Berner Fachhochschule
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AWT
3) JSF in Action

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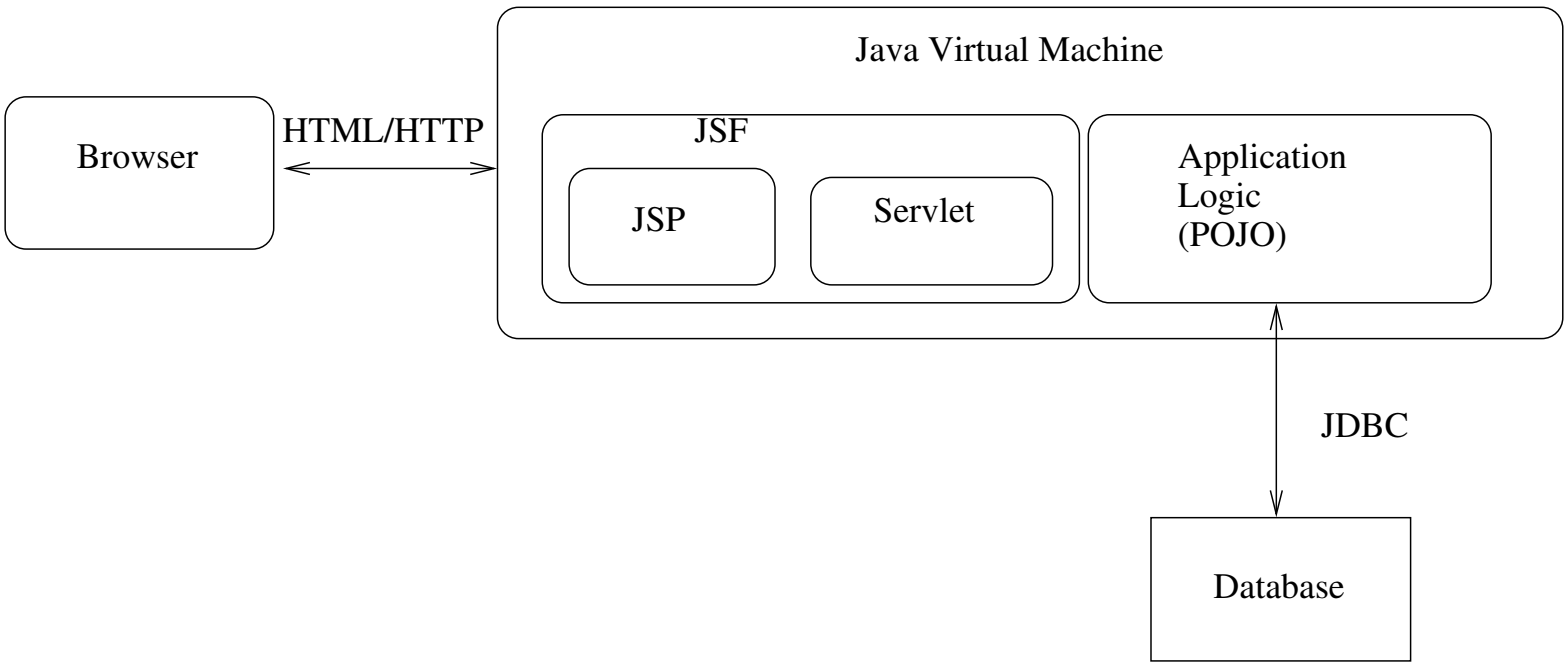
Java Server Faces

Java Server Faces

- **JSF is a standarized API**
  - Developed by a large consortium: People behind Jakarta Struts, Oracle Application Server, Sun Java Stuio, IBM WebSphere Studio, ...
- **Java delivers a Reference Implementation**
  - `http://java.sun.com`
- **Other Vendor implementations**
  - Apache My Faces
  - Oracle, IBM, Borland, ...
- **Web development with Swing ideas**
  - UI components organised in a tree
  - Event handling for each component
  - *Possible to develop using tools.*

