Java Web Application

- Servlets
- Beans
- JSPs
  - Scripting elements, EL, JSTL
- Static resources
  - HTML, CSS, images, ...
- Metadata files
  - web.xml, ...

Model 1 Architecture

- JSP + Bean
  - JSP for presentation
  - Bean for business logic
- Example
  - User management

Problems of Model 1 Architecture

- Using scripting elements mixes presentation and processing
- Hard to debug, maintain, or reuse code
- Not using scripting elements limits the interaction between presentation and processing to getters and setters
- Tedious to program
- Beans are no longer independent of the presentation layer, i.e. special getters/setters are needed

Improve Model 1 Architecture

- Create UI
- Input and output
- JSP, JFC/Swing ...

Model 2 Architecture

- A.K.A. Model-View-Controller (MVC) Architecture

Data Models

- Independent of UI
- Bean (POJO)
- E.g. the User class
About MVC

- Originate from the work on Smalltalk
- Widely used in GUI applications

MVC in a Web Application

- Browser sends request to server
- Controller processes request
- Model processes request
- View renders response
- Server sends response to client

... MVC in a Web Application

1. Process request
2. Create/update beans
3. Store beans in request, session, or application scope
4. Forward request to JSP page
5. Extract data from beans and display

Guest Book Example Using MVC

- Model
  - GuestBookEntry.java
- View
  - GuestBook.jsp, AddComment.jsp, EditEntry.jsp
- Controller
  - GuestBook.java, AddComment.java, EditEntry.java

Send Data From Controller to View ...

```java
request.getRequestDispatcher("path_to_jsp")
    .forward(request, response);
```

... Send Data From Controller to View

- Objects in application and session scope are shared by all servlets and JSPs of the application
- Additional data can be passed from servlet to JSP in request scope

```java
request.setAttribute("objName", obj);
request.getRequestDispatcher("path_to_jsp")
    .forward(request, response);
```
Forward vs. Redirect

- Forward:
  - `Dispatcher("path_to_jsp")` forward `request`, `response`

- Redirect:
  - `sendRedirect("another_url")`

More About the MVC Example

- One operation, one controller
- Requests always go to controllers first
- "Hide" JSPs under `/WEB-INF/`
- Controllers do not generate HTML
  - No `out.println()`
- JSPs are only used for display
- No scripting elements in JSP