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A DEVELOPER CONFERENCE 2001•2002

Servlets and Java Server Pages (JSP)

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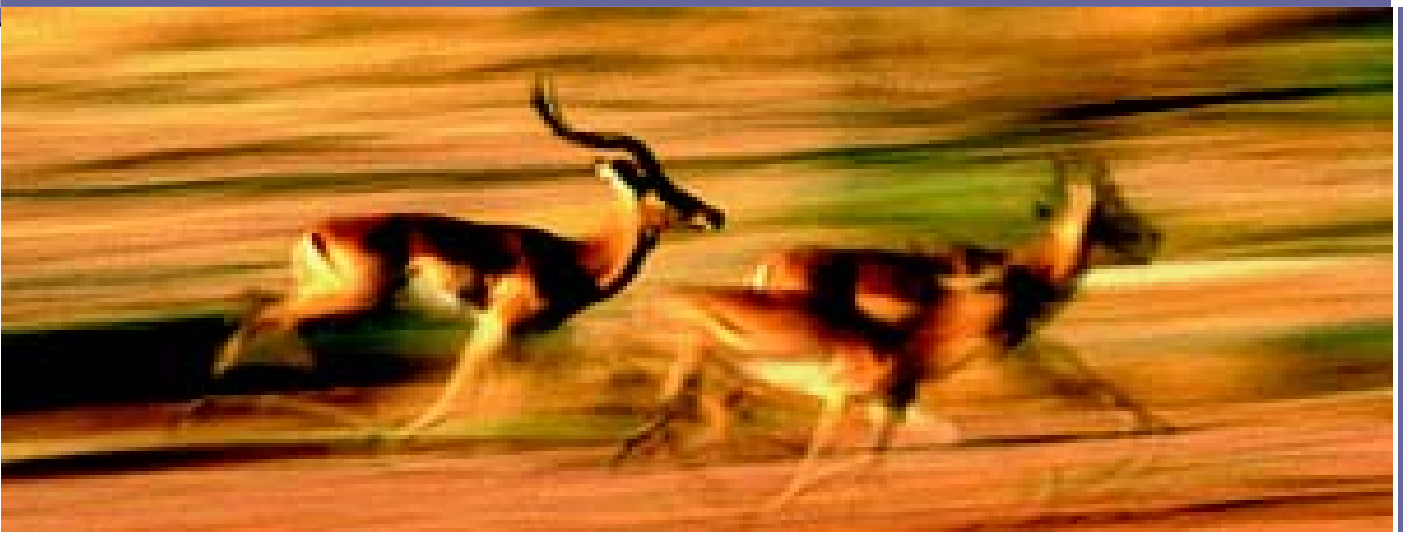
TAKE IT TO THE NTH



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Sun Microsystems

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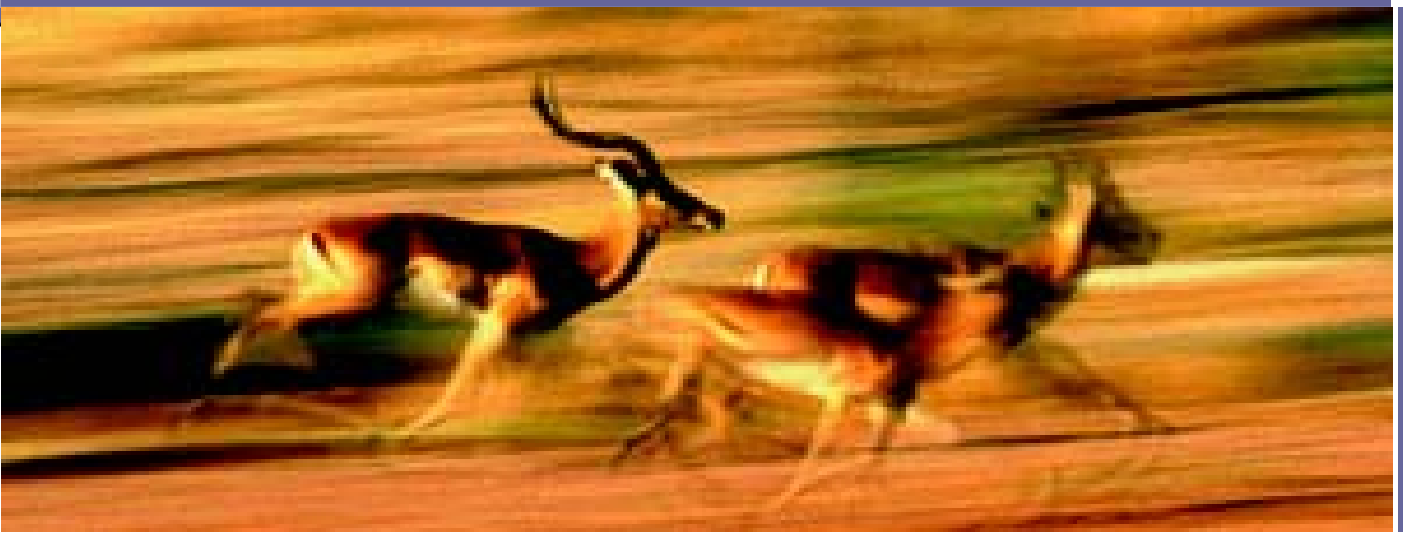
Agenda

What are Servlets?

What are JSPs?

Design issues

Resources and Summary



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What are Servlets?

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What Are Servlets?

Servlets are Java's answer to CGI/Perl...

Server side Java™ program

That respond to web server requests

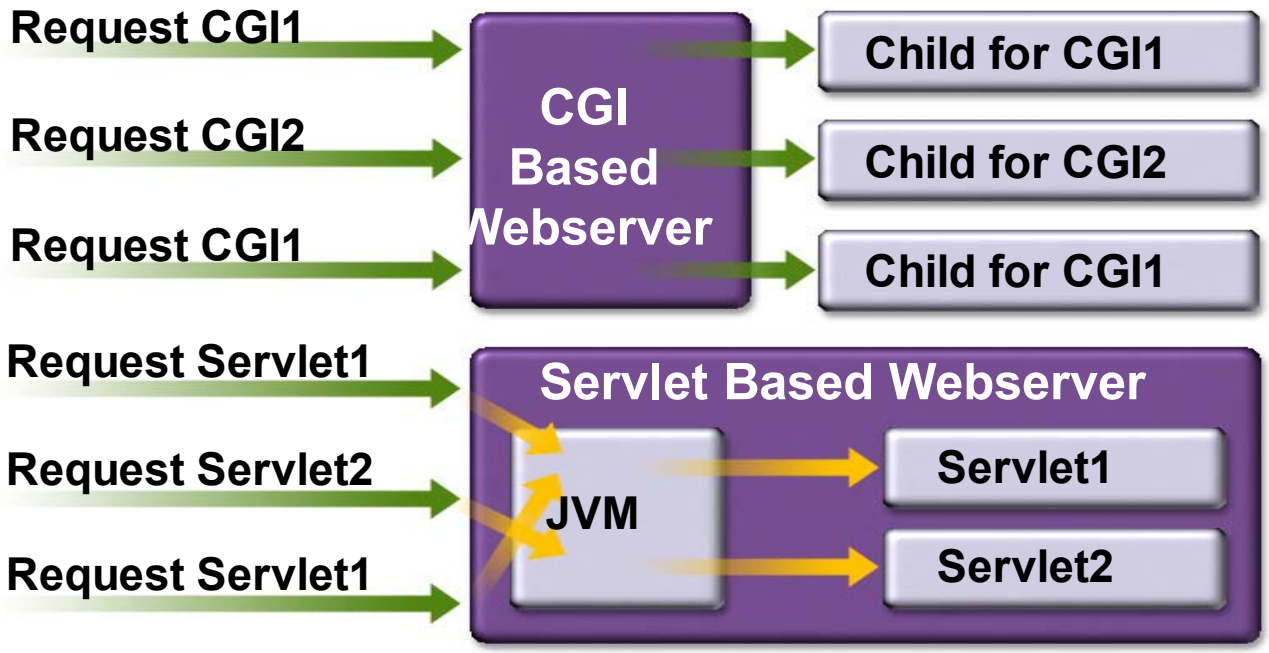
Used to **generate dynamic HTML**

Servlets vs. CGI

Scalable, uses Lightweight threads:

