>
<body>
<h2>A Test of Comments</h2>
<%-- This comment will not be visible in the page source --%>
</body>
</html>
```

This would generate following result:

A Test of Comments

There are a small number of special constructs you can use in various cases to insert comments or characters that would otherwise be treated specially. Here's a summary:

Syntax	Purpose
<%-- comment --%>	A JSP comment. Ignored by the JSP engine.
<!-- comment -->	An HTML comment. Ignored by the browser.
<\%	Represents static <% literal.
%\>	Represents static %> literal.
\'	A single quote in an attribute that uses single quotes.
\"	A double quote in an attribute that uses double quotes.

JSP Directives:

A JSP directive affects the overall structure of the servlet class. It usually has the following form:

```
<%@ directive attribute="value" %>
```

There are three types of directive tag:

Directive	Description
<%@ page ... %>	Defines page-dependent attributes, such as scripting language, error page, and buffering requirements.
<%@ include ... %>	Includes a file during the translation phase.
<%@ taglib ... %>	Declares a tag library, containing custom actions, used in the page

We would explain JSP directive in separate chapter JSP - Directives

JSP Actions:

JSP actions use constructs in XML syntax to control the behavior of the servlet engine. You can dynamically insert a file, reuse JavaBeans components, forward the user to another page, or generate HTML for the Java plugin.

There is only one syntax for the Action element, as it conforms to the XML standard:

```
<jsp:action_name attribute="value" />
```

Action elements are basically predefined functions and there are following JSP actions available:

Syntax	Purpose
jsp:include	Includes a file at the time the page is requested
jsp:include	Includes a file at the time the page is requested
jsp:useBean	Finds or instantiates a JavaBean
jsp:setProperty	Sets the property of a JavaBean
jsp:getProperty	Inserts the property of a JavaBean into the output
jsp:forward	Forwards the requester to a new page
jsp:plugin	Generates browser-specific code that makes an OBJECT or EMBED tag for the Java plugin
jsp:element	Defines XML elements dynamically.
jsp:attribute	Defines dynamically defined XML element's attribute.
jsp:body	Defines dynamically defined XML element's body.
jsp:text	Use to write template text in JSP pages and documents.

We would explain JSP actions in separate chapter JSP - Actions

JSP Implicit Objects:

JSP supports nine automatically defined variables, which are also called implicit objects. These variables are:

Objects	Description
request	This is the **HttpServletRequest** object associated with the request.
response	This is the **HttpServletResponse** object associated with the response to the client.
out	This is the **PrintWriter** object used to send output to the client.

session	This is the **HttpSession** object associated with the request.
application	This is the **ServletContext** object associated with application context.
config	This is the **ServletConfig** object associated with the page.
pageContext	This encapsulates use of server-specific features like higher performance **JspWriters**.
page	This is simply a synonym for **this**, and is used to call the methods defined by the translated servlet class.
Exception	The **Exception** object allows the exception data to be accessed by designated JSP.

We would explain JSP Implicit Objects in separate chapter JSP - Implicit Objects.

Control-Flow Statements:

JSP provides full power of Java to be embeded in your web application. You can use all the APIs and building blocks of Java in your JSP programming including decision making statements, loops etc.

Decision-Making Statements:

The **if...else** block starts out like an ordinary Scriptlet, but the Scriptlet is closed at each line with HTML text included between Scriptlet tags.

```
<%! int day = 3; %>
<html>
<head><title>IF...ELSE Example</title></head>
<body>
<% if (day == 1 | day == 7) { %>
      <p> Today is weekend</p>
<% } else { %>
      <p> Today is not weekend</p>
<% } %>
</body>
</html>
```

This would produce following result:

Today is not weekend

Now look at the following **switch...case** block which has been written a bit differentlty using **out.println()** and inside Scriptletas:

```
<%! int day = 3; %>
<html>
<head><title>SWITCH...CASE Example</title></head>
<body>
<%
switch(day) {
case 0:
   out.println("It\'s Sunday.");
   break;
```

```
case 1:
   out.println("It\'s Monday.");
   break;
case 2:
   out.println("It\'s Tuesday.");
   break;
case 3:
   out.println("It\'s Wednesday.");
   break;
case 4:
   out.println("It\'s Thursday.");
   break;
case 5:
   out.println("It\'s Friday.");
   break;
default:
   out.println("It's Saturday.");
}
%>
</body>
</html>
```

This would produce following result:

It's Wednesday.

Loop Statements:

You can also use three basic types of looping blocks in Java: **for, while,and do…while** blocks in your JSP programming.

Let us look at the following **for** loop example:

```
<%! int fontSize; %>
<html>
<head><title>FOR LOOP Example</title></head>
<body>
<%for ( fontSize = 1; fontSize <= 3; fontSize++){ %>
   <font color="green" size="<%= fontSize %>">
    JSP Tutorial
   </font><br />
<%}%>
</body>
</html>
```

This would produce following result:

JSP Tutorial
JSP Tutorial
JSP Tutorial

Above example can be written using **while** loop as follows:

```
<%! int fontSize; %>
<html>
<head><title>WHILE LOOP Example</title></head>
<body>
<%while ( fontSize <= 3){ %>
```

```
    <font color="green" size="<%= fontSize %>">
     JSP Tutorial
    </font><br />
<%fontSize++;%>
<%}%>
</body>
</html>
```

This would also produce following result:

JSP Tutorial
JSP Tutorial
JSP Tutorial

JSP Operators:

JSP supports all the logical and arithmatic operators supported by Java. Following table give a list of all the operators with the highest precedence appear at the top of the table, those with the lowest appear at the bottom.

Within an expression, higher precedenace operators will be evaluated first.

Category	Operator	Associativity
Postfix	() [] . (dot operator)	Left to right
Unary	++ - - ! ~	Right to left
Multiplicative	* / %	Left to right
Additive	+ -	Left to right
Shift	>> >>> <<	Left to right
Relational	> >= < <=	Left to right
Equality	== !=	Left to right
Bitwise AND	&	Left to right
Bitwise XOR	^	Left to right
Bitwise OR	|	Left to right
Logical AND	&&	Left to right
Logical OR	||	Left to right
Conditional	?:	Right to left
Assignment	= += -= *= /= %= >>= <<= &= ^= |=	Right to left
Comma	,	Left to right

JSP Literals:

The JSP expression language defines the following literals:

- **Boolean:** true and false
- **Integer:** as in Java
- **Floating point:** as in Java
- **String:** with single and double quotes; " is escaped as \", ' is escaped as \', and \ is escaped as \\.
- **Null:** null

JSP - FORM PROCESSING

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You must have come across many situations when you need to pass some information from your browser to web server and ultimately to your backend program. The browser uses two methods to pass this information to web server. These methods are GET Method and POST Method.

GET method:

The GET method sends the encoded user information appended to the page request. The page and the encoded information are separated by the ? character as follows:

```
http://www.test.com/hello?key1=value1&key2=value2
```

The GET method is the defualt method to pass information from browser to web server and it produces a long string that appears in your browser's Location:box. Never use the GET method if you have password or other sensitive information to pass to the server.

The GET method has size limtation: only 1024 characters can be in a request string.

This information is passed using QUERY_STRING header and will be accessible through QUERY_STRING environment variable which can be handled using getQueryString() and getParameter() methods of request object.

POST method:

A generally more reliable method of passing information to a backend program is the POST method.

This method packages the information in exactly the same way as GET methods, but instead of sending it as a text string after a ? in the URL it sends it as a separate message. This message comes to the backend program in the form of the standard input which you can parse and use for your processing.

JSP handles this type of requests using getParameter() method to read simple parameters and getInputStream() method to read binary data stream coming from the client.

Reading Form Data using JSP

JSP handles form data parsing automatically using the following methods depending on the situation:

- **getParameter():** You call request.getParameter() method to get the value of a form parameter.
- **getParameterValues():** Call this method if the parameter appears more than once and returns multiple values, for example checkbox.
- **getParameterNames():** Call this method if you want a complete list of all parameters in the current request.
- **getInputStream():** Call this method to read binary data stream coming from the client.

GET Method Example Using URL:

Here is a simple URL which will pass two values to HelloForm program using GET method.

http://localhost:8080/main.jsp?first_name=ZARA&last_name=ALI

Below is **main.jsp** JSP program to handle input given by web browser. We are going to use **getParameter()** method

which makes it very easy to access passed information:

```
<html>
<head>
<title>Using GET Method to Read Form Data</title>
</head>
<body>
<center>
<h1>Using GET Method to Read Form Data</h1>
<ul>
<li><p><b>First Name:</b>
   <%= request.getParameter("first_name")%>
</p></li>
<li><p><b>Last  Name:</b>
   <%= request.getParameter("last_name")%>
</p></li>
</ul>
</body>
</html>
```

Now type *http://localhost:8080/main.jsp?first_name=ZARA&last_name=ALI* in your browser's Location:box. This would generate following result:

USING GET METHOD TO READ FORM DATA

- **First Name**: ZARA
- **Last Name**: ALI

GET Method Example Using Form:

Here is a simple example which passes two values using HTML FORM and submit button. We are going to use same JSP main.jsp to handle this imput.