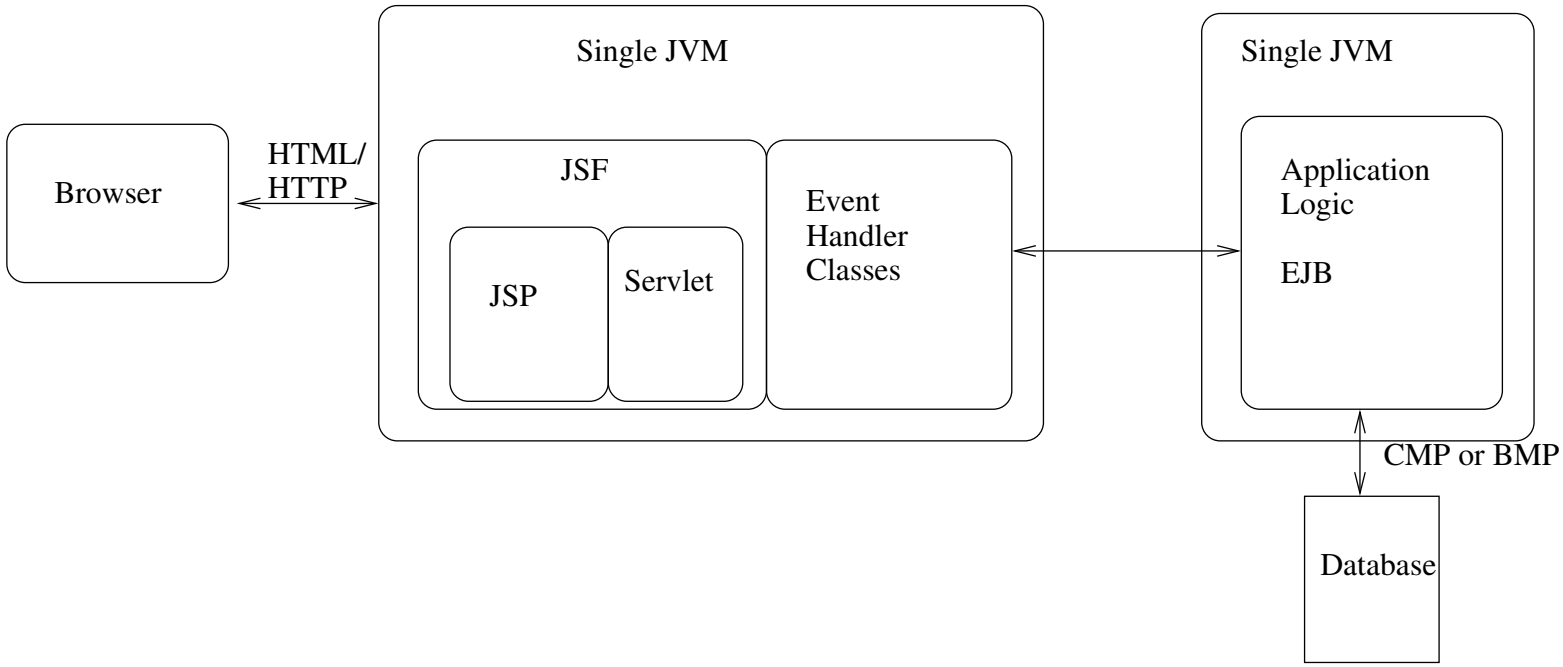
3/4 tier architecture

Three-tier JSF configuration



(POJO= Plain old Java objects)

