Session-8

MVC Pattern and Framework

Contents

- What are Frameworks?
- Introduction of MVC pattern/framework
- Evolution of Web Application design architecture
  - Model 1
  - Model 2
  - Application frameworks

What are frameworks?

Components/tools used to create applications.

- Tried and tested.
- Fulfill a specific need.
- Easy interface.
- Extensible.
- May be based on established Design Patterns.

Why do we need frameworks?

In today's economy, clients expect more for less.

- With a standard set of building blocks available, we can concentrate on the implementation of the business logic.

- It allows for either a shortened development timeframe or the ability to deliver more functionality.

- **Cost – Schedule – Quality**

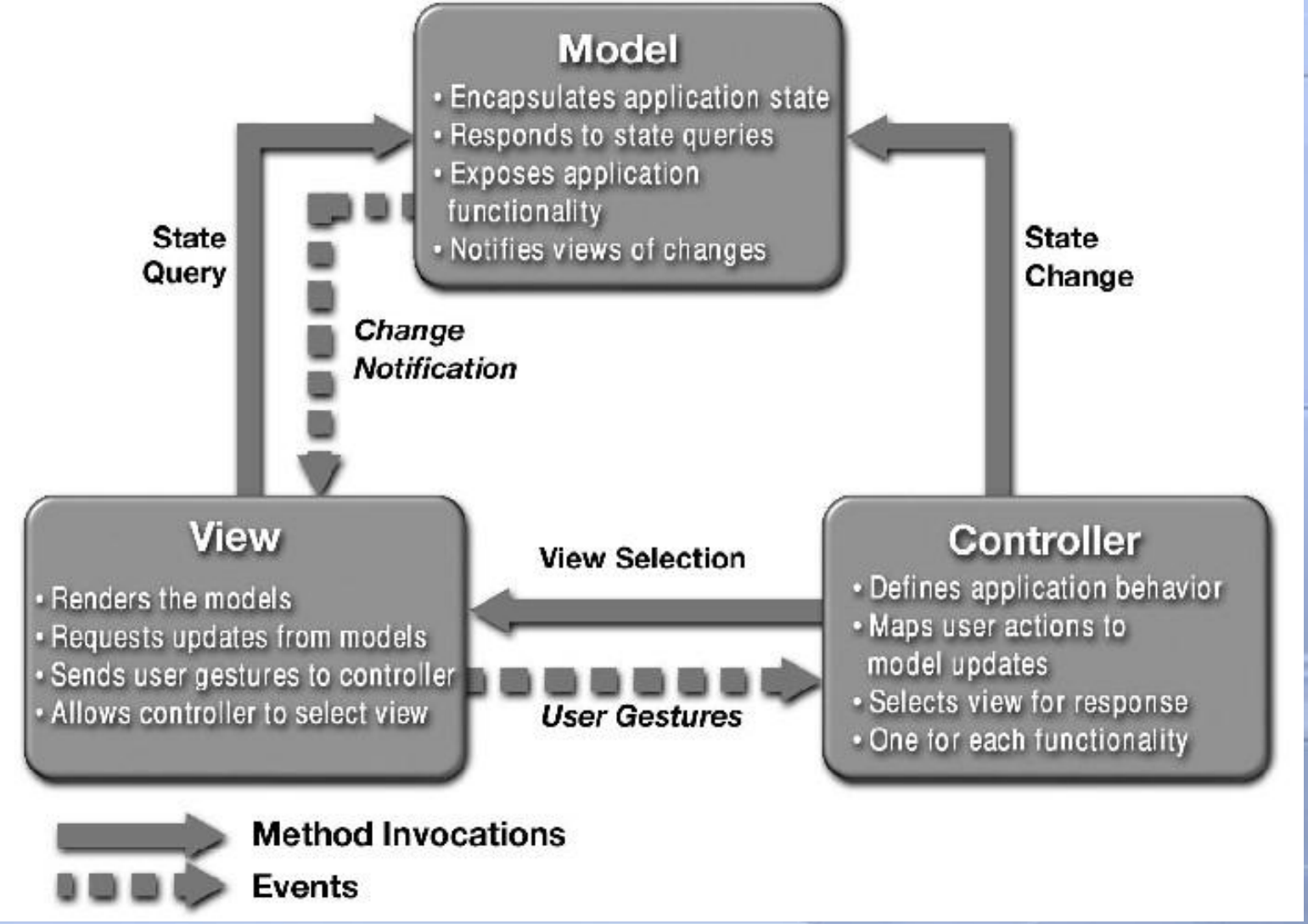
Advantages from the use of frameworks

- Allows faster prototyping
- Improved application quality
  - Fewer opportunities to introduce defects.
- Easier learning curve for new developers:
  - Simplified APIs & better documentation
  - Experienced peers for available for support
  - Examples exists displaying proper usage
- Consistent design across applications
- Easier for the maintenance activity.

MVC Framework

The goal of a Model-View-Controller framework is to achieve decoupling among the software components that are responsible for encapsulating business functions, rendering the content and controlling the navigation or flow.

MVC Pattern


Model
• Encapsulates application state
• Responds to state queries
• Exposes application functionality
• Notifies views of changes
State Query
State Change
Change Notification
View
• Renders the models
• Requests updates from models
• Sends user gestures to controller
• Allows controller to select view
View Selection
User Gestures
Controller
• Defines application behavior
• Maps user actions to model updates
• Selects view for response
• One for each functionality
Method Invocations
Events

Three Logical Layers in a Web Application

- **Model (Business process layer)**
  - Models the data and behavior behind the business process
  - Responsible for actually doing
    - Performing DB queries
    - Calculating the business process
    - Processing orders
  - Encapsulate of data and behavior which are independent of presentation

Three Logical Layers in a Web Application

- **View (Presentation layer)**
  - Display information according to client types
  - Display result of business logic (Model)
  - Not concerned with how the information was obtained, or from where (since that is the responsibility of Model)

Three Logical Layers in a Web Application

- **Controller (Control layer)**
  - Serves as the logical connection between the user's interaction and the business services on the back.
  - Responsible for making decisions among multiple presentations
    - e.g. User's language, locale or access level dictates a different presentation.
  - A request enters the application through the control layer, it will decide how the request should be handled and what information should be returned

