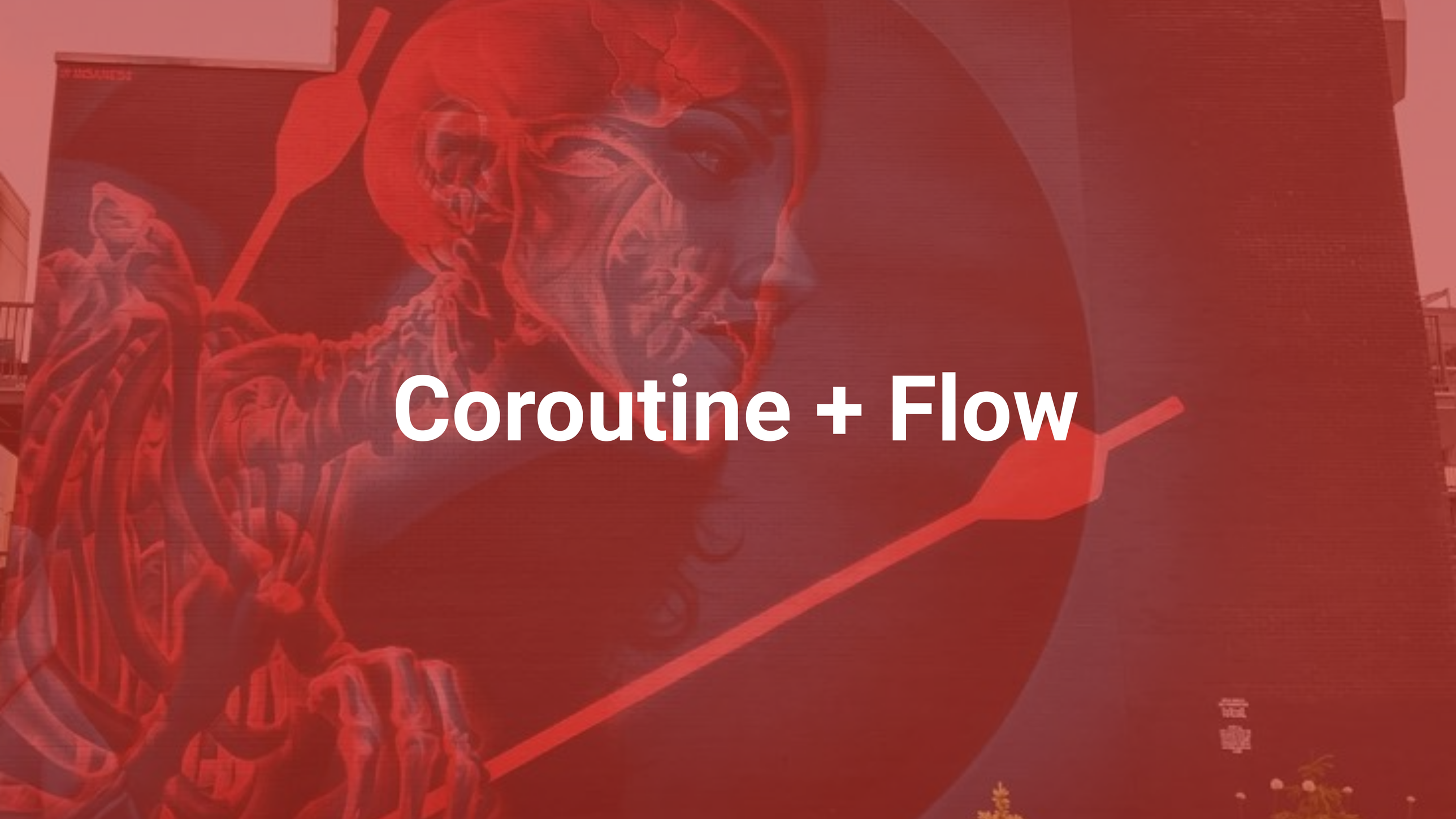
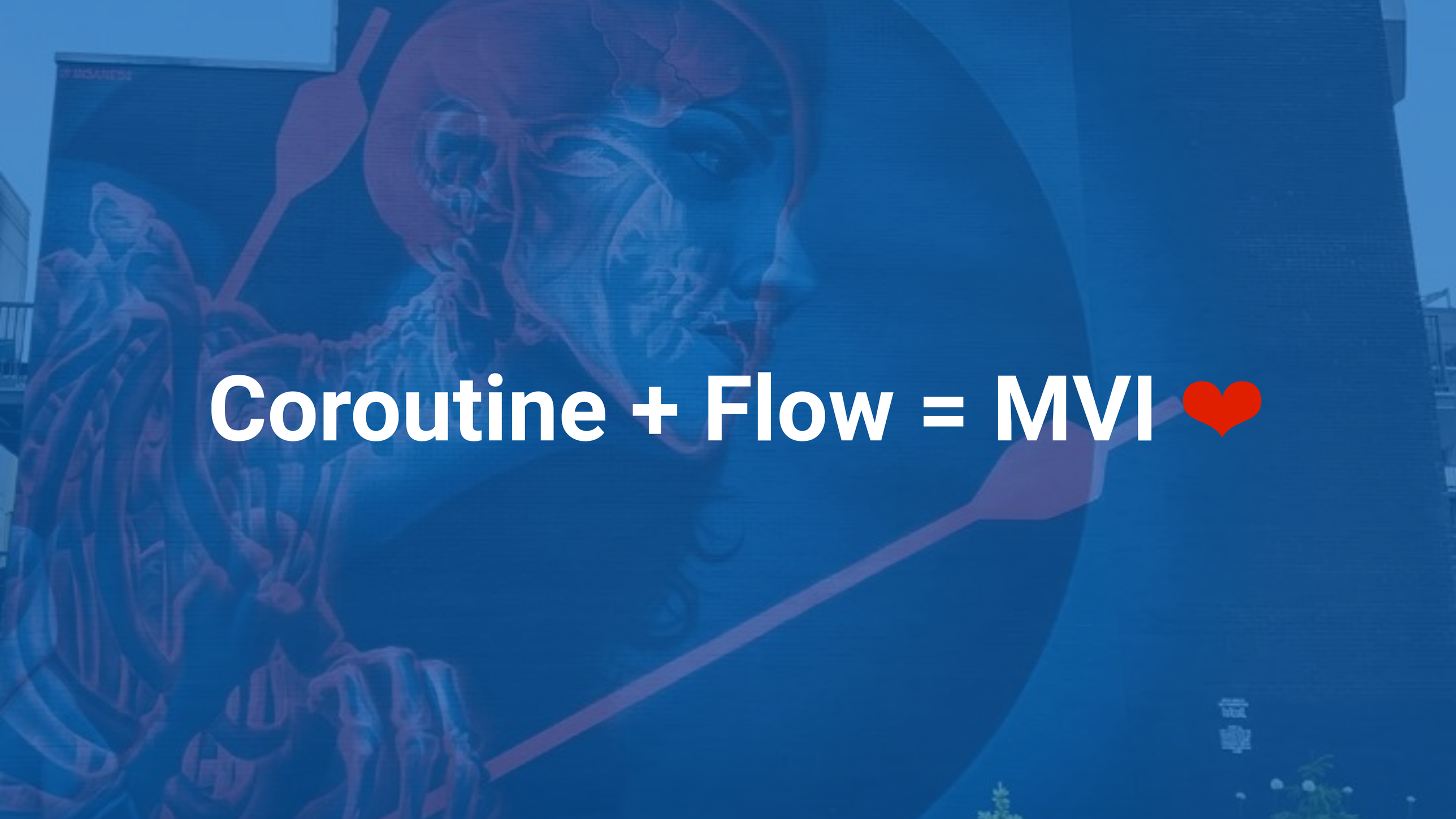
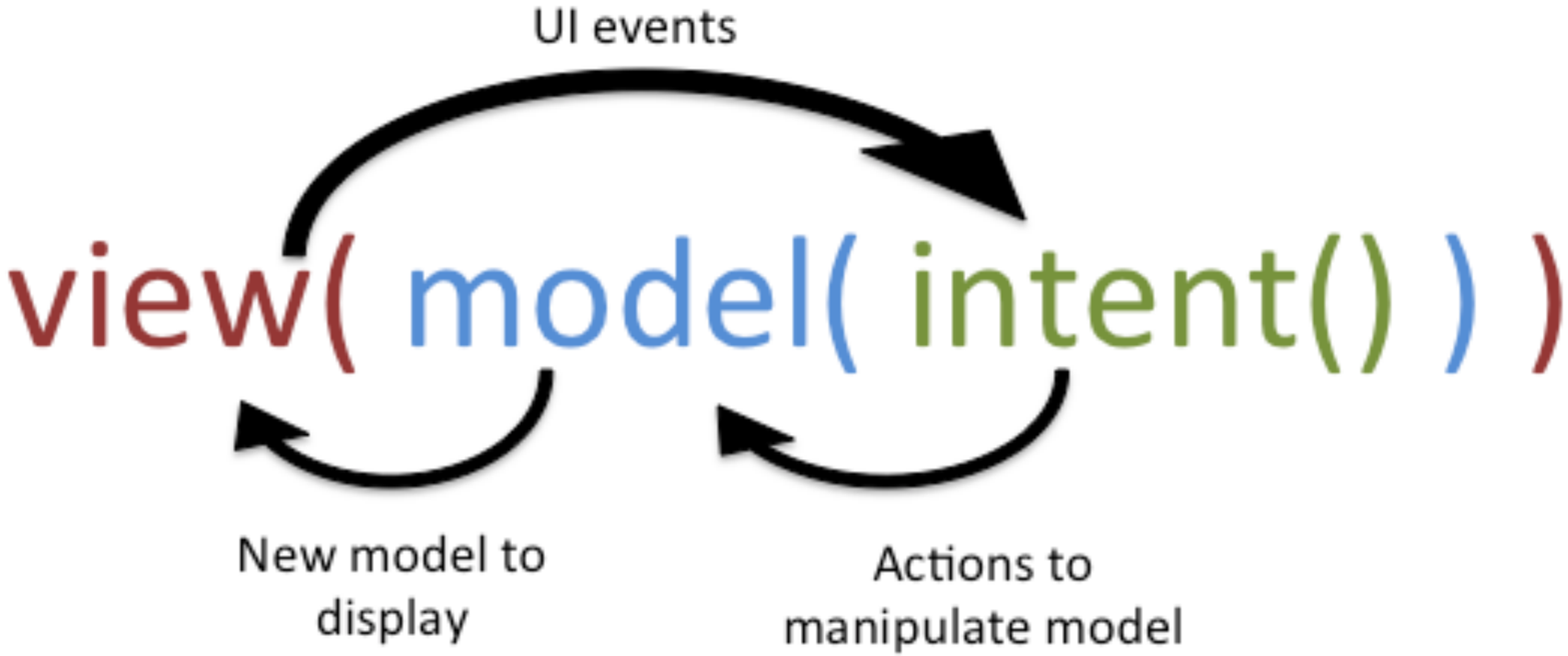
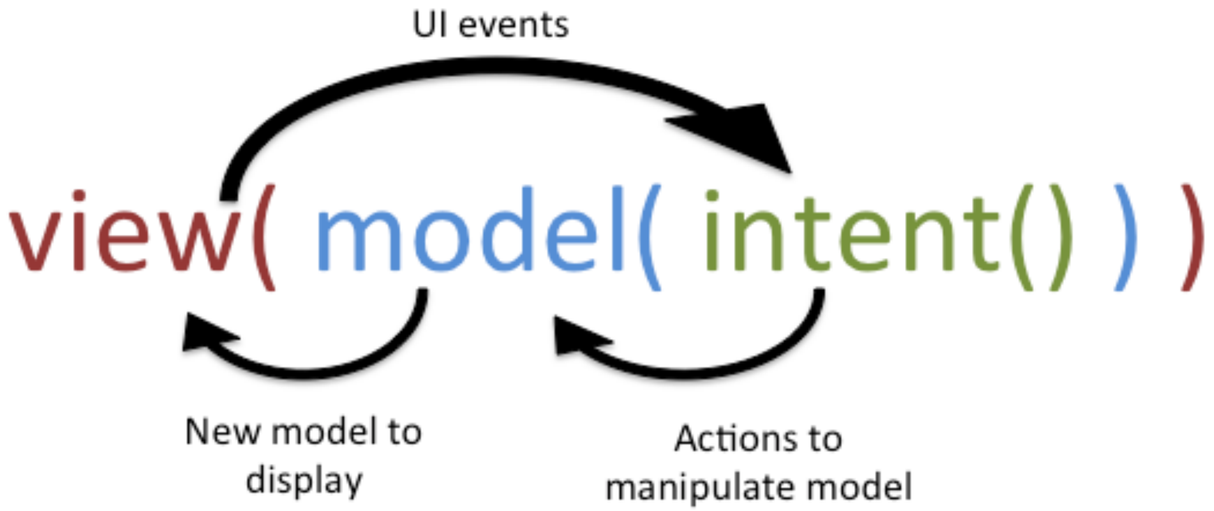


Coroutine + Flow

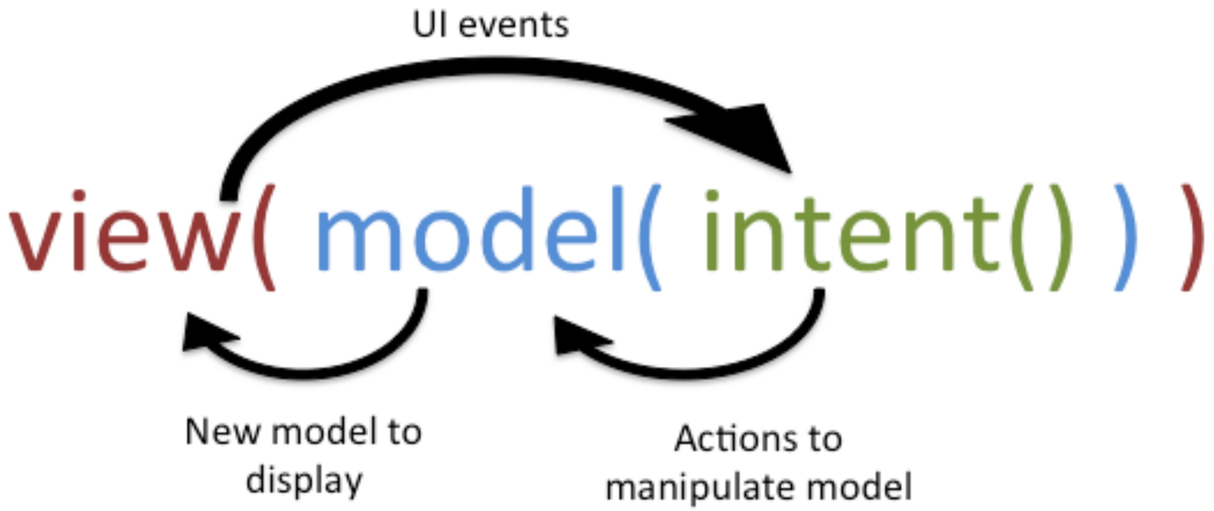

Coroutine + Flow = MVI ❤



http://hannesdorfmann.com/android/mosby3-mvi-1

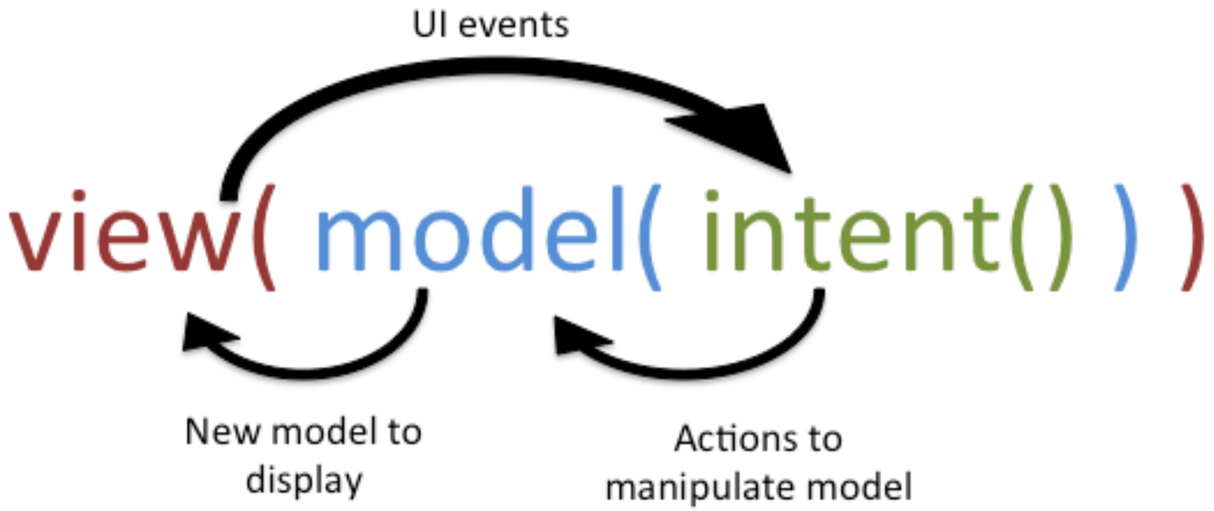

UI events
view(model(intent()))
New model to display
Actions to manipulate model

$$f(x)$$



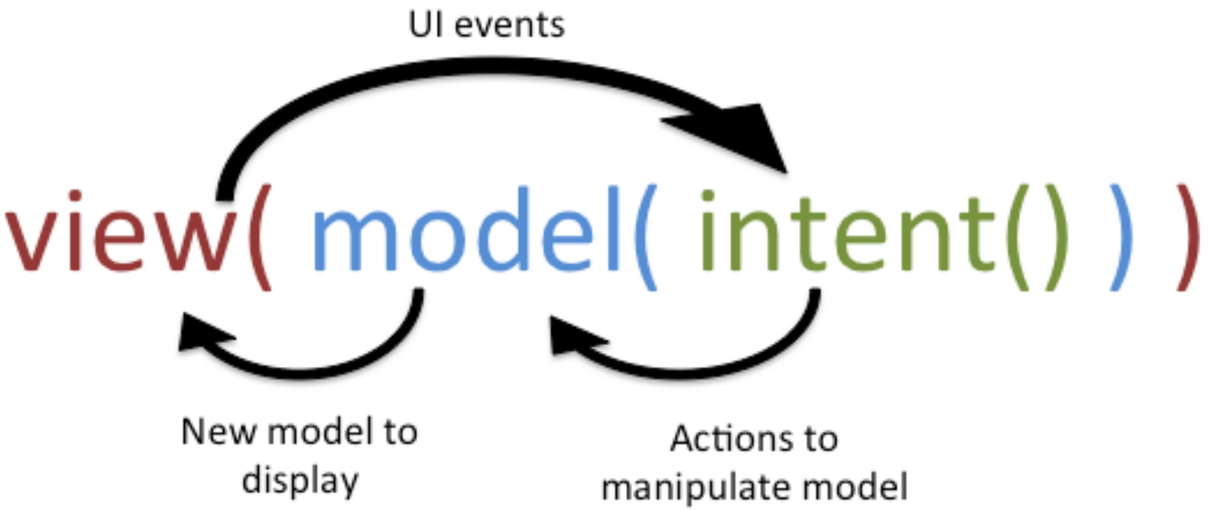
$$f(x)$$

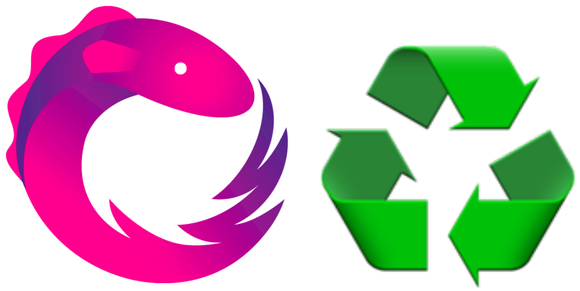
https://xkcd.com/1312



$$f(x)$$

https://xkcd.com/1312


UI events
view(model(intent()))
New model to display
Actions to manipulate model



```
private val disposables = CompositeDisposable()

disposables += streamA().subscribe( )
disposables += streamB().subscribe( )

disposables.clear()
```

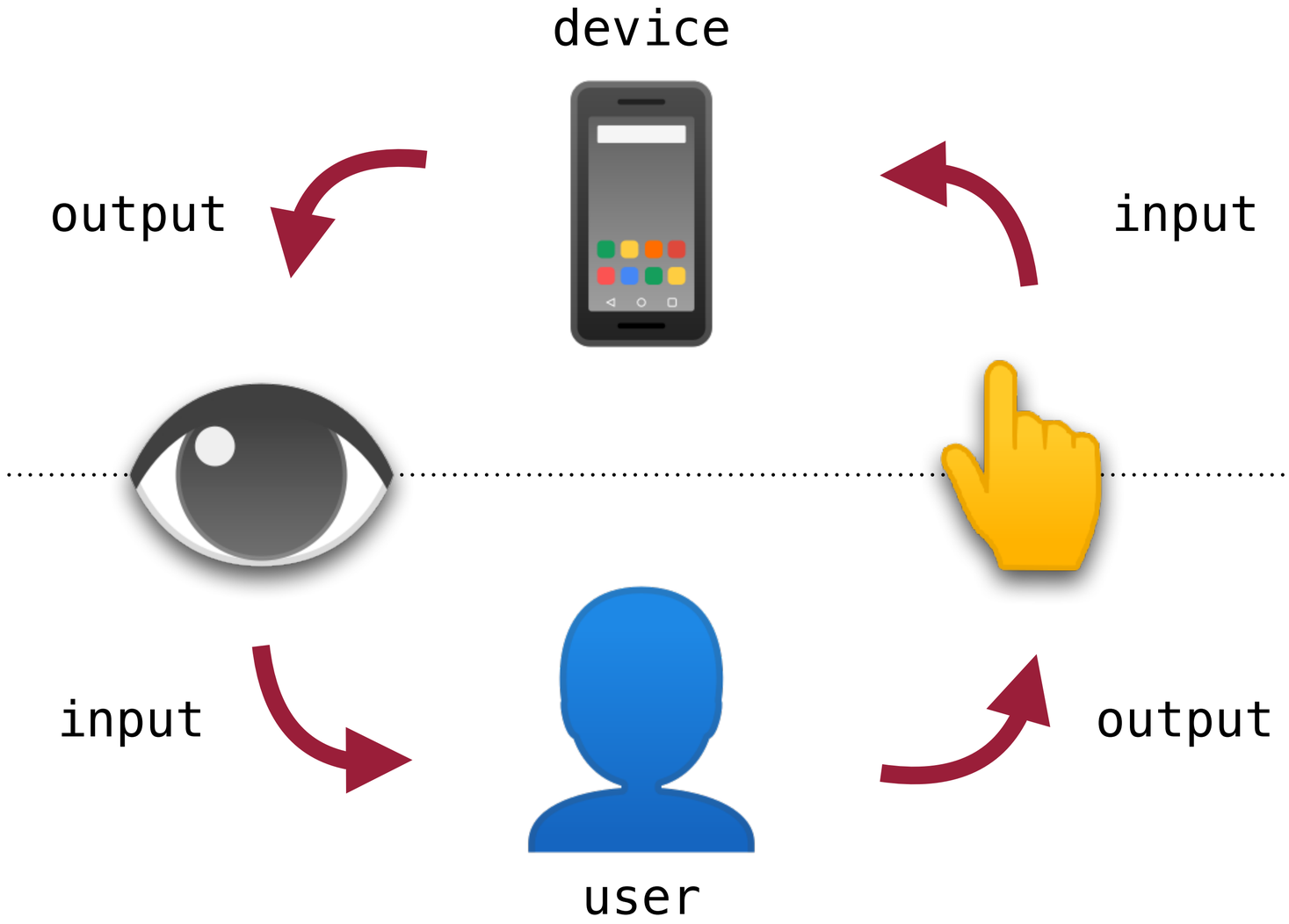
Coroutines & Flow

Coroutines & Flow

kotlinx-coroutines-android-1.3.0.jar 21 KB
kotlinx-coroutines-core-common-1.3.0.jar 137 KB