Four-tier JSF configuration



MVC

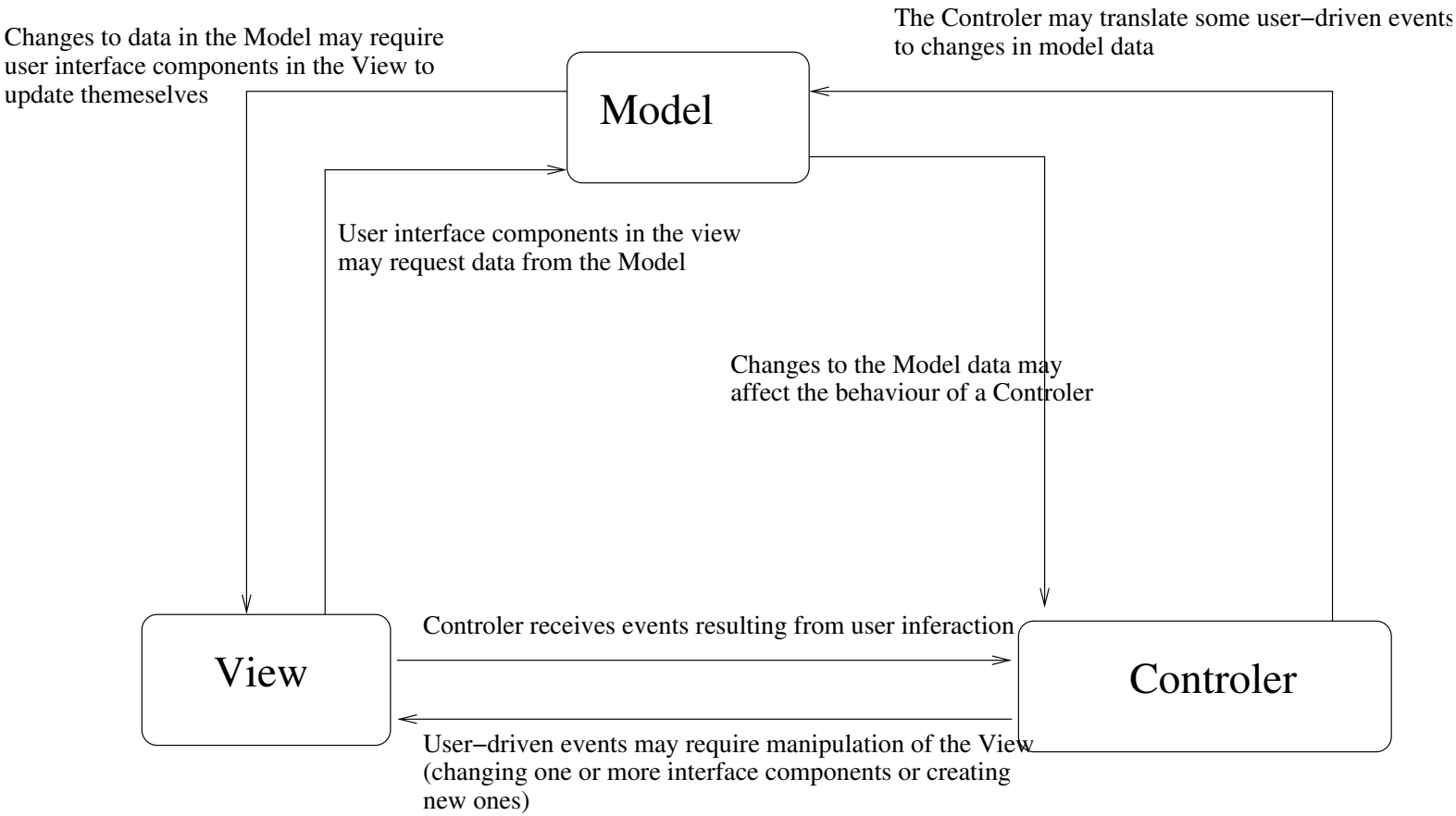
MVC: Model View Controler

- **An architecture for separating business logic from layout**
  - View part is the most volatil
  - Has to be addapted when changing OS, firm, ...
  - Highly coupled applications are difficult to maintain
- **MVC Pattern**
  - To have different representations of the same application
  - To provide different look and feels for a user interface
  - To reuse one or more user interface components independently of the application data.