Doesn't start new process for each request, Initialized once and persists in memory for multiple requests, cached

Multi-threaded



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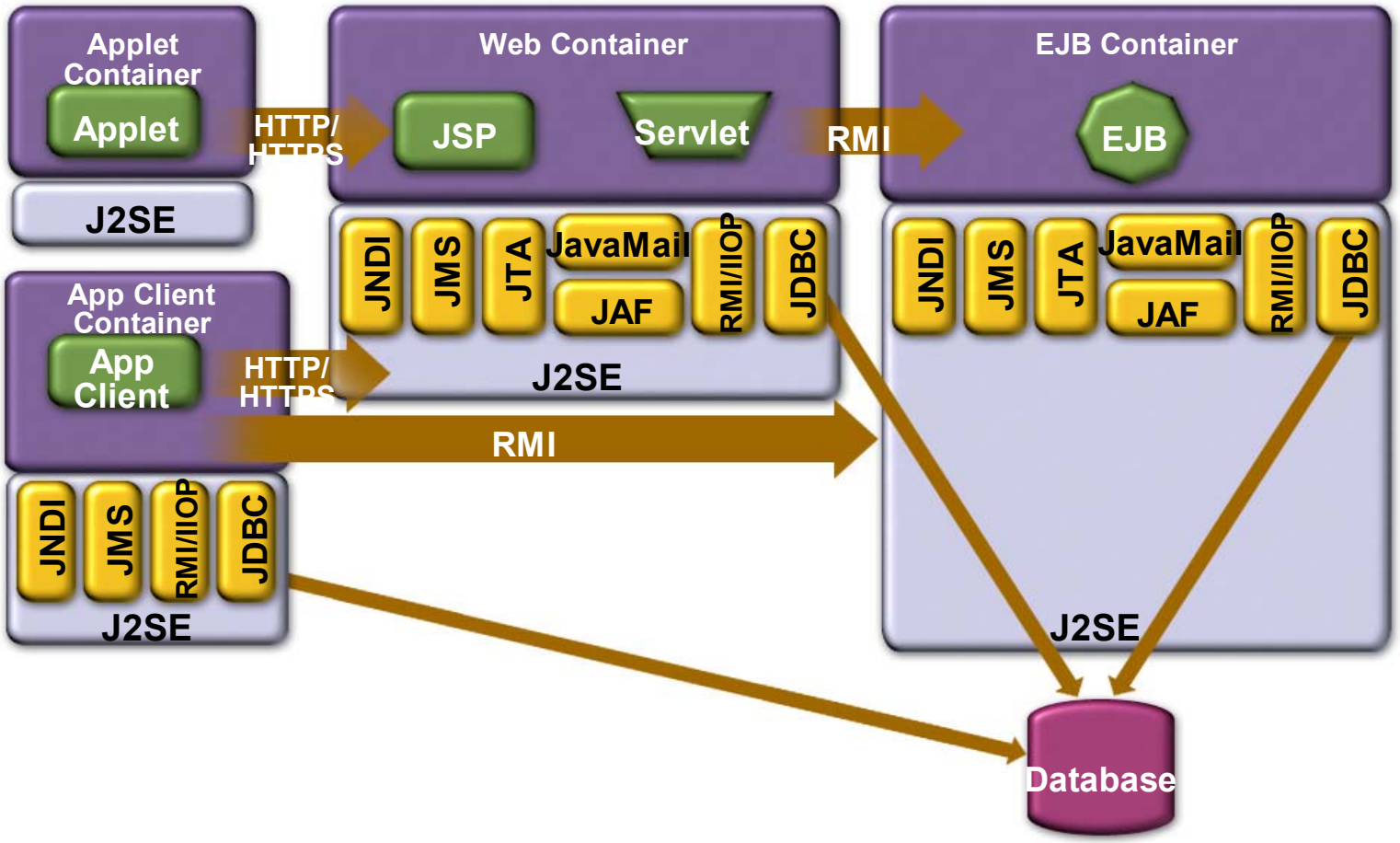
Why Servlets?

- Superior alternative to CGI:
  - **Multi-threaded, Cached, better security**
- Easy to program, Simple APIs for input arguments, cookies
- Written in Java
  - Can **take advantage of JDBC, EJB, JMS, JavaMail, JavaIDL, RMI, APIs...**

