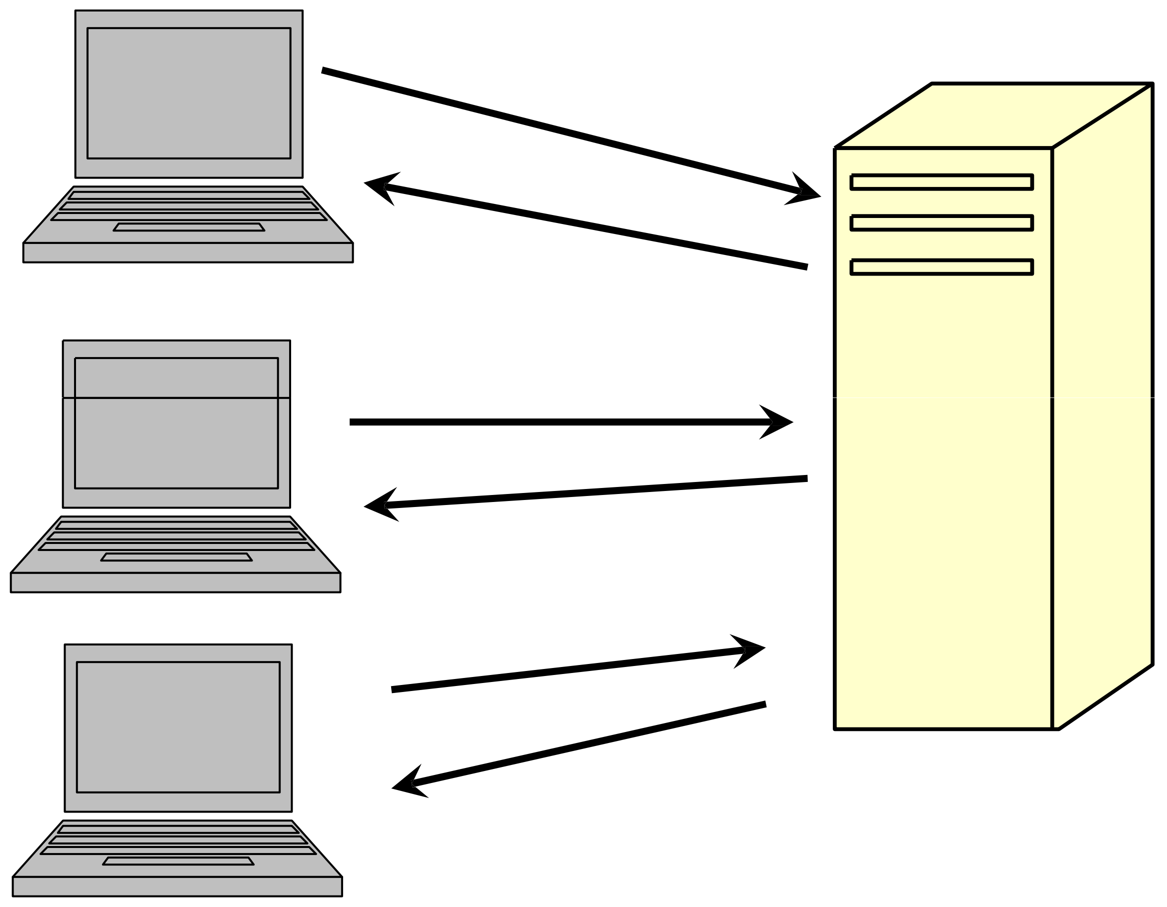
ĐẠI HỌC BÁCH KHOA HÀ NỘI
VIỆN CÔNG NGHỆ THÔNG TIN VÀ TRUYỀN THÔNG

Web Development Models

Content

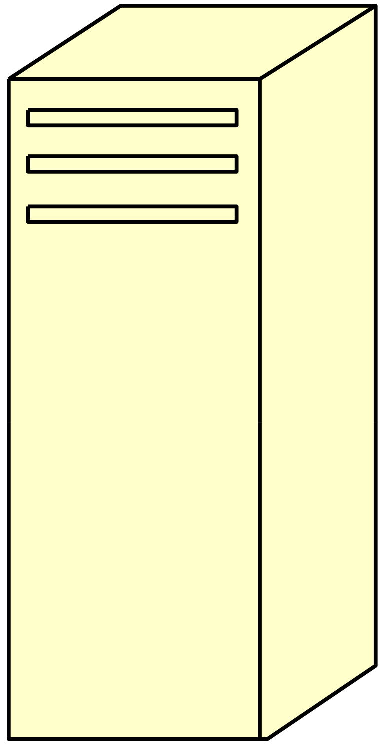
- Web Application Architecture: client-server
- Programming Languages on client side
- Programming Languages on server side
- 3-tier architecture and MVC model

Client-Server Model



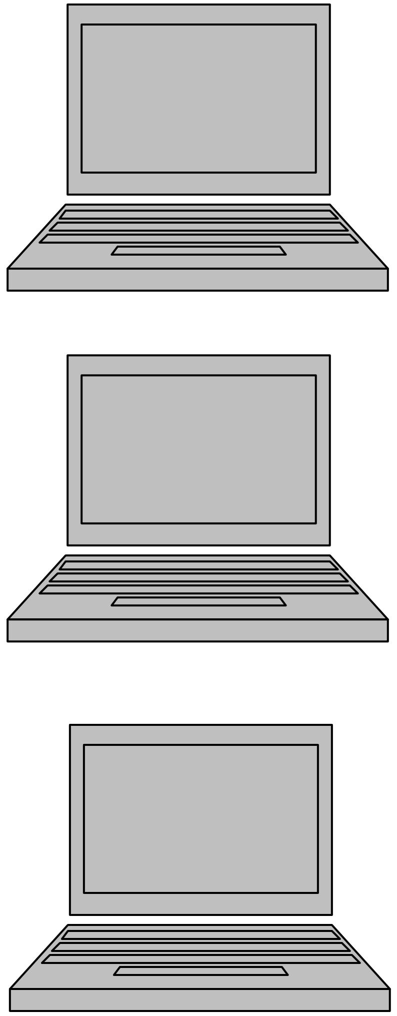
Server Roles

- Manage and store data, including:
  - User data
  - Application data
- Provide processing services for data
- Centralize data
- Manage user authentication, authorization mechanisms via login function



Client Roles

- Provide user interface
- Can store some small data (using cookie)
- Can process data (check validity of data that are entered by users
  - Thin client: only provides user interface, centralize data processing on server side
  - Thick client: realizes data processing on client side
- Can be accessed from everywhere with minimal software installation