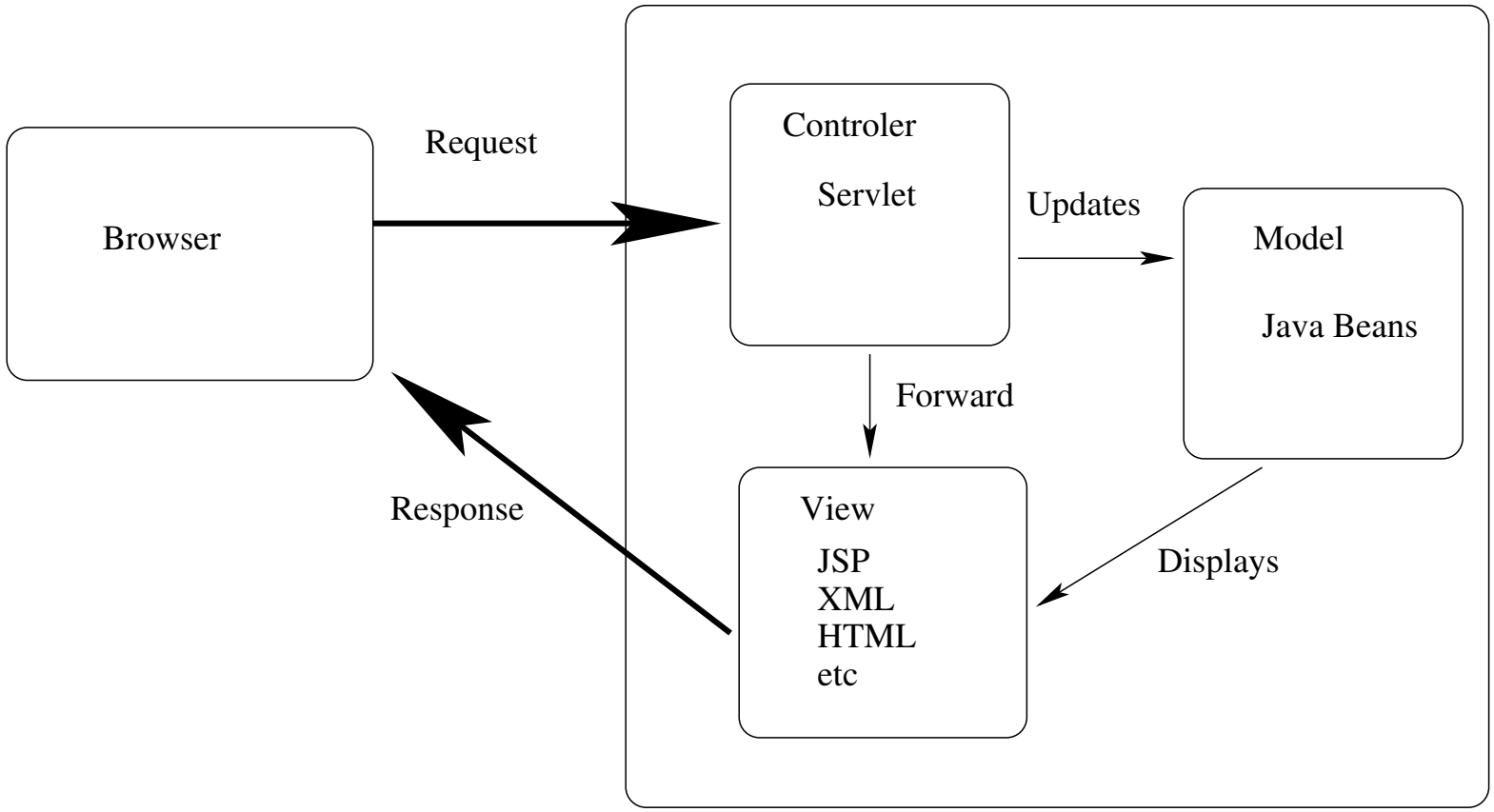
Model View Controler

- **Model**
  - Representation of application data (or state)
  - And Functional logic
  - It is the core of the application
- **View**
  - Representations of application data
  - This is the participant that a user directly interacts with
- **Controler**
  - Processes user-driven events
  - It may updatae the *Model* or direct manipulation of the *View*

Model View Controler (Cont.)



Model 2: MVC for the web



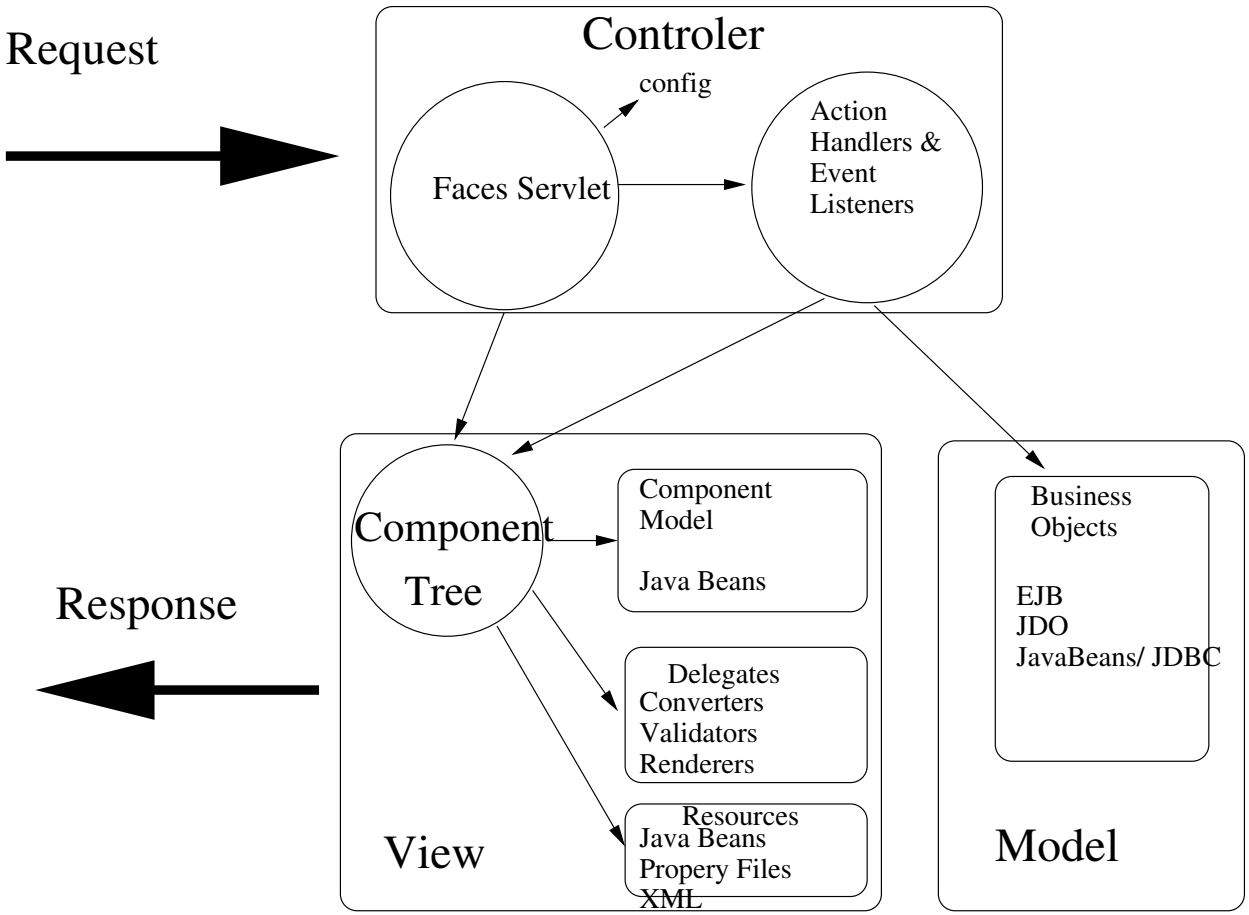
(Model 1 = JSP handling almost everything: forms, logic, sessions variables,. . .)

