How to cook a well done MVI for Android

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- Digital Nomad

DataArt
PUMA

PROBLEMS OF A MODERN APP

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- Lots of asynchronicity: REST, WebSockets, Pushes, …

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- Lots of asynchronicity: REST, WebSockets, Pushes, …
- State updates from random places
- Big size
- Async * Size => Something changes Somewhere and it all F***ed up
- Pain In The Ass when looking for “where it all started to go wrong”

COMMON STATE

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- Single source of truth

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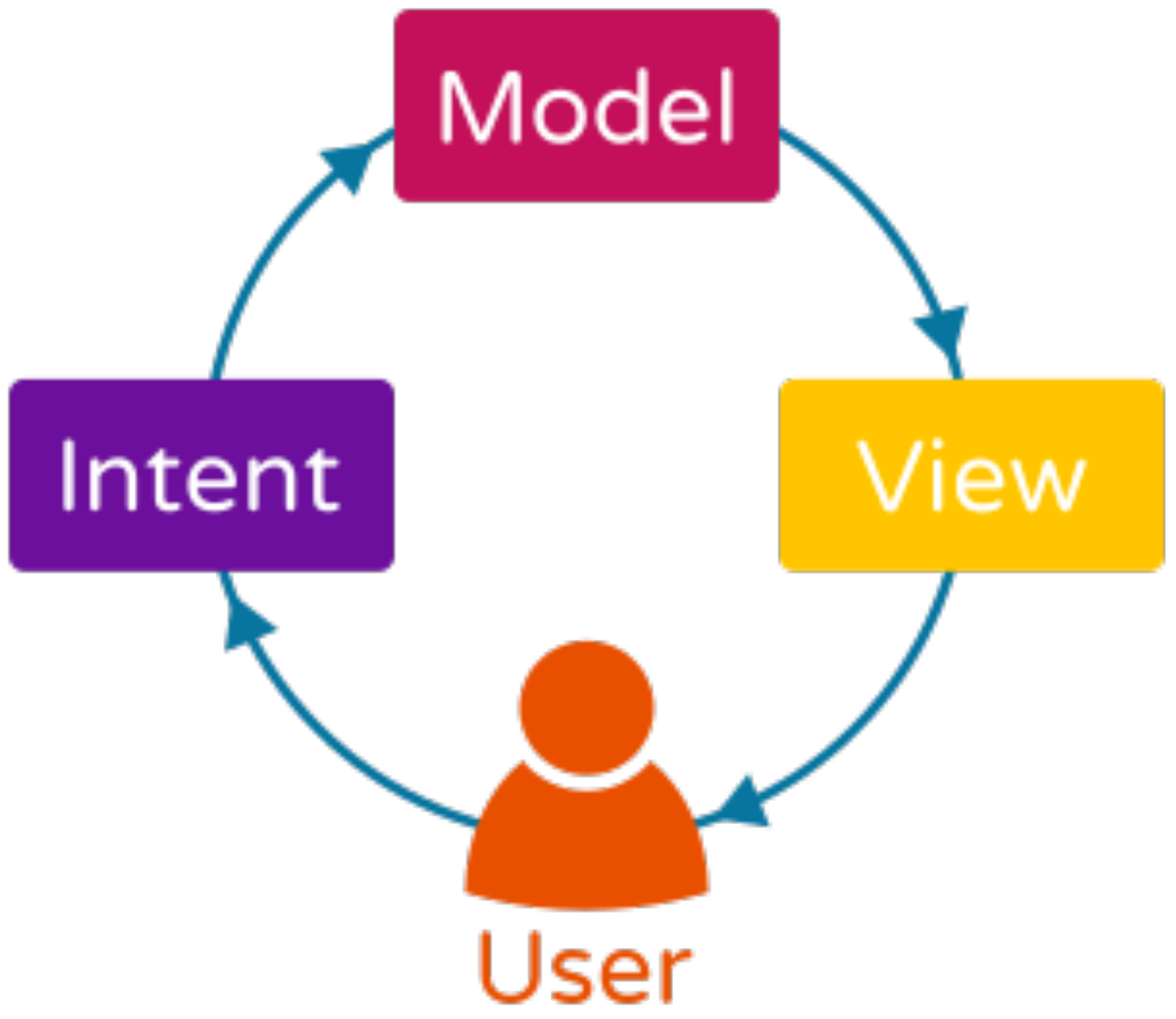
- Easy to check at any particular time
- Clear sequence of changes
- Easy to find the cause of the change
- Easy decoupled testing