Coroutines & Flow

Coroutines & Flow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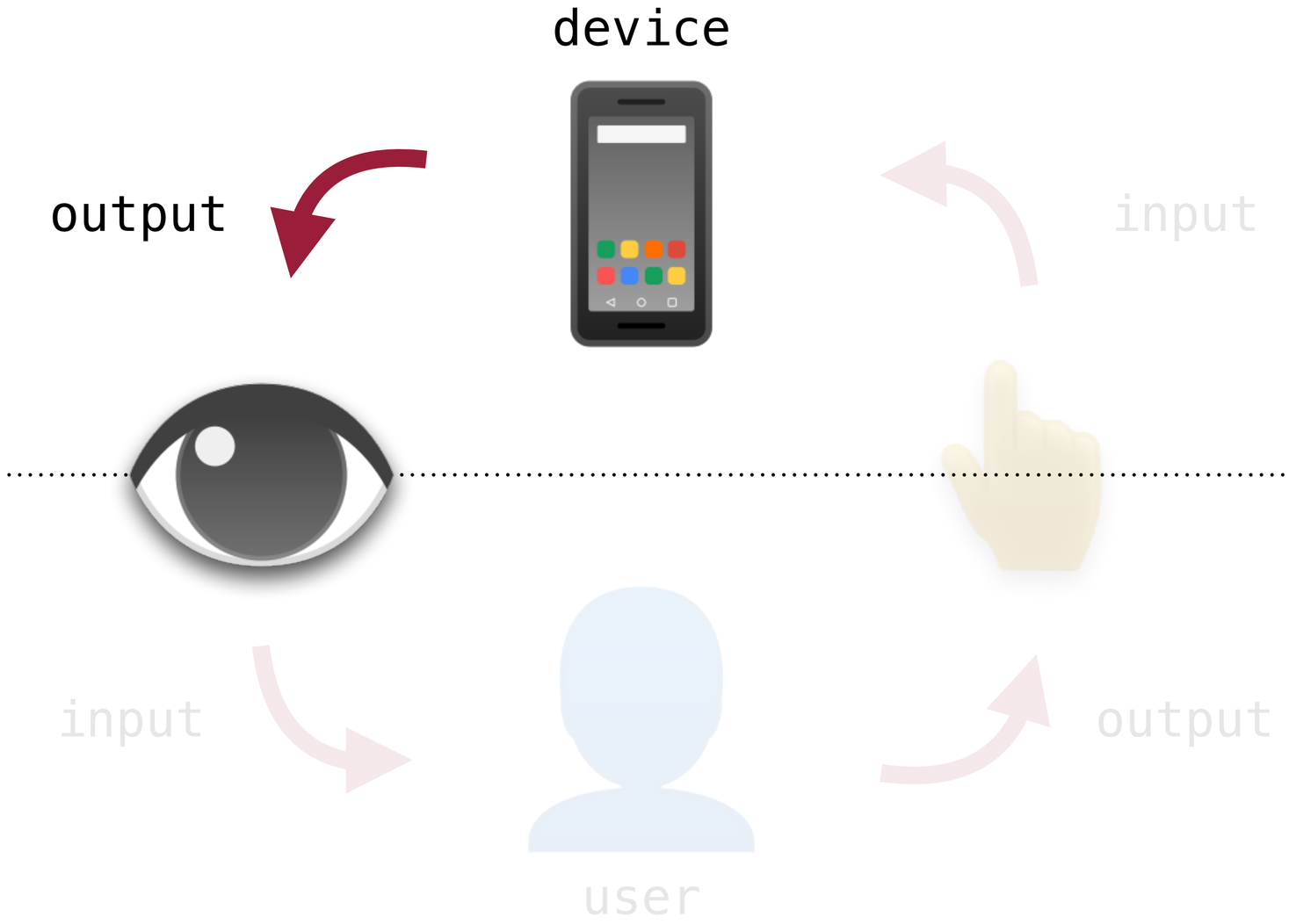
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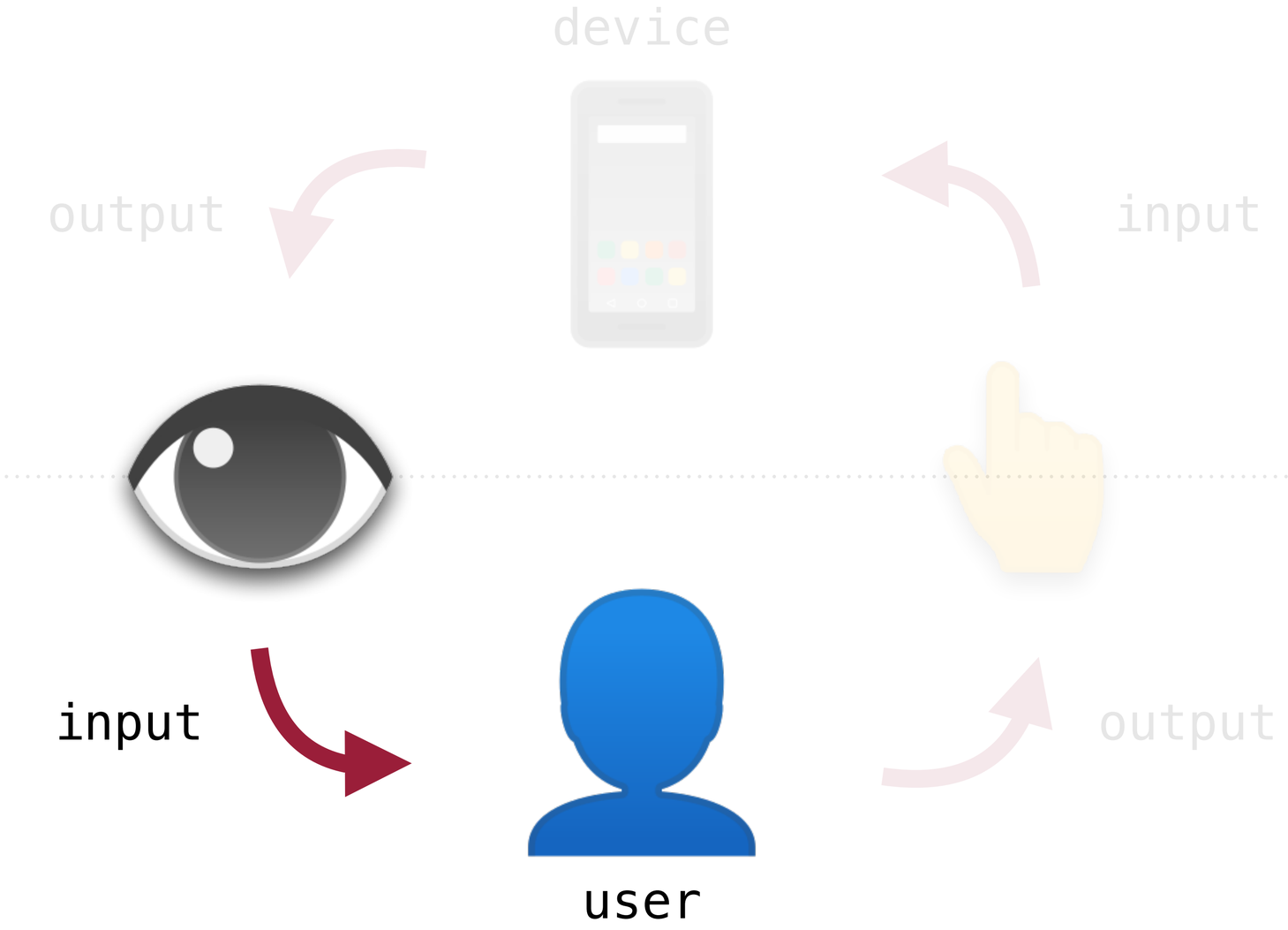
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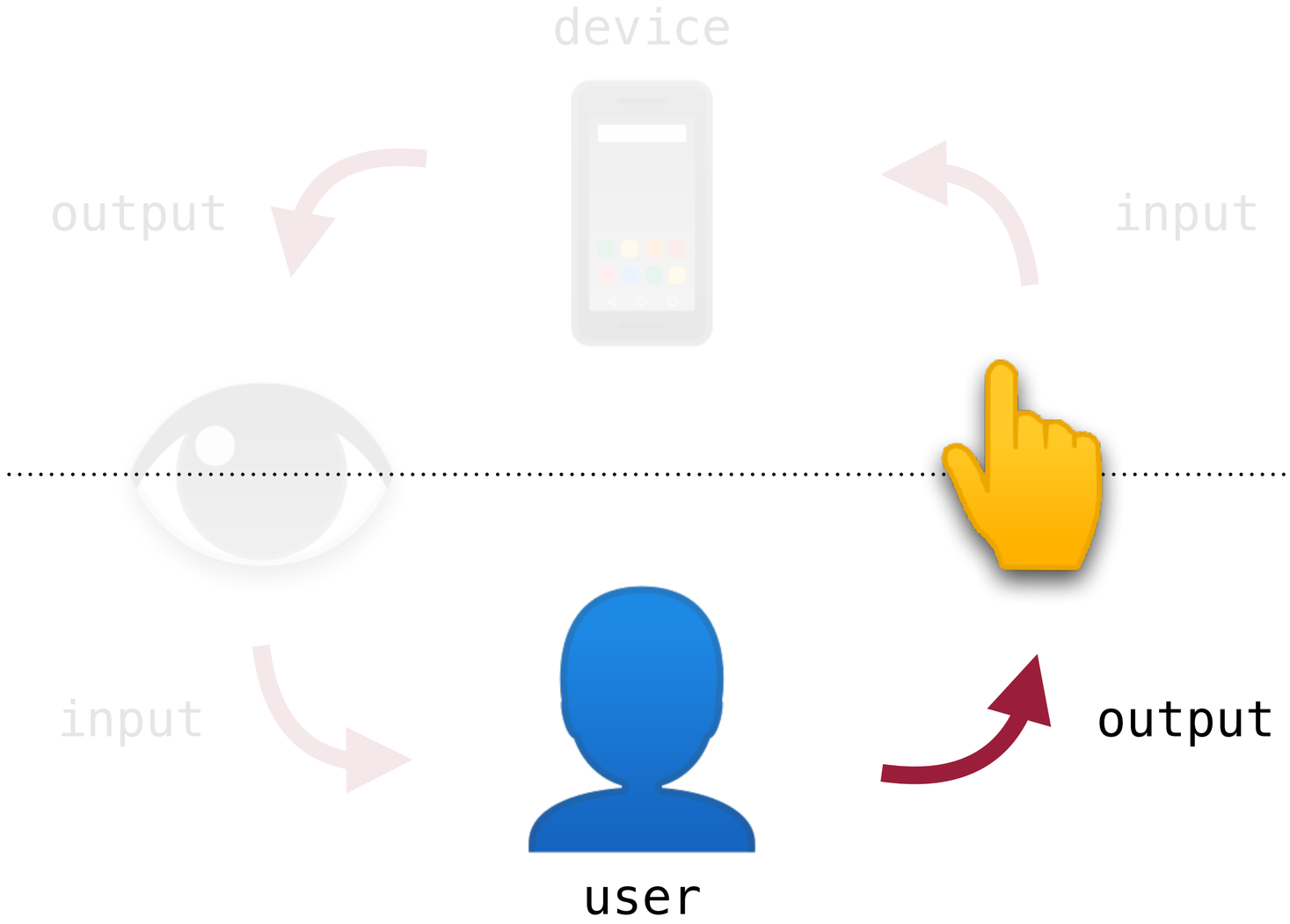
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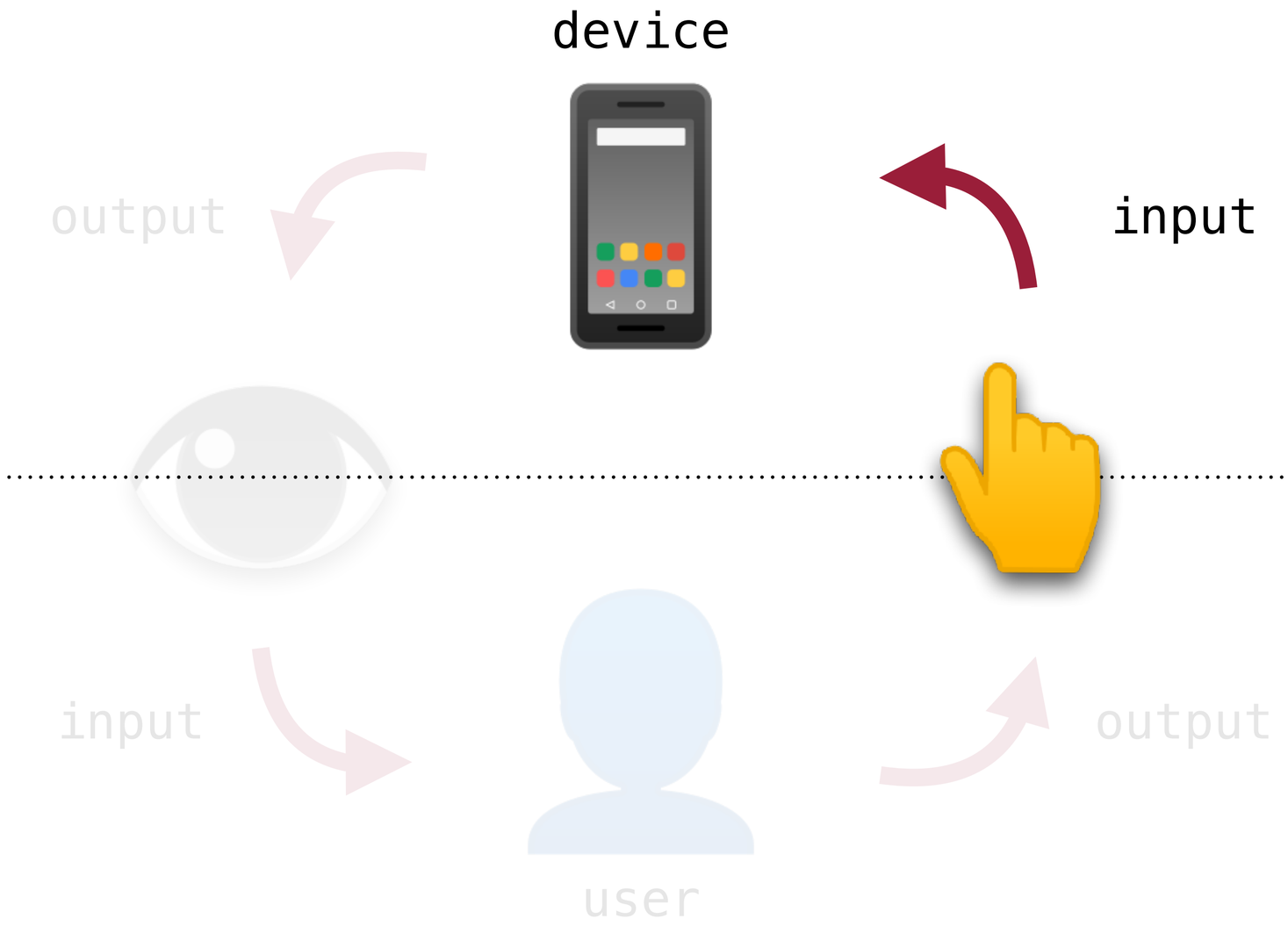
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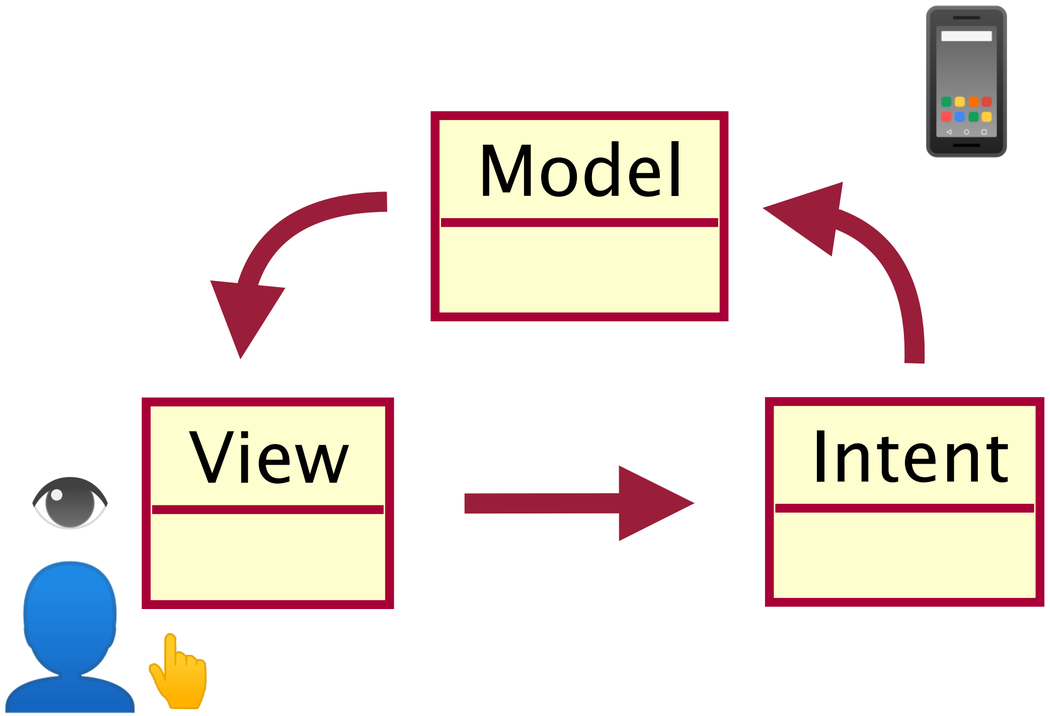
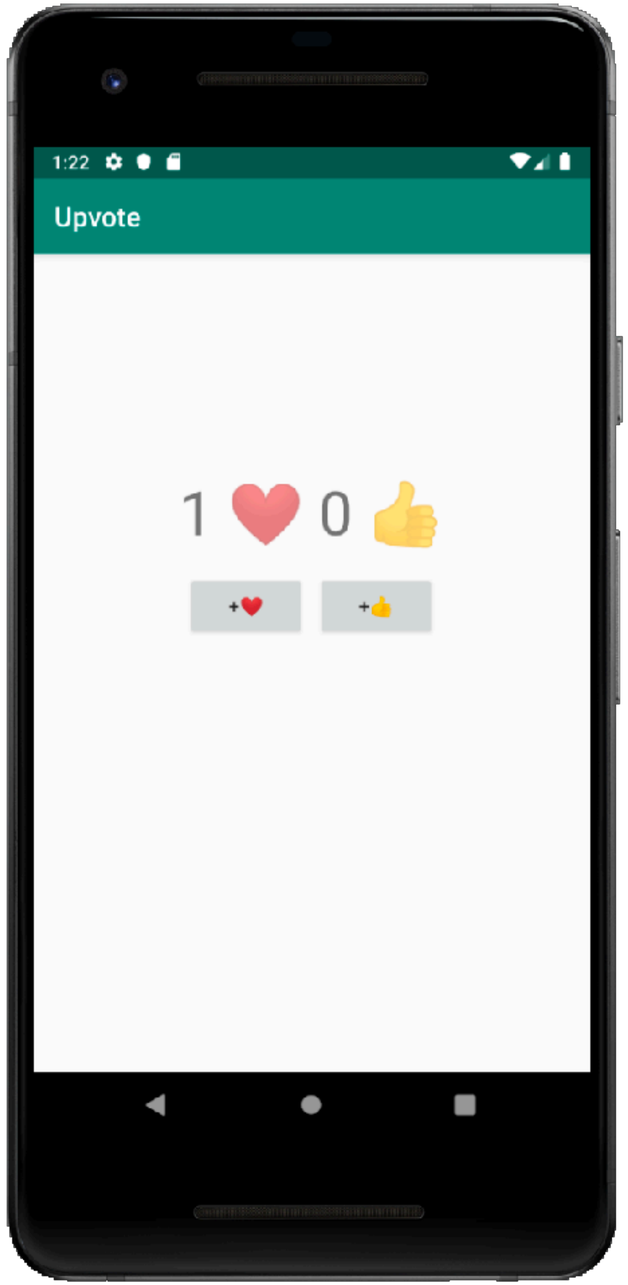

Model
View
Intent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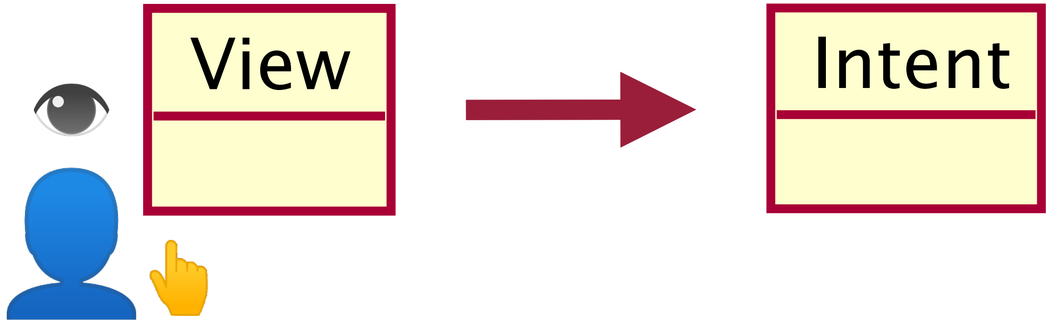
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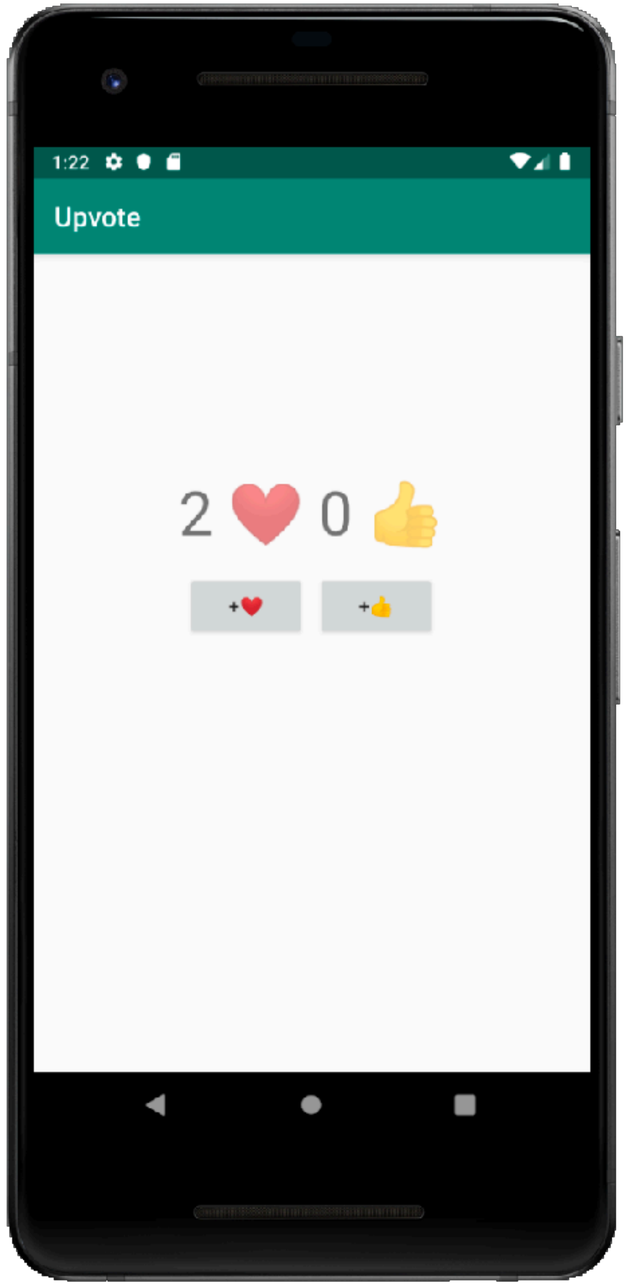
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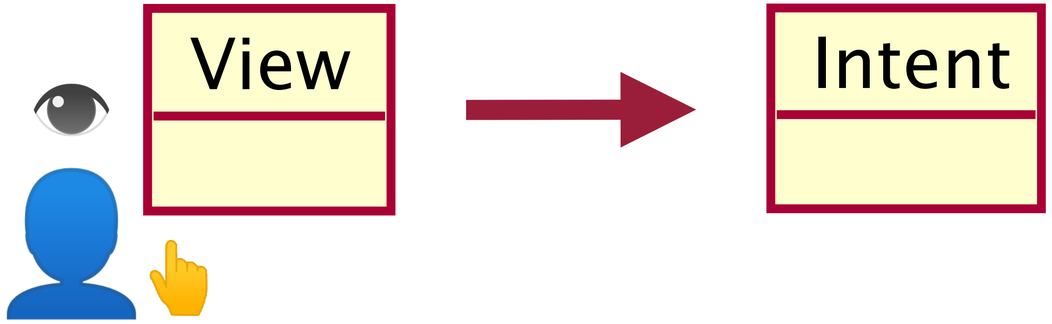
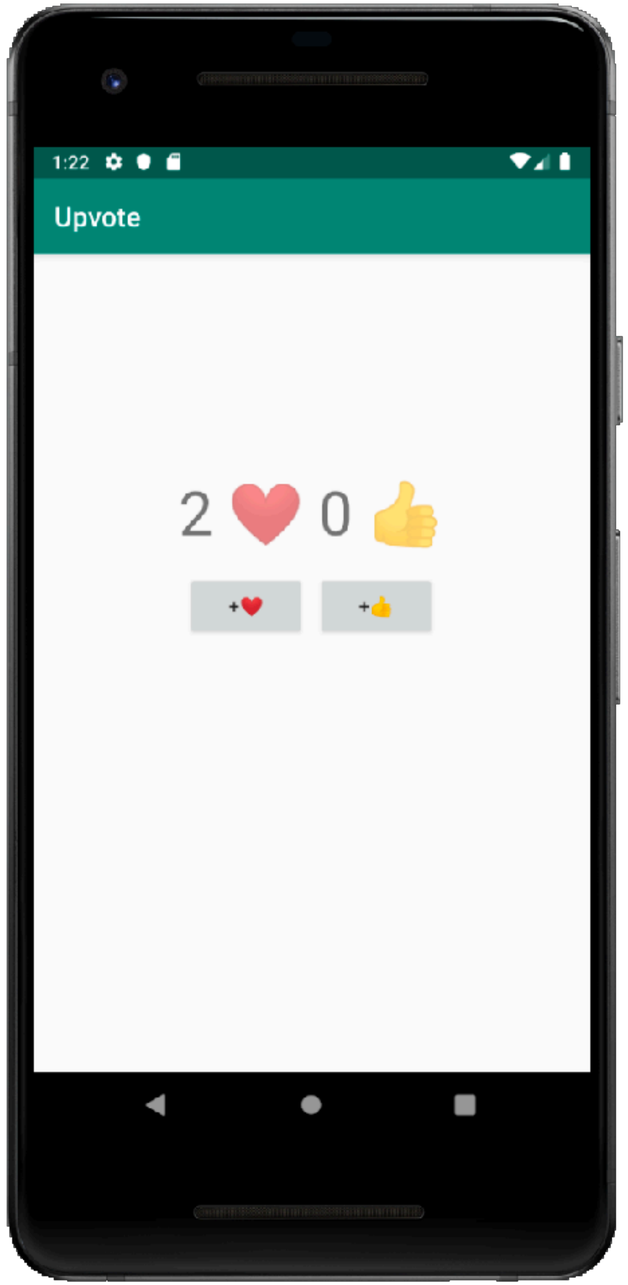

