

Architectural Patterns

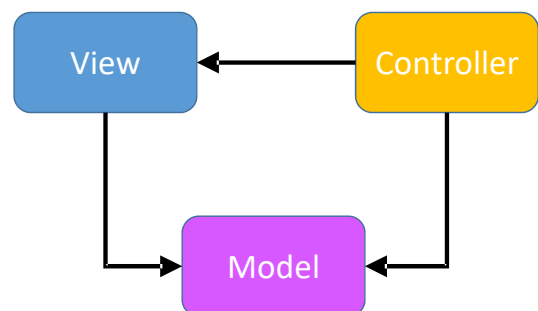
MVC, MVP, MVVM

Clean Architecture

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MVC

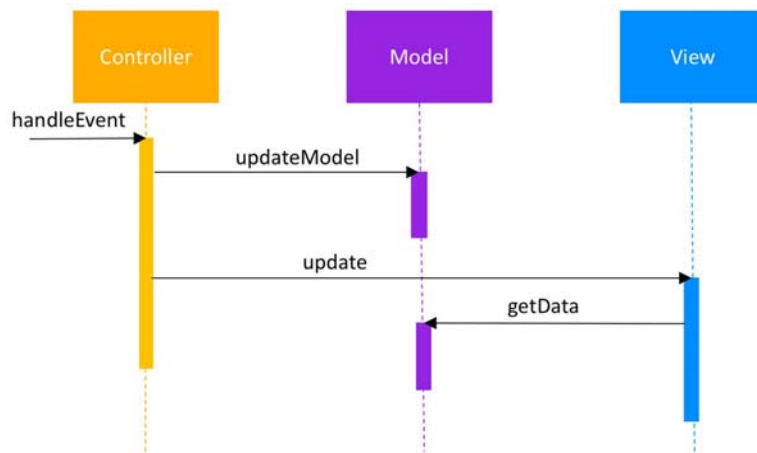
- **Model** - the data layer, responsible for managing the *business logic* and handling network or database API.
- **View** - the UI layer - a visualization of the data from the Model.
- **Controller** - the *logic layer*, gets notified of the user's behavior and updates the Model as needed.



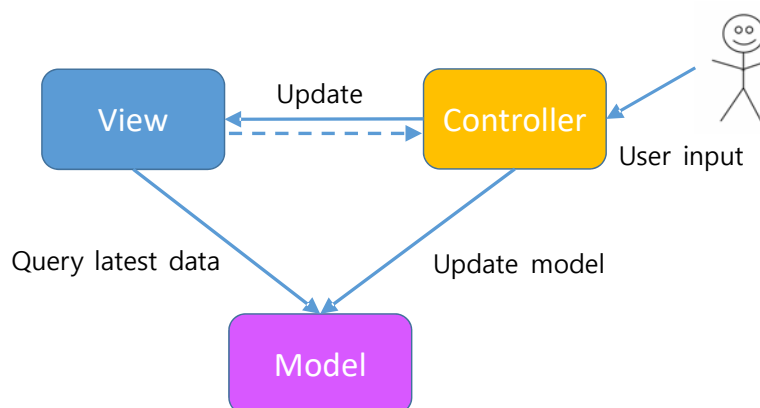
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Passive Model