Web Applications

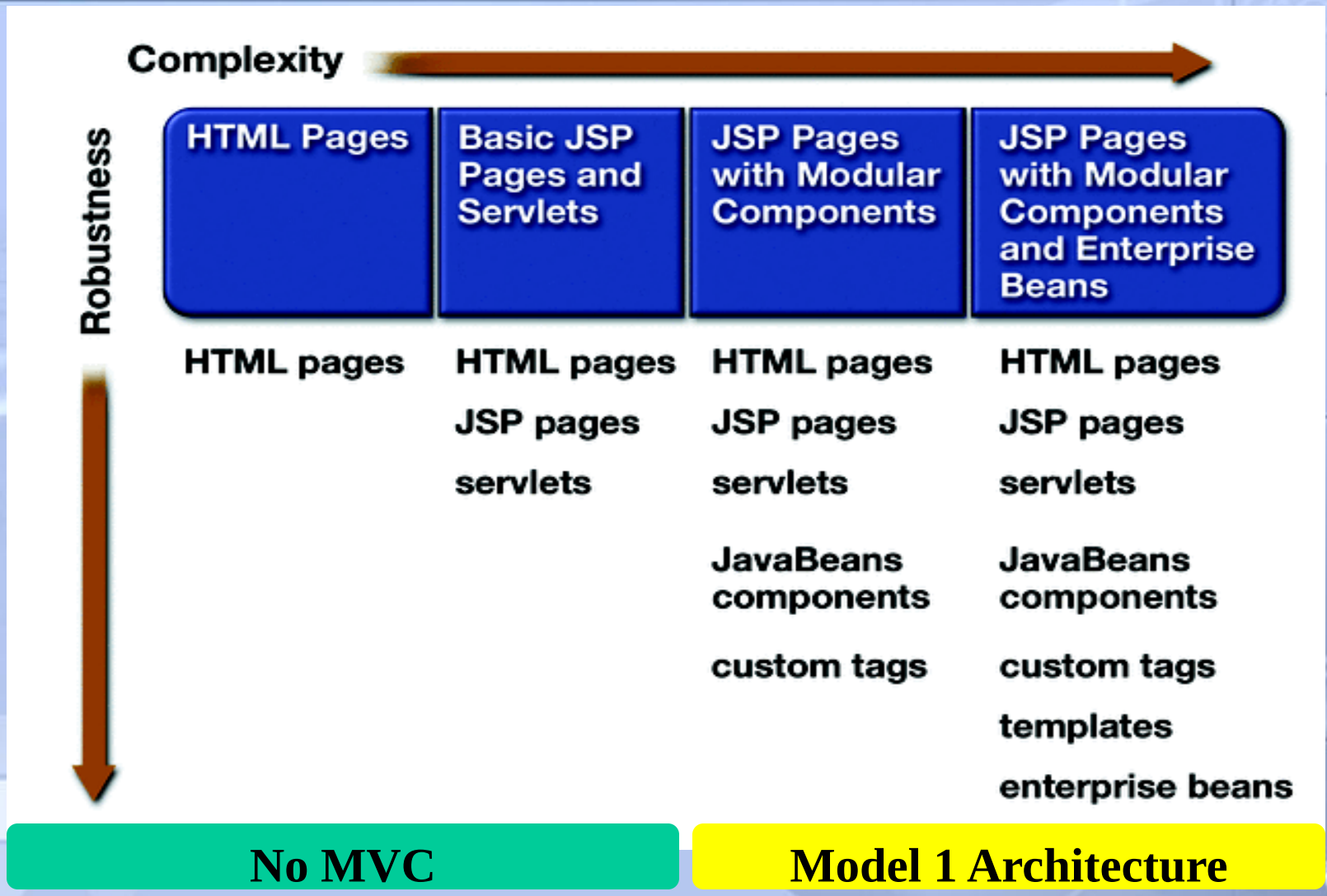
- It is often advantageous to treat each layer as an independent portion of your application.
- Do not confuse logical separation of responsibilities with actual separation of components.
- Some or of the layers can be combined into single components to reduce application complexity.

Evolution of Web Application Design Architecture

Evolution of MVC Architecture

1. No MVC
2. MVC Model 1 (Page-centric)
3. MVC Model 2 (Servlet-centric)
4. Web application frameworks
   - **Struts**
5. Standard-based Web application framework
   - **JavaServer Faces (JSR-127)**