View
Intent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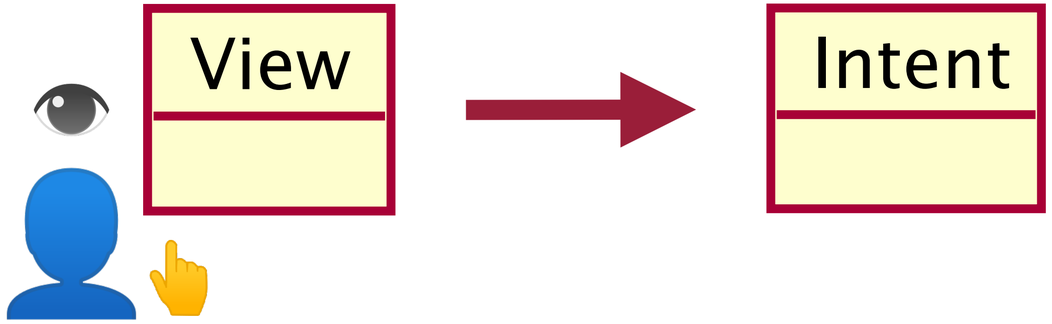
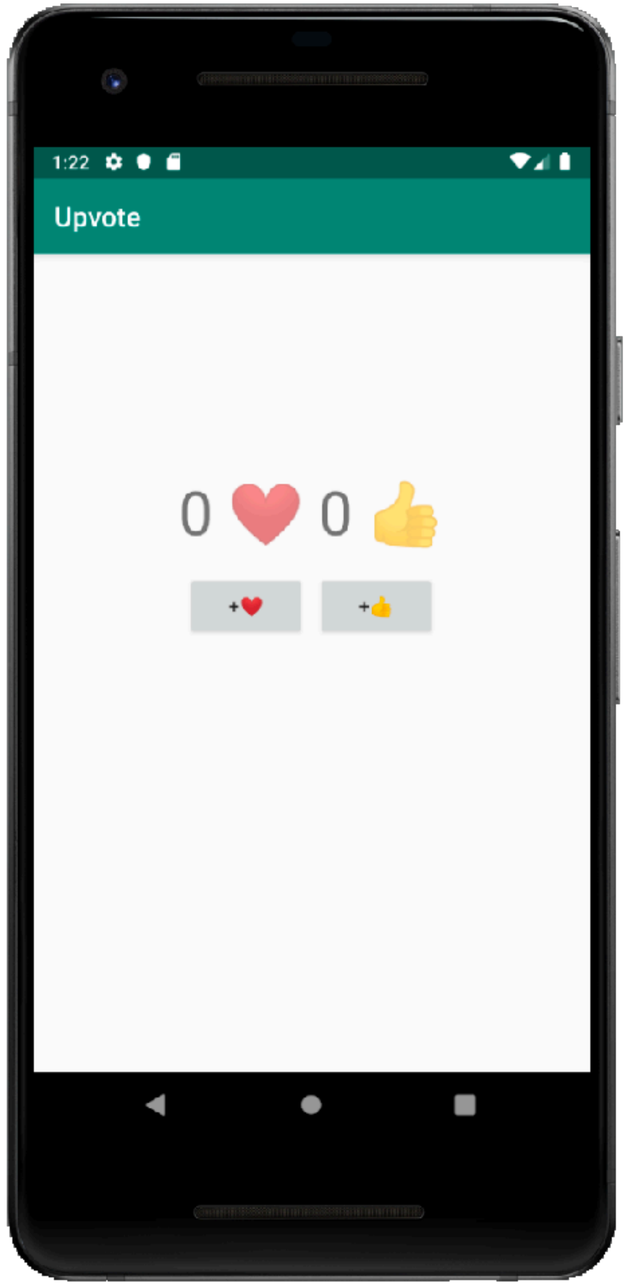
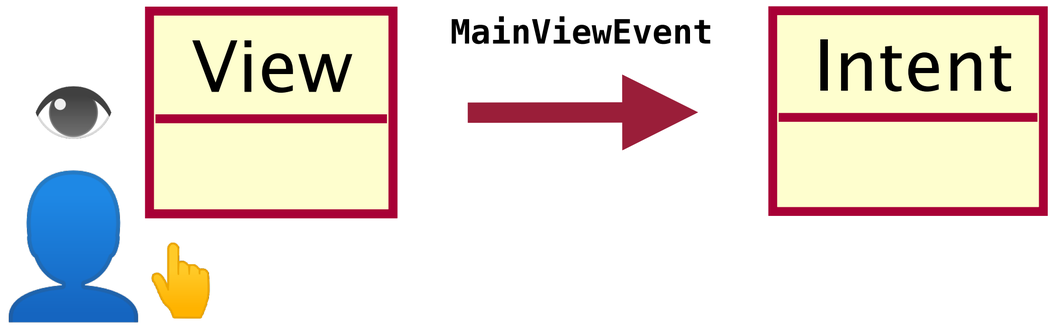
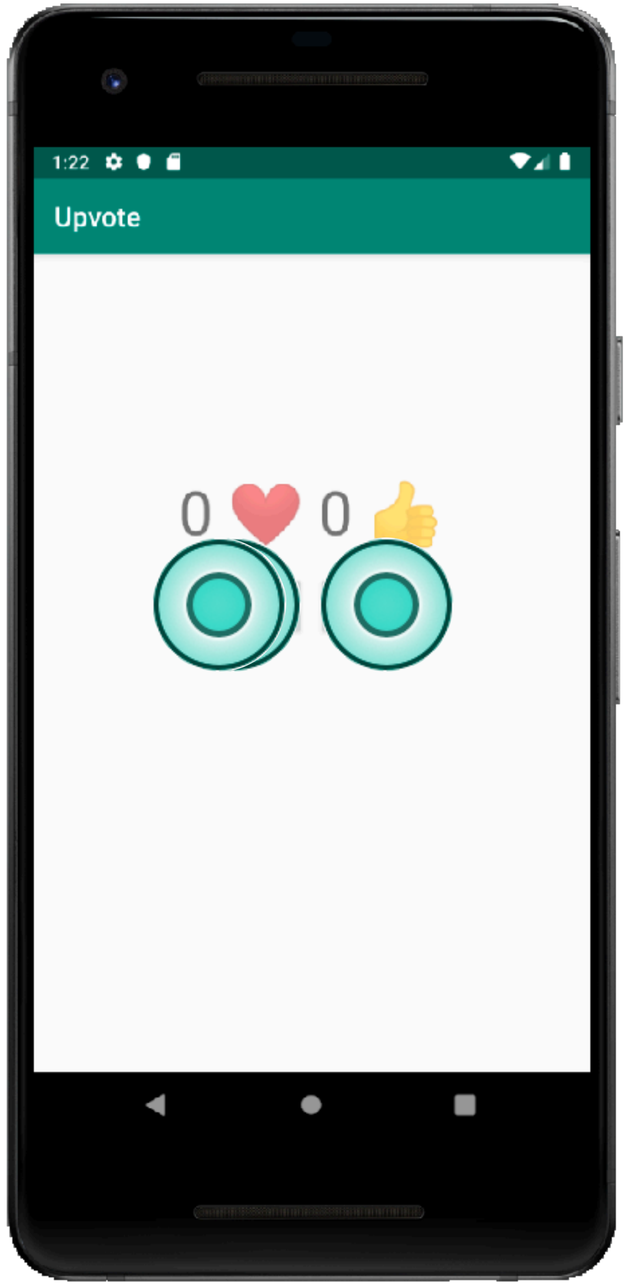

View
Intent




```
sealed class MainViewEvent {
    object ThumbsUpClick : MainViewEvent()
    object LoveItClick : MainViewEvent()
}
```



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sealed class MainViewEvent {
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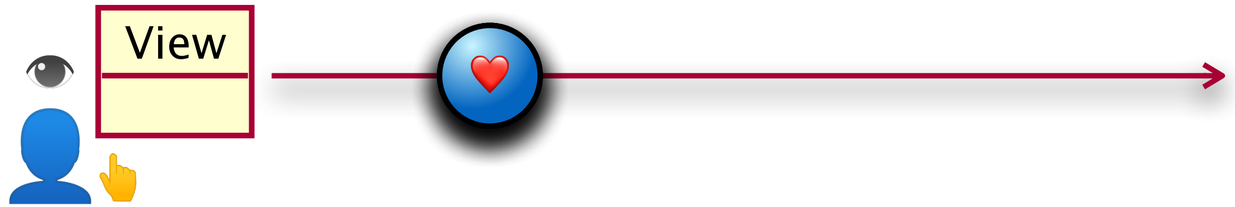
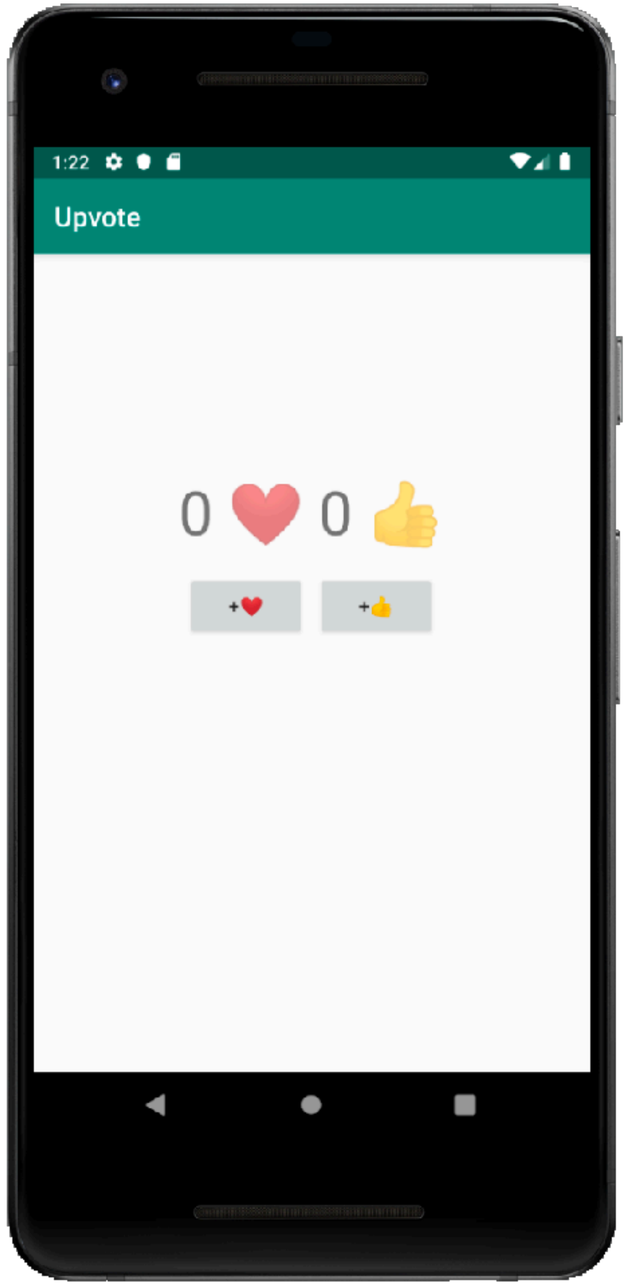
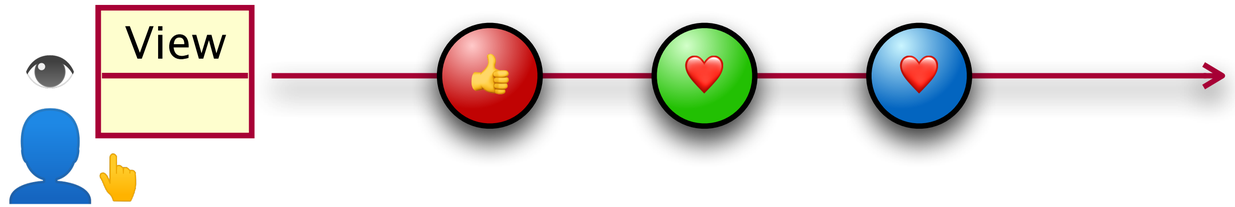
    object LoveItClick : MainViewEvent()
}
```

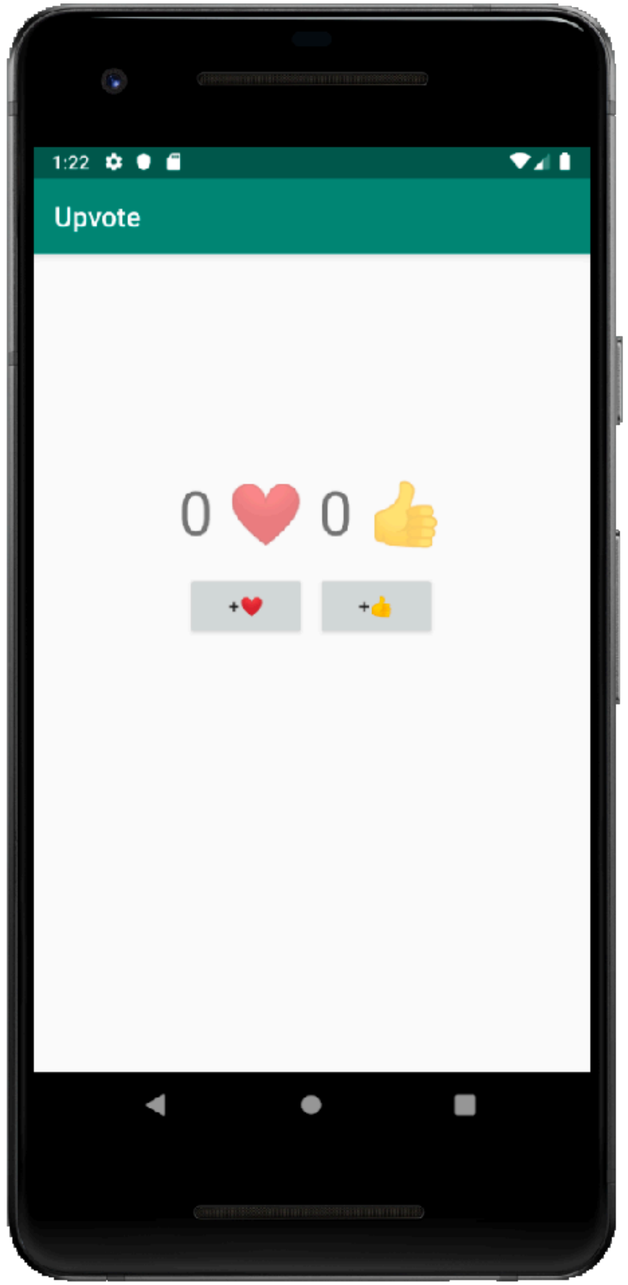
- MainViewEvent
  - +👍 ThumbsUpClick
  - +❤️ LoveItClick






```
fun View.clicks(): Flow<Unit> = callbackFlow { this: ProducerScope<Unit>
    val listener = View.OnClickListener { offer(Unit) }
    setOnClickListener(listener)
    awaitClose {
        setOnClickListener(null)
    }
}
```



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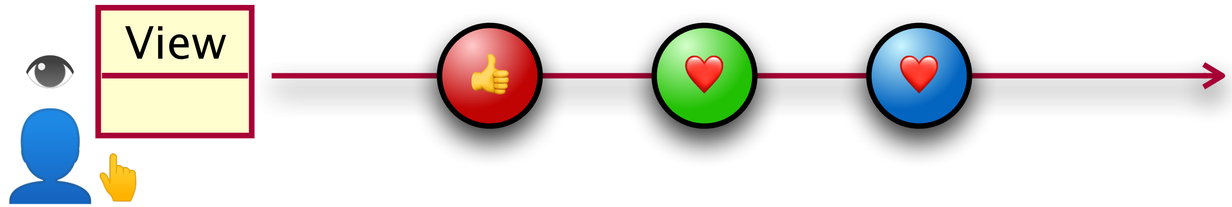

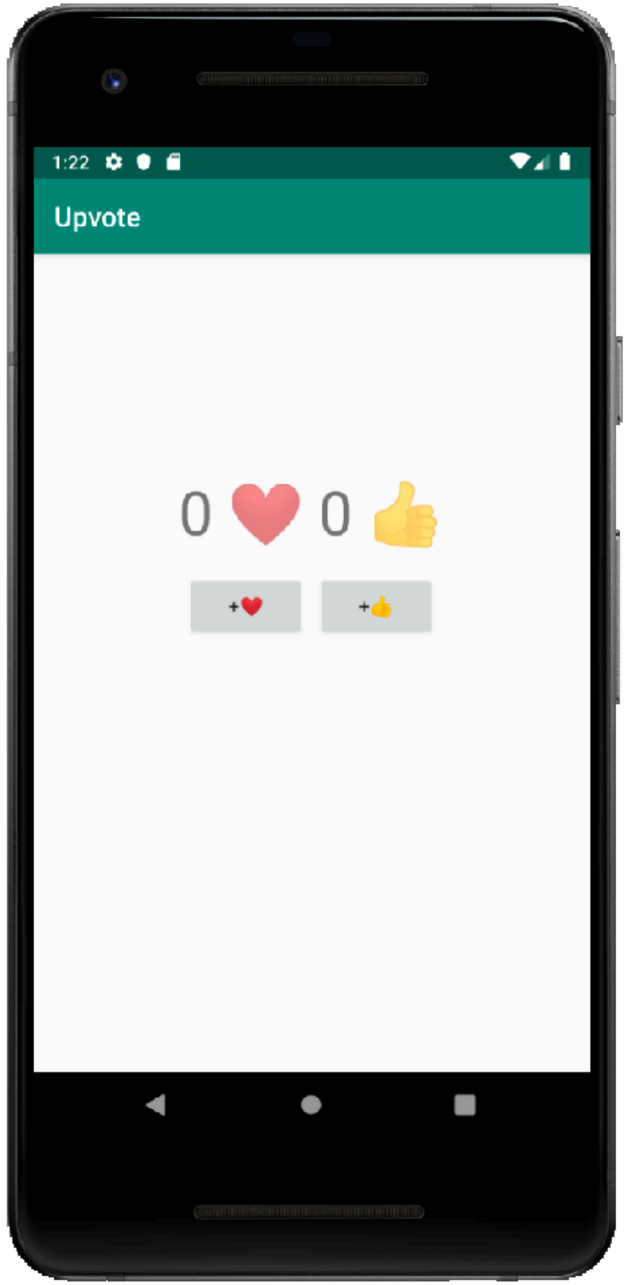


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```

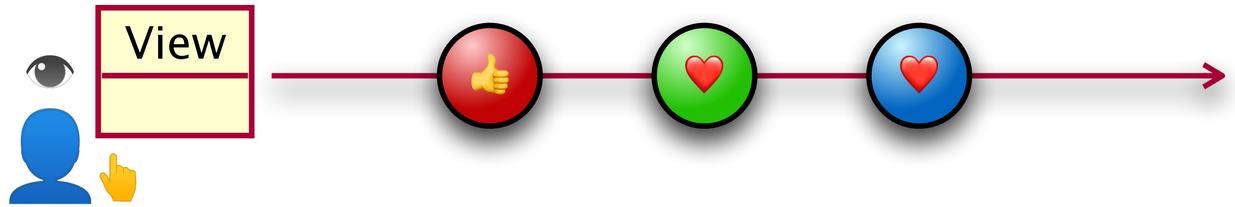

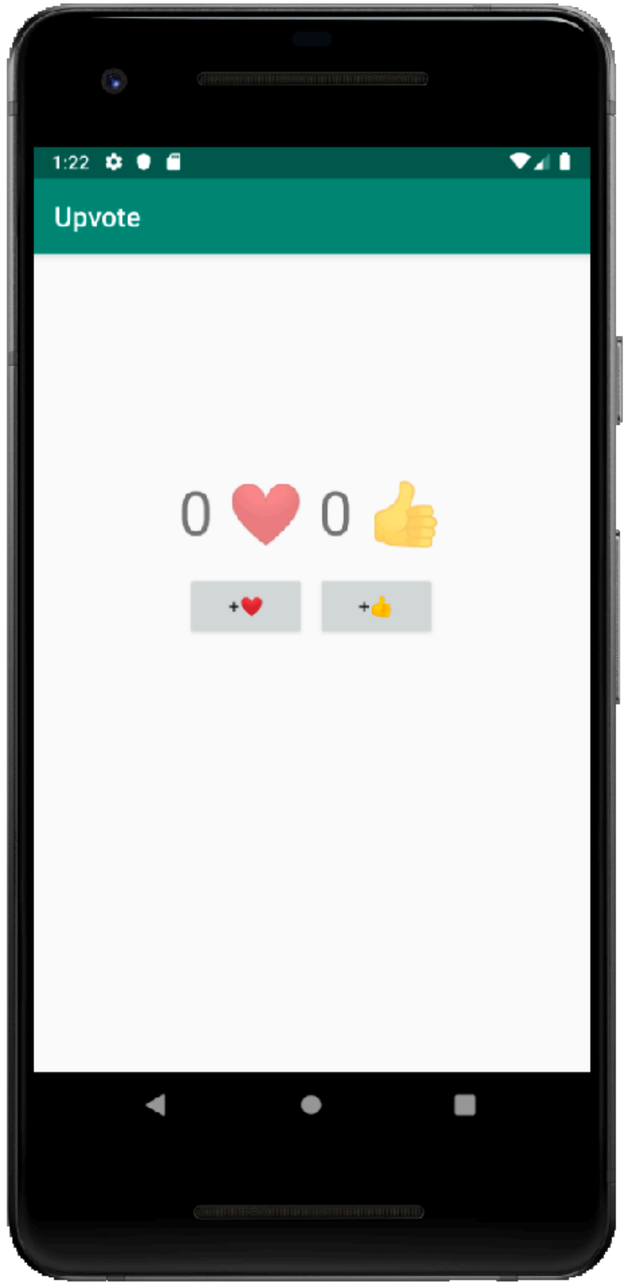


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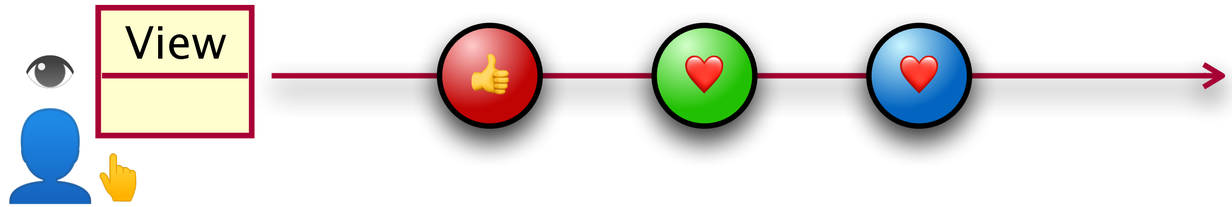
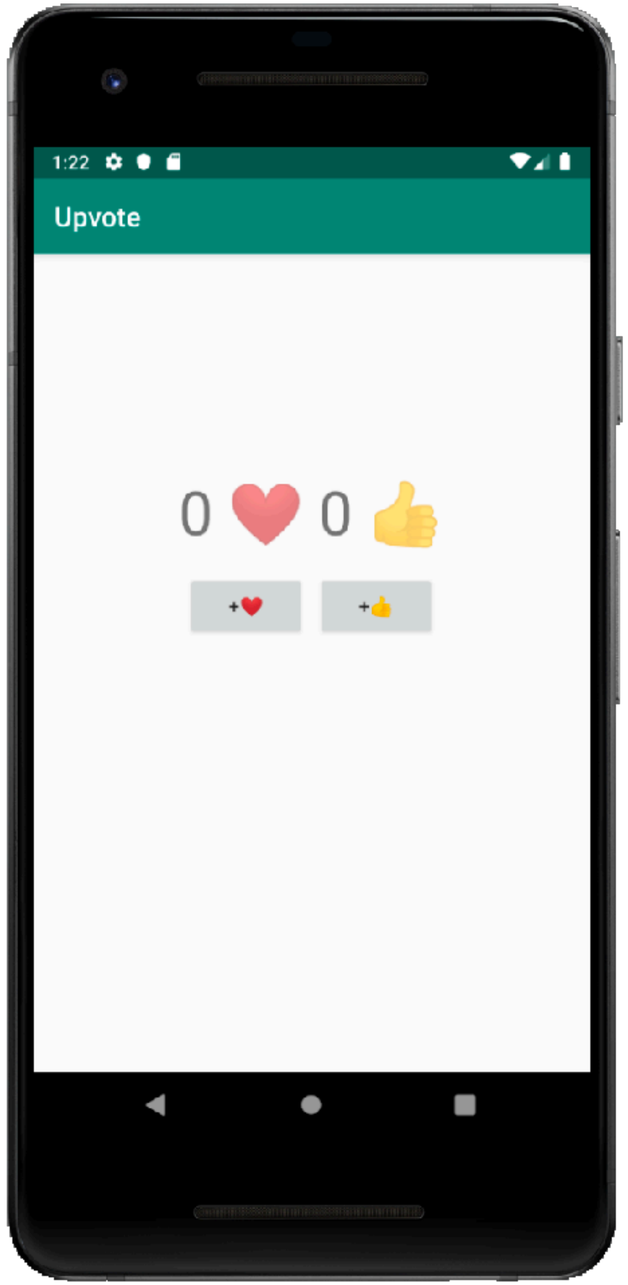
```

