

Model View View-Model (MVVM)



Agenda

- GUI Patterns
- Model View Controller - MVC
- Model View View-Model - MVVM

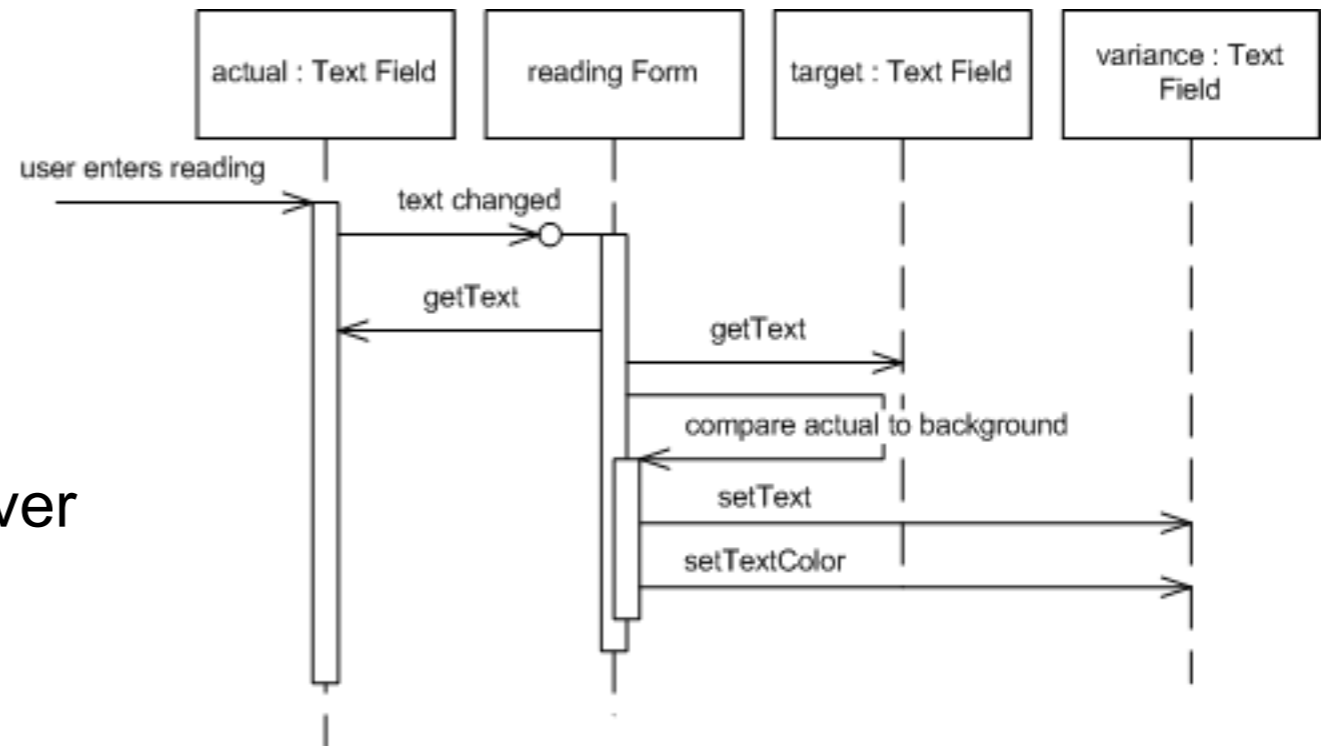
Graphical User Interfaces

- User Interface development - can be notoriously complex.
- Inherent complexity: the GUI component set is at varying levels of abstraction with sophisticated event mechanisms:
 - ▶ Controls
 - ▶ Containers/Dials/Widgets
 - ▶ Panels/Windows
 - ▶ Menus/Buttons/Dropdowns
- Accidental complexity: domain logic can easily become hopelessly intermingled with the GUI specific logic.