Evolution of Web Architecture

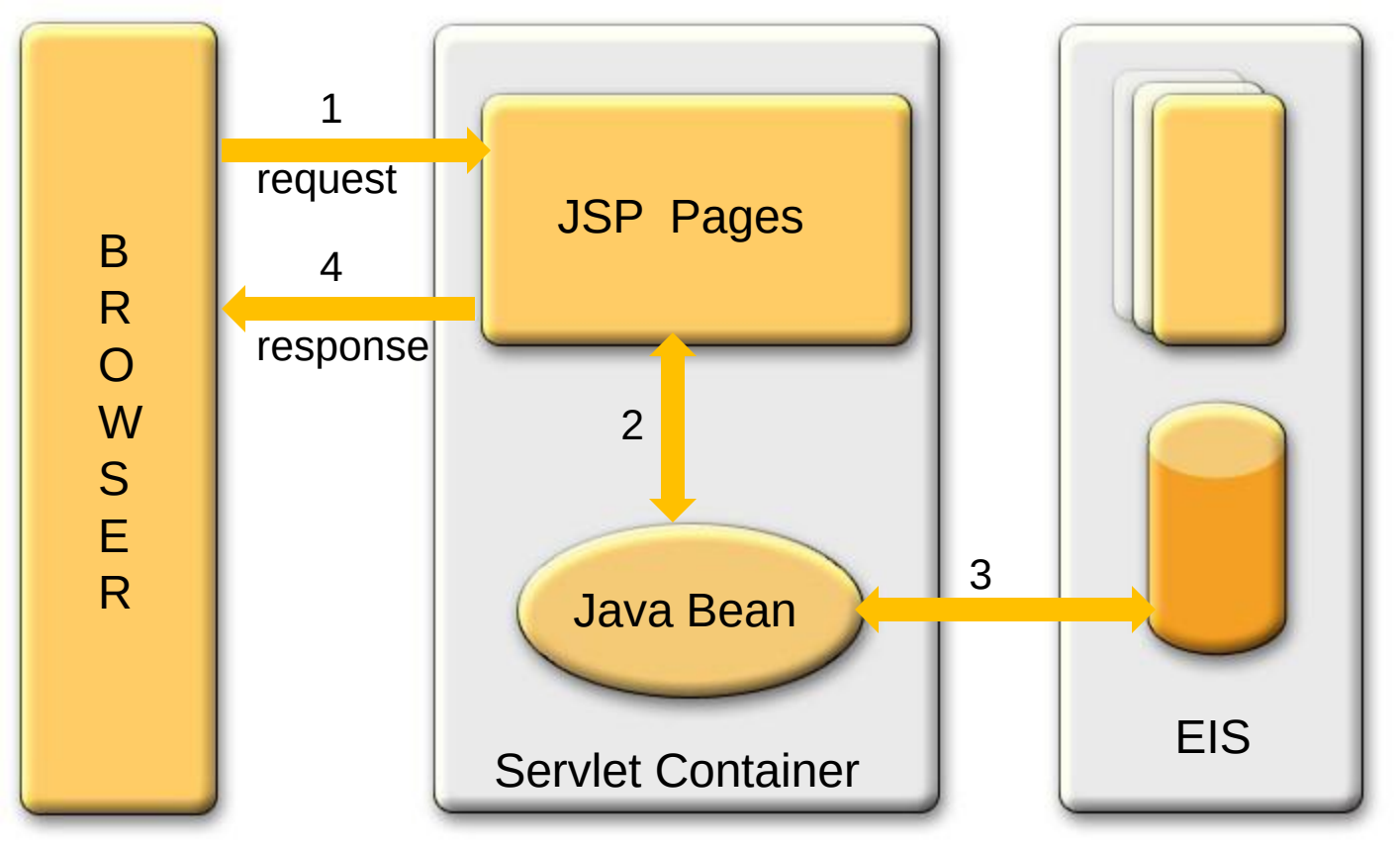


No MVC

Model 1 Architecture

Model 1 (Page-Centric Architecture)

Model 1 Architecture (Page-centric)