Java Server Faces

Java Server Faces

- **Event / Component Framework**
  - Application contains a component tree
  - Action Handlers and Event Listeners interract with these components
- **JSF = Swing for the web**
  - Components are composable (a set of components can form one big component)
  - Components are event-driven
  - They can change their apparence to fit common look and feel

JSF Model-2


Request
Controler
config
Faces Servlet
Action
Handlers &
Event
Listeners
Component
Tree
Component
Model
Java Beans
Delegates
Converters
Validators
Renderers
Resources
Java Beans
Propery Files
XML
View
Business
Objects
EJB
JDO
JavaBeans/ JDBC
Model
Response

Example: Hello Boss

Example: Hello Boss

- **One page for login,**
  - the user types its username (for the password, just double the code)
  - This is stored in a `ManagedBean` called `HelloBean`
- **How does it work:**
  - display page `hello.xhtml`
  - Populate to the bean `HelloBean`
  - Execute method `response()`
  - If the answer is `hello` go to `hello.xhtml`
  - If the answer is `response` go to `response.xhtml`

HelloBean

```
@ManagedBean
@SessionScoped
public class HelloBean implements Serializable {
    private String name;
    public String getName() { return name;}
    public void setName(String name) { this.name = name; }
    private String greeting;
    public String getGreeting() { return greeting;}
    public void setGreeting(String greeting) { this.greeting = greeting; }
     public String response(){
          if (name!=null && name.equals("Emmanuel")){
               return "response";
          }
          greeting="This is the wrong name";
          return "hello";
     }
}
```

View: hello.xhtml

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//
→EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml"
      xmlns:f="http://java.sun.com/jsf/core"
      xmlns:h="http://java.sun.com/jsf/html">
    <f:view contentType="text/html" />
    <h:head>
        <title>Hello World!</title>
    </h:head>
    <h:body bgcolor="white">
        <h2>My name is Duke. What is yours?</h2>
        <h2>#{helloBean.greeting}</h2>
        <h:form id="helloForm" >
            <h:graphicImage id="waveImg" url="#{resource['wave.med.gif
            →']}" />
            <h:inputText id="username" value="#{helloBean.name}" />
            <h:commandButton id="submit" action="#{helloBean.
            →response}" value="Submit" />
        </h:form></h:body></html>
```

View: response.xhtml

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 ↘
→Transitional//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-↘
→transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml"
      xmlns:f="http://java.sun.com/jsf/core"
      xmlns:h="http://java.sun.com/jsf/html">
<f:view contentType="text/html; charset=iso-8859-1" />
<head><title>Response</title></head>
<body>
    <h:form id="responseform">
    <h:graphicImage id="waveImg" url="#{resource['wave.med.gif']}↘
    →" />
    <h2>Hi, #{helloBean.name}</h2>
      <h:commandButton id="back" value="Back" action="hello" /↘
      →>
    </h:form>
</body>
</html>
```

JSF is event driven

- **Two types of events**
  - *Value Changed* (`javax.faces.event.ValueChangeEvent`)
    observes changes to the user interface component property
    - Expanding a tree,
    - changing the text of a field
  - *Action* (`javax.faces.event.ActionEvent`)
    Observes the activation of a descendent of a UICommand
    - buttons and hyperlinks
- **Example I:** Value Changed listener on an input text field

```
<h:inputText id="userId" value="#{login.userId}">
  <f:valueChangedListener type="ch.bfh.jsf.UserLoginChanged"↘
  →/>
<h:/inputText>
```

- **Example II:** Action event listener on a command button

```
<h:commandButton id="login" commandName="login">
 <f:actionListener type="ch.bfh.jsf.LoginActionListener" />
</h:commandButton>
```

Java Server Faces

- **Partialy page oriented**
  JSF is a descendant of Struts
  Value returned and navigation rules
- **Core: Event and Component driven**
  JSF has the same parents than Swing and belongs to the same familly.