GUI Events

- A significant source of complexity
- Fine-grained events
 - ▶ Mouse entered, exited
 - ▶ Mouse pressed
 - ▶ Radio button pressed, armed, rollover
- Coarse-grained events:
 - ▶ Radio button selected
 - ▶ Action performed
 - ▶ Domain property changed
- ▶ Managing the flow of these events requires careful consideration if design coherence is to be preserved.



GUI Patterns

- Reusable designs that can be realised with different toolkits:
 - ▶ Model View Controller (MVC)
 - ▶ Model View View Model (MVVM)
- Other patterns (<http://martinfowler.com/eaaDev/>)
 - ▶ Notification
 - ▶ Supervising Controller
 - ▶ Model View Presenter (MVP)
 - ▶ Passive View
 - ▶ Presentation Model
 - ▶ Event Aggregator
 - ▶ Window Driver
 - ▶ Flow Synchronization
 - ▶ Observer Synchronization
 - ▶ Presentation Chooser
 - ▶ Autonomous View

In particular, read
<http://martinfowler.com/eaaDev/uiArchs.html>
for background to these patterns

Key Principle: Separation of Concerns



“In computer science, separation of concerns (SoC) is a design principle for separating a computer program into distinct sections, such that each section addresses a separate concern. A concern is a set of information that affects the code of a computer program. A concern can be as general as the details of the hardware the code is being optimized for, or as specific as the name of a class to instantiate. A program that embodies SoC well is called a modular program.”