- **Controller** is the only class that manipulates the **Model**



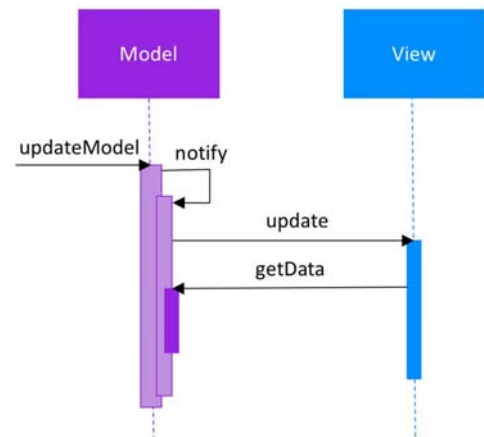
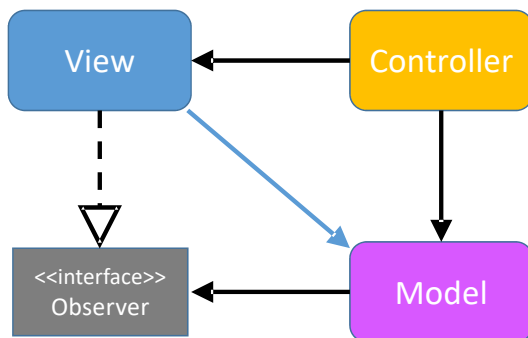
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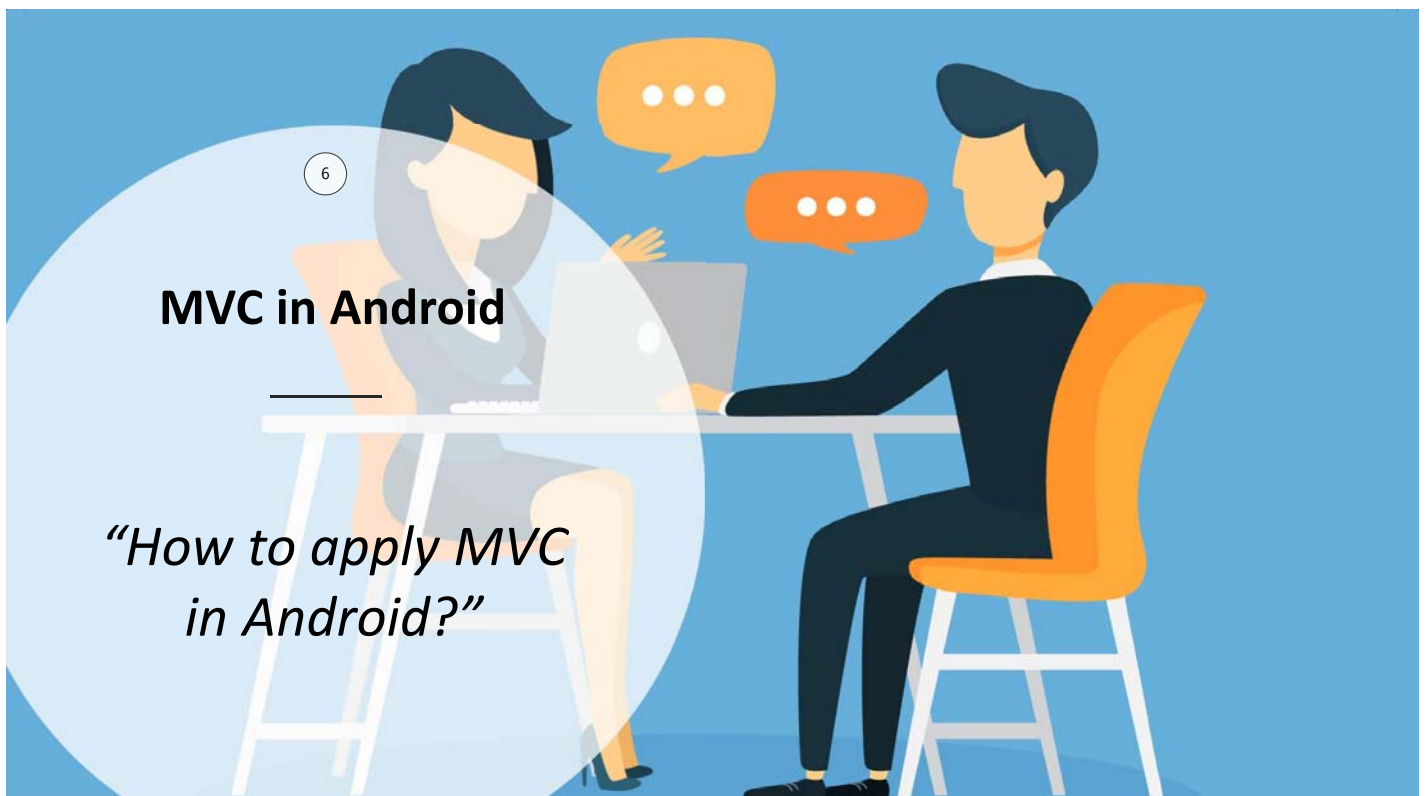
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Active Model

- Observer pattern



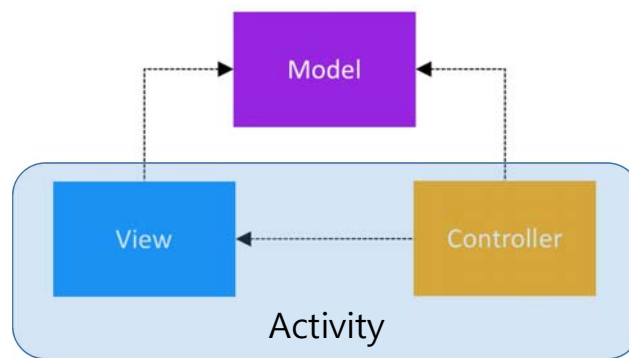
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Looking back, this sounds almost crazy!