COMMON STATE

Benefits are clear, but the arch implementation is still hard

UNIDIRECTIONAL DATA FLOW



UNIDIRECTIONAL DATA FLOW

```
view( model( intent() ) )
```

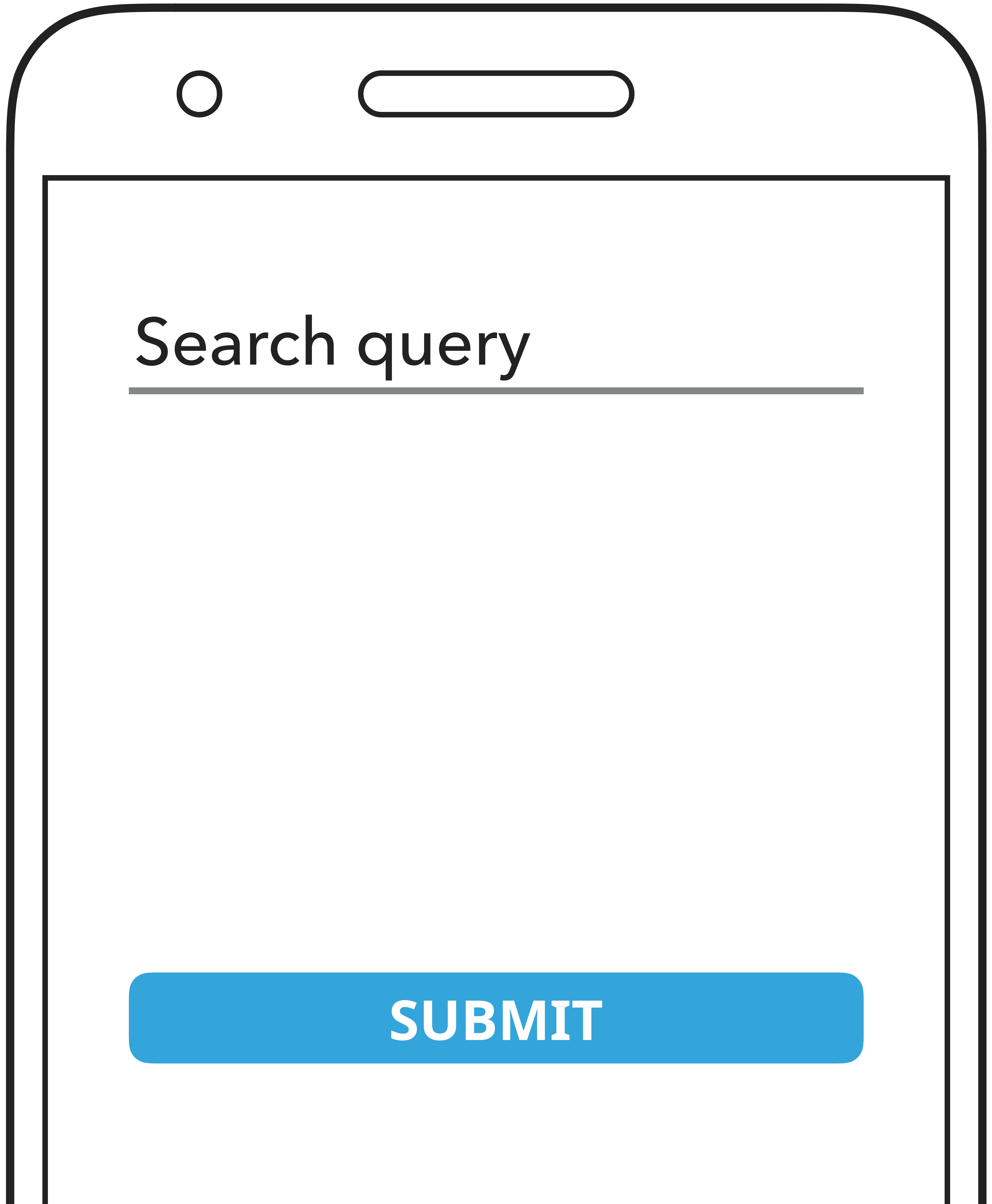
UNIDIRECTIONAL DATA FLOW

```
render( state( actions() ) )
```