```
<html>
<body>
<form action="main.jsp" method="GET">
First Name: <input type="text" name="first_name">
<br />
Last Name: <input type="text" name="last_name" />
<input type="submit" value="Submit" />
</form>
</body>
</html>
```

Keep this HTML in a file Hello.htm and put it in <Tomcat-installation-directory>/webapps/ROOT directory. When you would access *http://localhost:8080/Hello.htm*, here is the actual output of the above form.

First Name:

Last Name:

Try to enter First Name and Last Name and then click submit button to see the result on your local machine where tomcat is running. Based on the input provided, it will generate similar result as mentioned in the above example.

POST Method Example Using Form:

Let us do little modification in the above JSP to handle GET as well as POST methods. Below is **main.jsp** JSP program to handle input given by web browser using GET or POST methods.

Infact there is no change in above JSP because only way of passing parameters is changed and no binary data is being passed to the JSP program. File handling related concepts would be explained in separate chapter where we need to read binary data stream.

```
<html>
<head>
<title>Using GET and POST Method to Read Form Data</title>
</head>
<body>
<center>
<h1>Using GET Method to Read Form Data</h1>
<ul>
<li><p><b>First Name:</b>
   <%= request.getParameter("first_name")%>
</p></li>
<li><p><b>Last  Name:</b>
   <%= request.getParameter("last_name")%>
</p></li>
</ul>
</body>
</html>
```

Following is the content of Hello.htm file:

```
<html>
<body>
<form action="main.jsp" method="POST">
First Name: <input type="text" name="first_name">
<br />
Last Name: <input type="text" name="last_name" />
<input type="submit" value="Submit" />
</form>
</body>
</html>
```

Now let us keep main.jsp and hello.htm in <Tomcat-installation-directory>/webapps/ROOT directory. When you would access *http://localhost:8080/Hello.htm*, below is the actual output of the above form.

First Name:

Last Name:

Try to enter First and Last Name and then click submit button to see the result on your local machine where tomcat is running.

Based on the input provided, it would generate similar result as mentioned in the above examples.

Passing Checkbox Data to JSP Program

Checkboxes are used when more than one option is required to be selected.

Here is example HTML code, CheckBox.htm, for a form with two checkboxes

```
<html>
<body>
<form action="main.jsp" method="POST" target="_blank">
<input type="checkbox" name="maths" checked="checked" /> Maths
<input type="checkbox" name="physics"  /> Physics
<input type="checkbox" name="chemistry" checked="checked" />
                                                 Chemistry
```

```
<input type="submit" value="Select Subject" />
</form>
</body>
</html>
```

The result of this code is the following form

Maths Physics Chemistry

Below is main.jsp JSP program to handle input given by web browser for checkbox button.

```
<html>
<head>
<title>Reading Checkbox Data</title>
</head>
<body>
<center>
<h1>Reading Checkbox Data</h1>
<ul>
<li><p><b>Maths Flag:</b>
   <%= request.getParameter("maths")%>
</p></li>
<li><p><b>Physics Flag:</b>
   <%= request.getParameter("physics")%>
</p></li>
<li><p><b>Chemistry Flag:</b>
   <%= request.getParameter("chemistry")%>
</p></li>
</ul>
</body>
</html>
```

For the above example, it would display following result:

READING CHECKBOX DATA

- **Maths Flag :** : on
- **Physics Flag:** : null
- **Chemistry Flag:** : on

Reading All Form Parameters:

Following is the generic example which uses **getParameterNames()** method of HttpServletRequest to read all the available form parameters. This method returns an Enumeration that contains the parameter names in an unspecified order.

Once we have an Enumeration, we can loop down the Enumeration in the standard manner, using *hasMoreElements()* method to determine when to stop and using *nextElement()* method to get each parameter name.

```
<%@ page import="java.io.*,java.util.*" %>
<html>
<head>
<title>HTTP Header Request Example</title>
</head>
<body>
<center>
<h2>HTTP Header Request Example</h2>
```

```
<table width="100%" border="1" align="center">
<tr bgcolor="#949494">
<th>Param Name</th><th>Param Value(s)</th>
</tr>
<%
   Enumeration paramNames = request.getParameterNames();

   while(paramNames.hasMoreElements()) {
      String paramName = (String)paramNames.nextElement();
      out.print("<tr><td>" + paramName + "</td>\n");
      String paramValue = request.getHeader(paramName);
      out.println("<td> " + paramValue + "</td></tr>\n");
   }
%>
</table>
</center>
</body>
</html>
```

Following is the content of Hello.htm:

```
<html>
<body>
<form action="main.jsp" method="POST" target="_blank">
<input type="checkbox" name="maths" checked="checked" /> Maths
<input type="checkbox" name="physics"  /> Physics
<input type="checkbox" name="chemistry" checked="checked" /> Chem
<input type="submit" value="Select Subject" />
</form>
</body>
</html>
```

Now try calling JSP using above Hello.htm, this would generate a result something like as below based on the provided input:

READING ALL FORM PARAMETERS

Param Name	Param Value(s)
maths	on
chemistry	on

You can try above JSP to read any other form's data which is having other objects like text box, radio button or drop down box etc.

JSP - IMPLICIT OBJECTS

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JSP Implicit Objects are the Java objects that the JSP Container makes available to developers in each page and developer can call them directly without being explicitly declared. JSP Implicit Objects are also called pre-defined variables.

JSP supports nine Implicit Objects which are listed below:

Object	Description
request	This is the **HttpServletRequest** object associated with the request.
response	This is the **HttpServletResponse** object associated with the response to the client.
out	This is the **PrintWriter** object used to send output to the client.
session	This is the **HttpSession** object associated with the request.
application	This is the **ServletContext** object associated with application context.
config	This is the **ServletConfig** object associated with the page.
pageContext	This encapsulates use of server-specific features like higher performance **JspWriters**.
page	This is simply a synonym for **this**, and is used to call the methods defined by the translated servlet class.
Exception	The **Exception** object allows the exception data to be accessed by designated JSP.

The request Object:

The request object is an instance of a javax.servlet.http.HttpServletRequest object. Each time a client requests a page the JSP engine creates a new object to represent that request.

The request object provides methods to get HTTP header information including form data, cookies, HTTP methods etc.

We would see complete set of methods associated with request object in coming chapter: JSP - Client Request.

The response Object:

The response object is an instance of a javax.servlet.http.HttpServletResponse object. Just as the server creates the request object, it also creates an object to represent the response to the client.

The response object also defines the interfaces that deal with creating new HTTP headers. Through this object the JSP programmer can add new cookies or date stamps, HTTP status codes etc.

We would see complete set of methods associated with response object in coming chapter: JSP - Server Response.

The out Object:

The out implicit object is an instance of a javax.servlet.jsp.JspWriter object and is used to send content in a response.

The initial JspWriter object is instantiated differently depending on whether the page is buffered or not. Buffering can be easily turned off by using the buffered='false' attribute of the page directive.

The JspWriter object contains most of the same methods as the java.io.PrintWriter class. However, JspWriter has some additional methods designed to deal with buffering. Unlike the PrintWriter object, JspWriter throws IOExceptions.

Following are the important methods which we would use to write boolean char, int, double, object, String etc.

Method	Description
out.print(dataType dt)	Print a data type value
out.println(dataType dt)	Print a data type value then terminate the line with new line character.
out.flush()	Flush the stream.

The session Object:

The session object is an instance of javax.servlet.http.HttpSession and behaves exactly the same way that session objects behave under Java Servlets.

The session object is used to track client session between client requests. We would see complete usage of session object in coming chapter: JSP - Session Tracking.

The application Object:

The application object is direct wrapper around the ServletContext object for the generated Servlet and in reality an instance of a javax.servlet.ServletContext object.

This object is a representation of the JSP page through its entire lifecycle. This object is created when the JSP page is initialized and will be removed when the JSP page is removed by the jspDestroy() method.

By adding an attribute to application, you can ensure that all JSP files that make up your web application have access to it.

You can check a simple use of Application Object in chapter: JSP - Hits Counter

The config Object:

The config object is an instantiation of javax.servlet.ServletConfig and is a direct wrapper around the ServletConfig object for the generated servlet.

This object allows the JSP programmer access to the Servlet or JSP engine initialization parameters such as the paths or file locations etc.

The following config method is the only one you might ever use, and its usage is trivial:

```
config.getServletName();
```

This returns the servlet name, which is the string contained in the <servlet-name> element defined in the WEB-INF\web.xml file

The pageContext Object:

The pageContext object is an instance of a javax.servlet.jsp.PageContext object. The pageContext object is used to represent the entire JSP page.

This object is intended as a means to access information about the page while avoiding most of the implementation details.

This object stores references to the request and response objects for each request. The application, config, session, and out objects are derived by accessing attributes of this object.

The pageContext object also contains information about the directives issued to the JSP page, including the buffering information, the errorPageURL, and page scope.

The PageContext class defines several fields, including PAGE_SCOPE, REQUEST_SCOPE, SESSION_SCOPE, and APPLICATION_SCOPE, which identify the four scopes. It also supports more than 40 methods, about half of which are inherited from the javax.servlet.jsp. JspContext class.

One of the important methods is **removeAttribute**, which accepts either one or two arguments. For example, pageContext.removeAttribute ("attrName") removes the attribute from all scopes, while the following code only removes it from the page scope:

```
pageContext.removeAttribute("attrName", PAGE_SCOPE);
```

You can check a very good usage of pageContext in coming chapter: JSP - File Uploading.

The page Object:

This object is an actual reference to the instance of the page. It can be thought of as an object that represents the entire JSP page.

The page object is really a direct synonym for the **this** object.

The exception Object:

The exception object is a wrapper containing the exception thrown from the previous page. It is typically used to generate an appropriate response to the error condition.

We would see complete usage of this object in coming chapter: JSP - Exception Handling.