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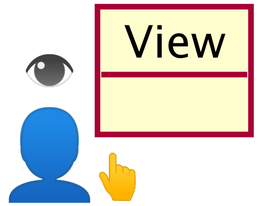
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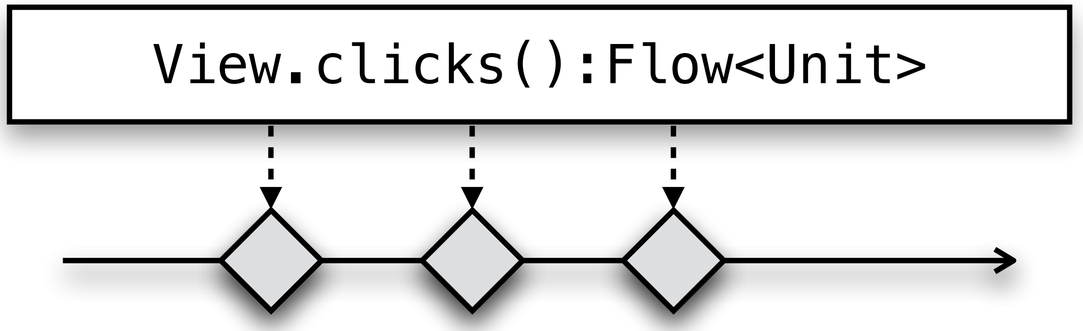
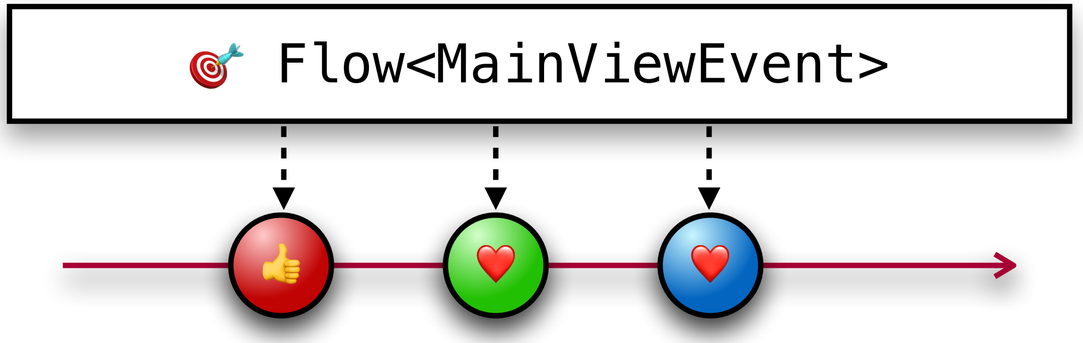
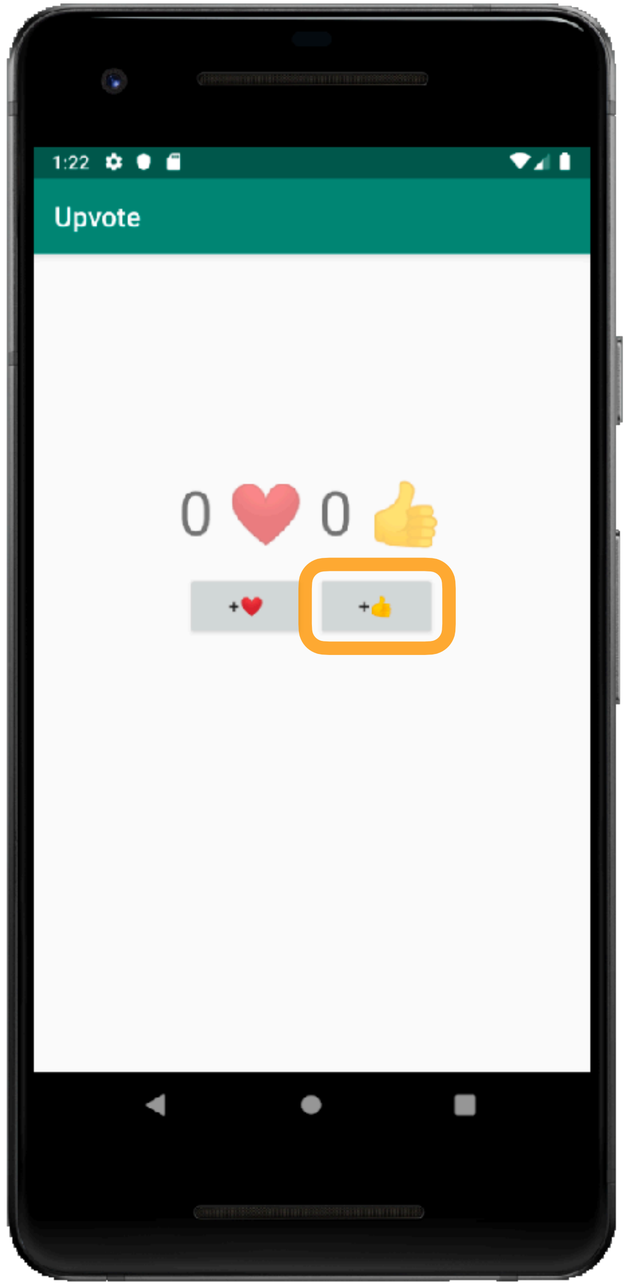

View.clicks():Flow<Unit>


Flow<MainViewEvent>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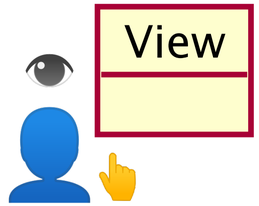
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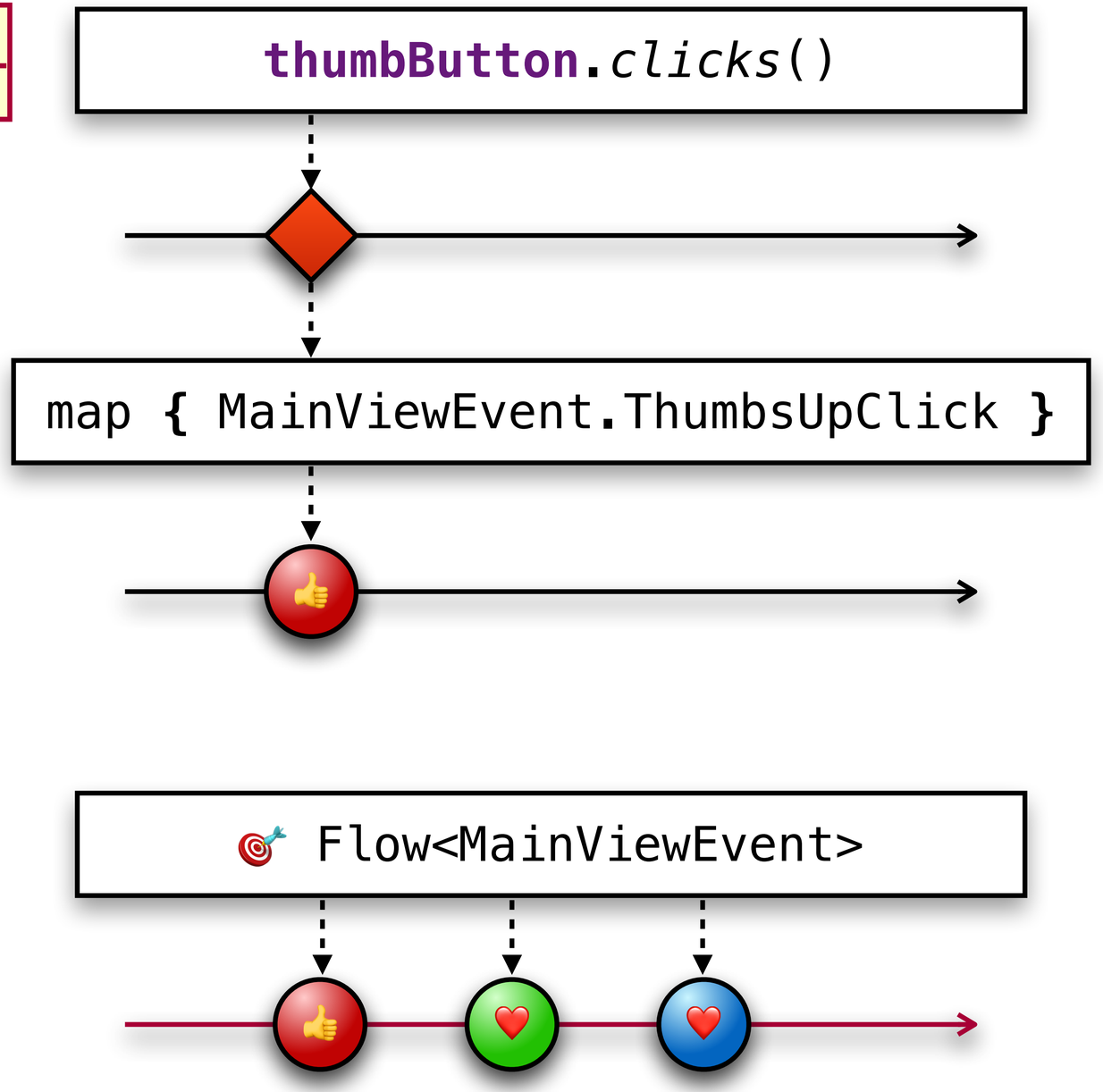
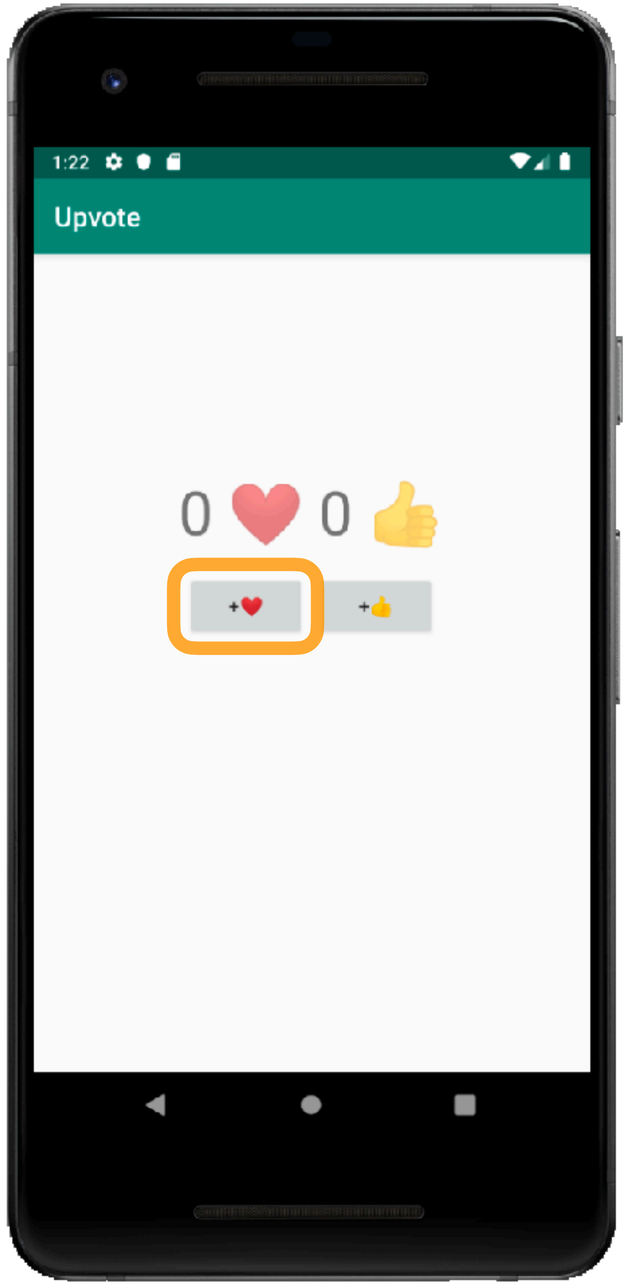

thumbButton.clicks()
map { MainViewEvent.ThumbsUpClick }
Flow<MainViewEvent>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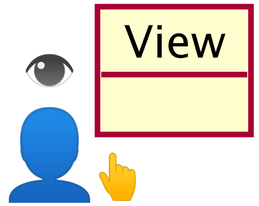
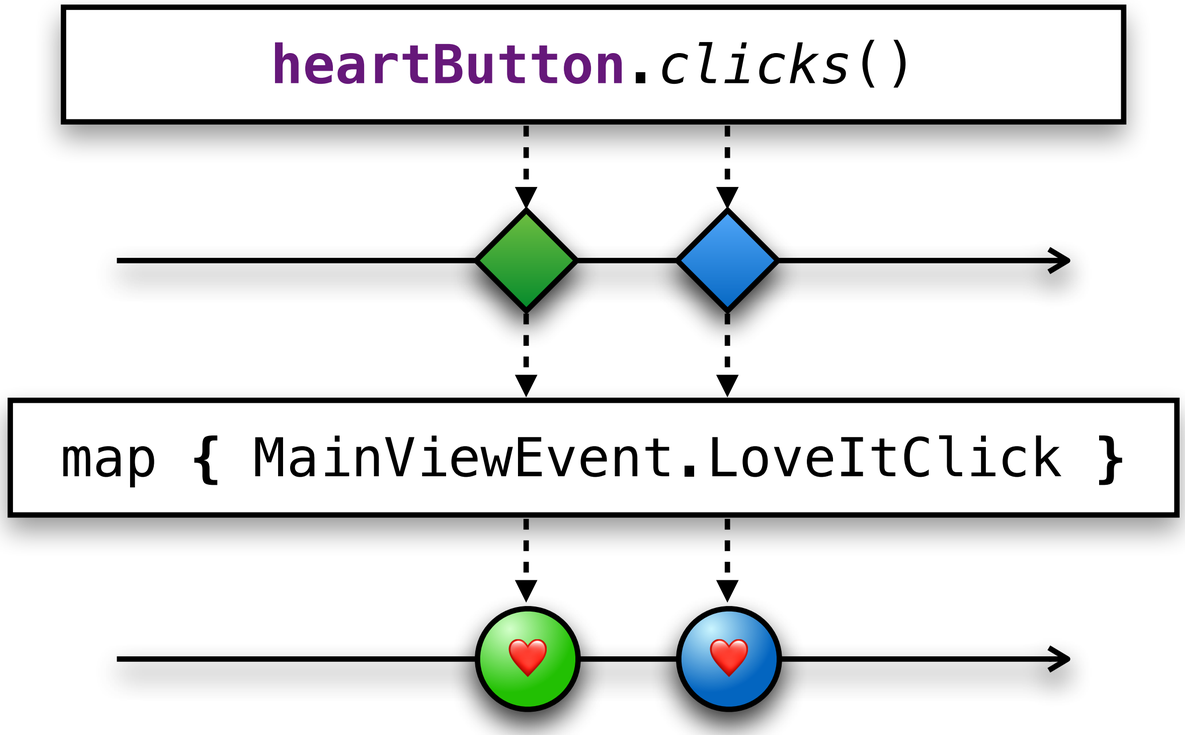
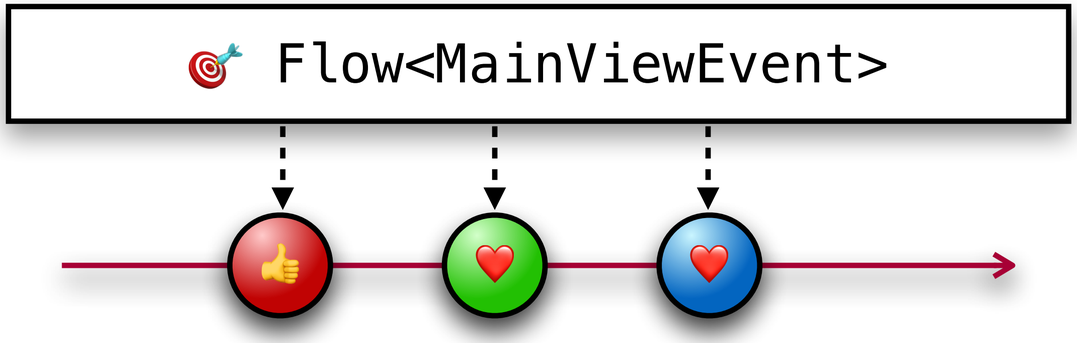
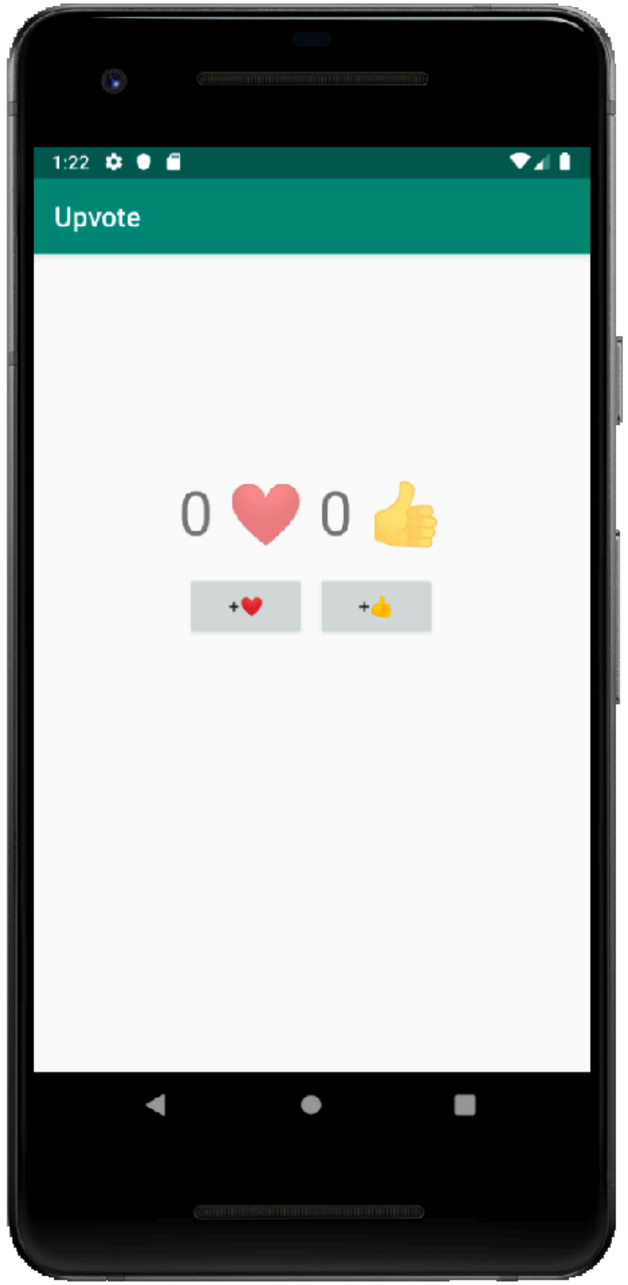

View

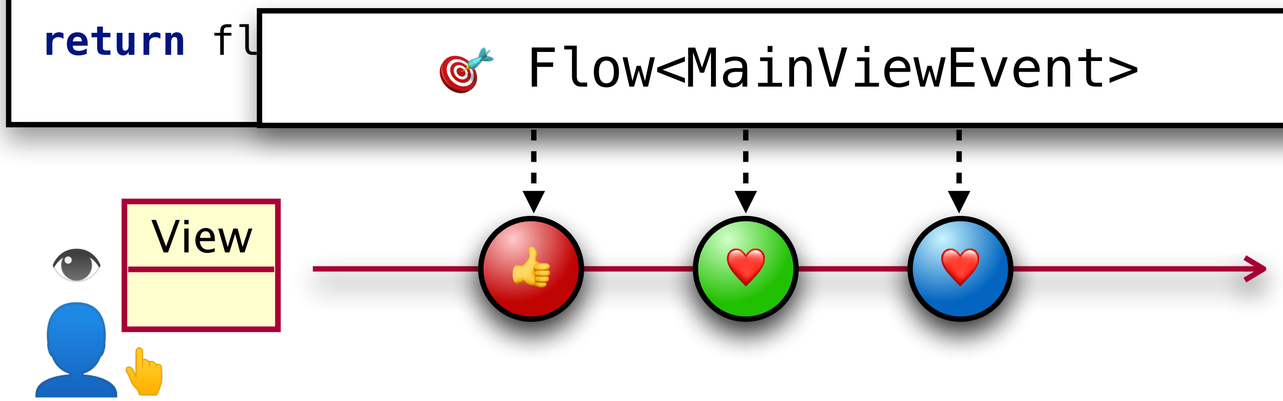

heartButton.clicks()
map { MainViewEvent.LoveItClick }

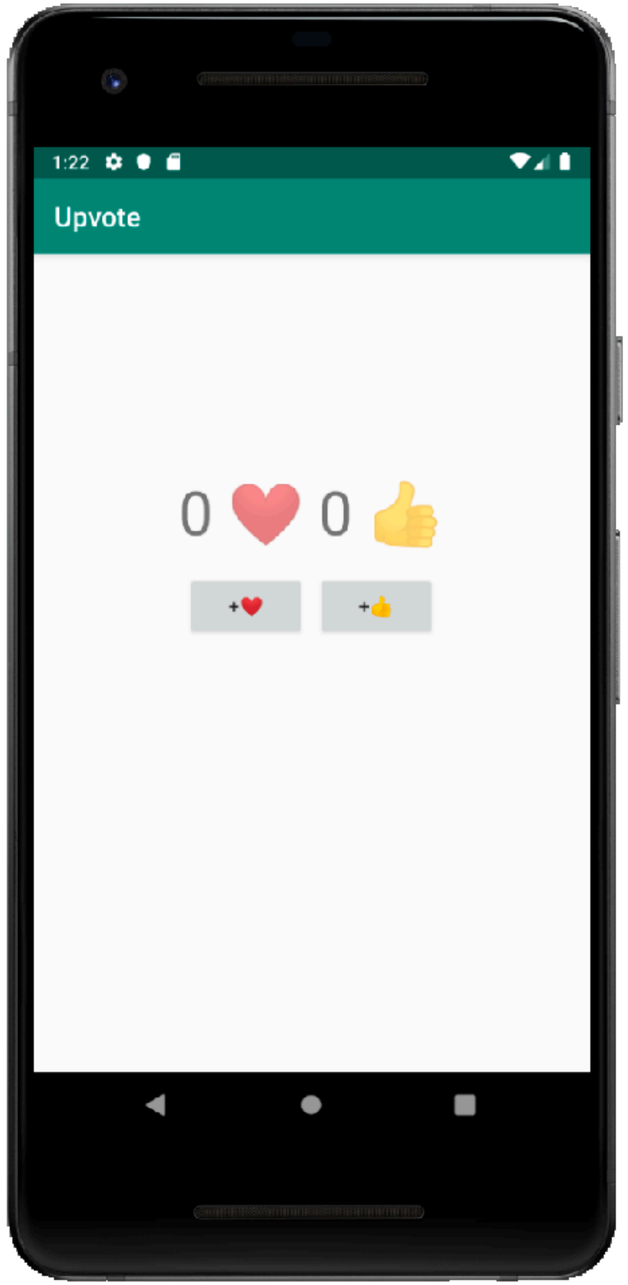

Flow<MainViewEvent>




```
val flows = listOf(
    heartButton.clicks().map { MainViewEvent.LoveItClick },
    thumbButton.clicks().map { MainViewEvent.ThumbsUpClick }
)

return fl
```



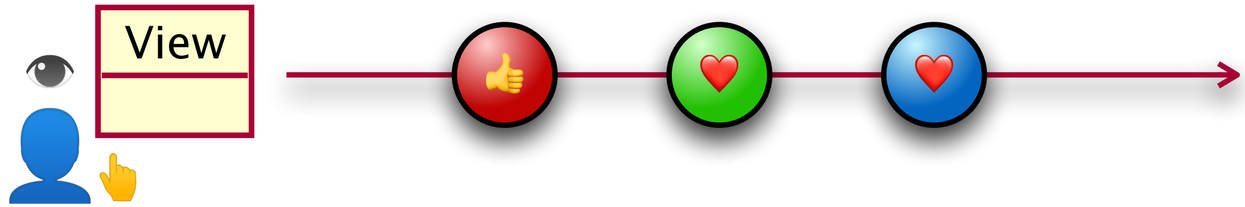


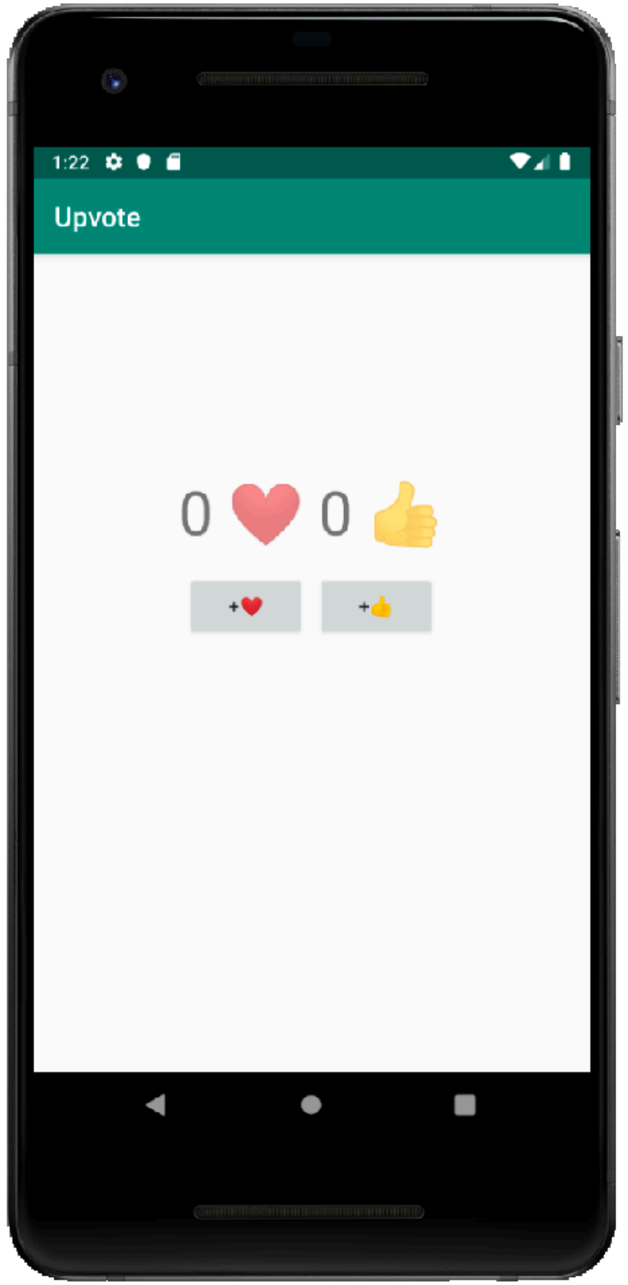

```
class MainActivity {

    override fun viewEvents(): Flow<MainViewEvent> {
        val flows = listOf(
            heartButton.clicks().map { MainViewEvent.LoveItClick },
            thumbButton.clicks().map { MainViewEvent.ThumbsUpClick }
        )

        return flows.asFlow().flattenMerge(flows.size)
    }

}
```