Typical answer:

An **Activity** is both the **View** and the **Controller**.



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Issues with Legacy Apps

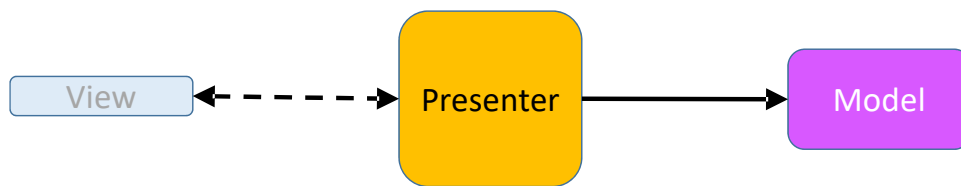
- They're extremely complex and difficult to read and modify.
- They contain all kinds of interdependences that can cause issues. So one thing breaks, likely many things will break.
- Dealing with lifecycle event is a pain because there's so many variables you need to account for.
- They are very difficult to unit test.

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MVP

- **Model** - the data layer. Responsible for handling the business logic and communication with the network and database layers.
- **View** - the UI layer. Displays the data and notifies **Presenter** about user actions.
- **Presenter** - retrieves data from **Model**, applies the UI logic and manages the state of **View**, decides what to display and reacts to user input notifications from **View**.

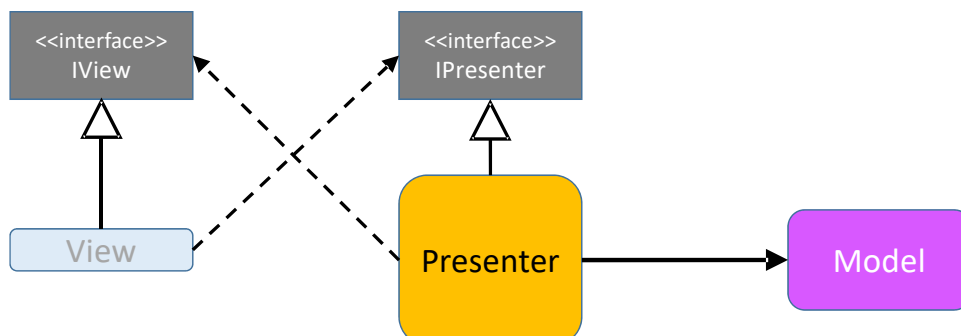
It this more testable?



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MVP (cont'd)

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MVP (cont'd)

- The relationship between the **Presenter** and its corresponding **View** is defined in a **Contract** interface class, making the code more readable and the connection between the two easier to understand.

```
public interface LoginContract {  
  
    interface ILoginView extends BaseView<ILoginPresenter> {  
        void showProgress();  
        void hideProgress();  
        void showUserNameEmptyError();  
        void showPasswordEmptyError();  
        void showLoginFailed();  
        void navigateToMain();  
        void showAlert();  
    }  
  
    interface ILoginPresenter extends BasePresenter {  
        boolean login(String username, String password);  
        void onDestroy();  
    }  
}
```

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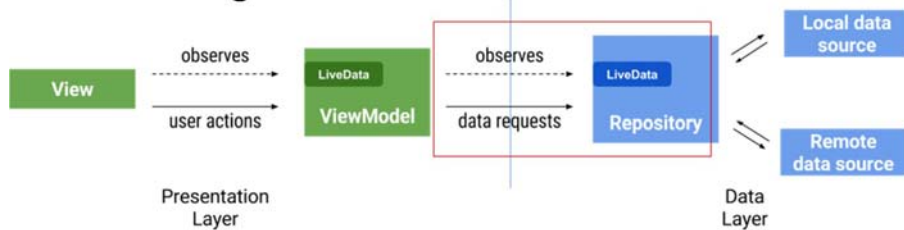
Problems of MVP

- Presenter is not life-cycle aware.
 - can have obsolete View references, which may cause memory leaks and app crash.
- Bloated Presenter
- Cyclic dependency?