Servlet and JSP™ Run in Web Container



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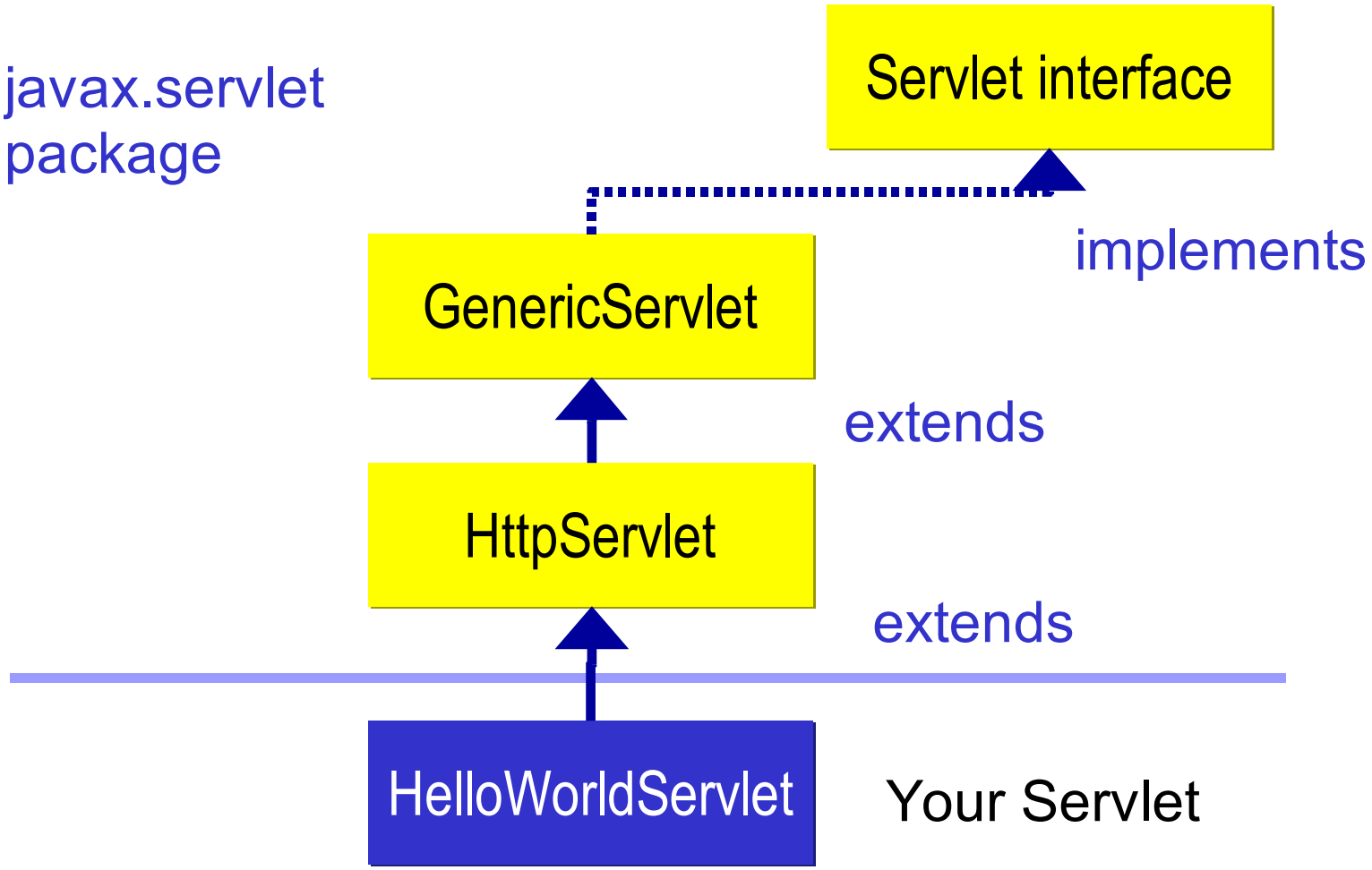
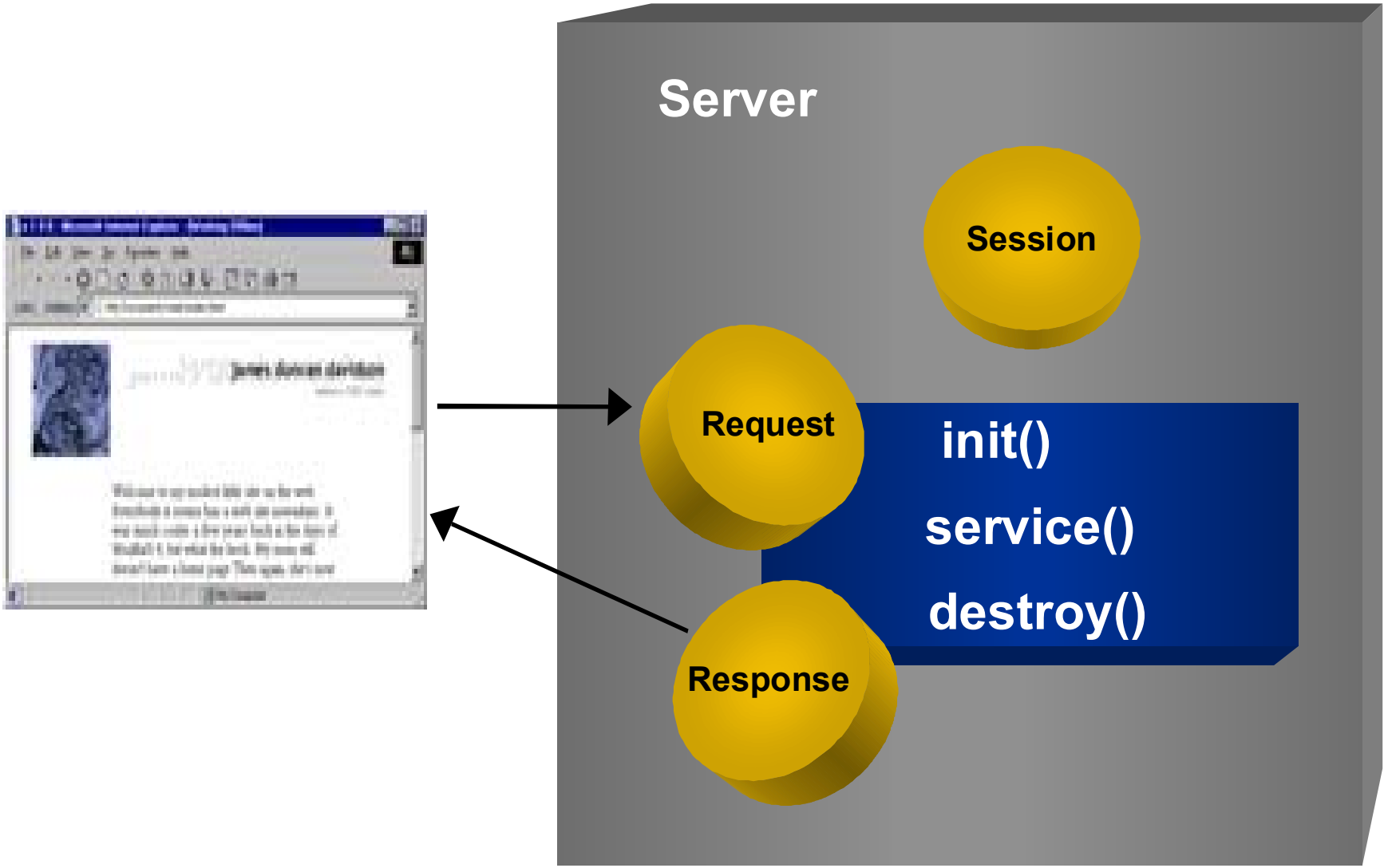
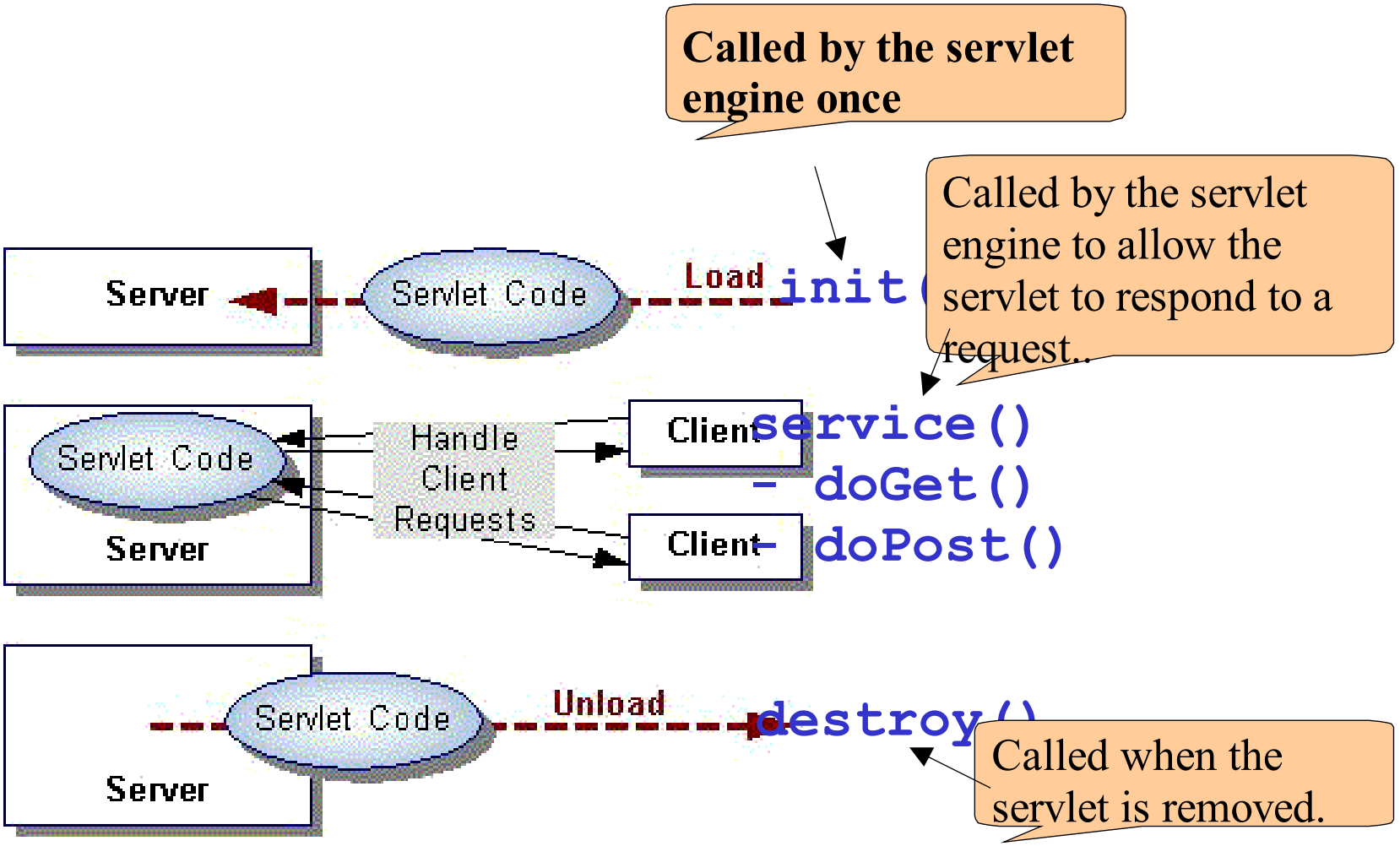
Servlet APIs