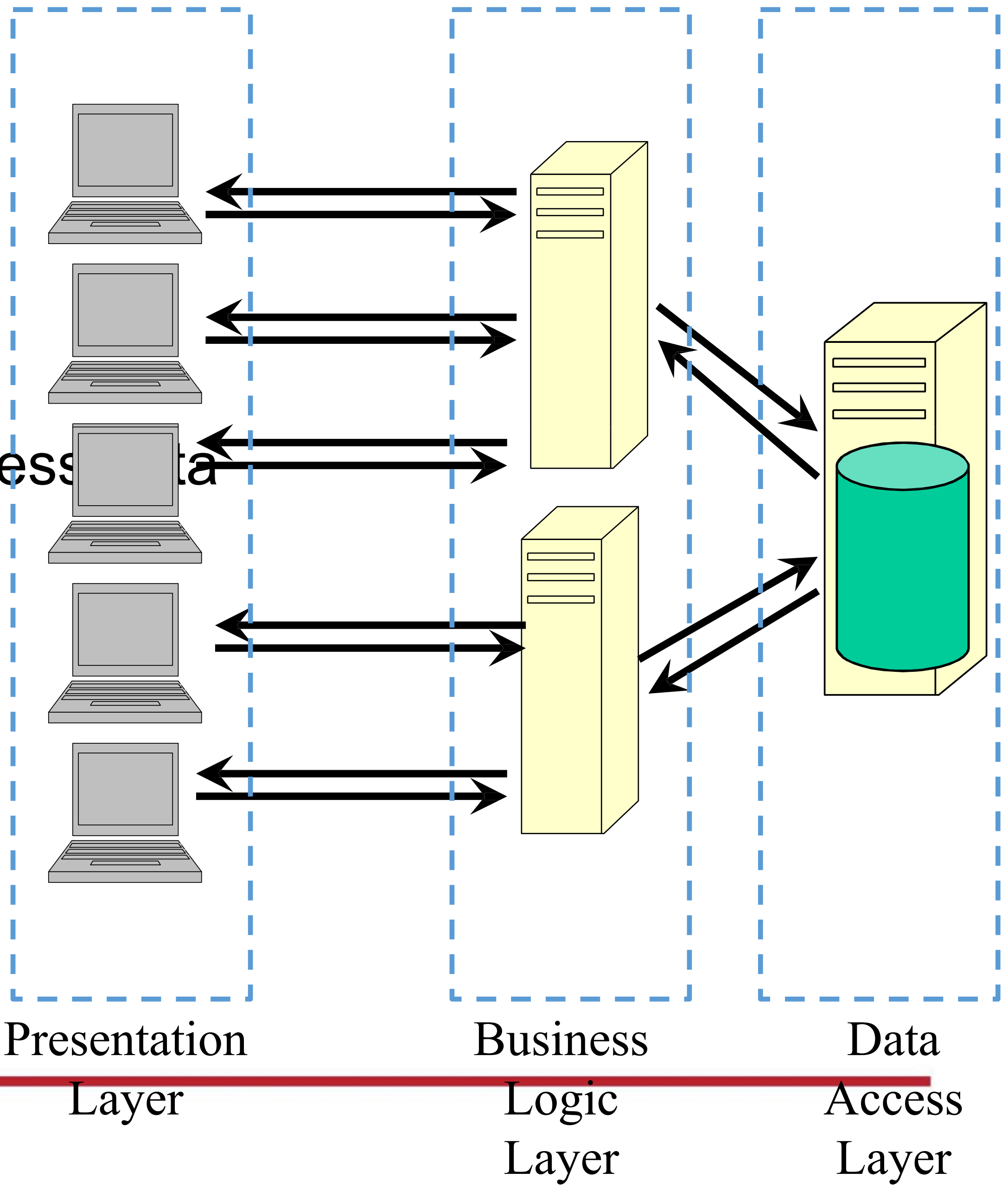


Client-Server Advantages

- Centralized storage and processing.
- No data redundancy
- Enhance the ability of sharing data
  - If data are distributed on multi-systems of users, it will cause difficulties in sharing the data because each system has its own database architecture

3-Tier Architecture

- Database Tier (Data Access Layer)
  - Stores and accesses data in low-level
- Server Tier (Business Logic Layer)
  - Manages application connections and process ta
- Client Tier (Presentation Layer)
  - Provides interface and processing



3-Tier Architecture Advantages

- Centralized Database can be accessed by many servers at the same time
- Allow load balance of user connections on many application servers
- **Data Access Layer** is consistently designed with hardware in order to serve specific its tasks:
  - Data manipulations: update, insert, remove, etc
  - Need more reliable hard drives
- **Business Logic Layer** are designed to provide connection points for user connections and run multi-applications
  - Need more computing power of CPU

Programming Languages

Client	Server	Database
Html	Java, Ruby	SQL
JavaScript	Visual Basic	NoSQL
Flash	PHP, Perl	
	Python	