Install Java Server Faces

Motivations

Motivations

- **Mojarra - Reference Implementation**
  - Used in the examples last week
  - Does contain mainly standard components
- **Apache MyFaces JSF implementation**
  - Does contain the same set of components
  - Contains also custom components
  - Is the most used JSF implementation
  - Is linked with other libraries:
    Tomahawk, Tobago, Trinidad
- **Other implementations**
  - Any vendor can develop his own implementation of JSF
  - Anybody can also develop his own set of new reusable components

Install Apache MyFaces

- **Download the MyFaces libraries**
  - `http://myfaces.apache.org/download.html`
- **Copy all the jar files into your `lib` directory**
  - `commons-beanutils.jar` Provides services for collections of beans
  - `commons-codec.jar` Provides implementation of common encoders and decoders such as Base64, Hexadecimal, Phonetic, and URL
  - `commons-collections.jar` The standard for collection handling in Java (`org.apache.commons.collections` packages)
  - `commons-digester.jar` The Rules-based processing of arbitrary XML documents
  - `commons-logging.jar` Providing a wrap-around for common Logging API's

Install Apache MyFaces (Cont.)

- `myfaces-api.jar` and `myfaces-impl.jar` the core MyFaces library
- `tomahawk.jar` contains other new components
- `commons-discovery.jar` used for locating classes that implement a given interface
- `commons-el.jar` the interpreter for the Expression Language defined in JSP 2.0
- `jstl.jar` JSP Standard Template Library

Use JSF tags in an XHTML file

- **Need to declare the JSF tag-libraries at the beginning of the file**
- **Encapsulate all the `<f:..>` and `<h:...>` tags inside a `<f:view>`**
- **Encapsulate all navigation items inside a `<h:form >`**

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//
→EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml"
      xmlns:f="http://java.sun.com/jsf/core"
      xmlns:h="http://java.sun.com/jsf/html">
    <f:view contentType="text/html" />
    <h:head>
        <title>Hello World!</title>
    </h:head>
    <h:body bgcolor="white">
      <h2>Hello World?</h2>
      <h:form id="helloForm" >
        <h:commandLink id="submit" action="menu" value="Back" />
       </h:form>
    </h:body>
</html>
```

Encapsulate texts of your application

- **No text should be written inside the application**
  - Text can be changed from outside
  - Text can be easily internationalized
- **Define a text file called :**
  `src/mylib/Messages.properties`

  hello=hello
  title=Hello Me
  back=Back
  send=Send

Encapsulate texts of your application (Cont.)

- **Declare the bundle in the XHTML file**

```
<f:loadBundle basename="mylib.Messages"
var="messages" />
```

- **Use the value to display the content (inside the view)**

```
<f:view>
<body>
<h1>#{messages.hello}</h1>
```

- **Content of the bundle is accessible using JSF EL (expression language) in any JSF tag (as `value` for instance).**

Backing Beans

- **Objects can be accessed in the JSF Expression Language**
  - They are called backing beans
  - Need to be registered in the faces-config.xml
  - Or to be registered using annotations
  - "Properties" are automatically matched to values
- **Declaration in the faces-config.xml**

```
<managed-bean>
  <description>
    The "backing_file" bean that backs up the name
  </description>
  <managed-bean-name>myuser</managed-bean-name>
  <managed-bean-class>
        ch.bfh.ti.awt.exampleMyFaces.User
  </managed-bean-class>
  <managed-bean-scope>request</managed-bean-scope>
</managed-bean>
```

Baking Bean (Cont.)

- **The previous declaration corresponds to the following class**
  - It is a bean containing one `String` property called `name`

```
package ch.bfh.ti.awt.exampleMyFaces;
public class User{
    private String name;
    public void setName(String n){
        name = n;
    }
    public String getName(){
        return name;
    }
}
```

Baking Bean (Cont.)

- **One can also simply "annotate" the Java Bean file**

```
package mylib;
import javax.faces.bean.ManagedBean;
import javax.faces.bean.SessionScoped;
import java.io.Serializable;

@ManagedBean
@SessionScoped
public class HelloBean implements Serializable {
    private String name;
    public String getName() { return name;}
    public void setName(String name) { this.name = name; }
}
```

Bean properties and EL

- **The property can be linked inside any XHTML file using JSF Expression Language**
- Can be used inside an output text (similar to message bundles)

  <f:loadBundle basename="mylib.Messages"
  var="messages" />
  ...
  <h1>#{*messages.hello*} #{*myuser.name*}</*h1*>

- The property can be used inside a form (both geter and seter are used)

```
<h:form>
Type your name: <h:inputText value="#{myuser.name}" />
<h:commandButton id="submit" action="sendname" value="Send" ↘
→/>
<h:commandLink value="Back" action="back" />
</h:form>
```

Components corresponding to html tags

- **Password (i.e. a field that one can not see)**

```
<h:form>
 <h:inputSecret value="#{user.pwd}" />
</h:form>
```

- **Image - file to be placed in `resources/` in the project (or `web/resources/` in our development environment**

```
<h:form><br>
 <h:graphicImage id="gi" alt="The image could not be found.↘
 →"
                 url="#{resource['bfh.jpg']}" width="250" height↘
                 →="250"
                 title="This is demo for 'graphicImage' tag" >
 </h:graphicImage>
</h:form>
```

The messages

- **A message can be associated with an input tag.**
  - Messages will not appear normally
  - During validation/conversion process, the component may receive some "messages".
  - They are displayed in the `<h:message>` tag when existing
  - Provide a way to display error messages not only by the object.