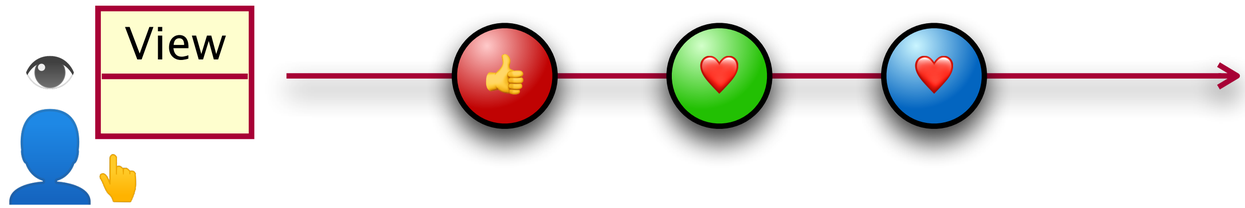


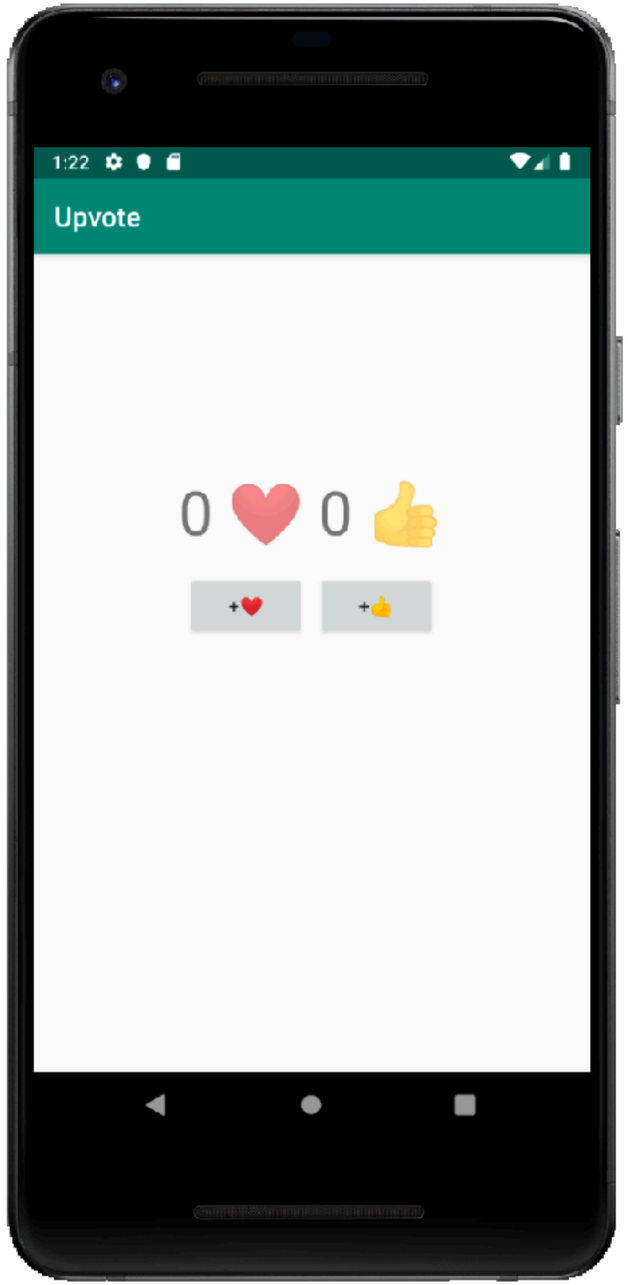

```
class MainActivity {

    override fun viewEvents(): Flow<MainViewEvent> {
        val flows = listOf(
            heartButton.clicks().map { MainViewEvent.LoveItClick },
            thumbButton.clicks().map { MainViewEvent.ThumbsUpClick }
        )

        return flows.asFlow().flattenMerge(flows.size)
    }

}
```



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        )

        return flows.asFlow().flattenMerge(flows.size)
    }

}
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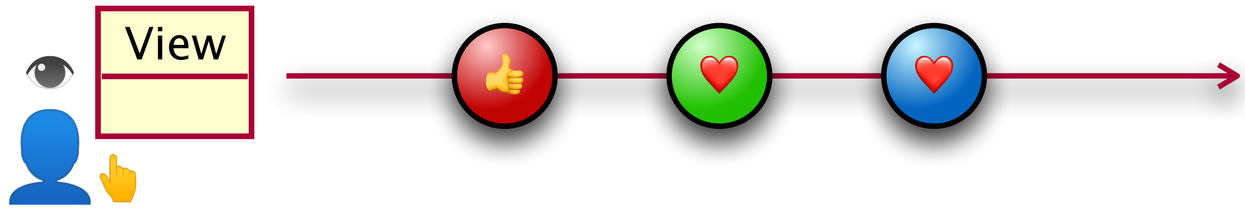

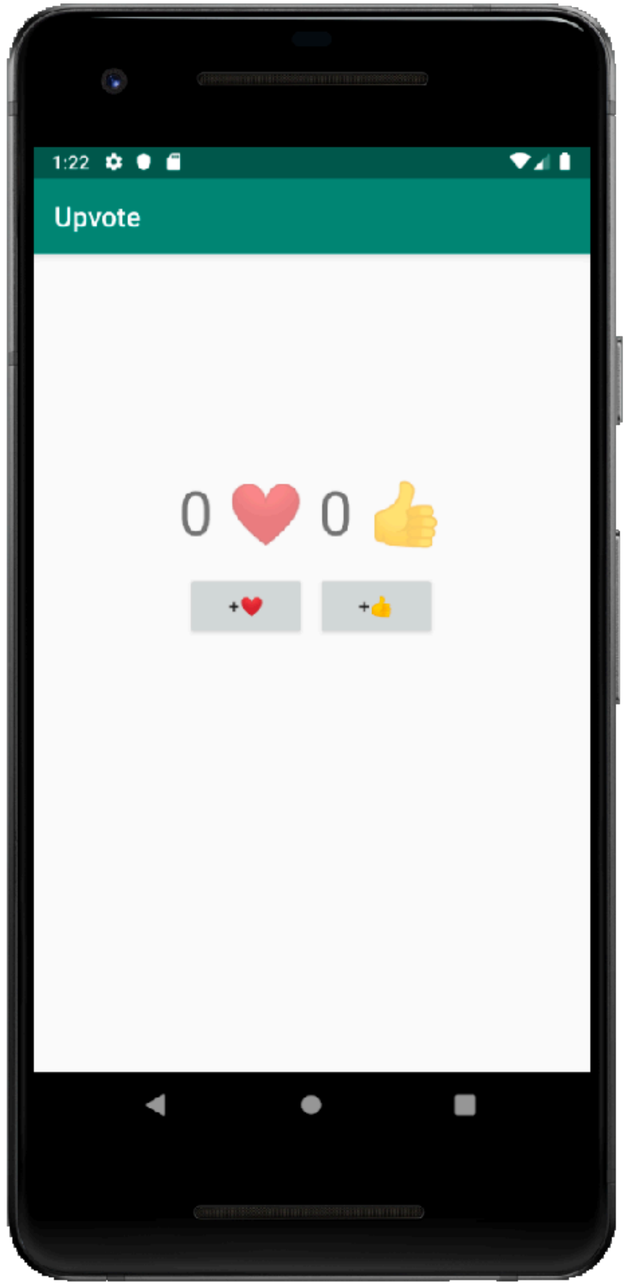


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        )

        return flows.asFlow().flattenMerge(flows.size)
    }

}
```
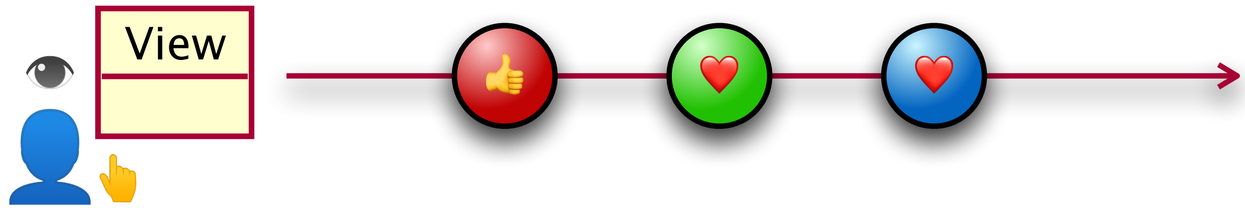
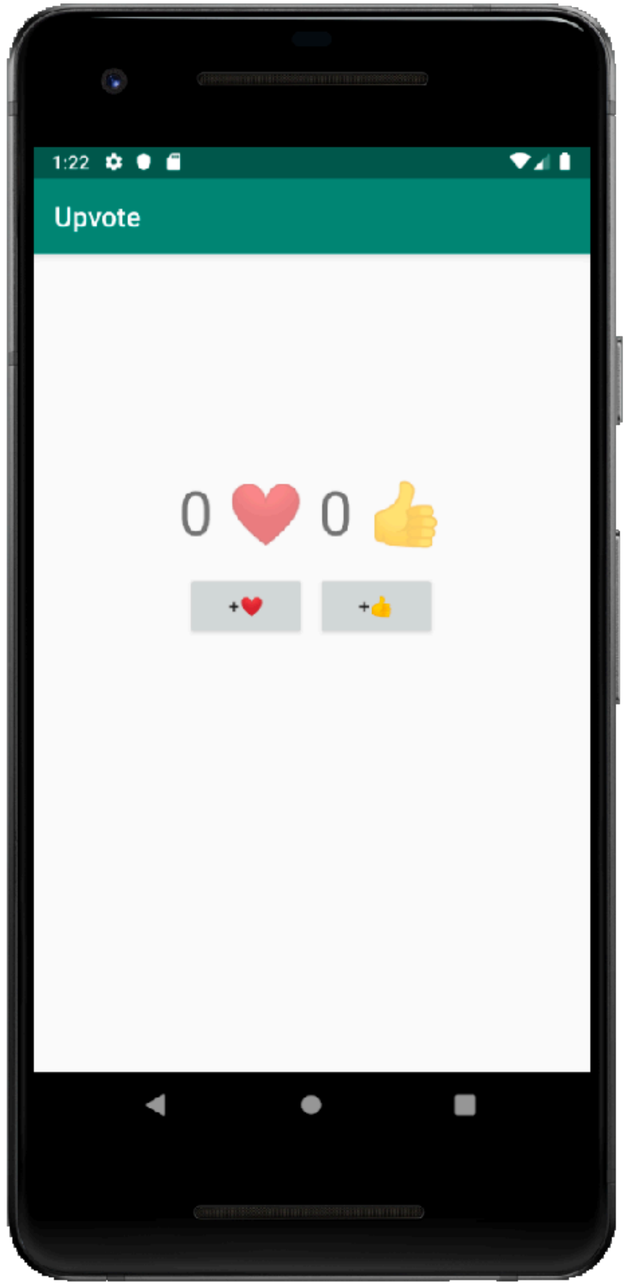





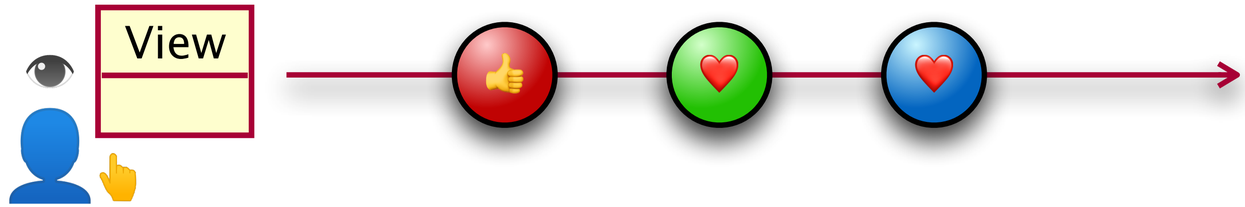

```kotlin
/**
 * This allows us to group all the viewEvents from
 * one view in a single Flow.
 */
interface ViewEventFlow<E> {
    fun viewEvents(): Flow<E>
}

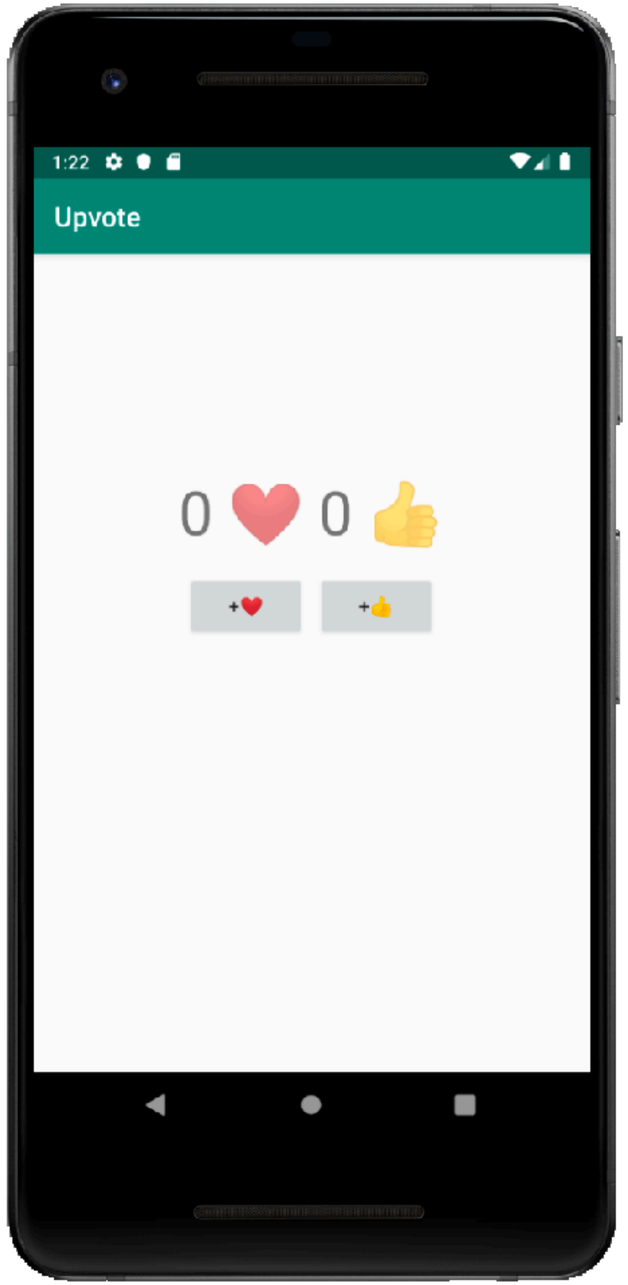
class MainActivity : ViewEventFlow<MainViewEvent> {

    override fun viewEvents(): Flow<MainViewEvent> {
        val flows = listOf(
            heartButton.clicks().map { MainViewEvent.LoveItClick },
            thumbButton.clicks().map { MainViewEvent.ThumbsUpClick }
        )

        return flows.asFlow().flattenMerge(flows.size)
    }

}
```






```
class MainActivity : ViewEventFlow<MainViewEvent> {

    val _scope: CoroutineScope = MainScope()

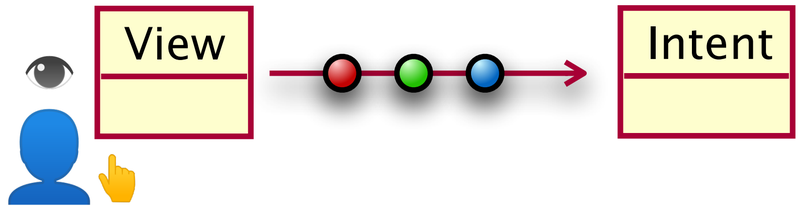
    override fun onCreate(savedInstanceState: Bundle?) {
        super.onCreate(savedInstanceState)
        // ...

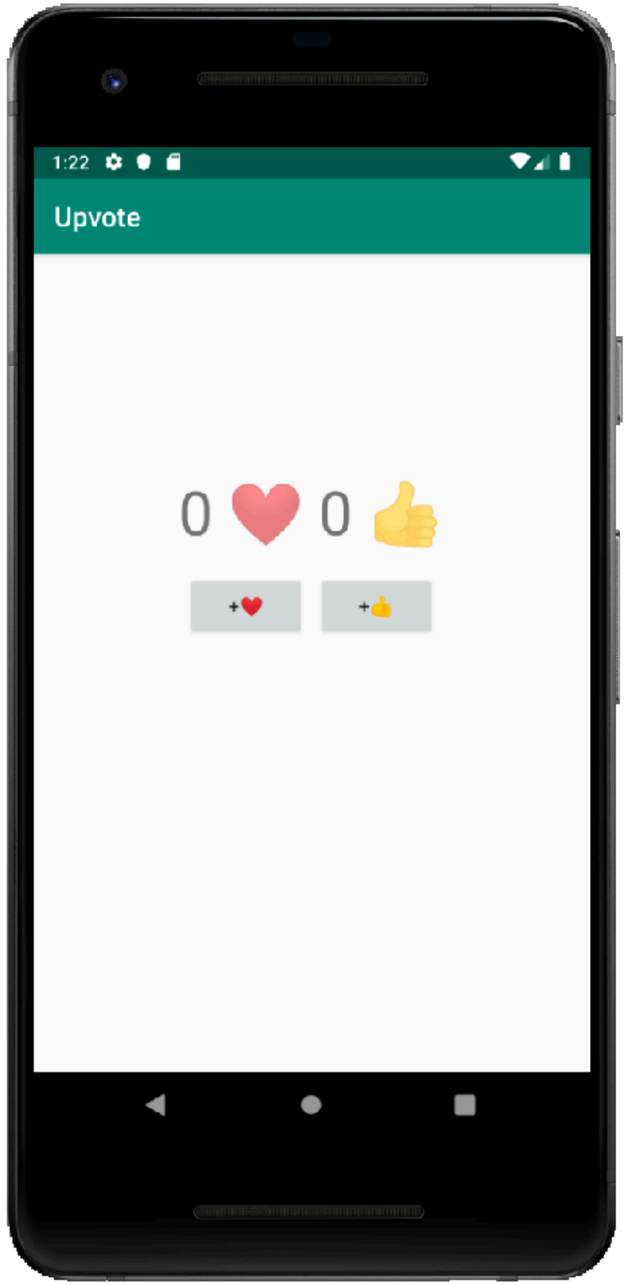
    }

    override fun onDestroy() {
        super.onDestroy()
        scope.cancel()
    }

    override fun viewEvents(): Flow<MainViewEvent> {
        // ...
    }

}
```






```
class MainActivity : ViewEventFlow<MainViewEvent> {

    val scope: CoroutineScope = MainScope()

    override fun onCreate(savedInstanceState: Bundle?) {
        super.onCreate(savedInstanceState)
        // ...

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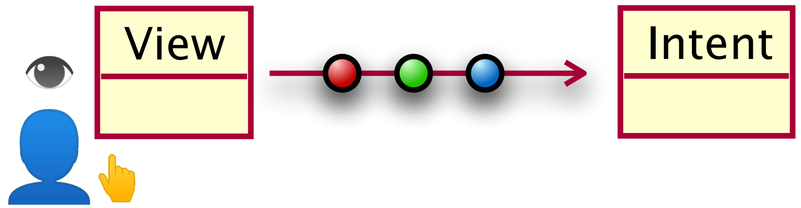

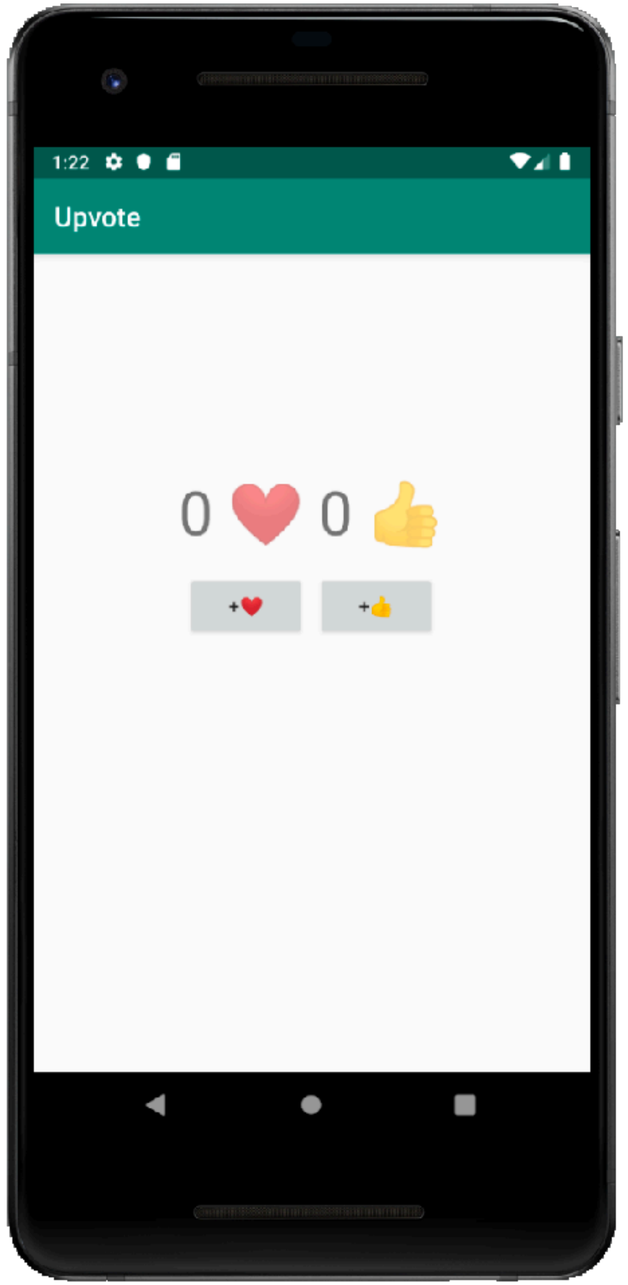


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class MainActivity : ViewEventFlow<MainViewEvent> {

    val scope: CoroutineScope = MainScope()

    override fun onCreate(savedInstanceState: Bundle?) {
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        scope.launch { this: CoroutineScope
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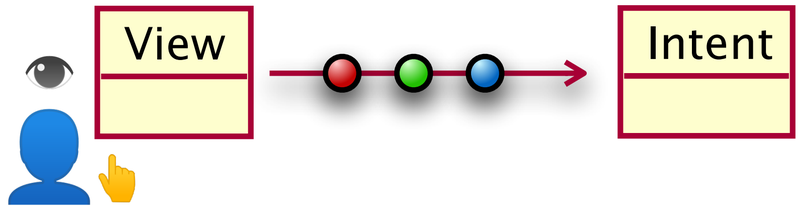

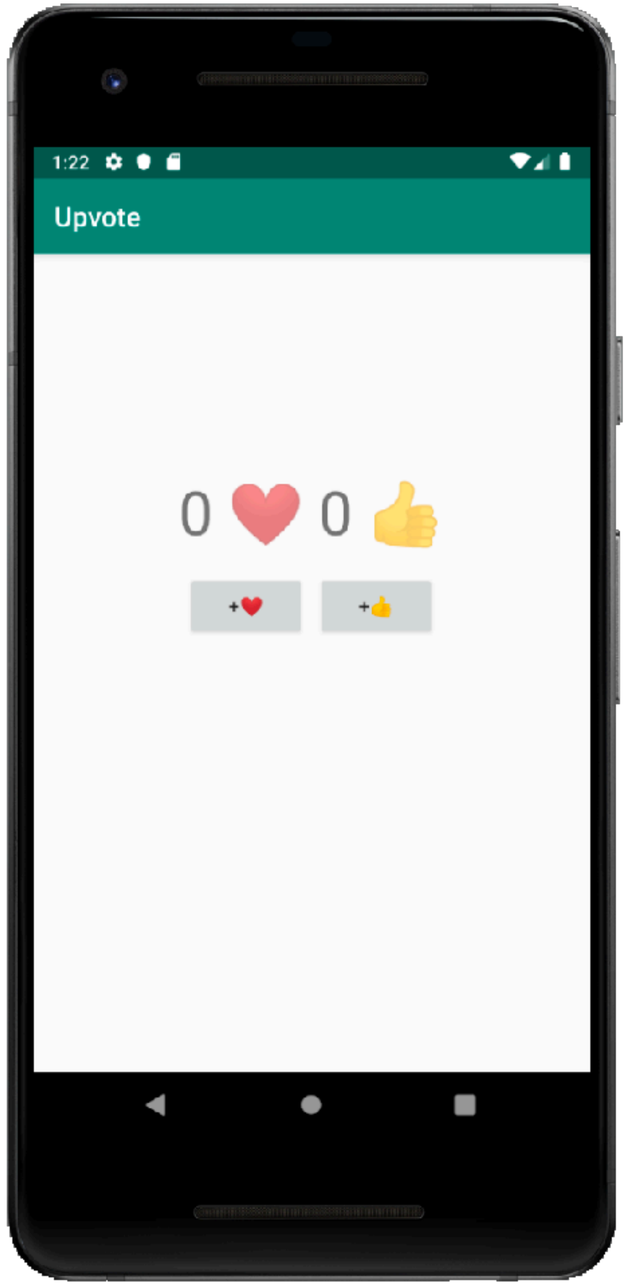


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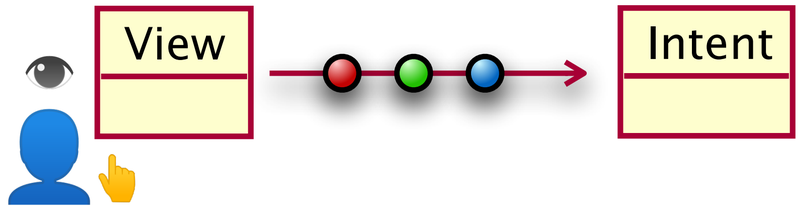