Client Programming Language

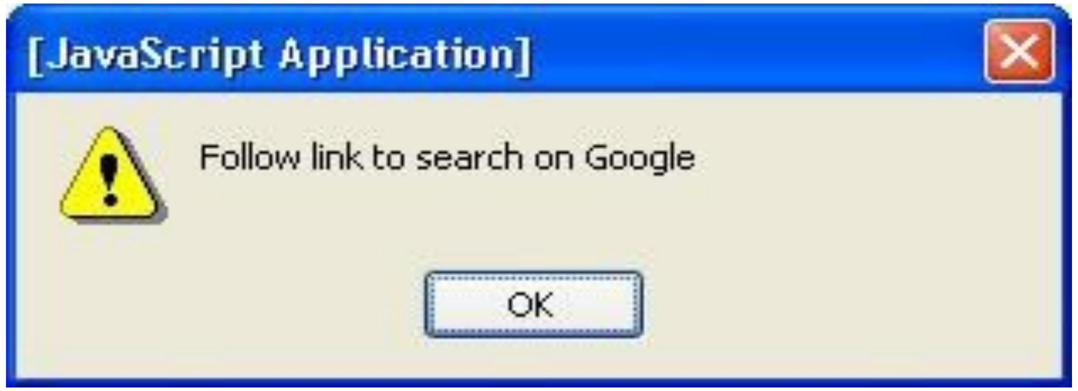
JavaScript

- Event Handling
- Statements (like C / Java)
- Operators
- Variables global (default)
  - Or local (e.g. var x = 1)
- Types can change
  - Eg. x = 1; x = ‘Hello’
- Function definition (reuse)
- Message Alerts
- Page element access with Document Object Model
  - Views HTML page as a tree of elements

Hello World Example

- This provides an annoying popup – try it!

```
<html>
<body>
<a href="http://www.google.co.uk"
  onMouseOver="(alert(
'Follow link to search on Google') )">
Search on Google
</a>
</body>
</html>
```



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Server Programming Language

- Java – uses Java servlets, Java Server Pages (JSP) and Java Beans.
- Ruby on Rails – uses ruby programs and Embedded Ruby (ERB).
- Visual Basic – Uses VB programs and Active Server Pages (ASP).
- Others:
  - PHP (Personal Home Page – originally)
  - CGI (Common Gateway Interface)
  - Perl (Named after the parable of the pearl)
  - Python (Named for the Monty Python skits)
  - Tcl (Tool Command Language)

PHP

- Very c-like
- Classes, etc., work very much like C/C++
- Designed to work in the world of HTML
- Is run-time interpreted by the web server

Simple PHP Example

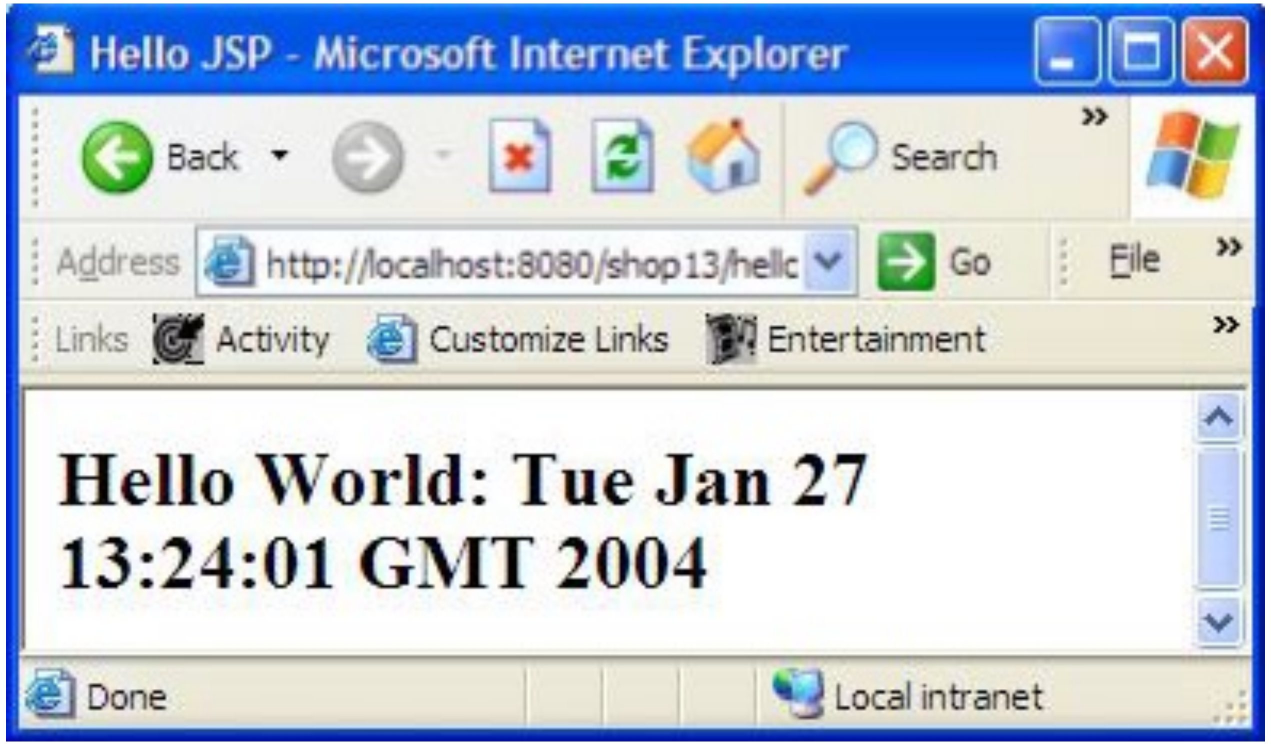
- PHP is meant to be invoked inline with content Page “escapes” into and out of a regular html document
- File extension is .php (was .php3 for version 3)

```
<html>
<head><title>Test page</title></head>
<body>
     The time is now
      <?php echo date();?>
      <hr>
</body>
</html>
```