Servlet Example



Servlet Lifecycle



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Anatomy of a Request

- The servlet's service() method is invoked with a Request and Response object
- The servlet provides a response to the request

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Request and Response Parameters

Request : Encapsulates all **information from** the **client**

- **HTTP request** headers
- InputStream or reader
- **Input parameters**: Form data, cgi data

Response: Encapsulates all **communication back to the client**

- **HTTP response** headers
- **OutputStream** or writer
- Setting cookies, redirects, error pages

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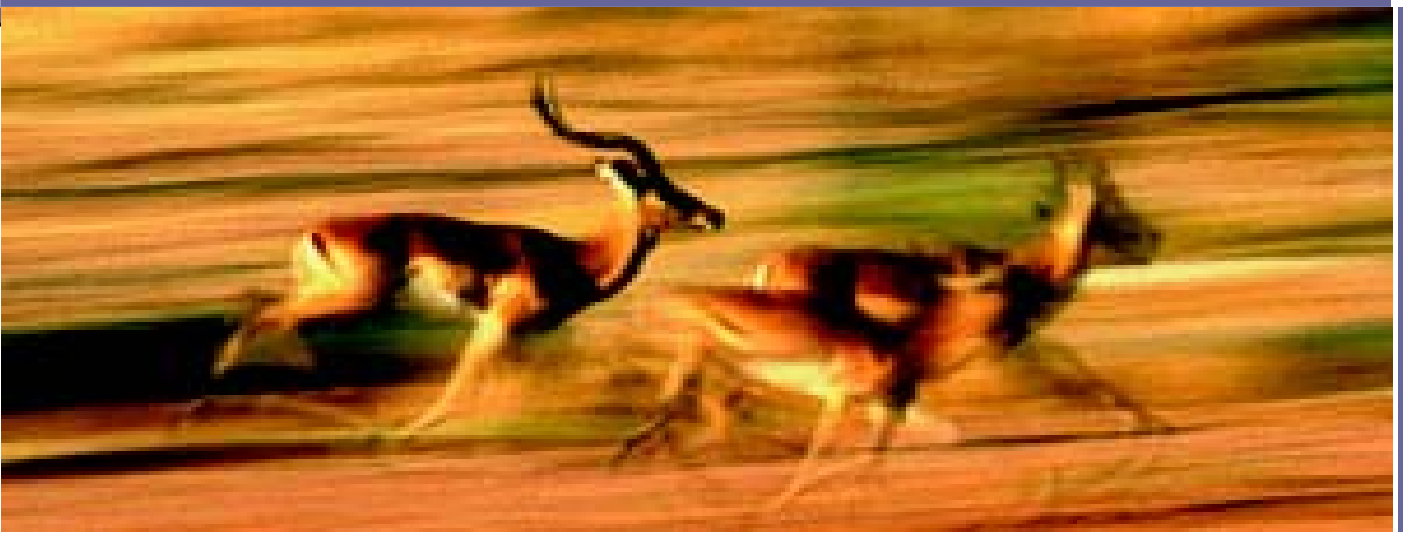
A Simple Servlet

Sample Code

```
public class ExampleServlet extends HttpServlet
{
    public void doGet(HttpServletRequest
request,
                      HttpServletResponse
response)
        throws ServletException, IOException
    {
        response.setContentType("text/html");
        PrintWriter out = response.getWriter();
        out.println("Hello!<BR>");
    }
}
```



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What are Java Server Pages?

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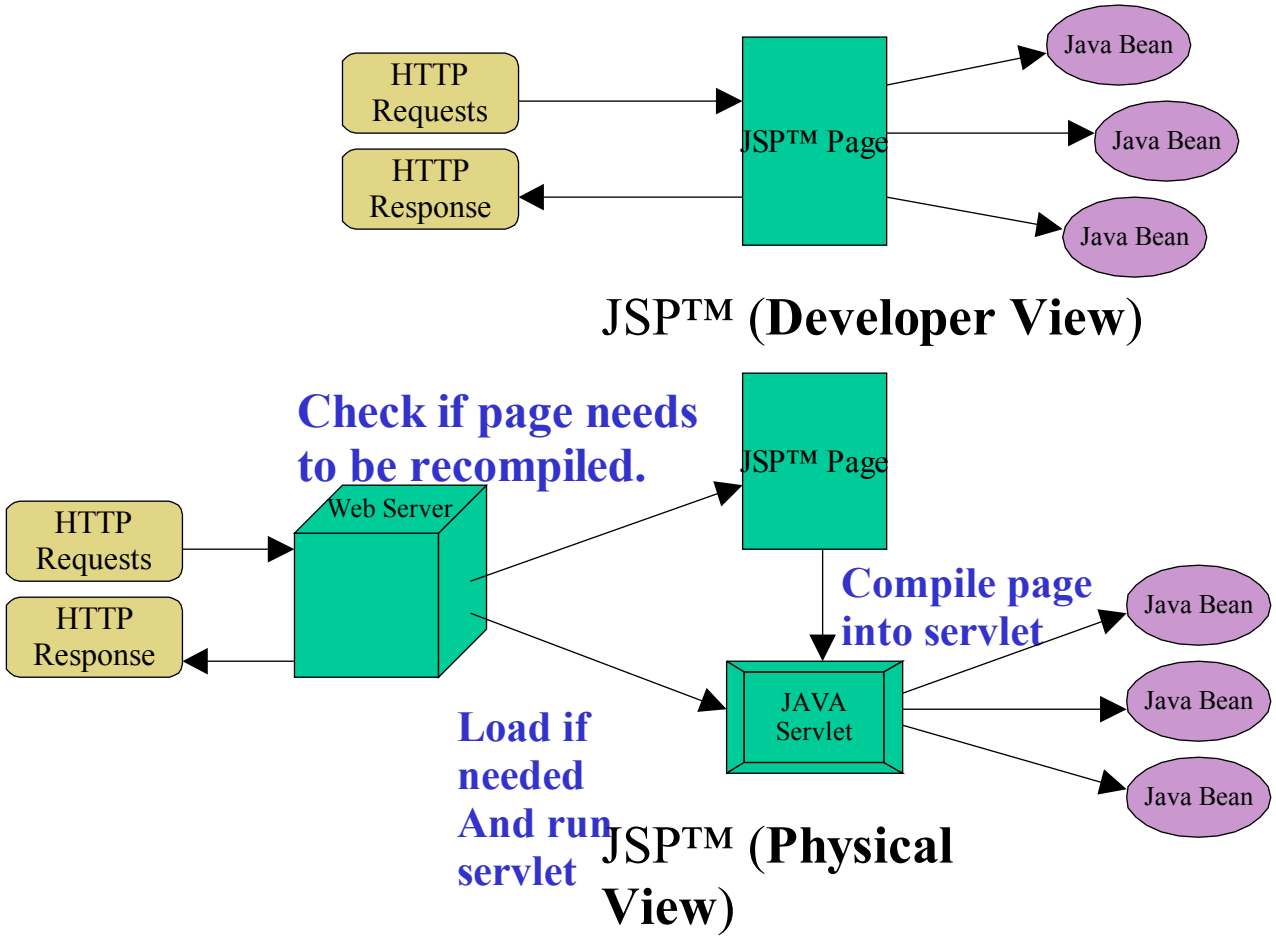
What is a Java Server Page?