Managing State with RxJava

Jake Wharton

REACTIVE STATE



REACTIVE STATE

```
submitBtn.clicks()
    .doOnNext {
      submitBtn.isEnabled = false
      progressView.visibility = VISIBLE
    }
    .flatMap { api.search(searchView.text.toString()) }
    .observeOn(uiScheduler)
    .doOnNext { progressView.visibility = GONE }
    .subscribe(
        { data -> showData(data) },
        {
          submitBtn.isEnabled = true
          toast("Search failed")
        }
    )
```

REACTIVE STATE

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submitBtn.clicks()
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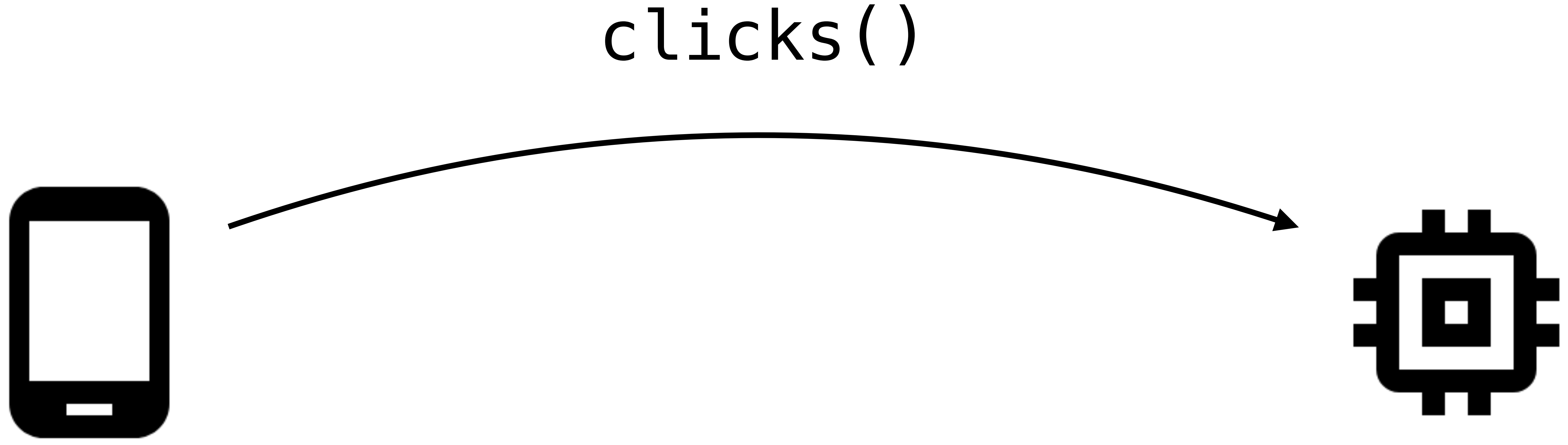
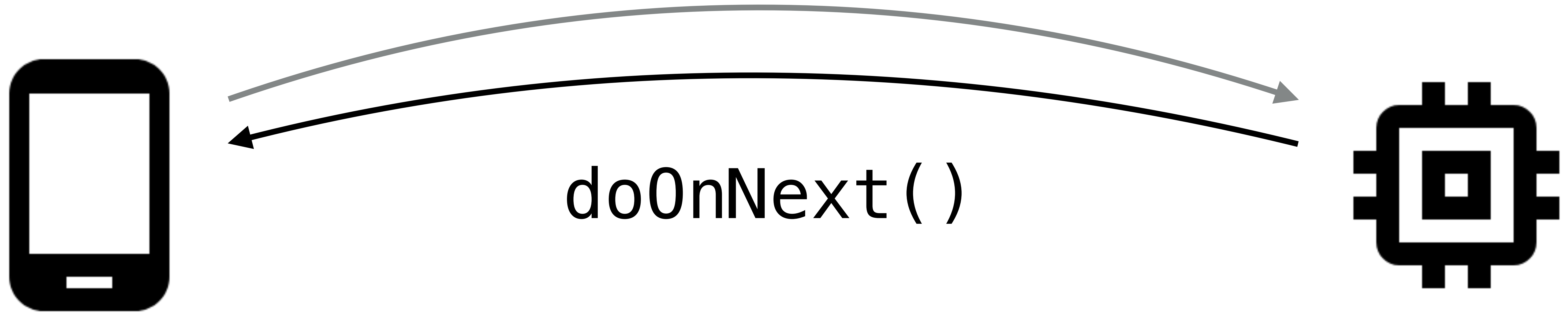
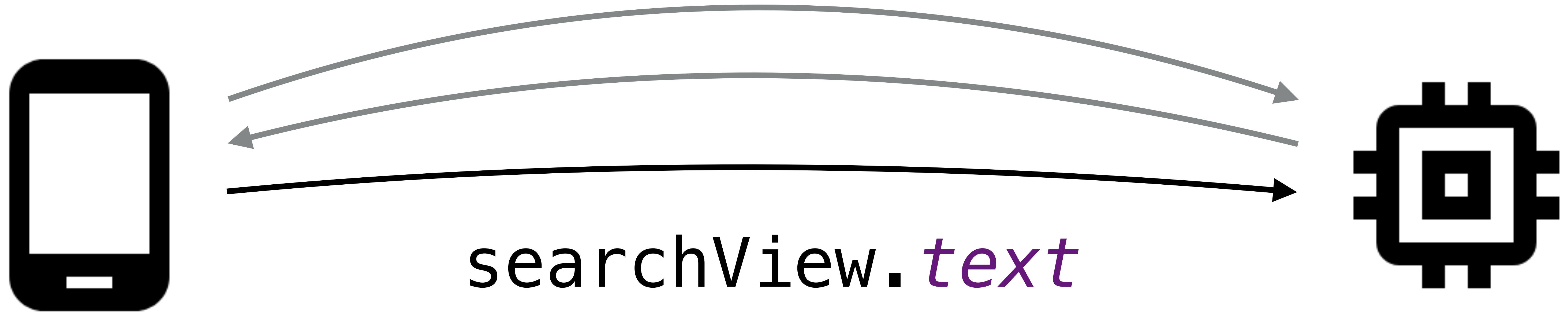
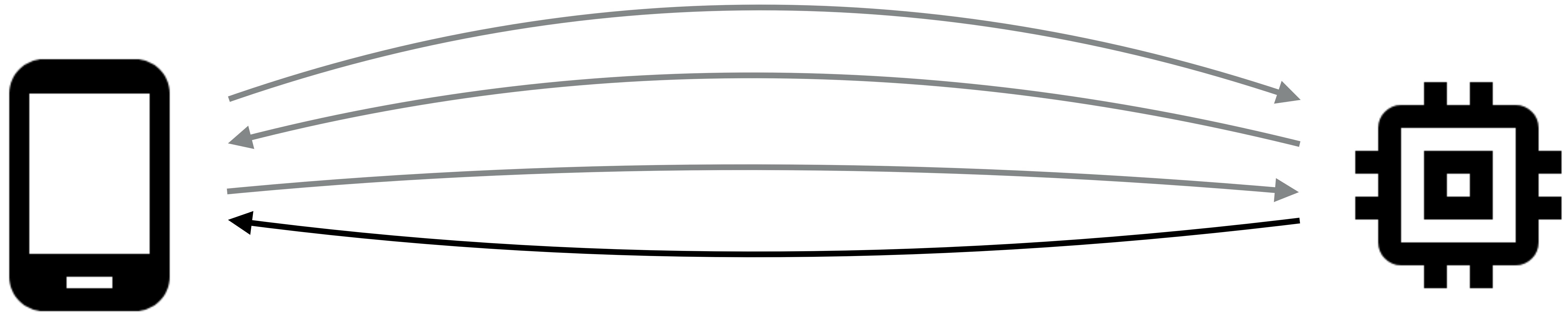
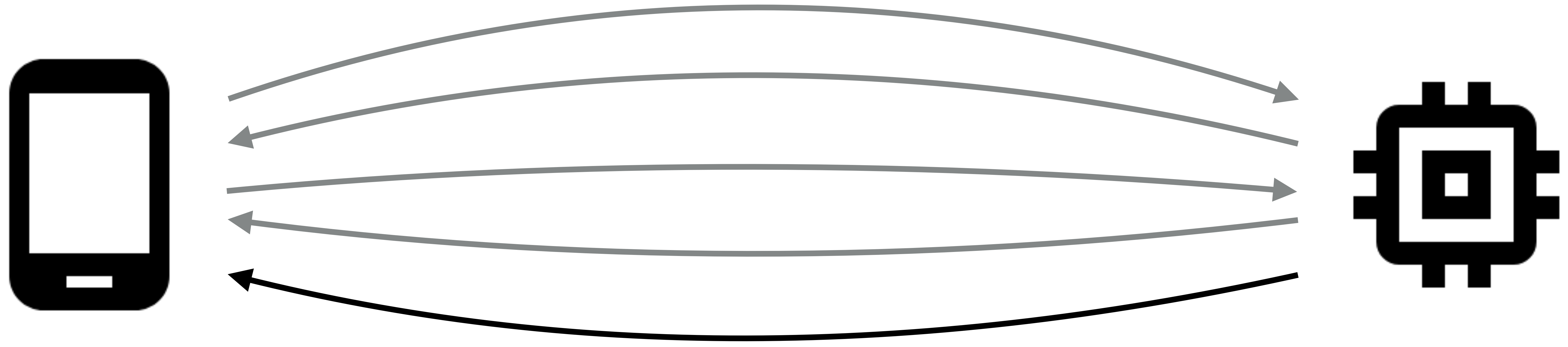