JSP Example

```
<html>
<head><title>Hello JSP</title></head>
<body>
<p> Hello World:
     <%= new java.util.Date() %>
</p>
</body>
</html>
```

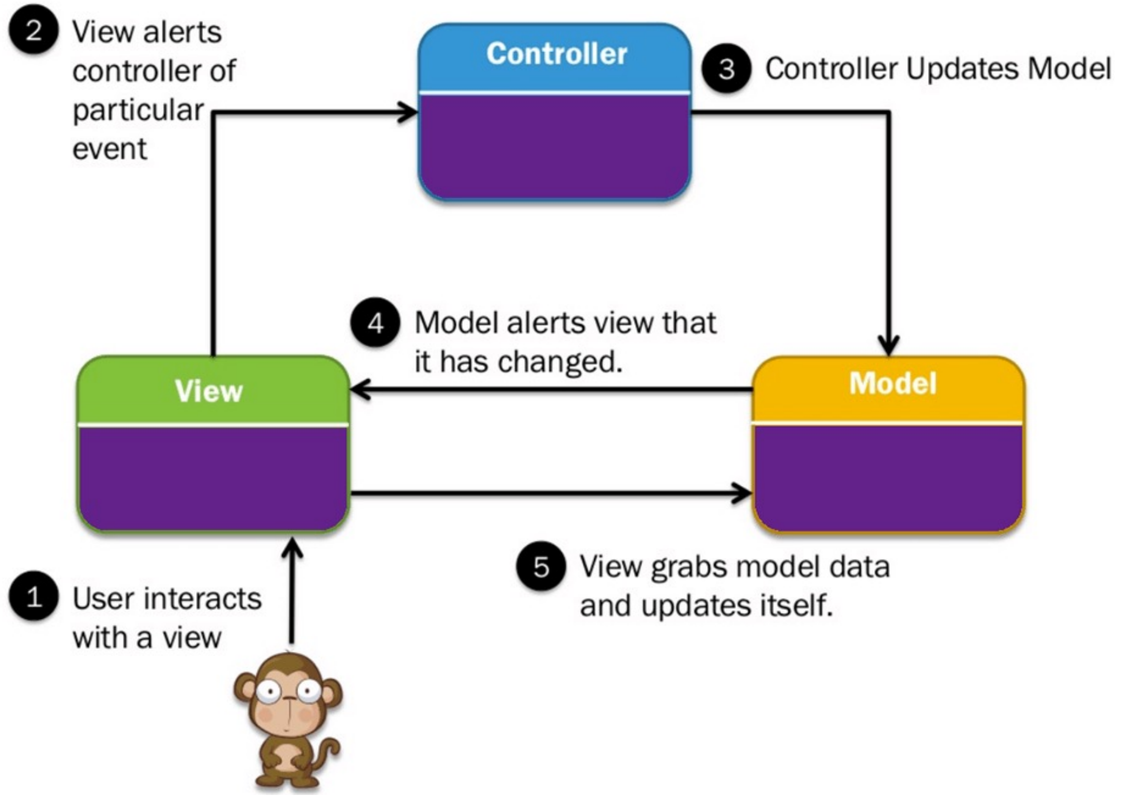
Produced



```
Hello World: Tue Jan 27
13:24:01 GMT 2004
```