JSP™ turns servlets inside out

- Presentation centric
- **Java code embedded in** a **HTML page**
- JSP™ is for **formatting output** such as HTML and XML

HTML to Java Bean Mapping

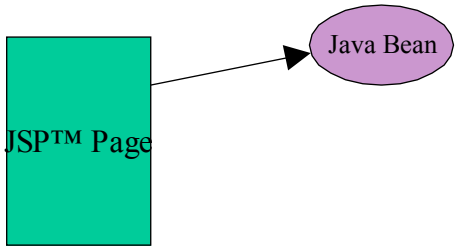


Example Servlet

```
public class HelloServlet extends HttpServlet{
public void doGet(HttpServletRequest request,
HttpServletResponse response)
   {
     response.setContentType("text/plain");
     PrintWriter out = response.getWriter();
     out.println("<html>");
     out.println("Hello World!");
     out.println("<br>");
     JspCalendar clock = new JspCalendar();
     out.println("Today is");
     out.println("<ul>");
     out.println("<li>Day of month: ");
     out.println("clock.getDayOfMonth());
     out.println("</ul>");
     out.println("</html>");
   }
}
```

Example JSP

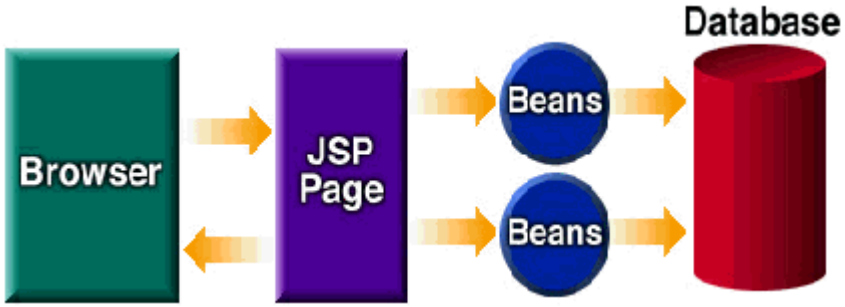
```
<html>
        Hello World!<br>
        <jsp:useBean id="clock"
class="calendar.JspCalendar" />
        Today is
        <ul>
        <li>Day of month:
        <%= clock.getDayOfMonth() %>
        </ul>
</html>
```



Usage models of JSPs

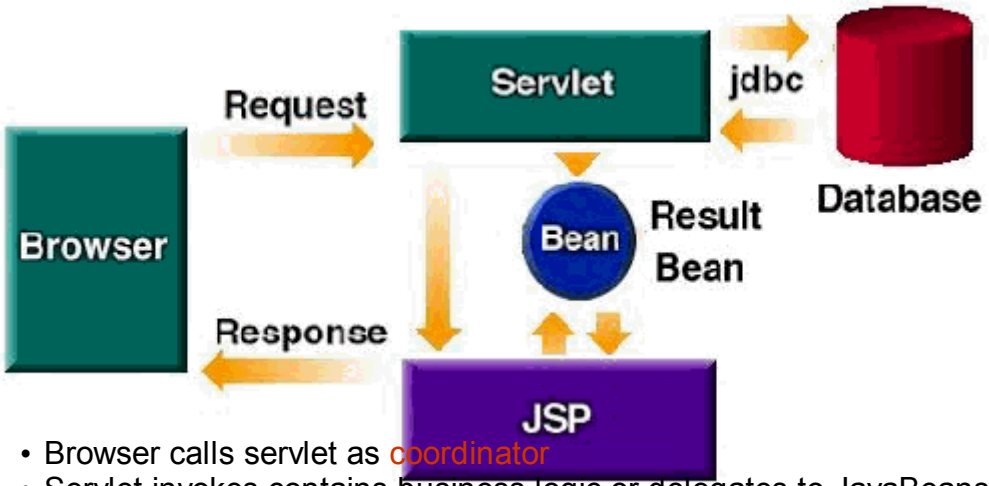
Intent from the original JSP specifications:

- Model 1:



- Browser calls JSP directly
- JSP uses JavaBeans to encapsulate business logic
- JSP delivers the response to the browser

- Model 2:



- Browser calls servlet as coordinator
- Servlet invokes contains business logic or delegates to JavaBeans
- Servlet stores result of business logic in embedded objects in Response
- JSP interrogates the Response and creates a page to send the browser

JSP Syntax Basics

- The JavaServer Pages specification includes:
  - Directives
  - Standard JSP™ Tags
  - Scripting elements
  - Implicit Objects
  - tag extensions

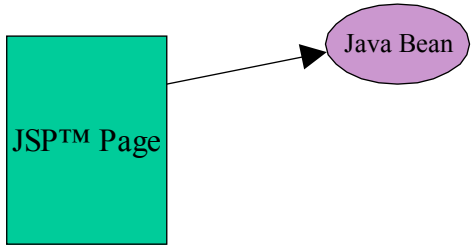
JSP™ Standard Tags

Example JSP standard tags:

```
<jsp:useBean id="clock"
  class="calendar.JspCalendar" />
<jsp:getProperty name="customer"
  property="name" />
<jsp:setProperty name="customer"
  property="name" param="username" />
```

JSP™ Standard Action Tags

- Standard Action tags used to access Java objects from the JSP™ page.
- Example JSP standard tag:




```
<jsp:useBean id="clock" class="calendar.JspCalendar" />
```

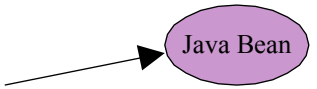
Like ***JspCalendar clock = new JspCalendar();***

The **JSP page accesses a bean object via a tag.**

- If a bean **doesn't exist**, it is **instantiated**.
- If **bean already exists**, it is **retrieved** from the **session** or the **request** context.

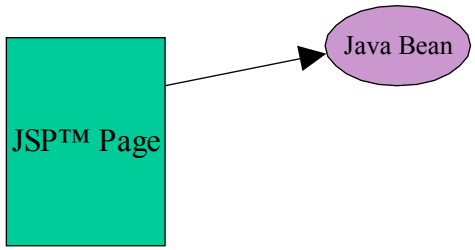
What is a JavaBean?

```
public class AccountBean {
    private String firstName;
    private String lastName;
    public AccountBean() {}
    public String getFirstName() {
       return firstName;
    }
    public void setFirstName(String f) {
       firstName = f;
   }
. . .
}
```



JavaBeans components are Java objects which follow a well-defined design/naming pattern

JSP™ Standard Tags



Example JSP standard tags:

```
<html>
<jsp:useBean id="accountBean" scope="session"
   class="AccountBean" />
```

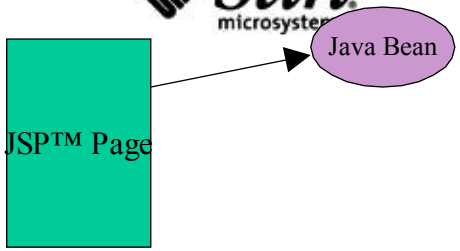
SetProperty: Automatically execute all setters in accountBean that match values provided as input

```
<jsp:setProperty name="accountBean" property="*"
   />
<form method=POST action=Account.jsp>

First Name
<INPUT type=text name="firstName"  >

<INPUT type=submit name="submit" value="Submit">
</form>
```

JSP™ Standard Tags



Example JSP standard tags:

```
<html>
<jsp:useBean id="accountBean"
  scope="session" class="AccountBean" />
First Name =
<jsp:getProperty name="accountBean"
  property="firstName" />"
</html>
```

getProperty: Retrieve value of named attribute

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JSP™ Scripting Elements

Declarations: define page level variables and methods

```
<%! QuoteBean q; %>
```

Scriptlets: JSP Java code fragments

```
<% q = new QuoteBean(); %>
```

Expressions: results of evaluating the expression are converted to a string

```
<%= q.getQuote("SUNW"); %>
```

Implicit Objects

- The JSP™ page has access to certain implicit objects that are always available
- They are the following:
  - **request - HttpServletRequest**
  - **Response – HttpServletResponse**
  - pageContext, HTTP **session**,
  - out, config, page, exception