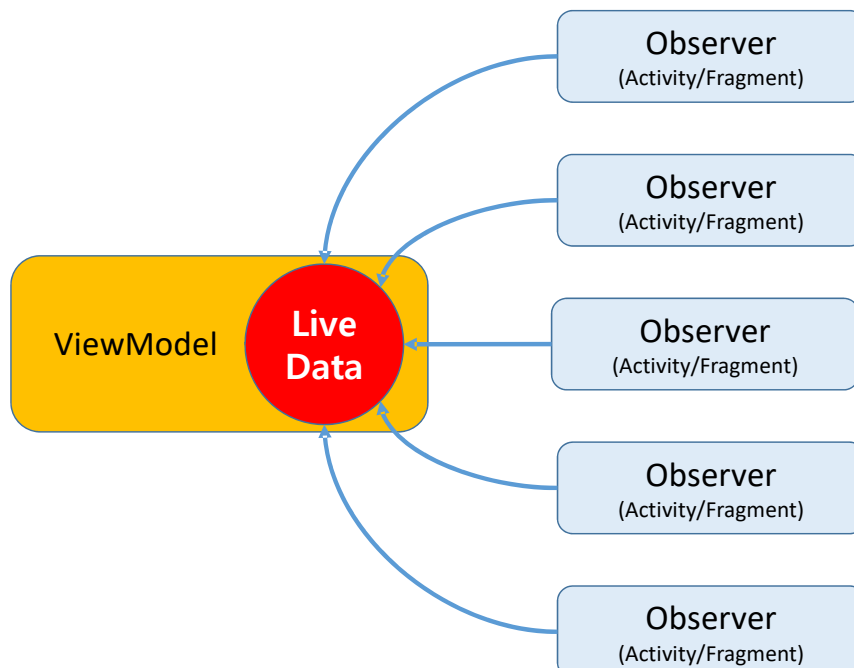
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MVVM

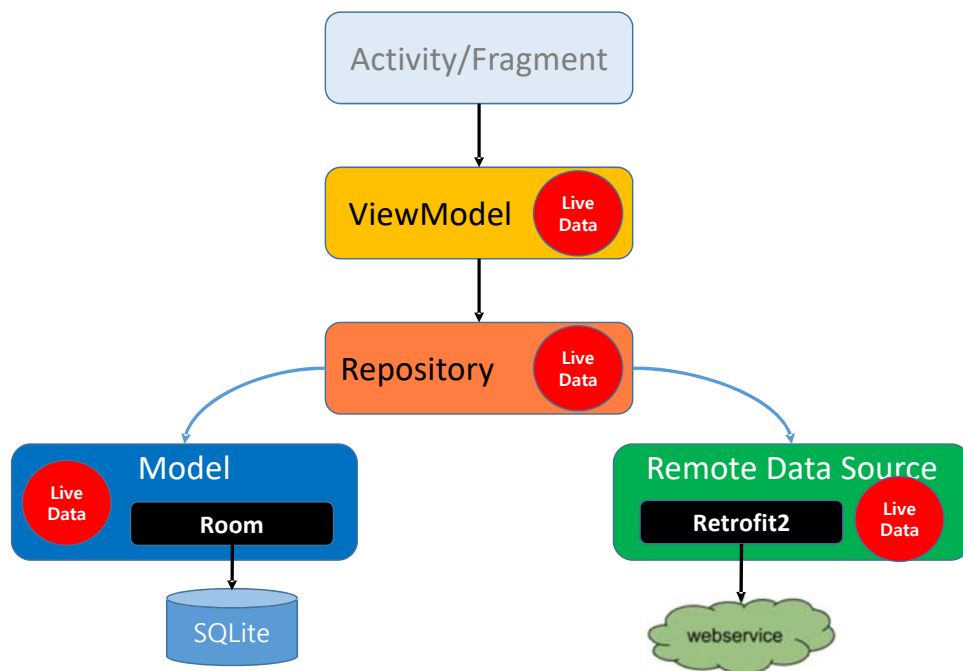
- **View** - informs the **ViewModel** about the user's actions
- **ViewModel** - *presentation layer, having UI logic and exposes streams of data relevant to the View*
 - Everything should go through the view model.
- **DataModel** - abstracts the data source. The **ViewModel** works with the **DataModel** to get and save the data.