```
<h:inputText id="input_text"
                        value="#{MessageBean.a}"
                        required="true" />
<h:message for="input_text" />
```

Navigation

Command-Link and -Button

Navigation in a JSF application

- **HTML navigation is not JSF conform**
  - `<a href="hello.jsf">` a link
  - `<form action="myprog.jsf">` a form
  - Both remove the consistency of a JSF session.
  - Component tree, status, session, are lost using those links
- **Use JSF navigation instead**
  - `Command link`
  - Is rendered like a link, but must be put inside a form
  - Value is the text displayed inside the link (can be any EL expression)
  - Action corresponds to JSF navigation (can also be the return value of an EL expression)

```
<h:form>
<h:commandLink value="Hello World" action="hello">
</h:commandLink>
</h:form>
```

JSF Navigation

- **Actions can also be generated by Buttons**
  - `Command Button`

```
 <h:form>
Type your name: <h:inputText value="#{myuser.name}" ↘
→/>
<h:commandButton id="submit" action="hello" value="↘
→Send" />
<h:commandLink value="Back" action="menu" />
</h:form>
```

  - Must be included in a form
  - Is rendered with a Button
  - Text in value is displayed in the button
  - Action is sent to the navigation of JSF (goes to the files `hello.xhtml` or `menu.xhtml`)

Action returned by a method

- **The action of a command link or button can be an EL expression**
  - Can be a string
  - Or the value returned by a method
- **The XHTML file:**

```
<h:form>
  <h:outputLabel for="userid">
     <h:outputText value="User ID" />
   </h:outputLabel>
   <h:inputText id="userId" value="#{login.userId}" /><br/>
   <h:outputLabel for="password">
       <h:outputText value="password" />
    </h:outputLabel>
    <h:inputSecret id="password" value="#{login.password}" /><br↘
    →/>
    <h:commandButton action="#{login.login}" value="Login" />
</h:form>
```

Action returned by a method (Cont.)

- **The corresponding Java Bean**

```
public String login(){
    if((userId==null) || (userId.length()<1))
        return "failure";
    if ((password == null) || (password.length()<1))
        return "failure";
    User user = null;
    UserSecurityService service = new ↘
    →UserSecurityService();
    user = service.login(userId,password);
    //user = new User("","");
    if(user == null)
        return "failure";
    return "success";
}
```

Navigation Rules

Navigation Rules

If no navigation rules are defined, the files `failure.xhtml` and `success.xhtml` will be executed.

Navigation Rules

- **Navigation can to be declared in the `faces-config.xml`**
  - Define a navigation link:
  - A page to come from
  - An action (the value written in the action attributes)
  - A page to go to.

```
<navigation-rule>
  <description>
      The main page, dispatching requests over the different JSF ↘
      →examples
 </description>
  <from-view-id>/menu.xhtml</from-view-id>
  <navigation-case>
      <description>
        The Hello World application (simple Hello world in JSF)
      </description>
      <from-outcome>hello</from-outcome>
      <to-view-id>/hello.xhtml</to-view-id>
  </navigation-case>
</navigation-rule>
```

Navigation Rules (Cont.)

- **Per default, the navigation does display the name of origin file**
  - If form is `menu.xhtml`
  - we click on a link
  - The URL remains `menu.xhtml`
- **We can change it by defining the navigation case to be a "redirect"**

```
<navigation-case>
  <description>
    The Hello World application (simple Hello world in JSF)
  </description>
  <from-outcome>hello</from-outcome>
  <to-view-id>/hello.xhtml</to-view-id>
  <redirect />
</navigation-case>
```

Display a Table

The component for displaying tables

- **The `DataTable` component**
  - Can display the content of any table
  - Takes a collection as input, and displays each of the elements
- **A table is composed of columns**
  - Elements in a component are displayed how they are placed (in the same order)
- **A column can contain a "header"**
  - This should not be placed anywhere
  - We use a facet
- **A facet represents a specific role in a component**
  - Facet is recognized using its name ("header" in our case)

A table (dataTable component)

```
<h:dataTable id="dataTable" styleClass="scrollerTable"
             var="module" value="#{modules.data}" rows="3"↘
             →>
 <h:column>
   <f:facet name="header">
   <h:outputText value="#{messages.tableHeaderNb}" />
   </f:facet>
   <h:outputText value="#{module.number}" />
 </h:column>
 <h:column>
   <f:facet name="header">
   <h:outputText value="#{messages.tableHeaderDesc}" />
   </f:facet>
   <h:outputText value="#{module.name}" />
 </h:column>
</h:dataTable>
```

The Java Bean