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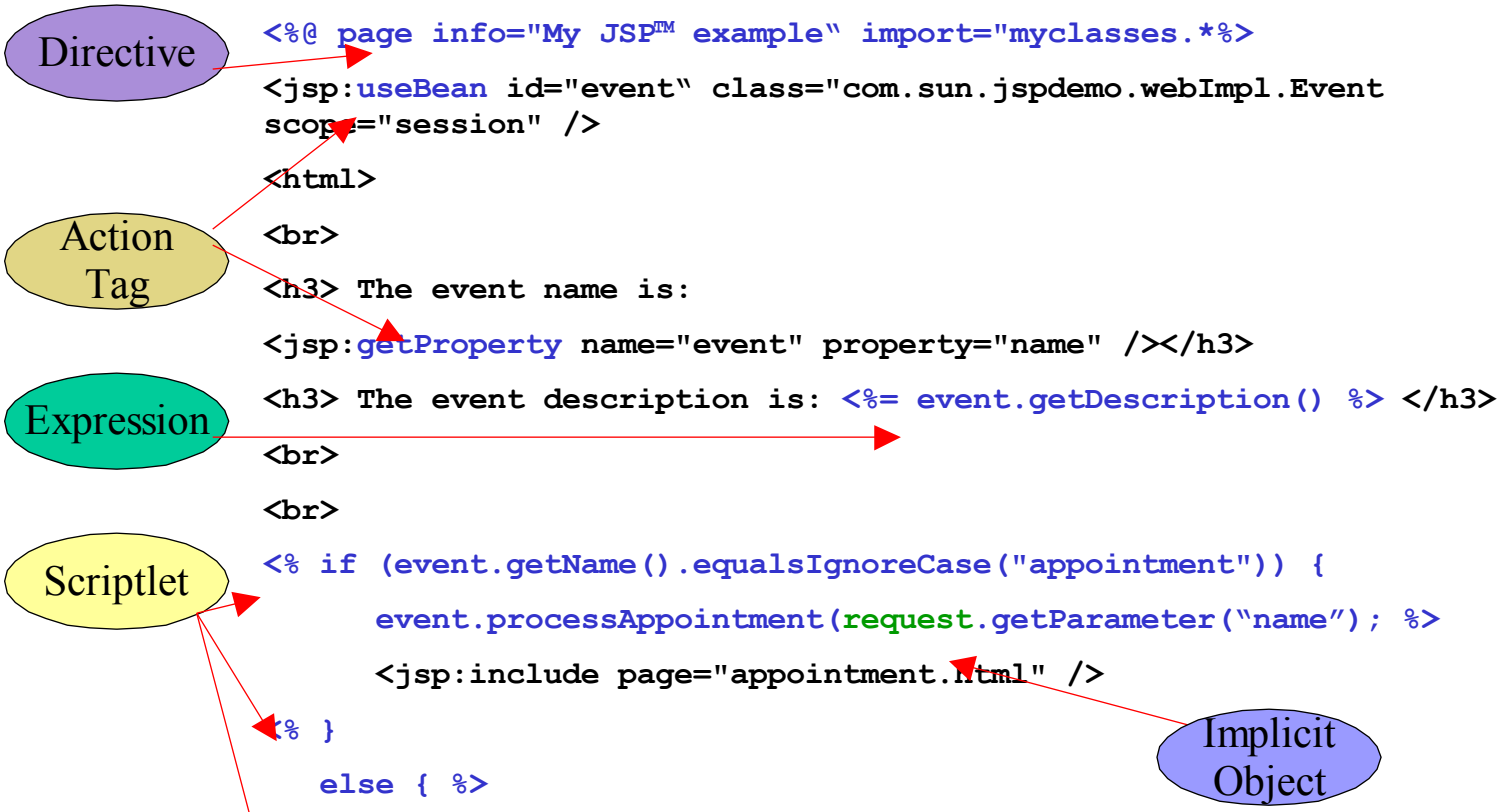
JSP™ Sample



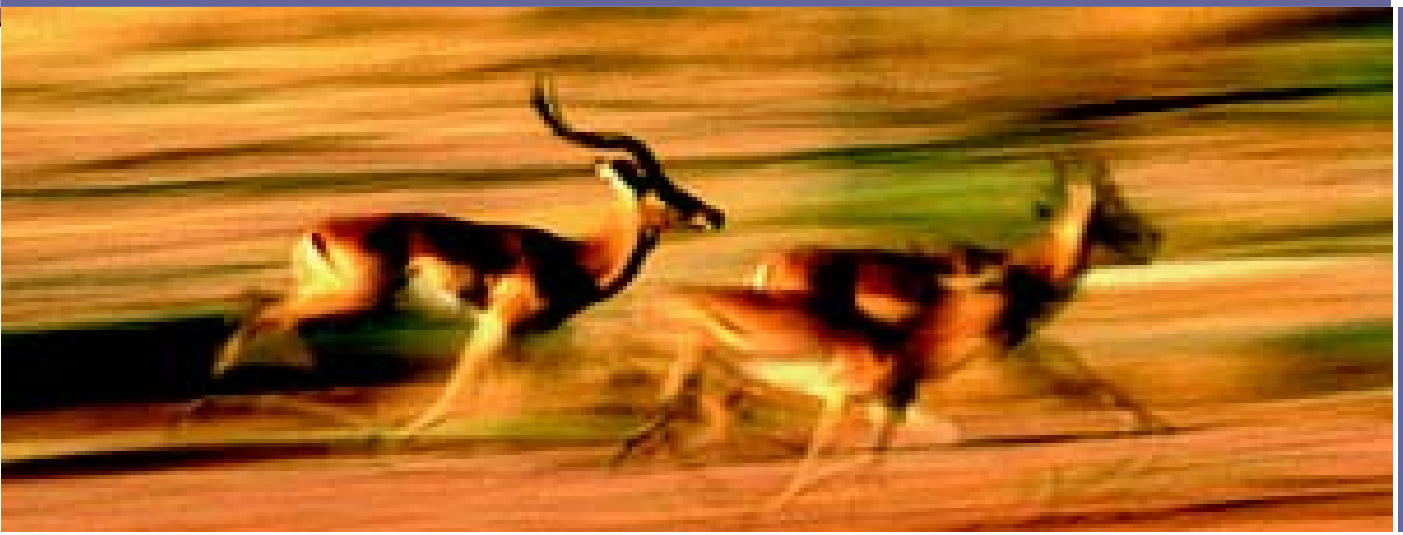

```
<%@ page info="My JSP™ example" import="myclasses.*%>
<jsp:useBean id="event" class="com.sun.jspdemo.webImpl.Event
scope="session" />
<html>
<br>
<h3> The event name is:
<jsp:getProperty name="event" property="name" /></h3>
<h3> The event description is: <%= event.getDescription() %> </h3>
<br>
<br>
<% if (event.getName().equalsIgnoreCase("appointment")) {
      event.processAppointment(request.getParameter("name"); %>
      <jsp:include page="appointment.html" />
<% }
   else { %>
      <jsp:include page="regular.html" />
<% } %>
</html>
```

Portable Tag Extension Mechanism

Designing tag libraries allows content developers to use custom tags instead of java code.

```
<%@ taglib uri="/WEB-INF/sqltaglib.tld" prefix="ora" %>
  <HTML>
    <HEAD> <TITLE>SQL Tags Example </TITLE> </HEAD>
    <BODY BGCOLOR="#FFFFFF">
      <HR>
        <ora:dbOpen URL="jdbc:oracle:oci8:@" user="scott"

                     password="tiger" connId="con1">
        </ora:dbOpen>
        <ora:dbQuery connId="con1">
              <!-- generates HTML table -->
              select * from EMP
        </ora:dbQuery>
        <ora:dbClose connId="con1" />
      <HR>
    </BODY>
  </HTML>
```