clicks()


doOnNext()

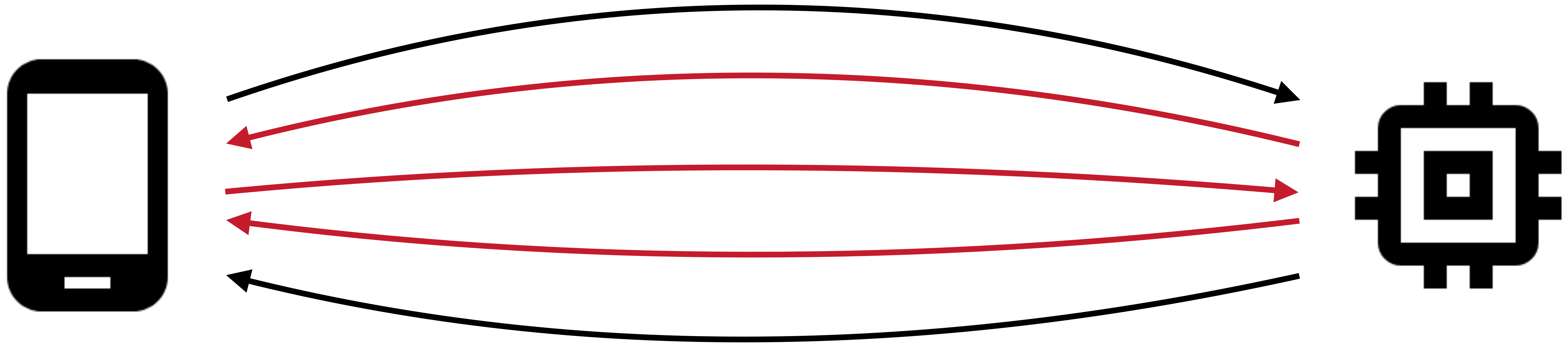

searchView.*text*



`doOnNext()`



`subscribe()`



REACTIVE STATE

```
sealed class UiAction {
  class SearchAction(val query: String) : UiAction()
}


sealed class UiState {
  object Loading : UiState()
  class Success(val data: Data) : UiState()
  class Failure(val error: Throwable) : UiState()
}
```