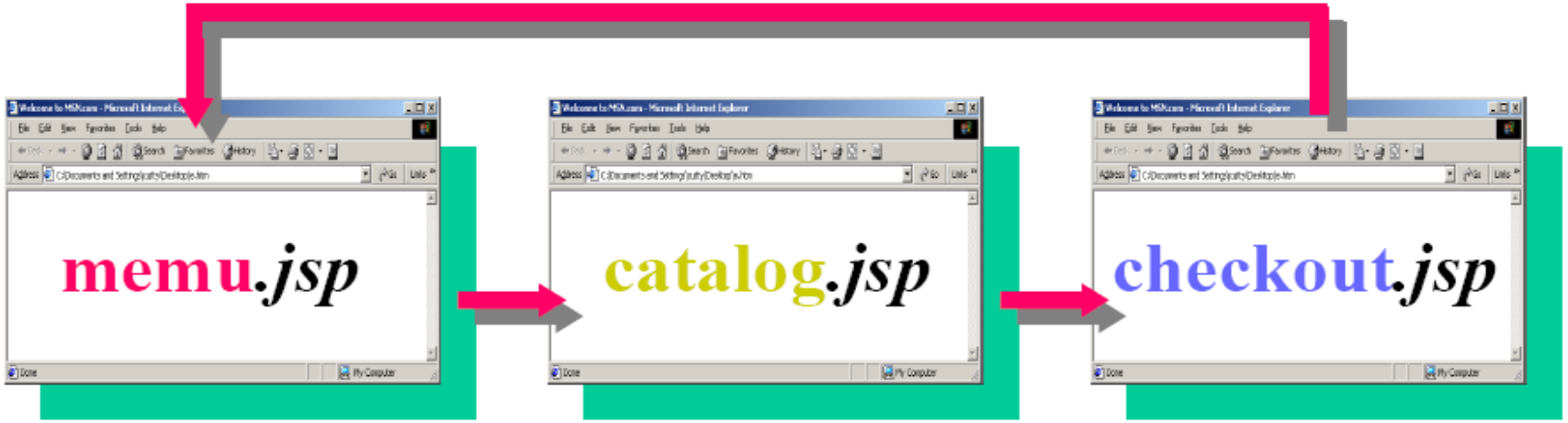
Page-centric Architecture

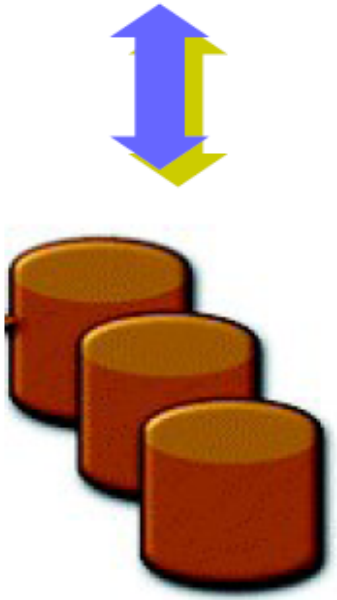
- Composed of a series of interrelated JSP pages
  - JSP pages handle all aspects of the application - presentation, control, and business process
- Business process logic and control decisions are hard coded **inside JSP pages**
  - in the form of JavaBeans, scriptlets, expression
- Next page selection is determined by
  - A user clicking on a hyper link, e.g.

    <A HERF="find.jsp>
  - Through the action of submitting a form, e.g.