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Design Issues

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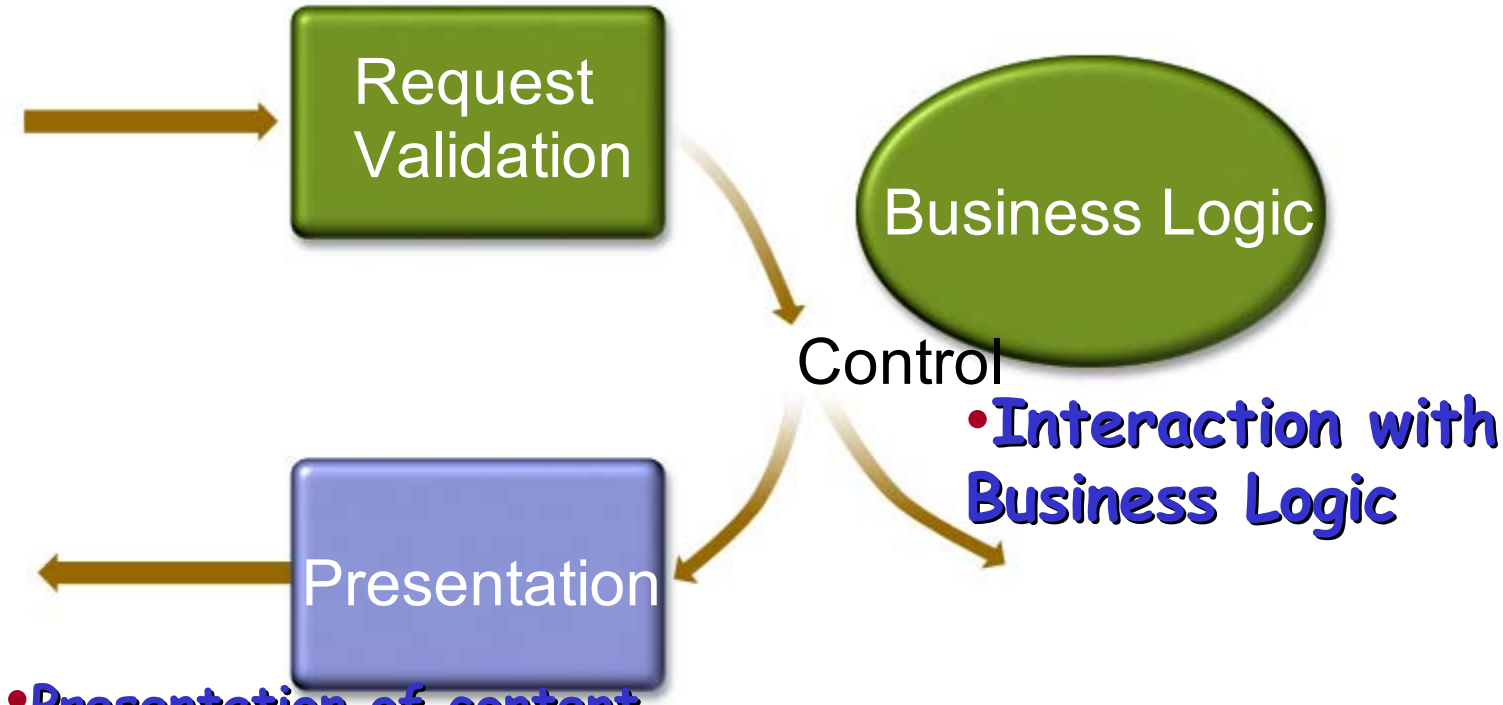
View Design Issues

- **View Consists of two parts**
  - **Request Processing**
    - (Part of the controller)
  - **Response Generation**
    - Presenation Layout

Tasks in Web Layer

- **Validation of Input**
  - Is form data complete and well-formed?



- **Presentation of content**
  - Get Data from Model Value Object
  - Present data to client

View

View: present User Interface (screen representation of model)

Request

Controller

Updates

Model

View Selection

Display

View

State Query (read only)

JSP
Custom JSP Actions
JavaBeans Components

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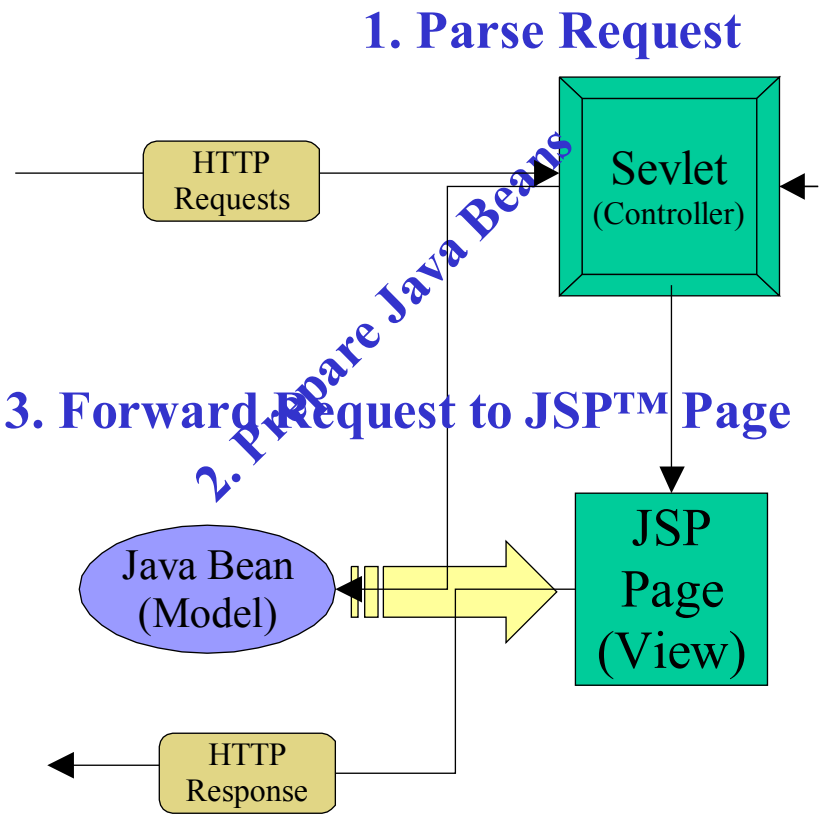
When Servlets, When JSP?

- Use servlets for dispatching between the Web tier and EJB tier
  - **Request processing** => use **servlet** and/or JavaBeans
- Use JSP™ technology for response generation
  - **Displaying HTML, XML** => use JSP™ technology

How Do I Use All These ?

- separation between content and application logic:
  - **Move request processing out** of JSP™ page.
  - JSP™ page is primarily **presentation layout.**