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Benefits of MVVM and LiveData

1. LiveData ensures your UI matches your data state.
 - LiveData follows the observer pattern.
 - LiveData notify observer objects when the lifecycle state changes.
 - LiveData can leads to cleaner code structure
2. You won't get memory leaks, well .. Less likely :-)
 - Observers are bound to lifecycle objects.
 - Lifecycle objects are cleaned up after their associated lifecycle is destroyed.

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Benefits of MVVM and LiveData (Cont'd)

3. No crashes due to stopped activities

- If the observers lifecycle is inactive, such as in the case of an activity in the backstack, then it does not receive any LiveData events.

4. No more manual lifecycle handling

- UI components just observe relevant data and don't stop or resume observation.
- LiveData automatically manages all of this since it's aware of the relevant lifecycle status changes while observing.

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Benefits of MVVM and LiveData (Cont'd)

5. Your data is always up to date.

- What happens if a lifecycle becomes inactive?
- It would receive the latest data on becoming active again.

6. Proper configuration changes

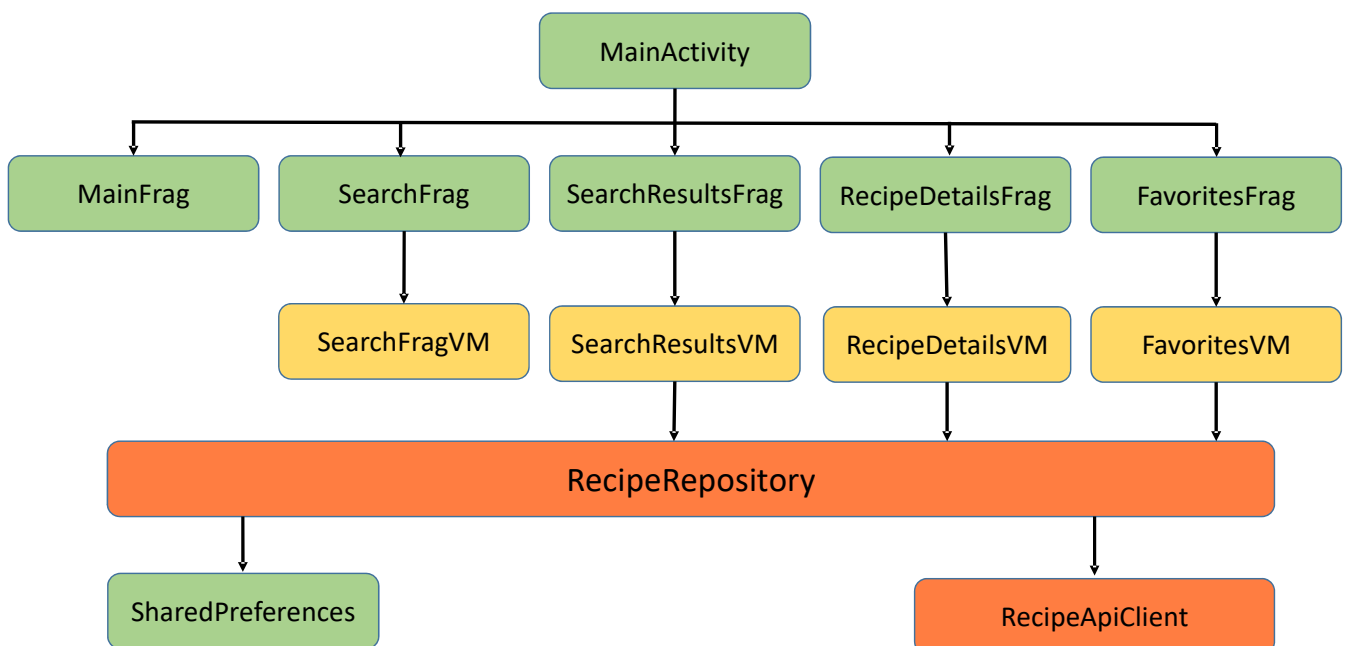
- On configuration changes, like device rotation, immediately latest available data is received.
- Prevents redundant request to network or DB.