https://en.wikipedia.org/wiki/Separation_of_concerns

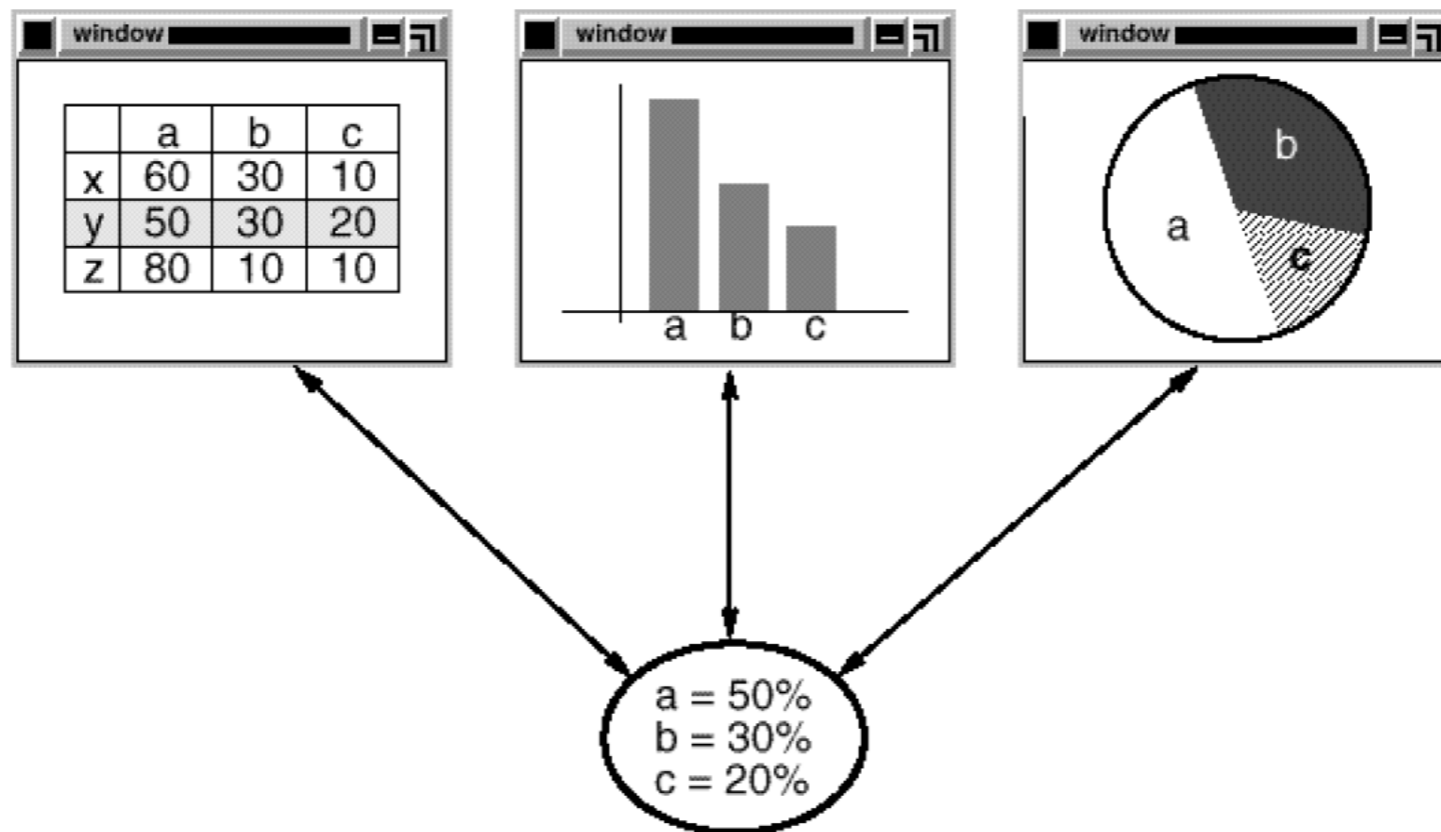
Model View Controller

- The Model/View/Controller (MVC) triad of classes is used to build user interfaces in Smalltalk-80.
- MVC consists of three kinds of objects:
 - Model is the application object
 - View is its screen presentation
 - Controller defines the way the user interface reacts to user input
- Before MVC, user interface designs tended to lump these objects together. MVC decouples them to increase flexibility and reuse