REACTIVE STATE

```
submitBtn.clicks()
    .map { SearchAction(searchView.text.toString()) }
    .flatMap { action ->
      api.search(action.query)
          .map<UiState> { result -> Success(result) }
          .onErrorReturn { e -> Failure(e) }
          .observeOn(uiScheduler)
          .startWith(Loading)
    }
    .subscribe { state ->
      submitBtn.isEnabled = state !is Loading
      progressView.visibility = if (state is Loading) VISIBLE else GONE
      when (state) {
        is Success -> showData(state.data)
        is Failure -> toast("Search failed")
      }
    }
```

REACTIVE STATE

```
val actions = submitBtn.clicks()
    .map { SearchAction(searchView.text.toString()) }

actions.flatMap { action ->
      api.search(action.query)
          .map<UiState> { result -> Success(result) }
          .onErrorReturn { e -> Failure(e) }
          .observeOn(uiScheduler)
          .startWith(Loading)
    }
    .subscribe { state ->
      submitBtn.isEnabled = state !is Loading
      progressView.visibility = if (state is Loading) VISIBLE else GONE
      when (state) {
        is Success -> showData(state.data)
        is Failure -> toast("Search failed")
      }
    }
```

REACTIVE STATE

```kotlin
val actions = submitBtn.clicks()
    .map { SearchAction(searchView.text.toString()) }

val states = actions.flatMap { action ->
      api.search(action.query)
          .map<UiState> { result -> Success(result) }
          .onErrorReturn { e -> Failure(e) }
          .observeOn(uiScheduler)
          .startWith(Loading)
    }

states.subscribe { state ->
      submitBtn.isEnabled = state !is Loading
      progressView.visibility = if (state is Loading) VISIBLE else GONE
      when (state) {
        is Success -> showData(state.data)
        is Failure -> toast("Search failed")
      }
    }
```

REACTIVE STATE

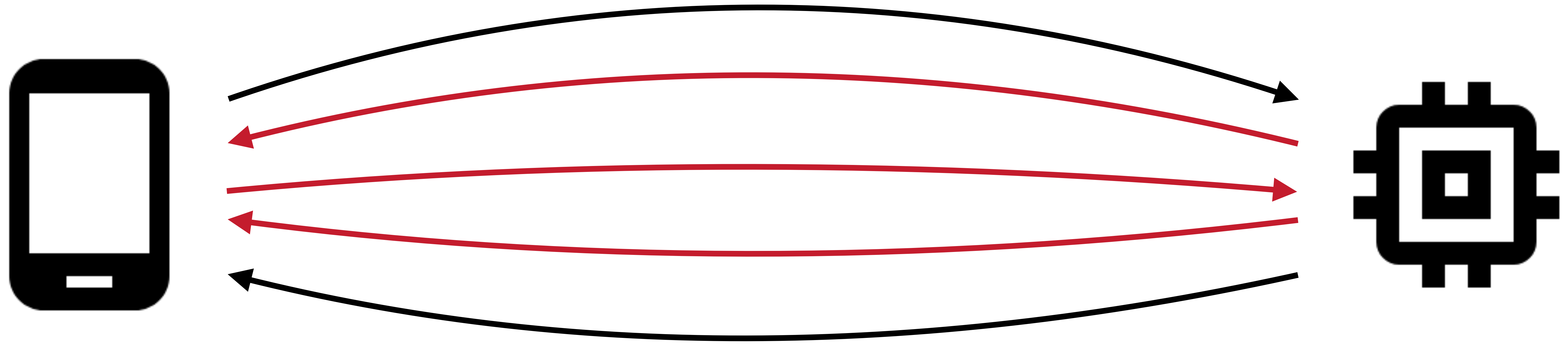
```kotlin
val actions = submitBtn.clicks()
    .map { SearchAction(searchView.text.toString()) }

val states = actions.flatMap { action ->
      api.search(action.query)
          .map<UiState> { result -> Success(result) }
          .onErrorReturn { e -> Failure(e) }
          .observeOn(uiScheduler)
          .startWith(Loading)
    }

states.subscribe(::render)

private fun render(state: UiState) {
  submitBtn.isEnabled = state !is Loading
  progressView.visibility = if (state is Loading) VISIBLE else GONE
  when (state) {
    is Success -> finish()
    is Failure -> toast("Search failed")
  }
}
```