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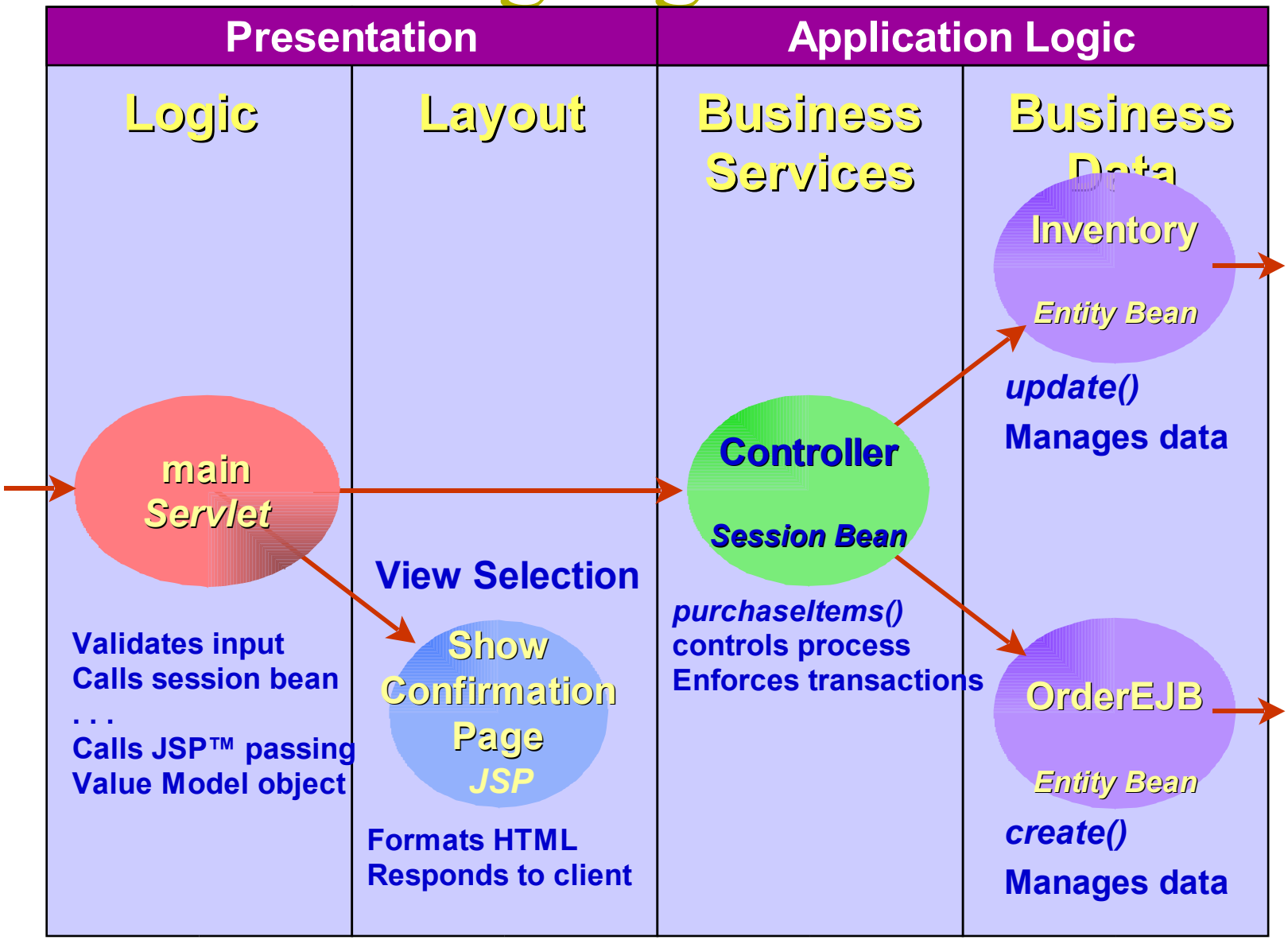
View Design Guidelines

Build View in the Web-tier

- Use **JavaServer Pages**™ (JSP™) components for **presentation layout**
- **Custom tags** and JavaBeans™ components for **presentation logic**

All working together



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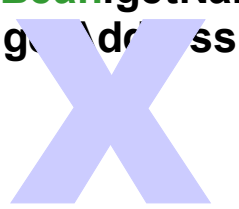
Example Servlet

```
public void doPost (HttpServletRequest req, HttpServletResponse res) {
    String userId = req.getSession().getValue("userId");

    IAccountHome accountHome;
    IAccountBean account;

    Context initCtx = new InitialContext();
    accountHome = initCtx.lookup("com/AccountHome");
    account = accountHome.findByPrimaryKey(userId);
    AccountBean accountBean= account.getAccountDetails();

    Wri
    out
    out.println("<BODY>Name " + accountBean.getName() + ".<br>");
    out.println("Address:  " + accountBean.g  dr  ss() );
    •
    •
    •
}
```

This is *ugly* — we need some help!



Example JSP

JSPs are a presentation layer for Servlets...

```
<HTML>
<HEAD><TITLE>Your account</TITLE></HEAD>
<BODY>
  <%AccountBean accountBean=(AccountBean)
          req.getAttribute("accountBean");
  %>
      Name :  <%=accountBean.getName()%> <br>
        Address:  <%=accountBean.getAddress()%> <br>
    </BODY>
</HTML>
```

Example JSP

JSPs are a presentation layer for Servlets...

```
<HTML>
<HEAD><TITLE>Your account</TITLE></HEAD>

<BODY>
<jsp:useBean id="accountBean" scope=“request"
class="AccountBean"/>
 Name :
<jsp:getProperty name="accountBean" property=“name" />“

Address:
<jsp:getProperty name="accountBean “property=“address"/>“

    </BODY>
</HTML>
```

Example Servlet Dispatching to JSP

Servlets are Java's answer to CGI/Perl...

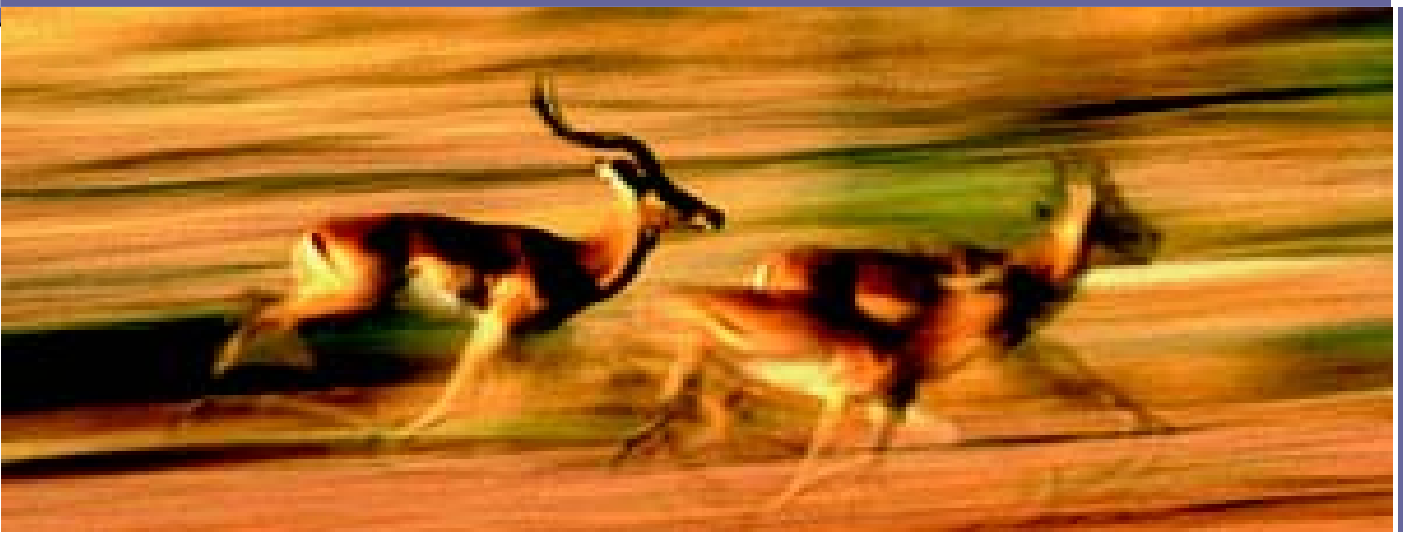
```
public void doPost (HttpServletRequest req, HttpServletResponse res)  {
    String userId = req.getSession().getValue("userId");

    IAccountHome accountHome;
    IAccountBean account;

    Context initCtx = new InitialContext();
    accountHome = initCtx.lookup("com/AccountHome");
    account = accountHome.findByPrimaryKey(userId);
    AccountBean accountBean= account.getAccountDetails();
```

Java Server Pages to the rescue!

```
    RequestDispatcher dispatcher;
    ServletContext context =getServletContext();
```

Why do I care?

- Enables separation of presentation *logic* from presentation *layout*
- Enable your experts to play to their strengths



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Resources and Summary

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Resources

- http://java.sun.com/j2ee
- http://java.sun.com/j2ee/blueprints
- http://java.sun.com/j2ee/tutorial
- http://java.sun.com/products/servlet

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Additional Resources

J2EE
- java.sun.com/j2ee

Sun ONE
- www.sun.com/sunone

Java Community Process (JCP)
- jcp.org

Java and XML
- java.sun.com/xml

Web Services
- www.webservices.org

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Summary

This Section Discussed design and implementation of the VIEW. You should now understand:

- View Design Issues
- Guidelines for Architecting the "View" or Presentation logic
- Servlets for presentation requests
- JSP™ s for presentation layout

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Call for Action!

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