Synchronization

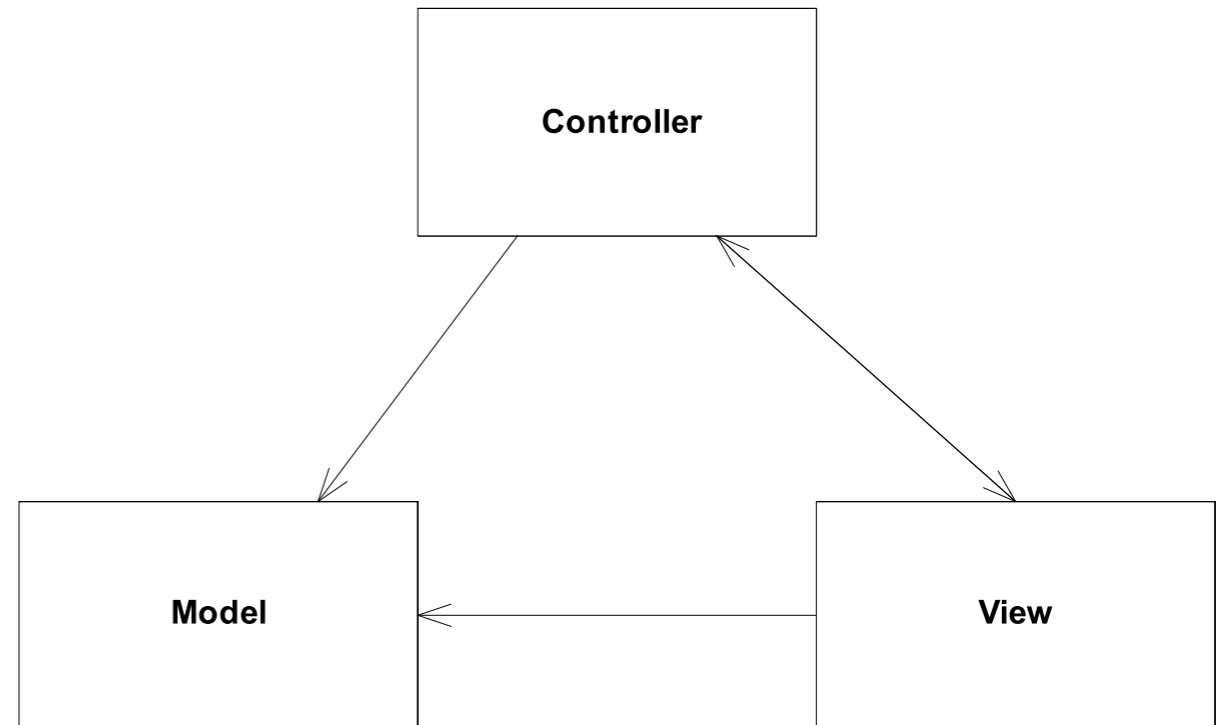
- MVC synchronizes views and models via Observer Synchronization.
 - A view must ensure that its appearance reflects the state of the model.
 - Whenever the model's data changes, the model notifies views that depend on it.
 - In response, each view gets an opportunity to update itself.
- This approach allows multiple views to be attached views to a model to provide different presentations.