    <FORM ACTION="search.jsp">

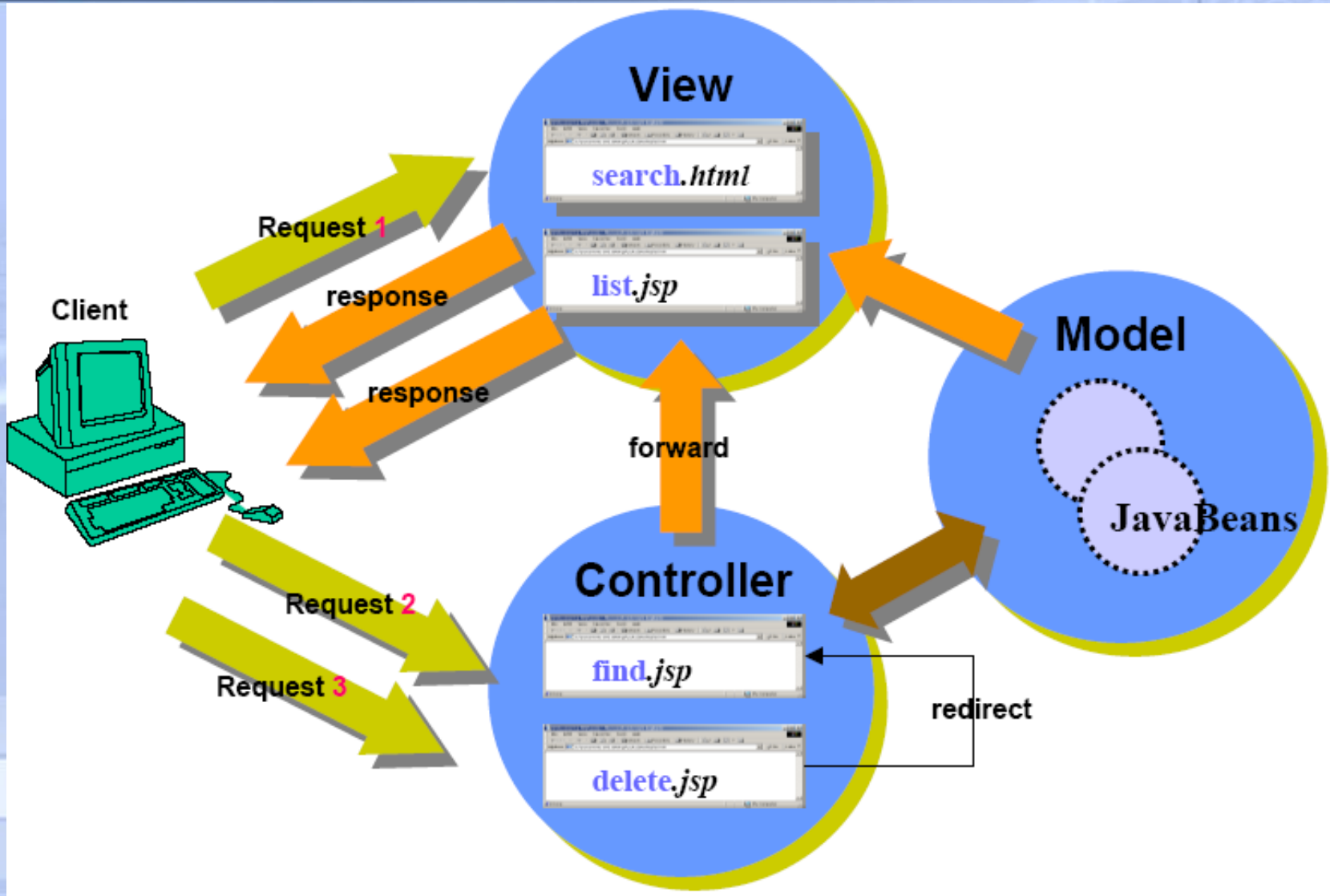
Page-centric Architecture





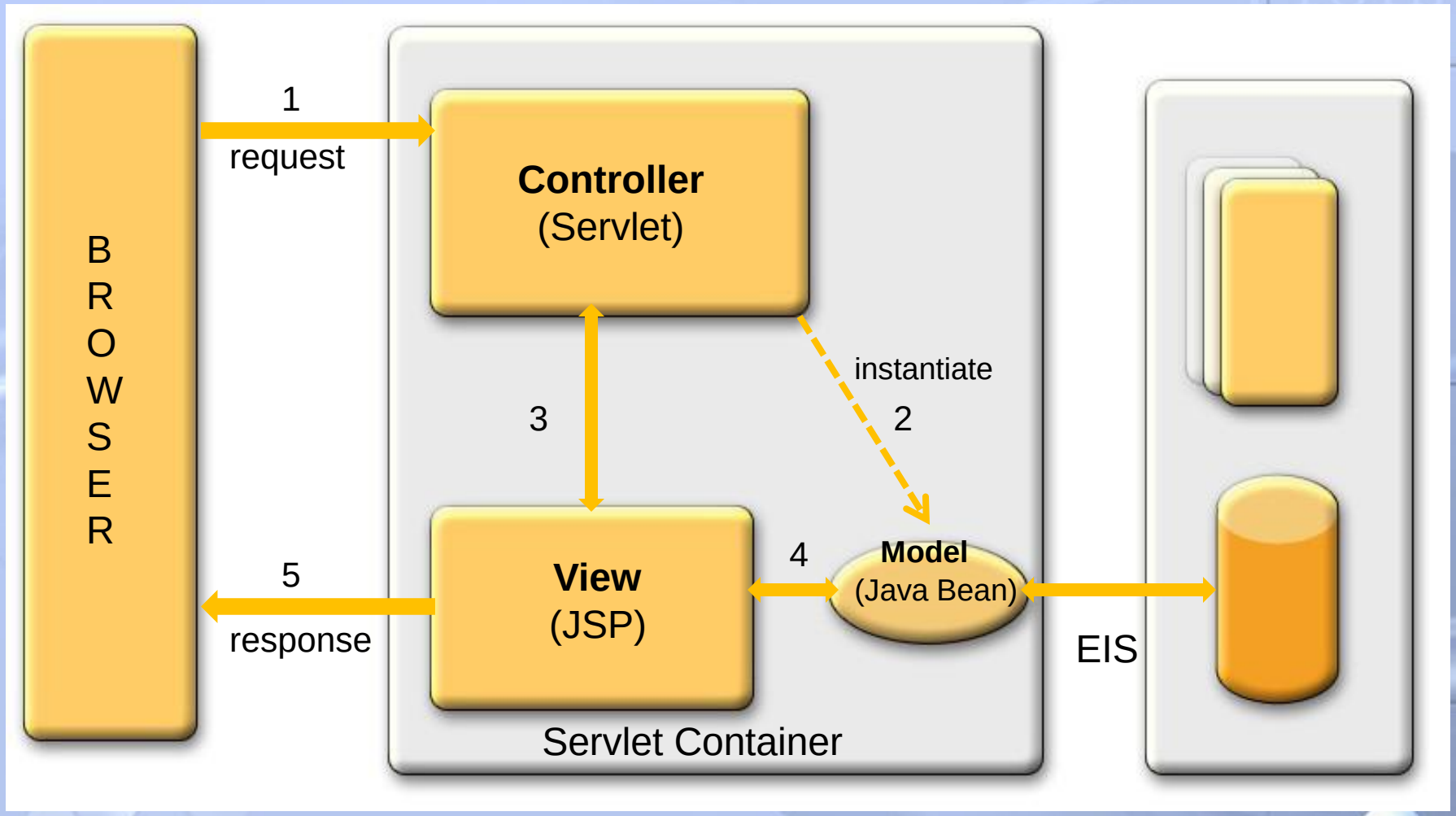
dataBase

Page-centric Scenario



Model 2 (Servlet-Centric Architecture)

Model 2 Architecture (Servlet-centric)