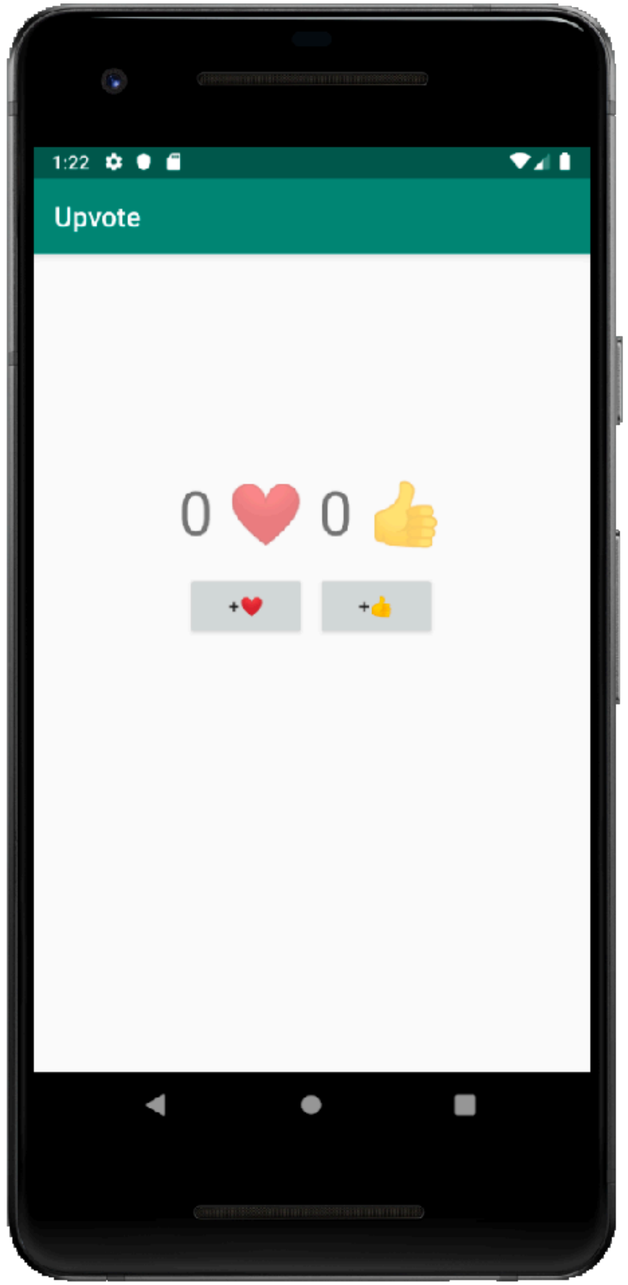


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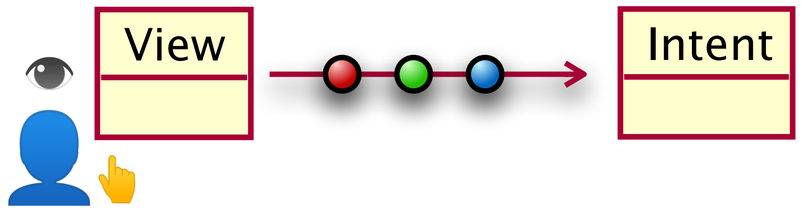

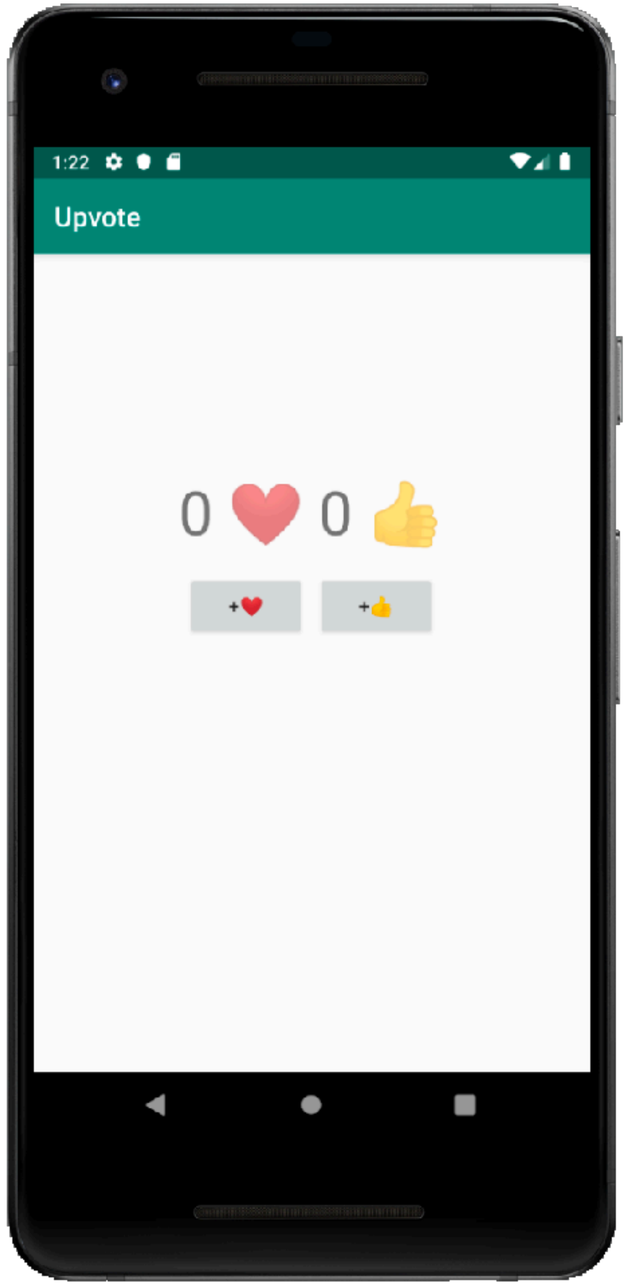


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        // ...
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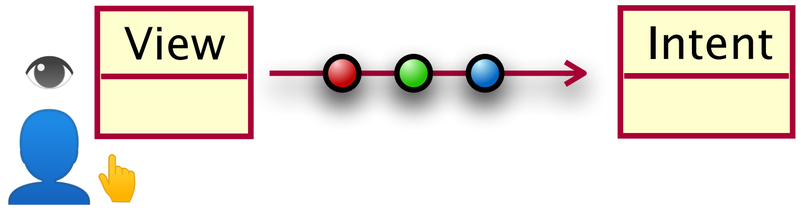
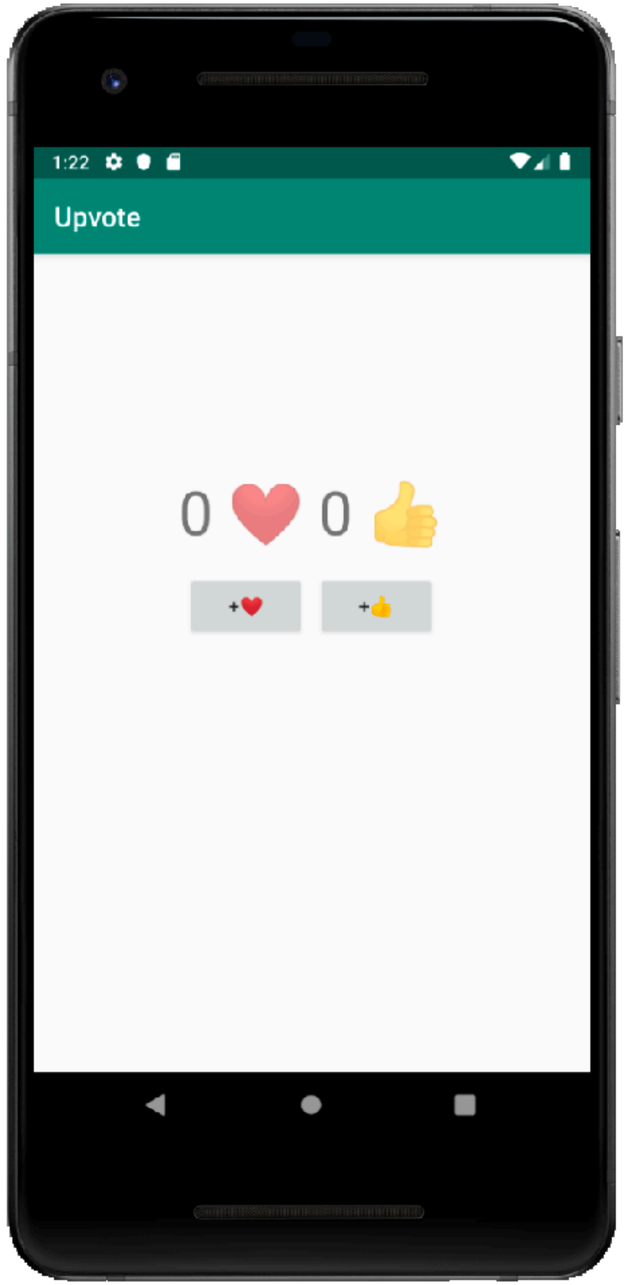
```



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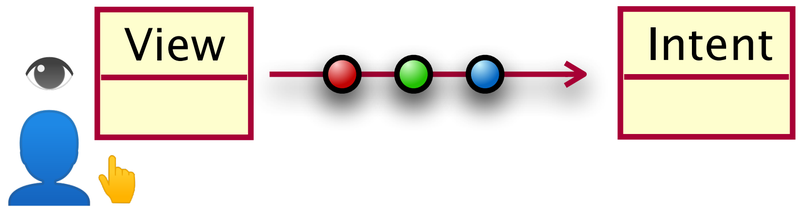

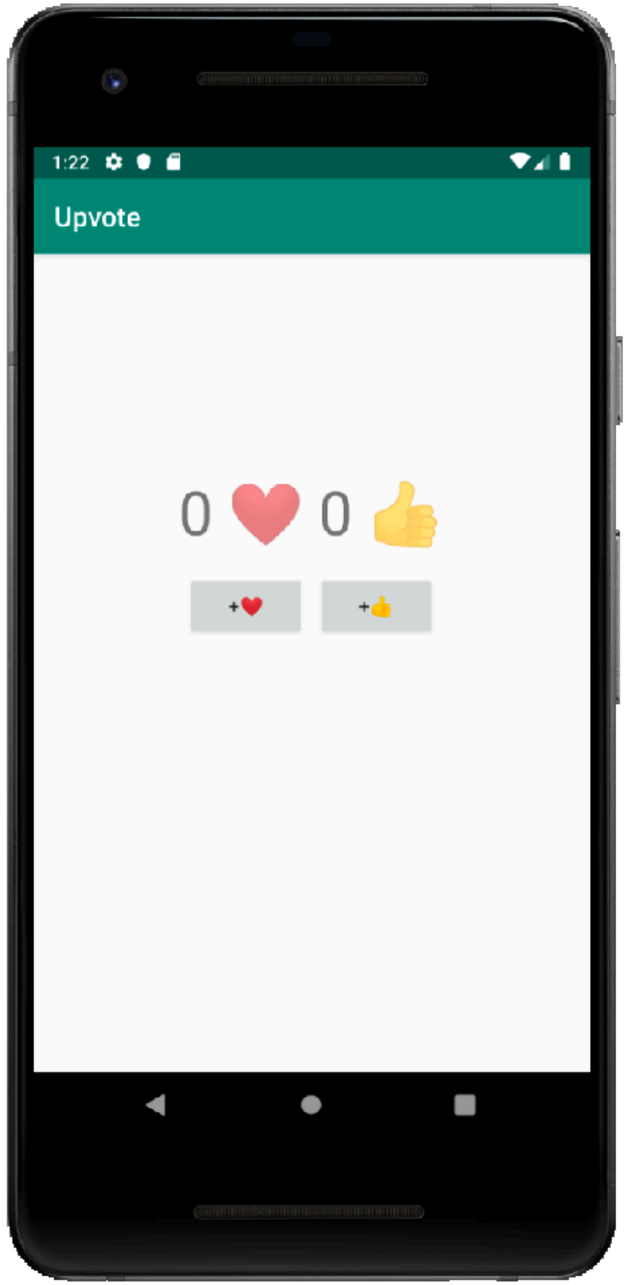


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    val scope: CoroutineScope = MainScope()

    override fun onCreate(savedInstanceState: Bundle?) {
        super.onCreate(savedInstanceState)
        // ...
        viewEvents()
            .onEach { ? }
            .launchIn(scope)
    }

    override fun onDestroy() {
        super.onDestroy()
        scope.cancel()
    }

    override fun viewEvents(): Flow<MainViewEvent> {
        // ...
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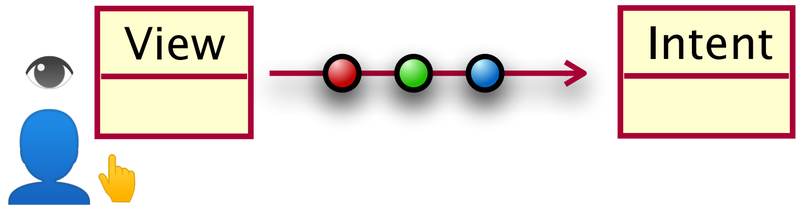
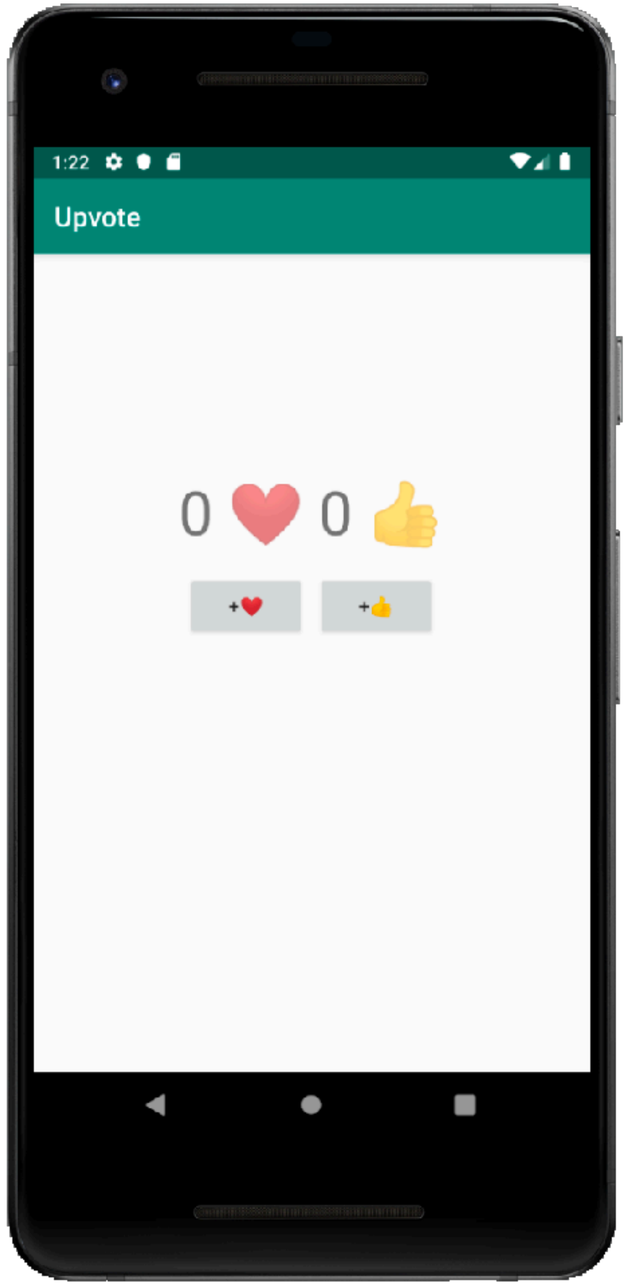
```



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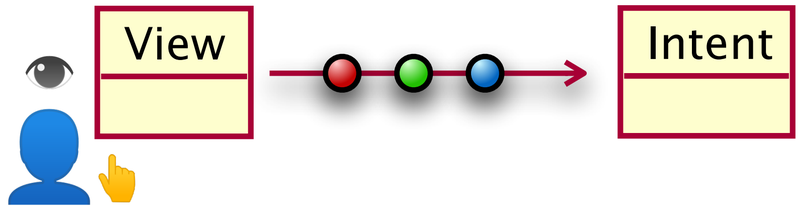

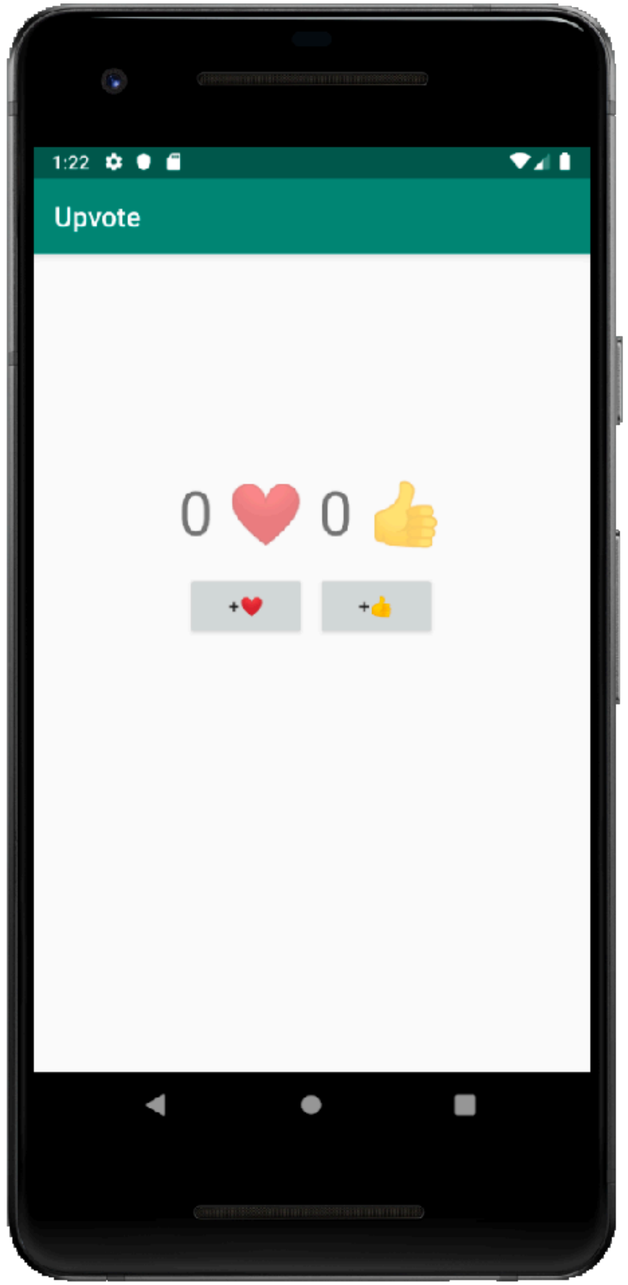


```
class MainActivity : ViewEventFlow<MainViewEvent> {

    val scope: CoroutineScope = MainScope()

    override fun onCreate(savedInstanceState: Bundle?) {
        super.onCreate(savedInstanceState)
        // ...
        viewEvents()
            .onEach { event ->
                MainViewIntentFactory.process(event)
            }
            .launchIn(scope)
    }

    override fun onDestroy() {
        super.onDestroy()
        scope.cancel()
    }

    override fun viewEvents(): Flow<MainViewEvent> {
        // ...
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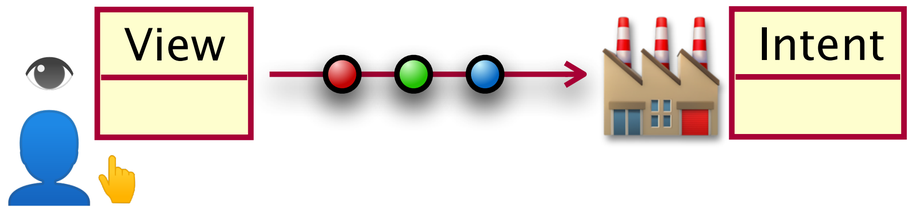
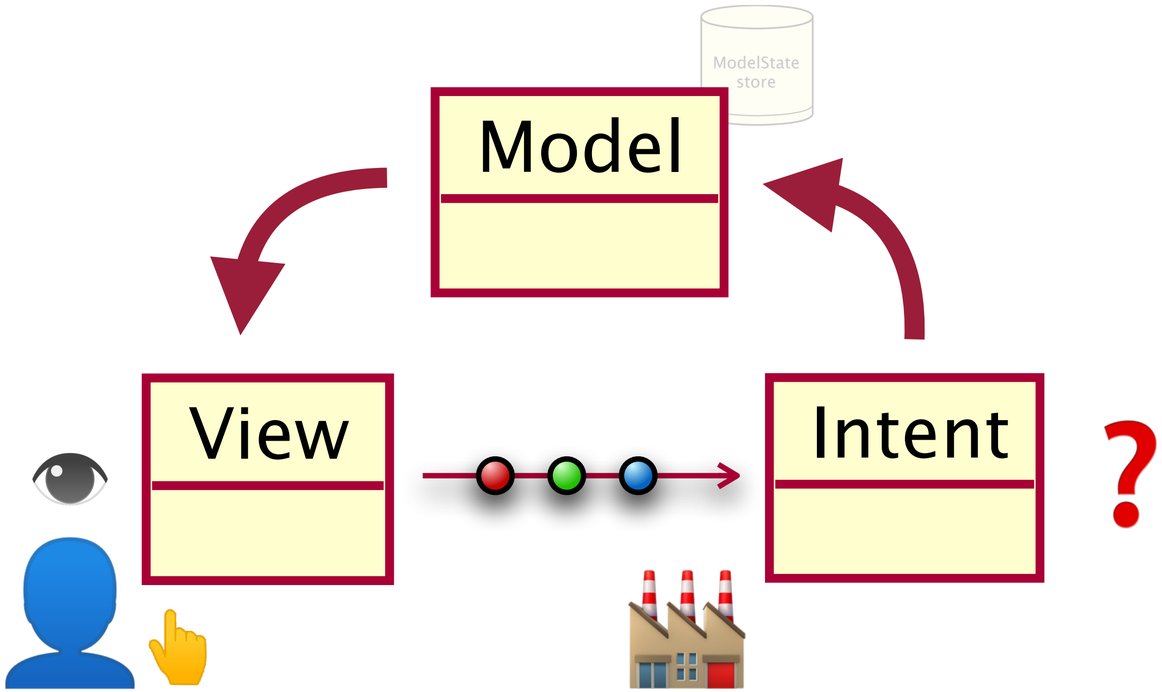
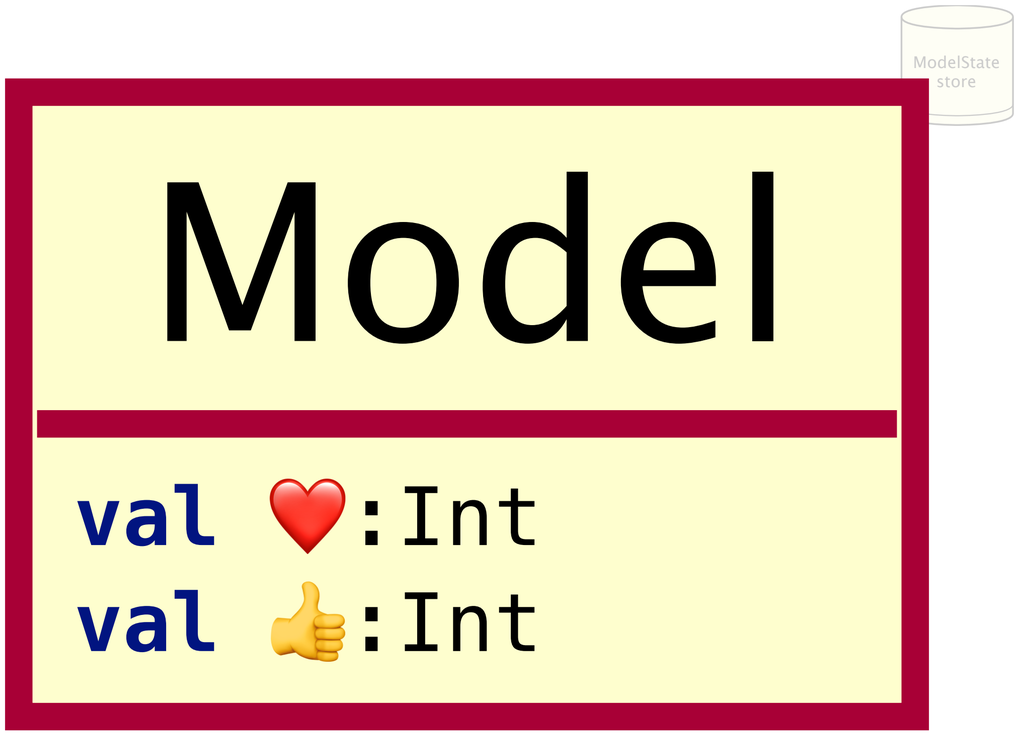
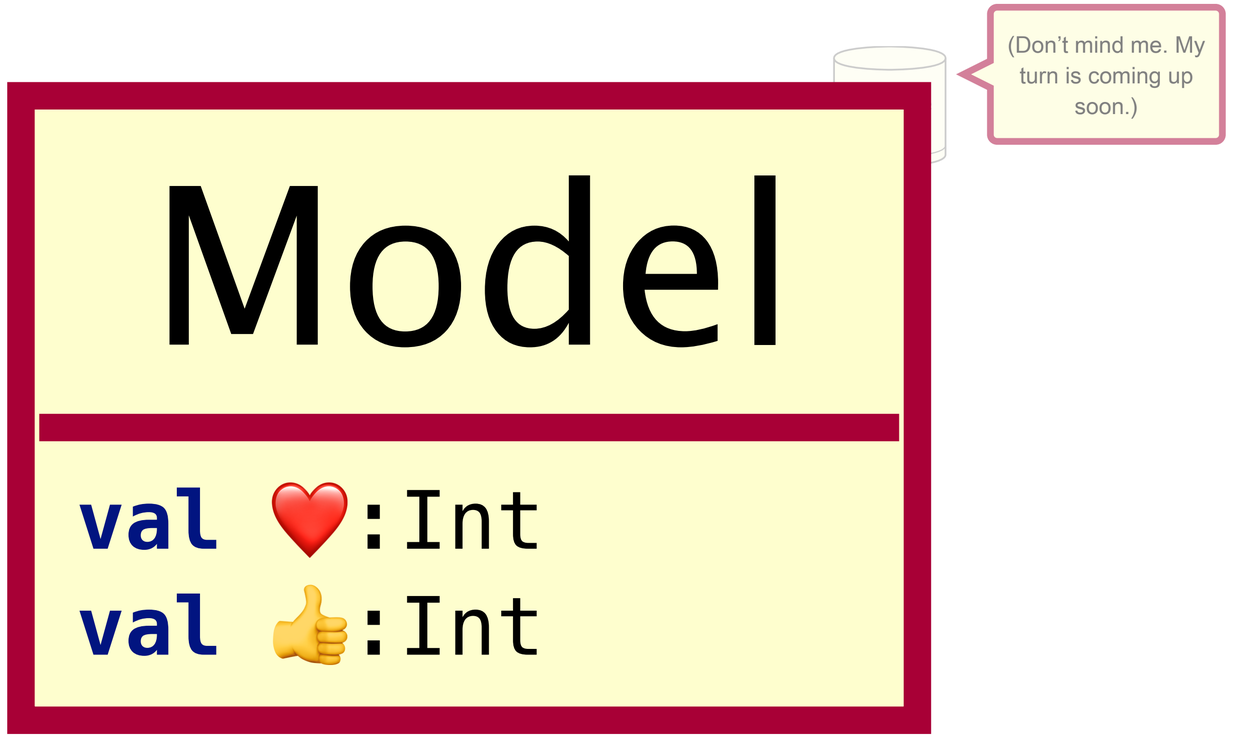
```




ModelState
store
Model
View
Intent
?