View / Model

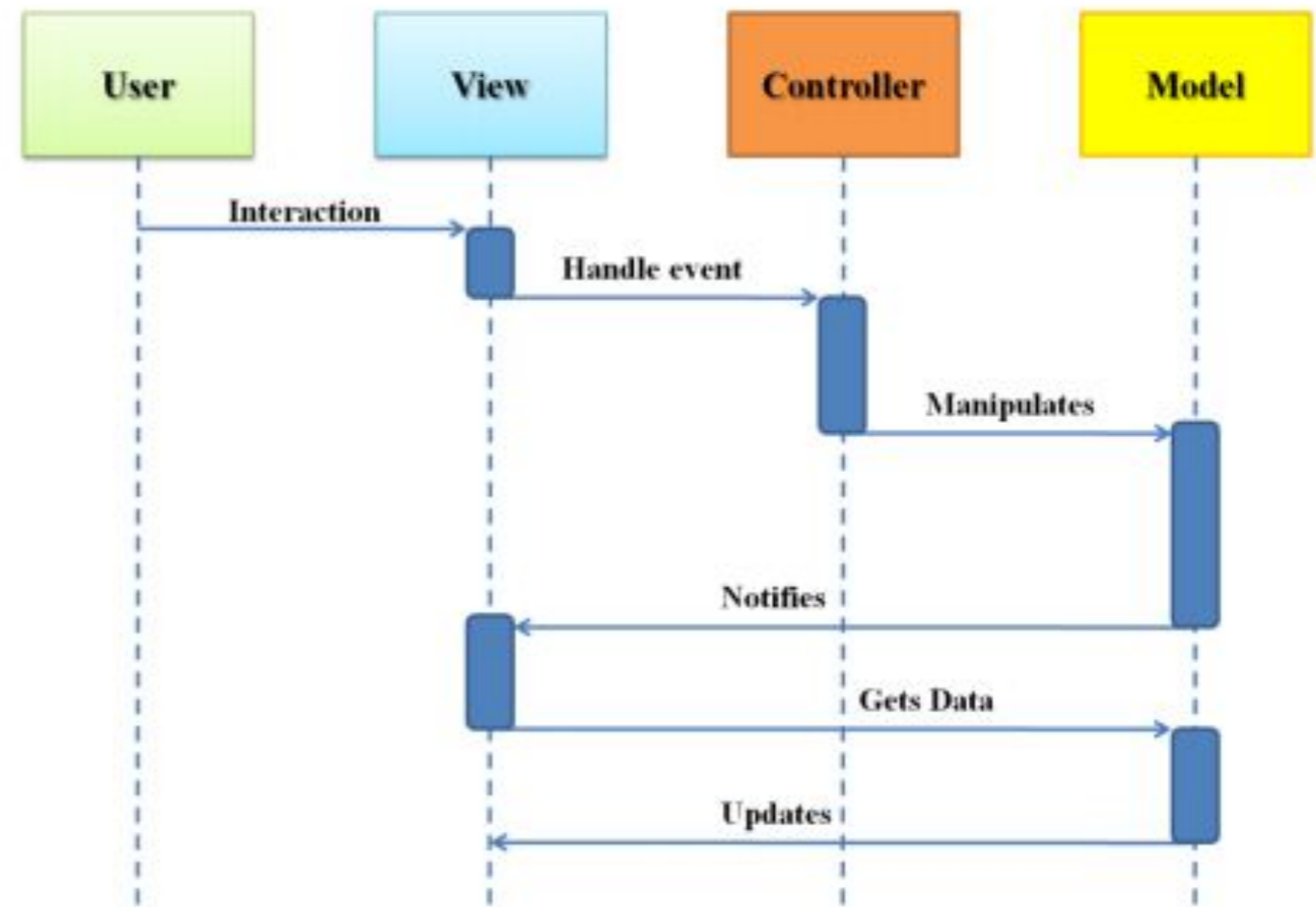
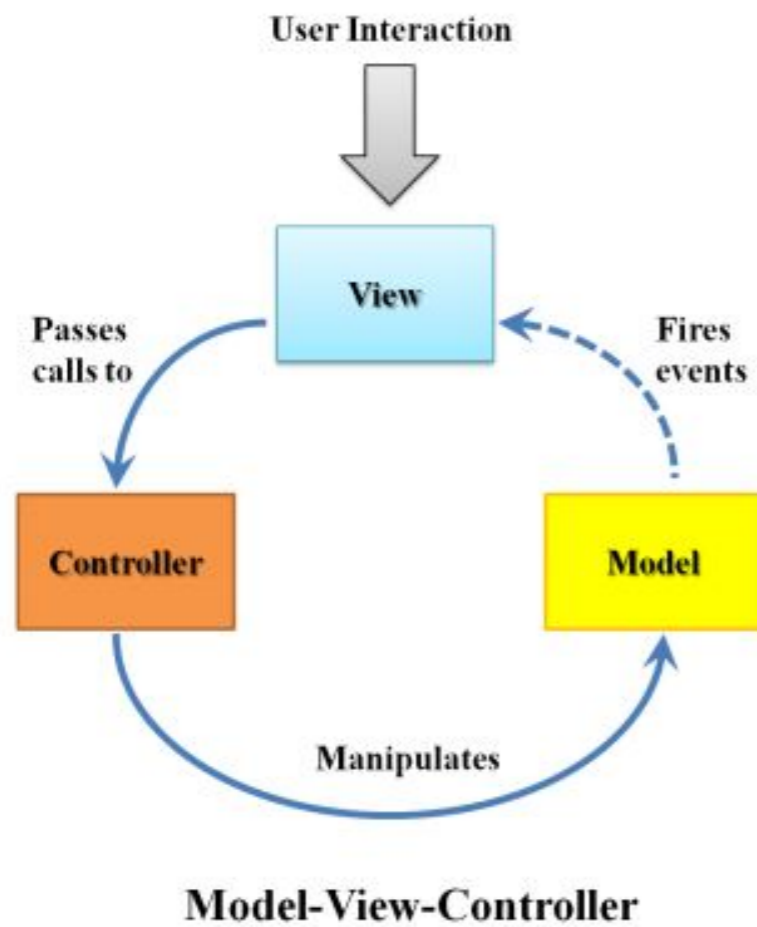