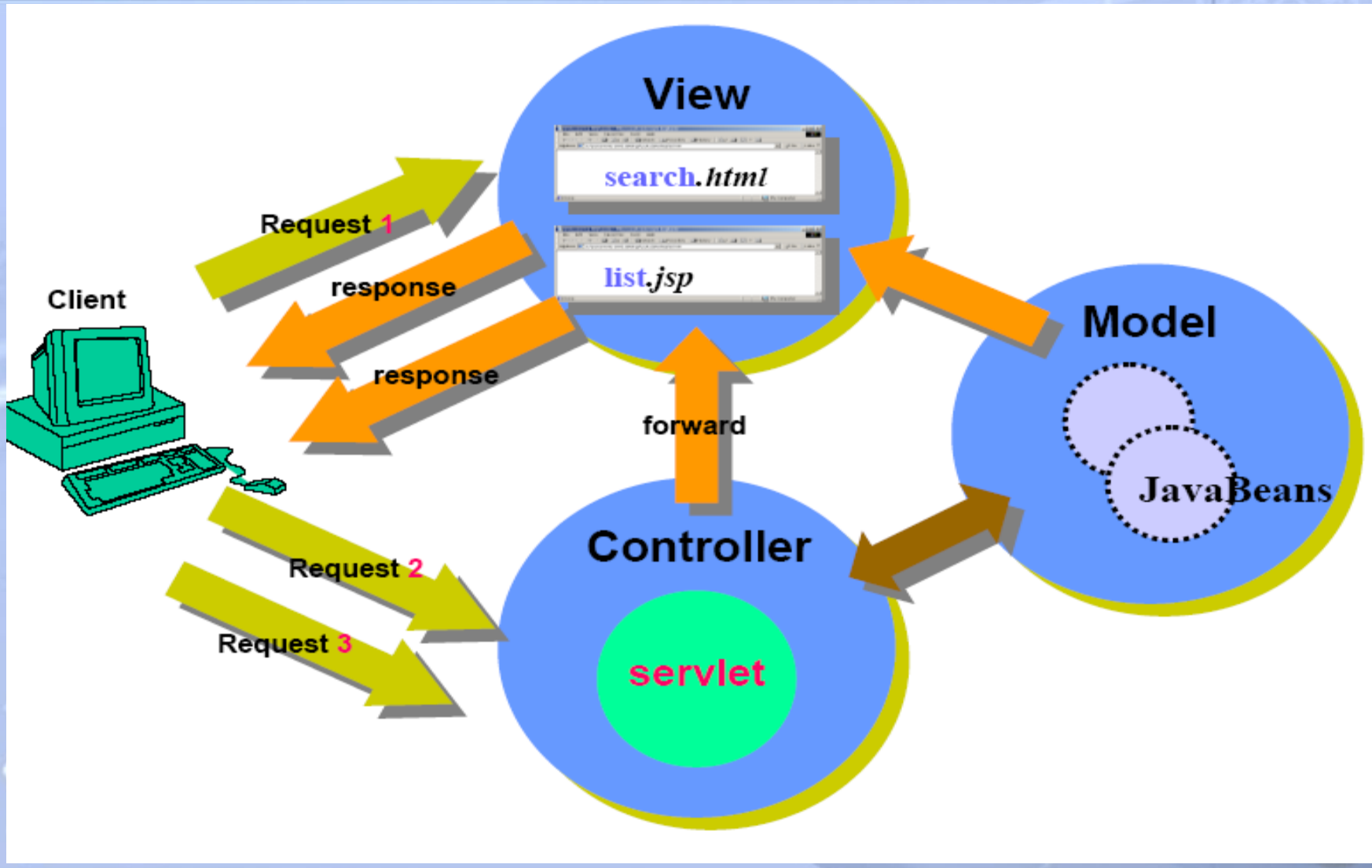
Why Model 2 Architecture?

- What if you want to present different JSP pages depending on the data you receive?
  - JSP technology alone even with JavaBeans and custom tags (Model 1) cannot handle it well
- Solution
  - Use Servlet and JSP together (Model 2)
  - Servlet handles initial request, partially process the data, set up beans, then forward the results to one of a number of different JSP pages

Servlet-centric Architecture

- **JSP pages are used only for presentation**
  - Control and application logic handled by a servlet (or set of servlets)
- **Servlet serves as a gatekeeper**
  - Provides common services, such as authentication, authorization, login, error handling, and etc.
- **Servlet serves as a central controller**
  - Act as a state machine or an event dispatcher to decide upon the appropriate logic to handle the request.
  - Performs redirecting

Servlet-centric Scenario



Web Application Framewrok

Web Application Frameworks

- Based on MVC Model 2 architecture.
- Web-tier applications share common set of functionality
  - Dispatching HTTP requests
  - Invoking model methods
  - Selecting and assembling views
- Provide classes and interfaces that can be used/extended by developers.

Why Web Application Framework?

- De-coupling of presentation tier and business logic into separate components
- Provides a central point of control
- Provides rich set of features
- Facilitates unit-testing and maintenance
- Availability of compatible tools
- Provides stability
- Enjoys community-supports
- Simplifies internationalization
- Simplifies input validation

Why Web Application Framework?

- Frameworks have evolved with Java Server technology.
- JSP/Servlets are still hard to use.
- Frameworks define re-usable components to make this job easier.
- A good framework defines how components work to create a usable application.

Web Application Frameworks

- Apache Struts
- JavaServer Faces (JSR-127)
  - A server side user interface component framework for JavaTM technology-based web applications
- Echo
- Tapestry

Thank you!