```
package mylib;
import java.util.*;
@ManagedBean
@SessionScoped
public class DataBean implements Serializable{
    List data;
    public DataBean(){
        data = new LinkedList();
        // The following Data should be hold out of a Database
        data.add(new Module("2405","Marketing"));
        data.add(new Module("7083","Ergonomie, Psychologie"));
       ...
    }
    public List getData(){
        return data;
    }
    public void setData(List l){
       return;
    }
}
```

Event Handling

Event Handling

- **Navigation and Event Handling**
  - Navigation moves between pages
  - Even Handling is fired even if the page remains the same
- **Two types of events**
  - Value Changed Event
    When the value contained in a component is changed
    Typical for Input fields
  - Action Event
    A link or a button have been clicked
    There is no need to use an action and a navigation

Event Handling

- **For instance define links without action**

```
 <h:form>
<h:commandLink id="fr" value="#{bundle.french}">
  <f:actionListener type="mypackage.LanguageChangedActionEvent" ↘
  →/>
</h:commandLink>
<h:commandLink id="de" value="#{bundle.german}">
  <f:actionListener type="mypackage.LanguageChangedActionEvent" ↘
  →/>
</h:commandLink>
```

- **Define an event handling**

```
public class LanguageChangedActionEvent implements ActionListener {
    public void processAction(ActionEvent e)
        throws AbortProcessingException{
        String language = e.getComponent().getId();
        FacesContext context = FacesContext.getCurrentInstance();
        context.getViewRoot().setLocale(new Locale(language));
    }
}
```

The Tomahawk Library

The Tomahawk Library

- **Supported by the Apache Fundation**
  - Part of MyFaces project (but not in the core API)
  - Contains useful components
- **Examples of MyFaces Tomahawk Components**
  - Calendar (inline or popup)
  - Data Scroller (for paging of tables)
  - jscookmenu (for creating a dynamic menu)
  - newspaperTable (for displaying Data on many columns, like a newspaper)
  - tabbedPane
  - tree2
  - ...

Install Tomahawk

- **Download Tomahawk**
  - From the apache web site.
- **Install `tomahawk.jar` in your library path**
  - Be sure it will be accordingly deployed
- **Insert the Tomahawk taglib in your JSP files**

```
<html xmlns="http://www.w3.org/1999/xhtml"
      xmlns:f="http://java.sun.com/jsf/core"
      xmlns:h="http://java.sun.com/jsf/html"
      xmlns:t="http://myfaces.apache.org/tomahawk">
```

Example: The DataScroller

- **Suppose we have a List of modules**
  - It is stored in a Java Bean
  - The list is displayed in a dataTable
- **We want to add paging functionality**
  - We need the DataScroller Tomahawk Component (`<t:dataScroller>`)
  - But we need to use tomahawk `dataTable` also

A Paged table

```
<h:form>
<t:dataTable id="dataTable"
styleClass="scrollerTable" var="module" value="#{modules.data}" rows="3">
<h:column>
        <f:facet name="header">
        <h:outputText value="#{messages.tableHeaderRowNumber}" />
        </f:facet>
        <h:outputText value="#{module.number}" />
</h:column>
<h:column>
        <f:facet name="header">
        <h:outputText value="#{messages.tableHeaderRowDescription}" />
        </f:facet>
        <h:outputText value="#{module.name}" />
</h:column>
</t:dataTable>
  <h:panelGrid columns="1" styleClass="scrollerTable2"
               columnClasses="standardTable_ColumnCentered">
    <t:dataScroller id="pagination" for="dataTable" fastStep="20" pageCountVar="pageCount"
                    pageIndexVar="pageIndex" styleClass="scroller" paginator="true" paginatorMaxPages="↘
                    →14"
                    paginatorTableClass="paginator" paginatorActiveColumnStyle="font-weight:bold;">
            <f:facet name="previous">
                        <t:outputText value="<" />
            </f:facet>
            <f:facet name="next">
                        <t:outputText value=">" />
            </f:facet>
            <f:facet name="fastforward">
                         <t:outputText value=">>" />
            </f:facet>
    </t:dataScroller>
```

Conclusion

- **Building a JSF Application**
  - Create the Business Logic
  - Create the Data Beans
  - Define the pages and the connection to beans (using EL)
  - Define Navigation between the pages
- **JSF is powerful**
  - You can implement your own new components
  - You can import new libraries of components (like Tomahawk)

References

- **Books**
  - Mastering Java Server Faces
    B.Dudney et al. - Wiley
  - Pro JSF and Ajax - Building Rich Internet Components
    J.Jacobi and J. R. Fallows - Apress (2006)
  - The definitive guide to Apache MyFaces and Facelets
    Z Wadia et al. - Apress (2008)
- **MyFaces web site**
  `http://myfaces.apache.org/`
- **Tomahawk Web Site**
  `http://myfaces.apache.org/tomahawk/index.html`
- **mojarra** JSF 2 Reference Implementation,
  `https://javaserverfaces.dev.java.net/`