MVC Development Model

- Architectural Pattern from Smalltalk (1979)
- Decouples data and presentation
- Eases the development


2 View alerts controller of particular event
Controller
3 Controller Updates Model
4 Model alerts view that it has changed.
View
Model
5 View grabs model data and updates itself.
1 User interacts with a view

MVC – The Model

- The “Model” contains the data
- Has methods to access and possibly update it’s contents.
- Often, it implements an interface which defines the allowed model interactions.
- Implementing an interface enables models to be pulled out and replaced without programming changes.

MVC – The View

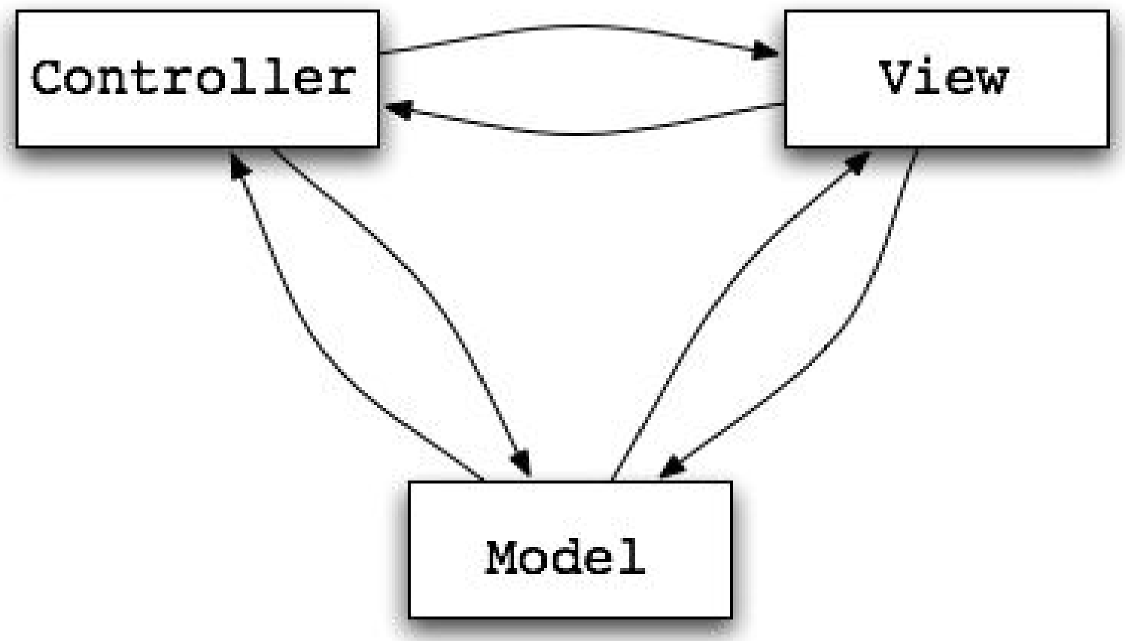
- The View provides a visual representation of the model.
- There can be multiple views displaying the model at any one time.
    - For example, a companies finances over time could be represented as a table and a graph.
    - These are just two different views of the same data.
- When the model is updated, all Views are informed and given a chance to update themselves.

MVC – The Controller

- It interprets mouse movement, clicks, keystrokes, etc
- Communicates those activities to the model – eg: delete row, insert row, etc

Example Control Flow in MVC

- User interacts with the VIEW UI
- CONTROLLER handles the user input (often a callback function attached to UI elements)
- CONTROLLER updates the MODEL
- VIEW uses MODEL to generate new
- UI waits for user interaction