Controller

- MVC encapsulates response and model update mechanisms in a Controller object.
- The Controller is the “glue” between the Model and the View.
- The View renders model updates on the screen, but is not permitted to modify the model.
- The View forwards events to the controller
- The Controller does not have access to the screen but can modify the model.



MVC Sequence Diagrams



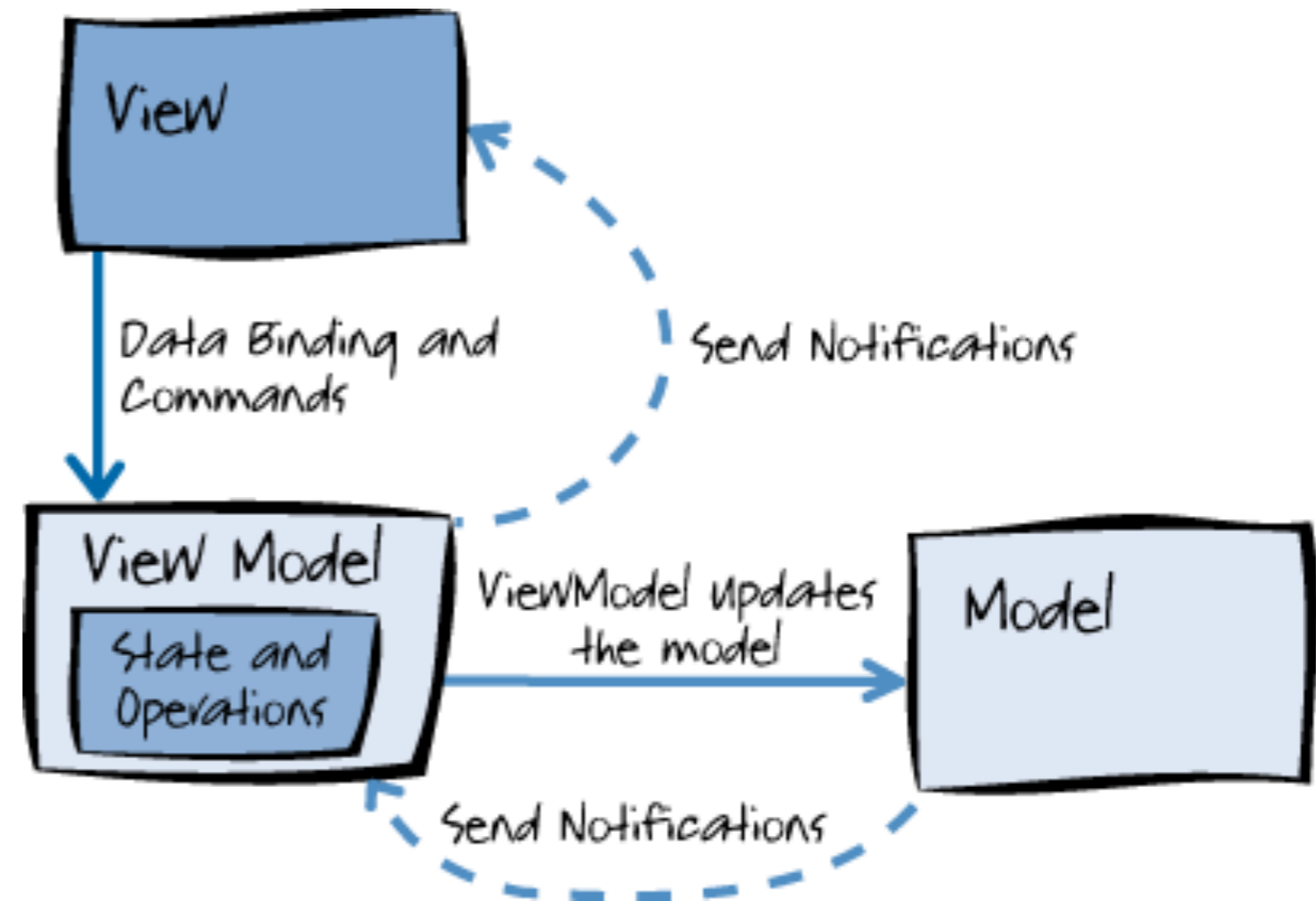
Sequence Diagram of MVC

Potential Advantages

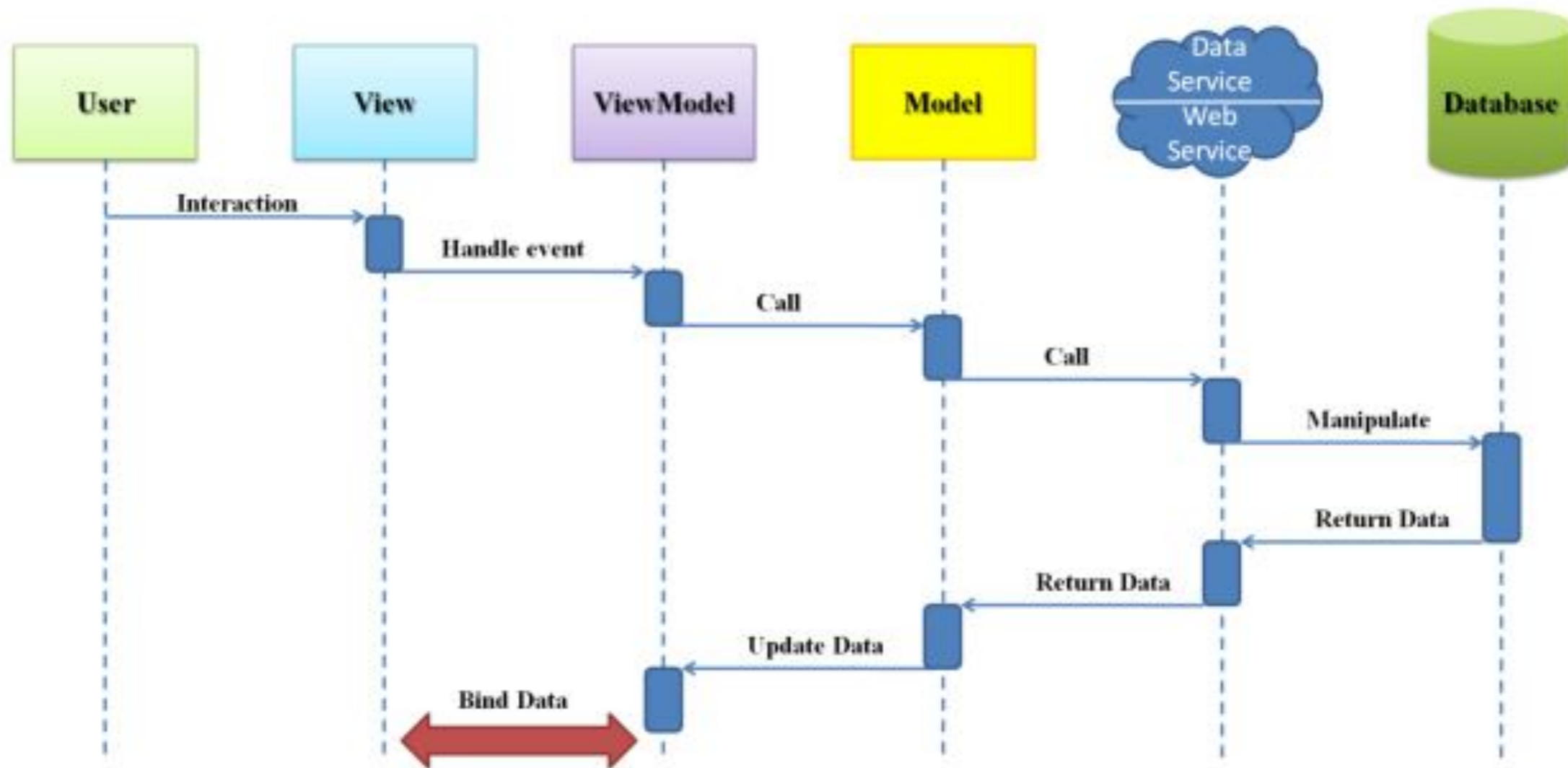
- Since MVC handles the multiple views using the same enterprise model it is easier to maintain, test and upgrade the multiple system.
- It will be easier to add new clients just by adding their views and controllers.
- Since the Model is completely decoupled from view it allows lot of flexibilities to design and implement the model considering reusability and modularity.
- This makes the application extensible and scalable

Model View View-Model

- Model: refers to a domain model, which represents real state content
- View: As in the MVC, the view is the structure, layout, and appearance of what a user sees on the screen.
- View model : an abstraction of the view exposing public properties and commands. Instead of the controller of the MVC pattern, MVVM has 'bound' properties - automatically synchronised with the view



MVVM Sequence Diagram



Sequence Diagram of MVVM