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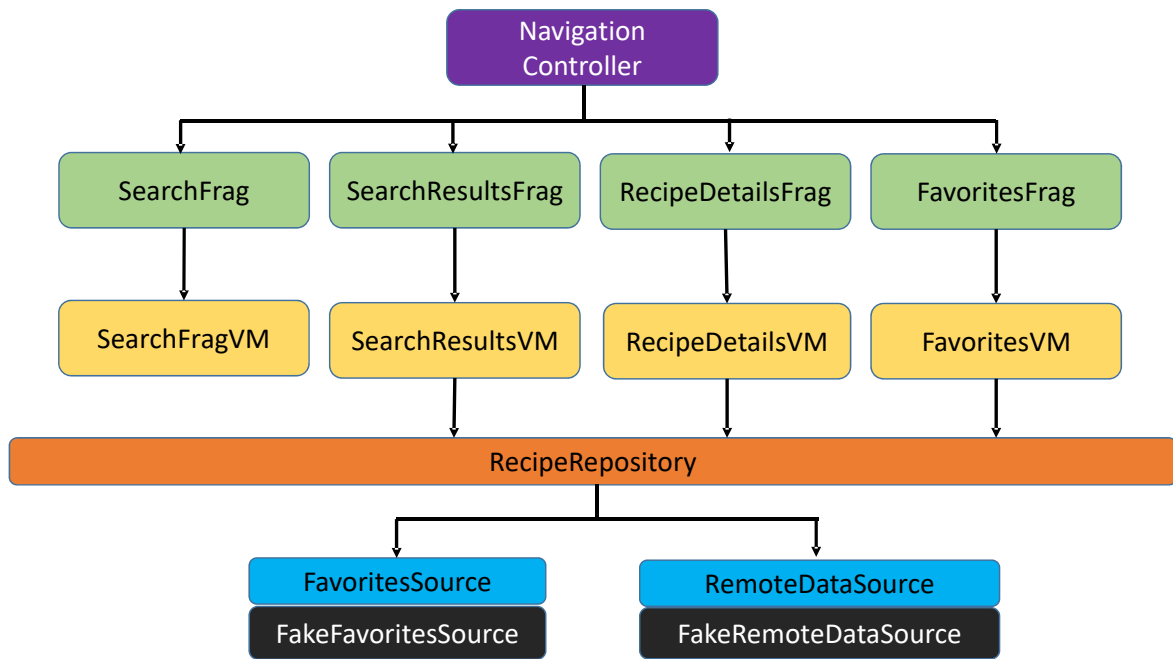
MVP/MVVM and Testability

- **Views** should be dumb and implement Passive View.
 - Passive View pattern is a concept that UI logic should be minimum.
 - As for SRP, **views have only the responsibility of rendering.**
- The **Presentation layer** should be responsible of having business logic (like input validation), communication to data layer and provide data for UI rendering.
- **Presentation layer (ViewModel or Presenter) does not use android framework it should be agnostic**, so you can encapsulate all logic and that makes it testable. **It should not have any direct dependency of view.**
 - We can use JVM unit testing here.

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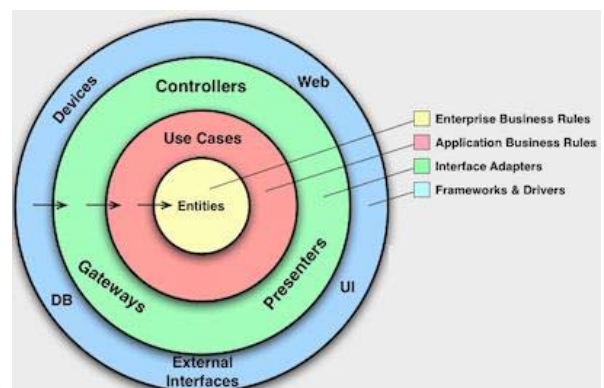
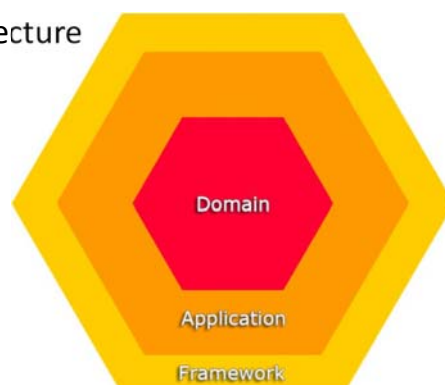
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What about Use Cases?

- Hexagonal Architecture
 - aka Ports and Adapter)
- Clean Architecture
- Onion Architecture



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