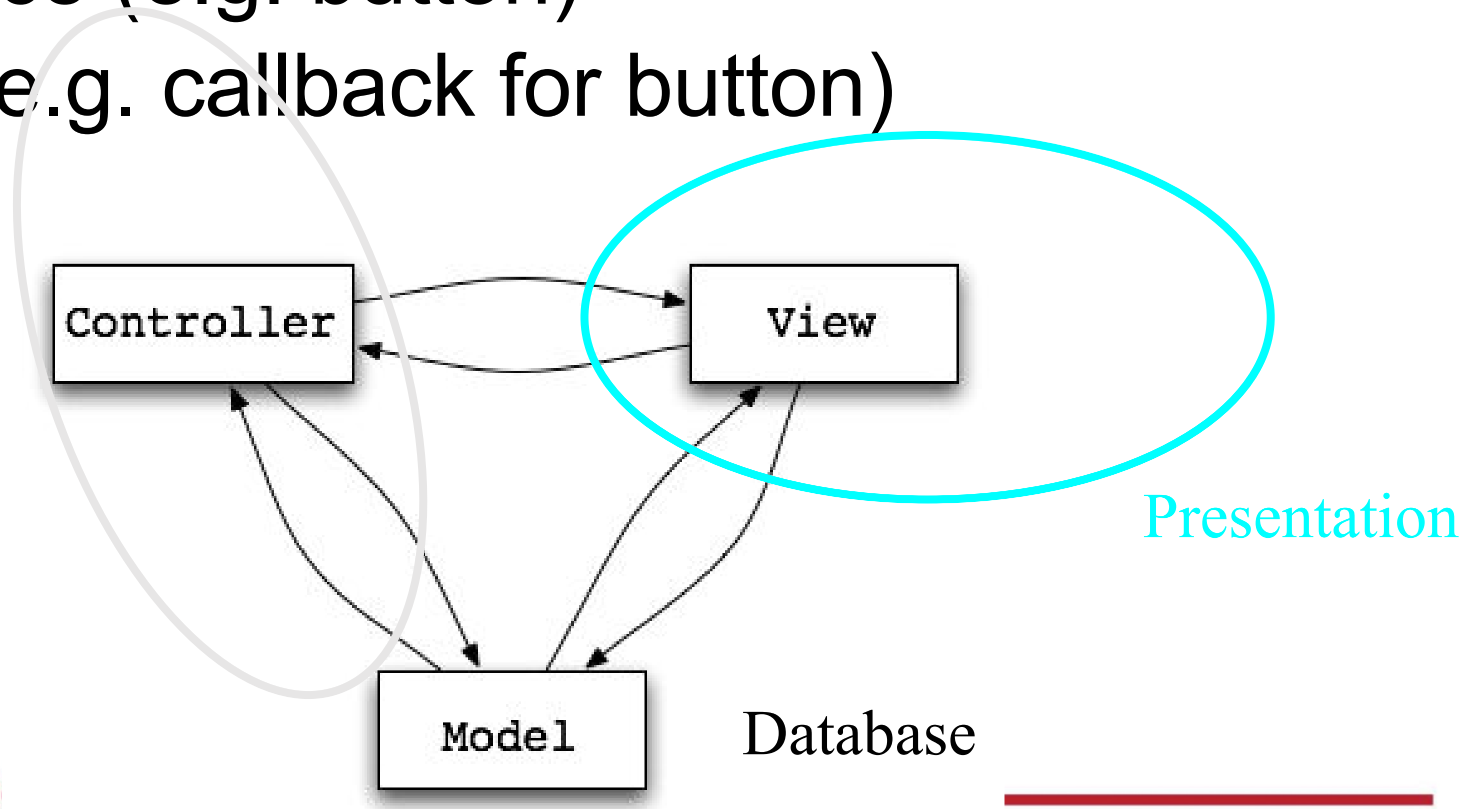


MVC Advantages

- MVC decouples the model, view, and controller from each other to increase flexibility and reuse.
  - You can attach multiple views to the model without rewriting it.
  - You can change the way a view responds to user input without changing the visual presentation. For example, you might use a pop-up menu instead of keyboard command keys.

3 Tier Layers vs. MVC

- Presentation:
  - View is the user interface (e.g. button)
  - Controller is the code (e.g. callback for button)
- Data:
  - Model is the database



Summary

- Client-Server Model
- 3-Tier Architecture
- Dynamic Web Programming Languages
- MVC Model