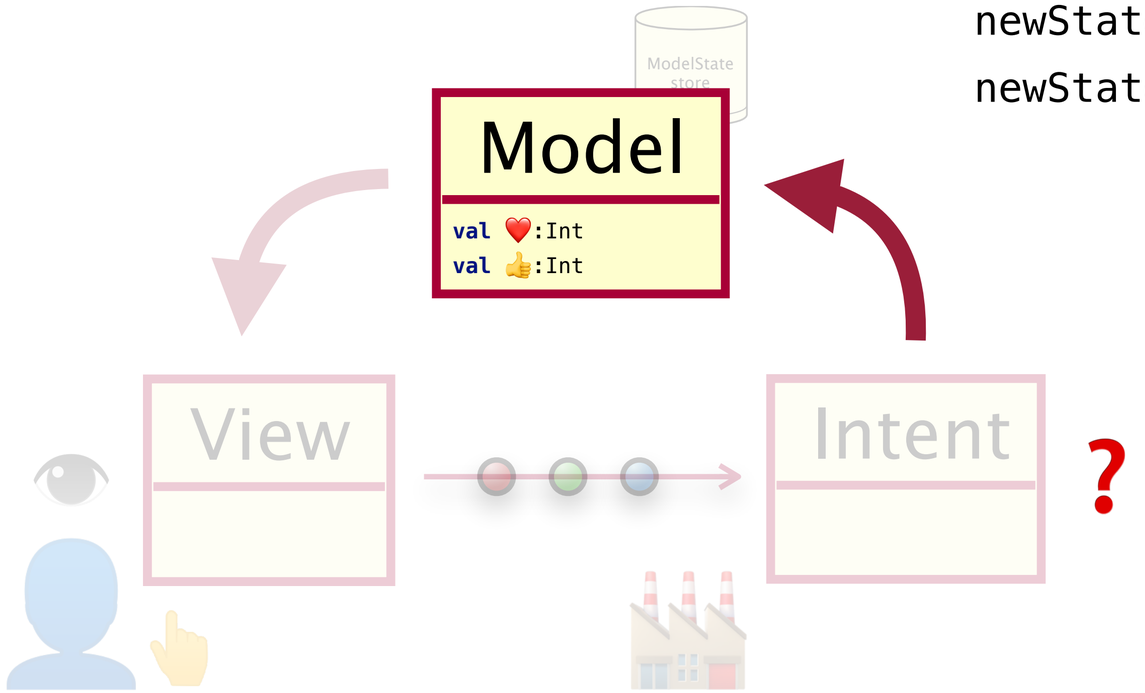

ModelState
store
Model
val ❤️:Int
val 👍:Int




```
data class UpvoteModel(val hearts:Int, val thumbs:Int)
```

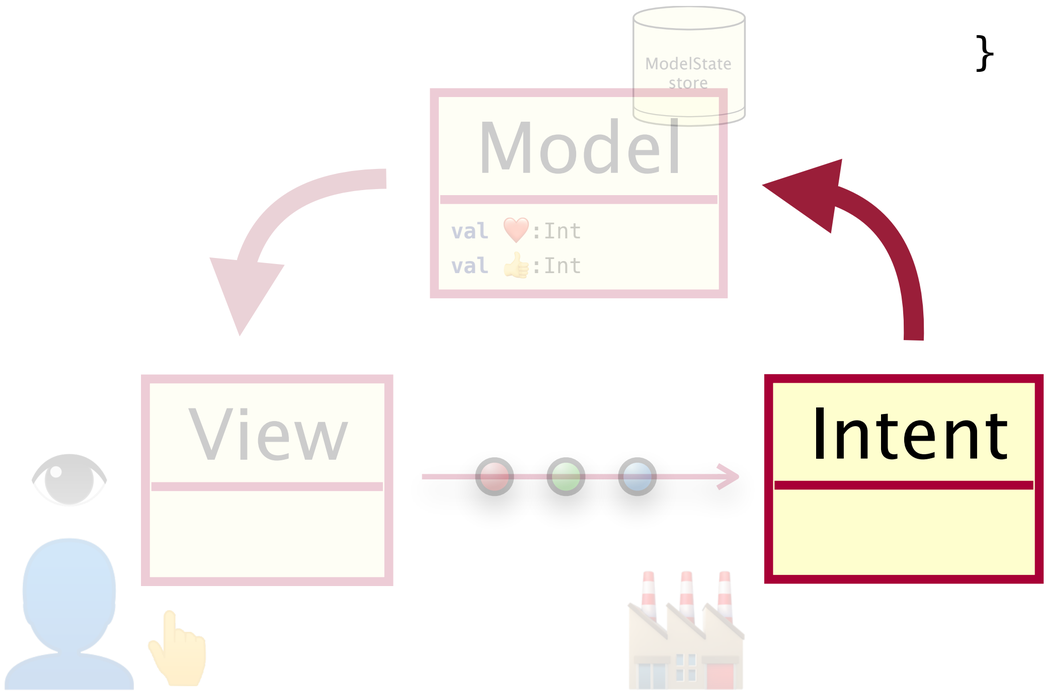
```
data class UpvoteModel(val hearts:Int, val thumbs:Int)

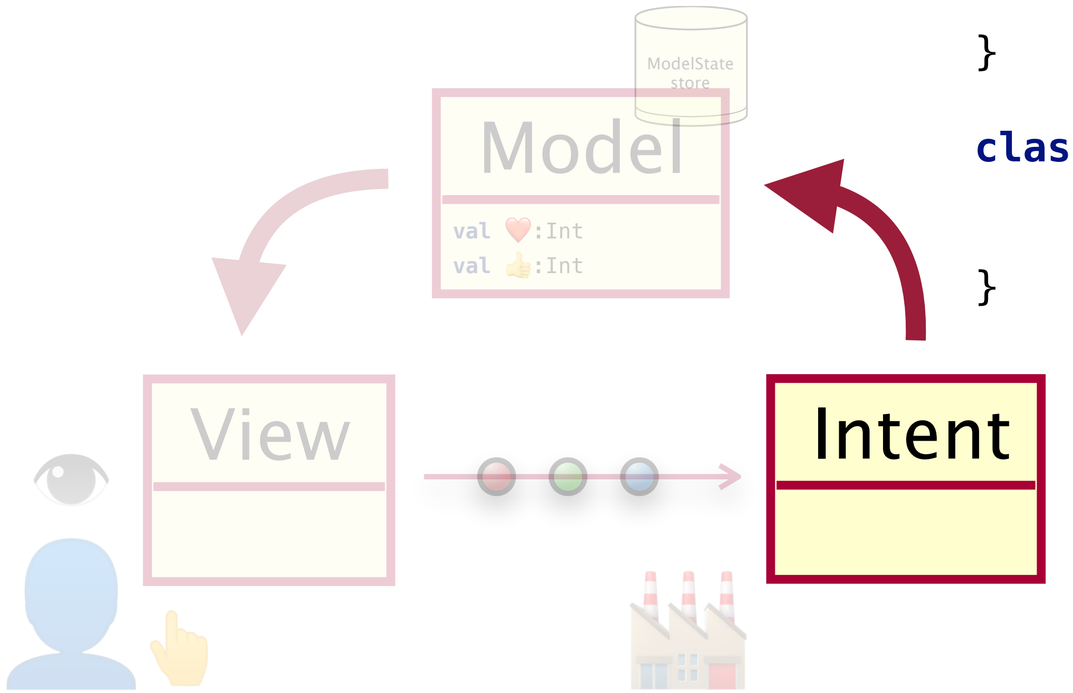
newState = oldState.copy(thumbs = thumbs + 1) // 0, 1
newState = newState.copy(hearts = hearts + 1) // 1, 1
newState = newState.copy(hearts = hearts + 1) // 2, 1
```



```kotlin
data class UpvoteModel(val hearts:Int, val thumbs:Int)

interface Intent<T> {
    fun reduce(oldState: T): T
}
```

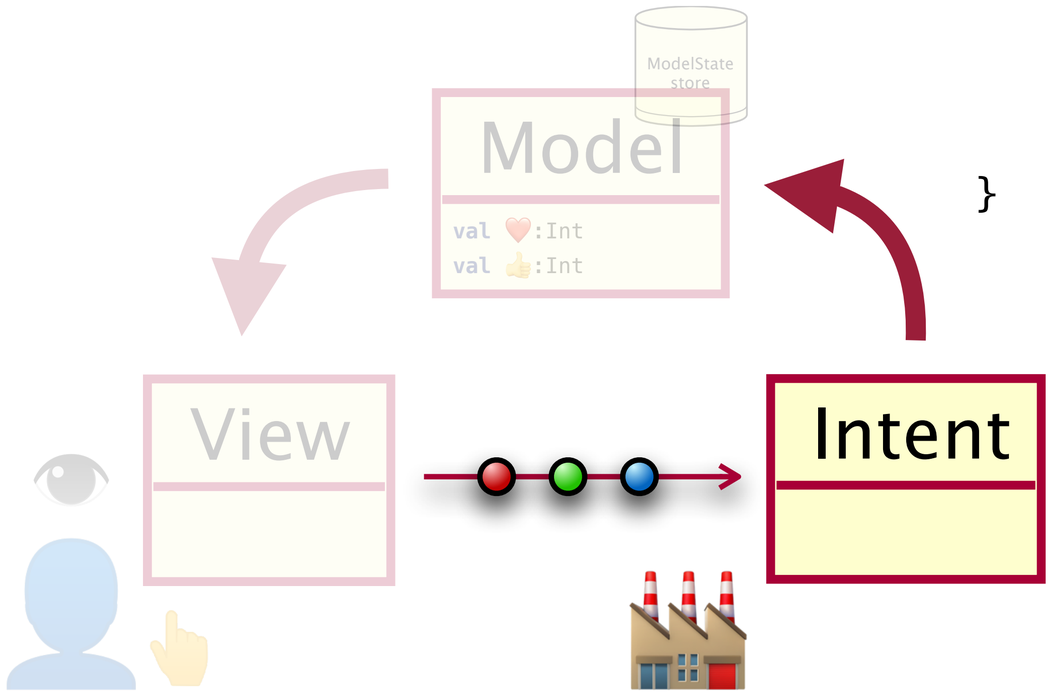





```
data class UpvoteModel(val hearts:Int, val thumbs:Int)

interface Intent<T> {
    fun reduce(oldState: T): T
}

class AddHeart():Intent<UpvoteModel> {
    override fun reduce(oldState: UpvoteModel) =
        oldState.copy(hearts = oldState.hearts + 1)
}
```




```
data class UpvoteModel(val hearts:Int, val thumbs:Int)

fun toIntent(viewEvent: MainViewEvent):Intent<UpvoteModel> {
    return when (viewEvent) {
        MainViewEvent.LoveItClick -> AddHeart()
        MainViewEvent.ThumbsUpClick -> AddThumb()
    }
}
```

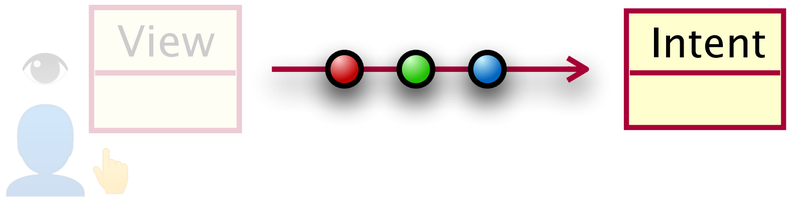
```
interface IntentFactory<E> {
    suspend fun process(viewEvent:E)
}

object MainViewIntentFactory : IntentFactory<MainViewEvent> {

    override suspend fun process(viewEvent: MainViewEvent) {
        UpvoteModelStore.process(toIntent(viewEvent))
    }

    private fun toIntent(viewEvent: MainViewEvent):Intent<UpvoteModel> {
        return when (viewEvent) {
            MainViewEvent.LoveItClick -> AddHeart()
            MainViewEvent.ThumbsUpClick -> AddThumb()
        }
    }

}
```



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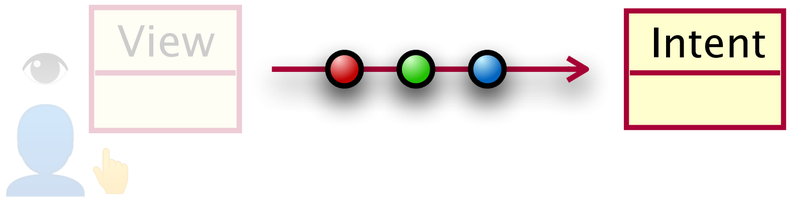
    private fun toIntent(viewEvent: MainViewEvent):Intent<UpvoteModel> {
        return when (viewEvent) {
            MainViewEvent.LoveItClick -> AddHeart()
            MainViewEvent.ThumbsUpClick -> AddThumb()
        }
    }

}
```



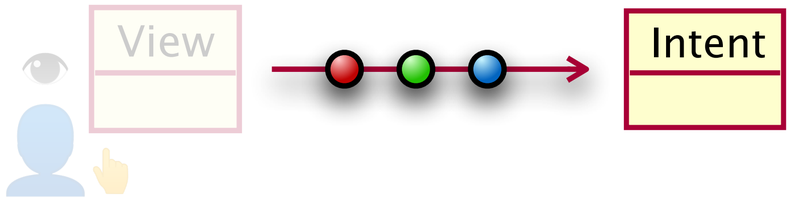
```
interface IntentFactory<E> {
    suspend fun process(viewEvent:E)
}

object MainViewIntentFactory : IntentFactory<MainViewEvent> {

    override suspend fun process(viewEvent: MainViewEvent) {
        UpvoteModelStore.process(toIntent(viewEvent))
    }

    private fun toIntent(viewEvent: MainViewEvent):Intent<UpvoteModel> {
        return when (viewEvent) {
            MainViewEvent.LoveItClick -> AddHeart()
            MainViewEvent.ThumbsUpClick -> AddThumb()
        }
    }

}
```



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```
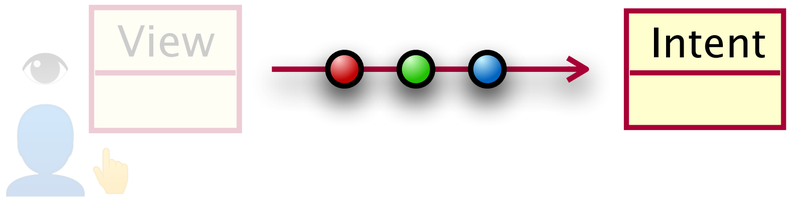
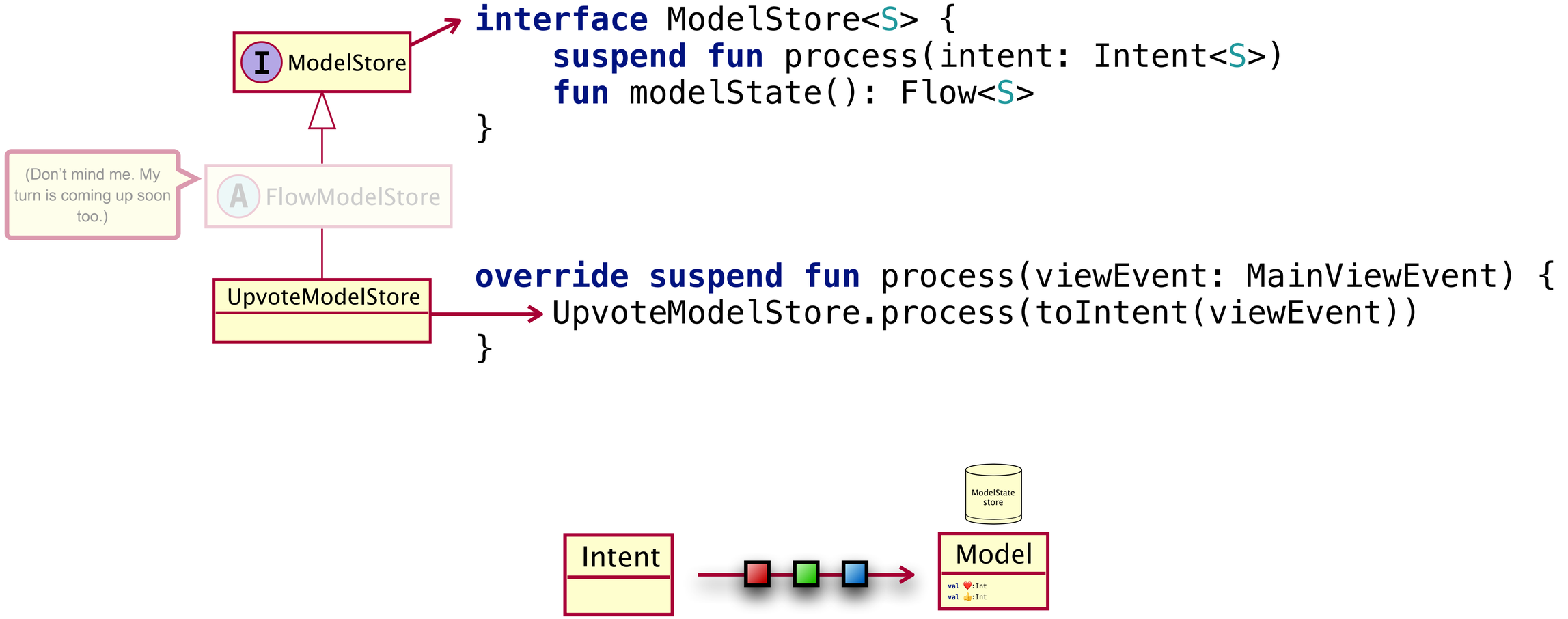
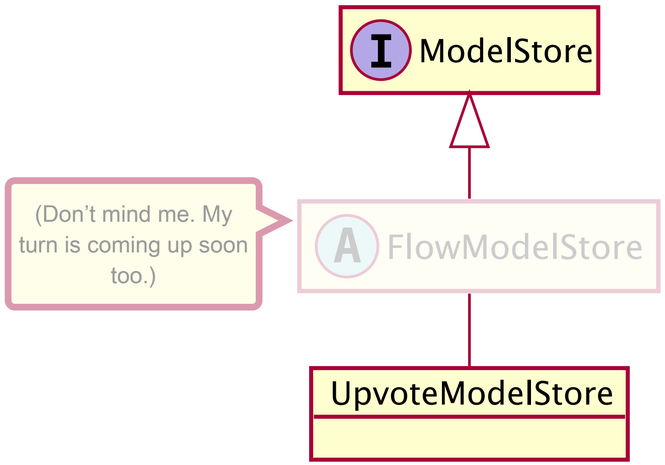
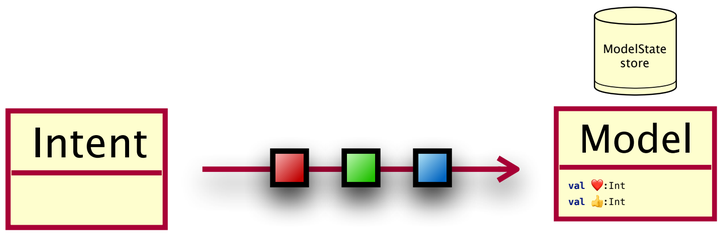



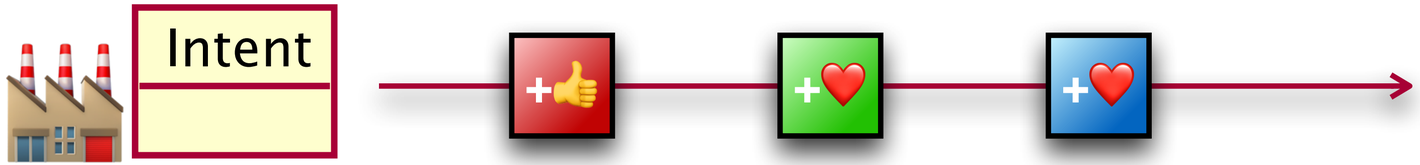

I ModelStore
(Don't mind me. My turn is coming up soon too.)
A FlowModelStore
UpvoteModelStore
interface ModelStore<S> {
suspend fun process(intent: Intent<S>)
fun modelState(): Flow<S>
}
override suspend fun process(viewEvent: MainViewEvent) {
UpvoteModelStore.process(toIntent(viewEvent))
}

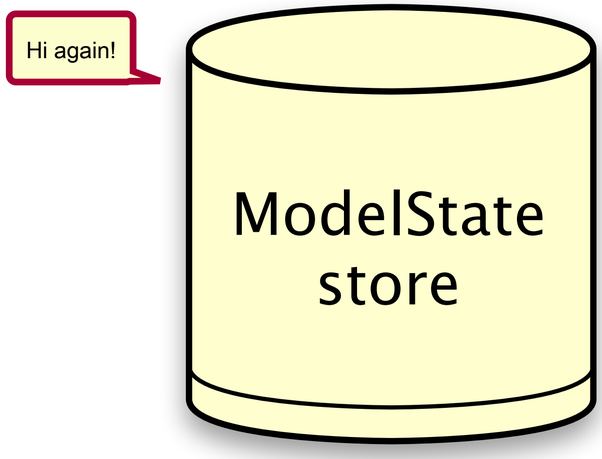
ModelState store
Intent
Model
val ❤️:Int
val 👍:Int



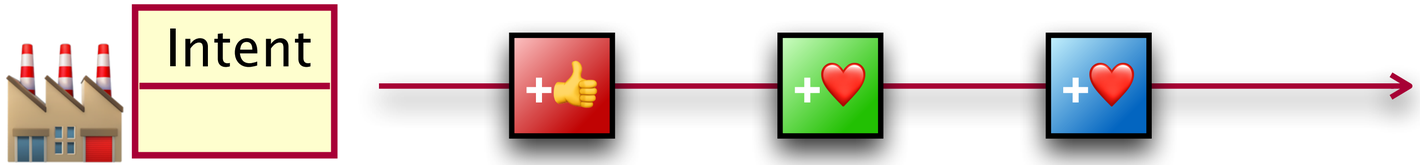

```
interface ModelStore<S> {
    suspend fun process(intent: Intent<S>)
    fun modelState(): Flow<S>
}
```







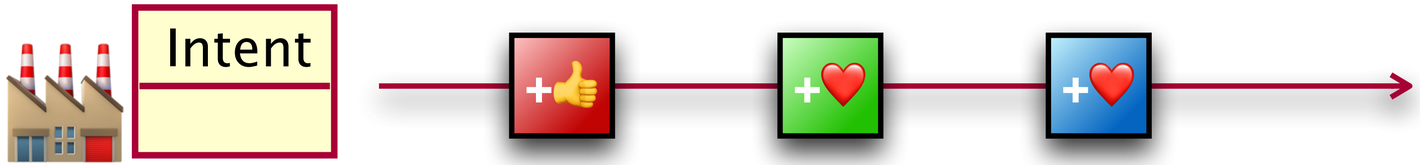

