Software design & architecture

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<u>Interaction-Oriented Architecture</u>

The primary objective of interaction-oriented architecture is to separate the interaction of user from data abstraction and business data processing. The interaction-oriented software architecture decomposes the system into three major partitions −

Data module − Data module provides the data abstraction and all business logic.

Control module − Control module identifies the flow of control and system configuration actions.

View presentation module − View presentation module is responsible for visual or audio presentation of data output and it also provides an interface for user input.

Interaction-oriented architecture has two major styles − Model-View-Controller (MVC) and Presentation-Abstraction-Control (PAC). Both MVC and PAC propose three components decomposition and are used for interactive applications such as web applications with multiple talks and user interactions. They are different in their flow of control and organization. PAC is an agent-based hierarchical architecture but MVC does not have a clear hierarchical structure.

<u>Model-View-Controller (MVC)</u>

MVC decomposes a given software application into three interconnected parts that help in separating the internal representations of information from the information presented to or accepted from the user.

Module	Function
Model	Encapsulation the underlying data and business logic
View	Respond to user action and direct the application flow
Controller	Formats and present the data from model to user.

MVC - I

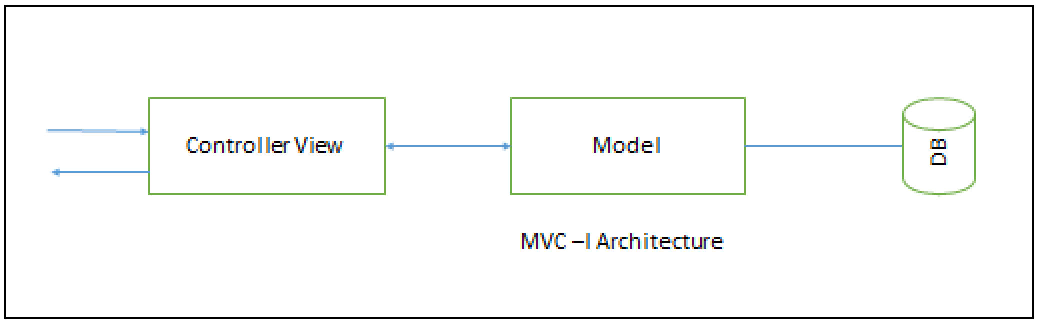
It is a simple version of MVC architecture where the system is divided into two sub-systems –

The Controller-View – The controller-view acts as input /output interface and processing is done.

The Model – The model provides all the data and domain services.

MVC-I Architecture

The model module notifies controller-view module of any data changes so that any graphics data display will be changed accordingly. The controller also takes appropriate action upon the changes.

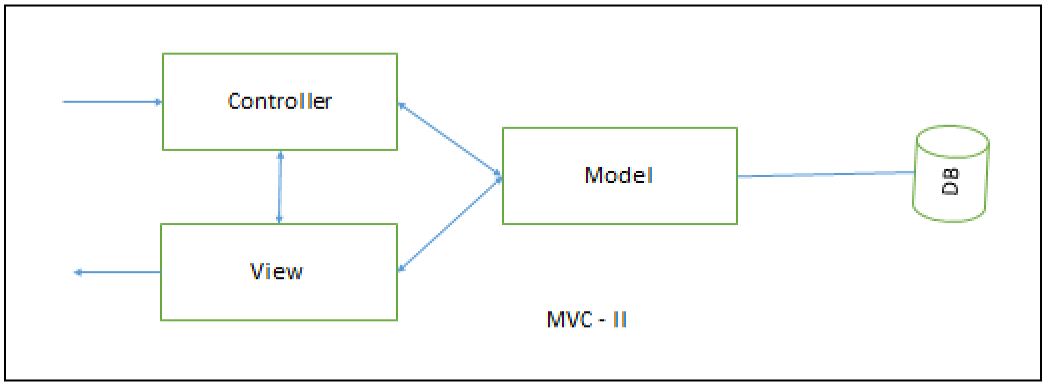


MVC - II

MVC–II is an enhancement of MVC-I architecture in which the view module and the controller module are separate. The model module plays an active role as in MVC-I by providing all the core functionality and data supported by database.

The view module presents data while controller module accepts input request, validates input data, initiates the model, the view, their connection, and also dispatches the task.

MVC-II Architecture



MVC Application

Advantages

- There are many MVC vendor framework toolkits available.
- Multiple views synchronized with same data model.
- Easy to plug-in new or replace interface views.
- Used for application development where graphics expertise professionals, programming professionals, and data base development professionals are working in a designed project team.

Disadvantages

- Not suitable for agent-oriented applications such as interactive mobile and robotics applications.
- Multiple pairs of controllers and views based on the same data model make any data model change expensive.
- The division between the View and the Controller is not clear in some cases.

Presentation-Abstraction-Control (PAC)

In PAC, the system is arranged into a hierarchy of many cooperating agents (triads). It was developed from MVC to support the application requirement of multiple agents in addition to interactive requirements. Each agent has three components −

- The presentation component − Formats the visual and audio presentation of data.
- The abstraction component − Retrieves and processes the data.
- The control component − Handles the task such as the flow of control and communication between the other two components.

Applications

- Effective for an interactive system where the system can be decomposed into many cooperating agents in a hierarchical manner.
- Effective when the coupling among the agents is expected to be loose so that changes on an agent does not affect others.
- Effective for distributed system where all the agents are distantly distributed and each of them has its own functionalities with data and interactive interface.
- Suitable for applications with rich GUI components where each of them keeps its own current data and interactive interface and needs to communicate with other components.

Advantages

- Support for multi-tasking and multi-viewing
- Support for agent reusability and extensibility
- Easy to plug-in new agent or change an existing one
- Support for concurrency where multiple agents are running in parallel in different threads or different devices or computers

Disadvantages

- Overhead due to the control bridge between presentation and abstraction and the communication of controls among agents.
- Difficult to determine the right number of agents because of loose coupling and high independence among agents.
- Complete separation of presentation and abstraction by control in each agent generate development complexity since communications between agents only take place between the controls of agents.