```
interface ModelStore<S> {
    suspend fun process(intent: Intent<S>)
    fun modelState(): Flow<S>
}
```



ModelState store

```
val intents = Channel<Intent<S>>()
```

```
suspend fun process(intent: Intent<S>) {
    intents.send(intent)
}
```



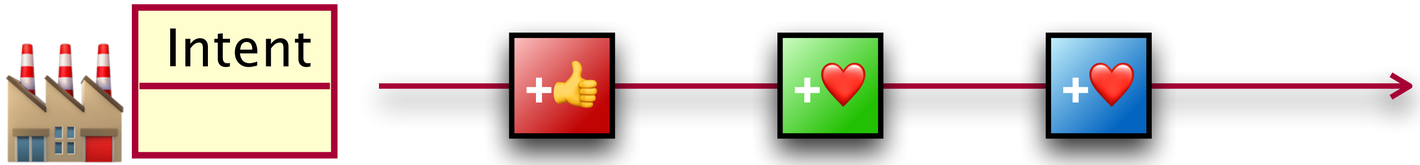
ModelState store

```
val intents = Channel<Intent<S>>()
```

```
suspend fun process(intent: Intent<S>) {
    intents.send(intent)
}
```

```
val store = ConflatedBroadcastChannel(startingState)
```

```
override fun modelState(): Flow<S> {
    return store.asFlow()
}
```

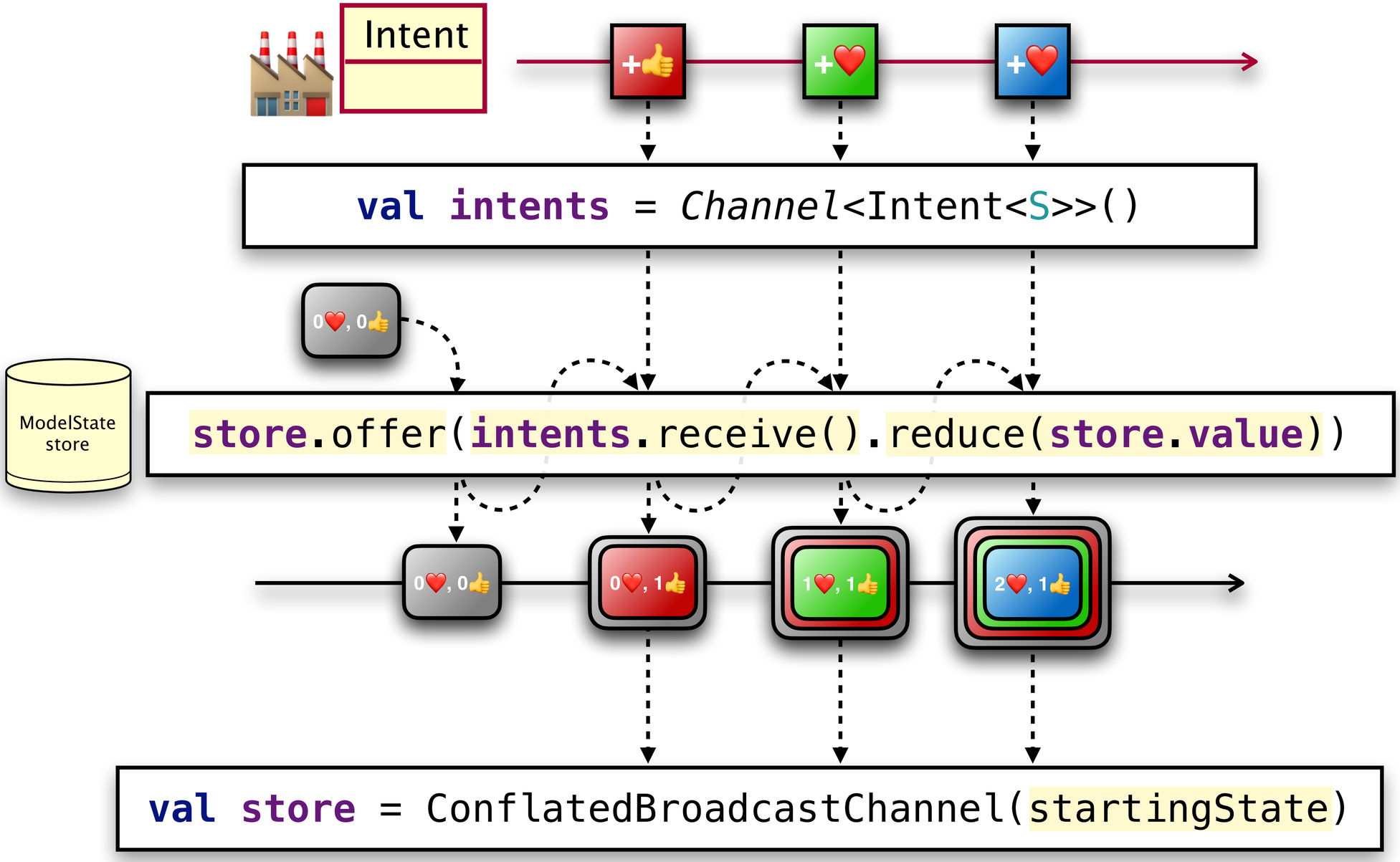


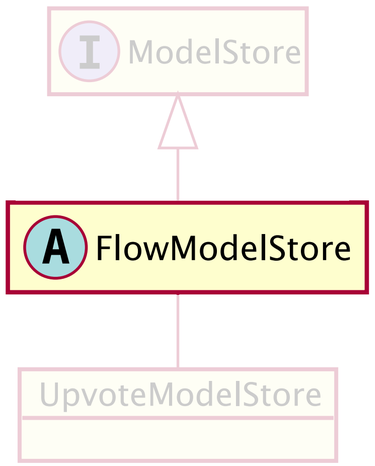
ModelState
store

```
val intents = Channel<Intent<S>>()
```

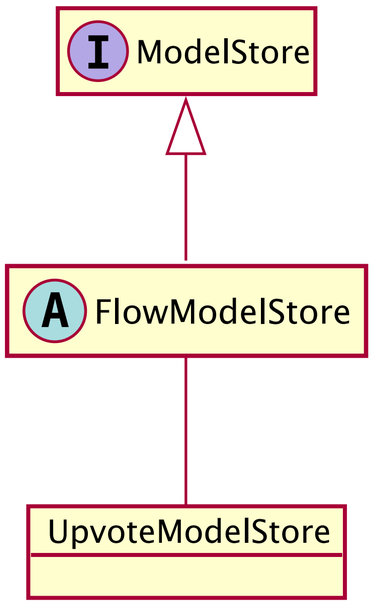
? ? ?

```
val store = ConflatedBroadcastChannel(startingState)
```


Intent
+👍
+❤️
+❤️
val intents = Channel<Intent<S>>()
0❤️, 0👍
ModelState
store
store.offer(intents.receive().reduce(store.value))
0❤️, 0👍
0❤️, 1👍
1❤️, 1👍
2❤️, 1👍
val store = ConflatedBroadcastChannel(startingState)



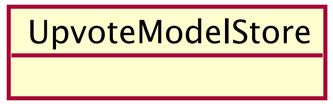

```kotlin
open class FlowModelStore<S>(startingState: S) : ModelStore<S> {
    private val scope = MainScope()
    private val intents = Channel<Intent<S>>()
    private val store = ConflatedBroadcastChannel(startingState)

    init {
        // Reduce from MainScope()
        scope.launch {
            while (isActive) store.offer(intents.receive().reduce(store.value))
        }
    }

    // Could be called from any coroutine scope/context.
    override suspend fun process(intent: Intent<S>) {
        intents.send(intent)
    }

    override fun modelState(): Flow<S> {
        return store.asFlow()
    }

    fun close() {
        intents.close()
        store.close()
        scope.cancel()
    }
}
```




```
interface ModelStore<S> {
    suspend fun process(intent: Intent<S>)
    fun modelState(): Flow<S>
}
```

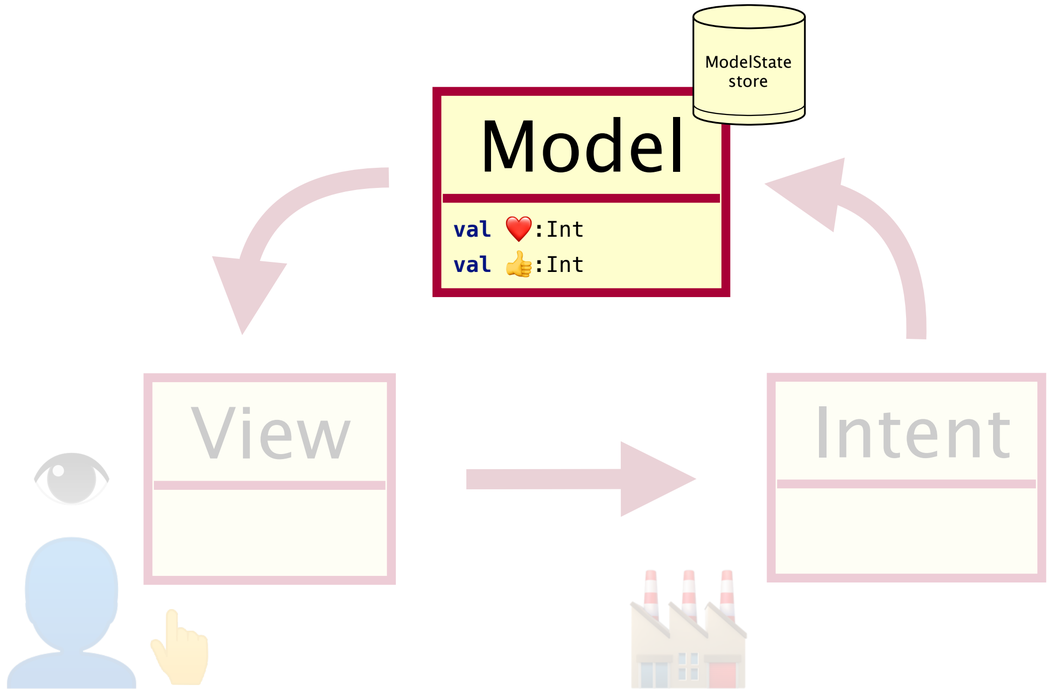
```
open class FlowModelStore<S>(startingState: S) : ModelStore<S> {
        // ...
}
```

```
object UpvoteModelStore :
    FlowModelStore<UpvoteModel>(UpvoteModel(0, 0))
```

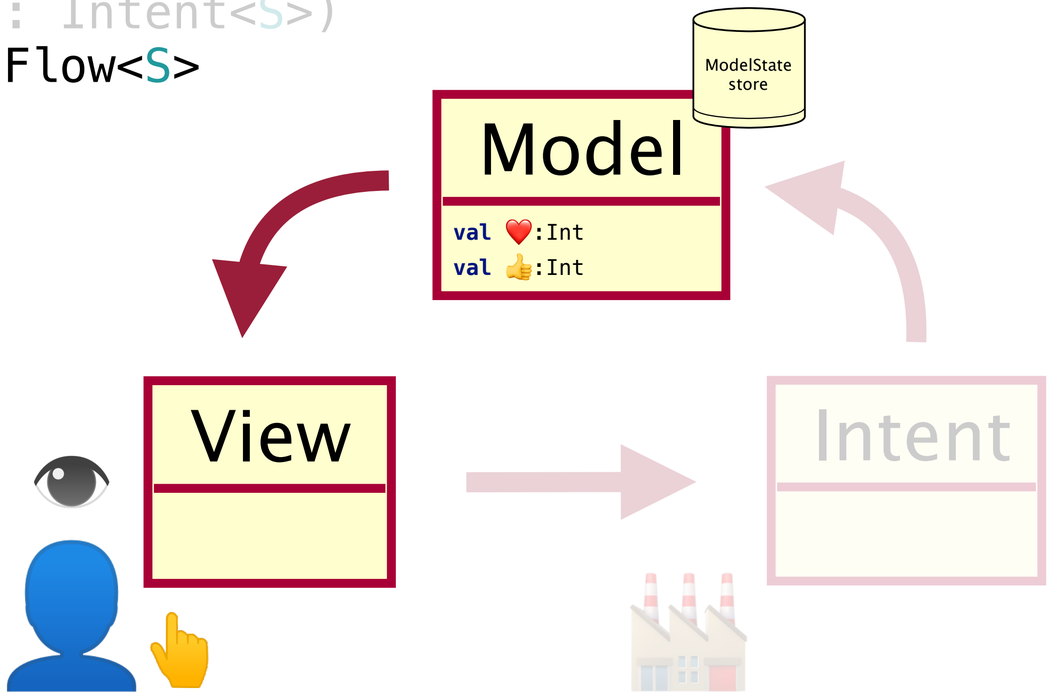


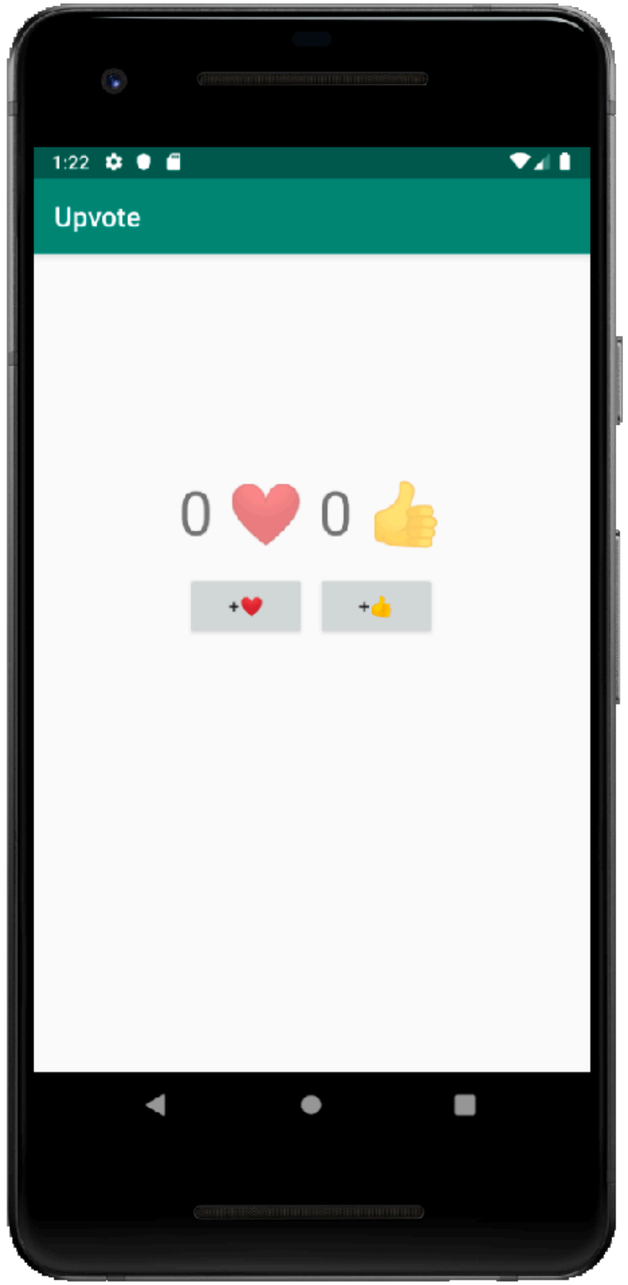

```
object UpvoteModelStore :
    FlowModelStore<UpvoteModel>(UpvoteModel(0, 0))
```

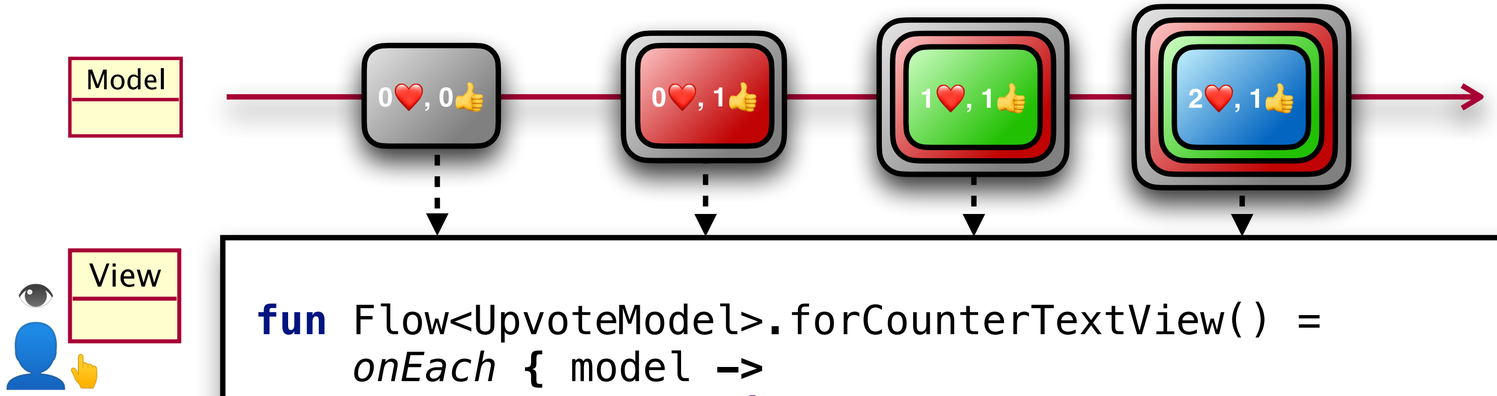
```
object UpvoteModelStore
```



```
object UpvoteModelStore

interface ModelStore<S> {
    fun process(intent: Intent<S>)
    fun modelState(): Flow<S>
}
```

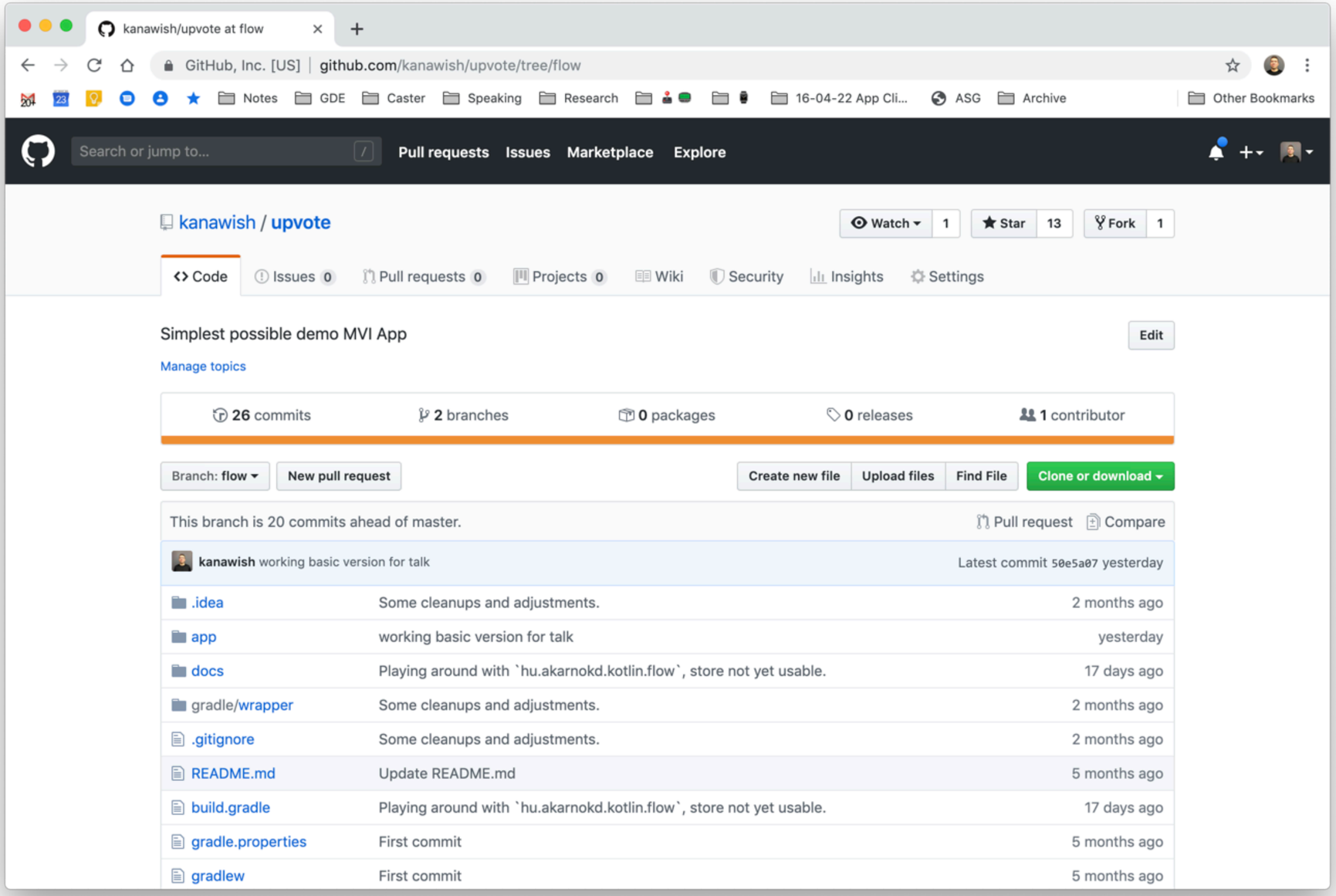




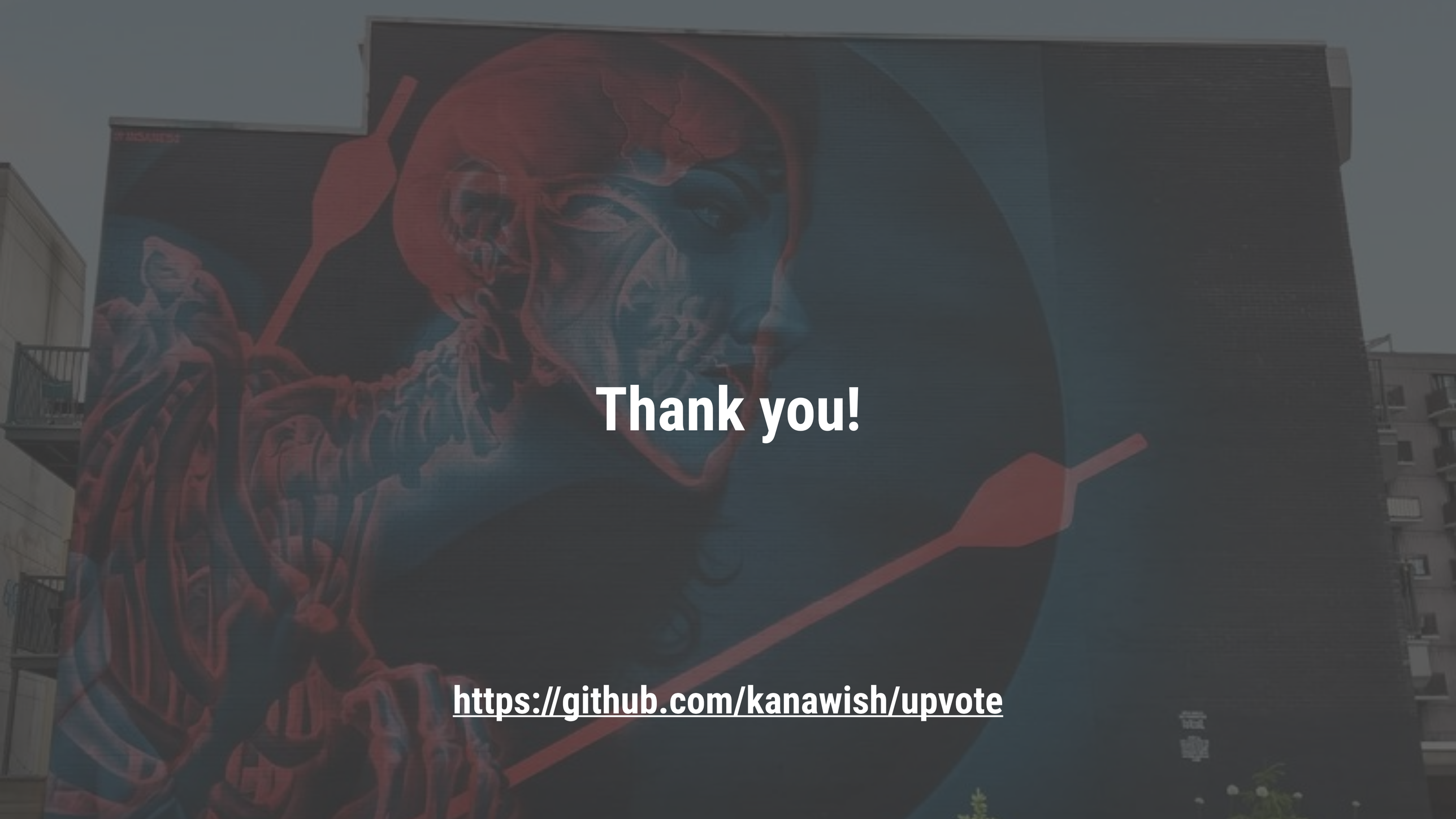



```
fun Flow<UpvoteModel>.forCounterTextView() =
    onEach { model ->
        counterTextView.text =
            "{model.hearts} ❤️ {model.thumbs} 👍"
    }

// Input(s)
UpvoteModelStore
    .modelState()
    .forCounterTextView()
    .launchIn(scope)
```

Live demo?



https://github.com/kanawish/upvote



Thank you!

https://github.com/kanawish/upvote