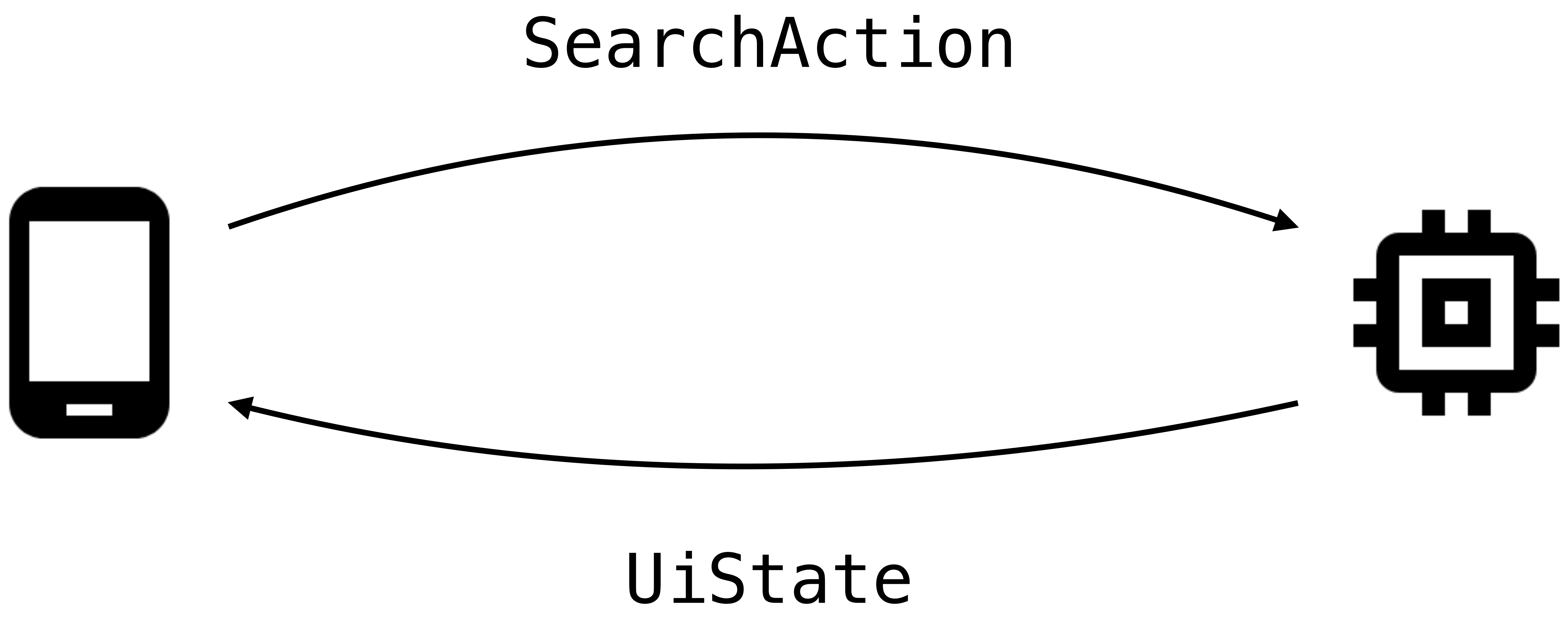
REACTIVE STATE

```
class SearchComponent(private val api: Api, val uiScheduler: Scheduler) {
  fun bind(actions: Observable<SearchAction>): Observable<UiState> {

    return actions.flatMap { action ->
      api.search(action.query)
          .map<UiState> { result -> Success(result) }
          .onErrorReturn { e -> Failure(e) }
          .observeOn(uiScheduler)
          .startWith(Loading)
    }

  }
}
```

REACTIVE STATE

```
class SearchComponent(private val api: Api, val uiScheduler: Scheduler) {
  fun bind(actions: Observable<SearchAction>): Observable<UiState> {

    return actions.flatMap { action ->
      api.search(action.query)
          .map<UiState> { result -> Success(result) }
          .onErrorReturn { e -> Failure(e) }
          .observeOn(uiScheduler)
          .startWith(Loading)
    }

  }
}

// View part
searchComponent.bind(actions).subscribe(::render)
```




SearchAction
UiState

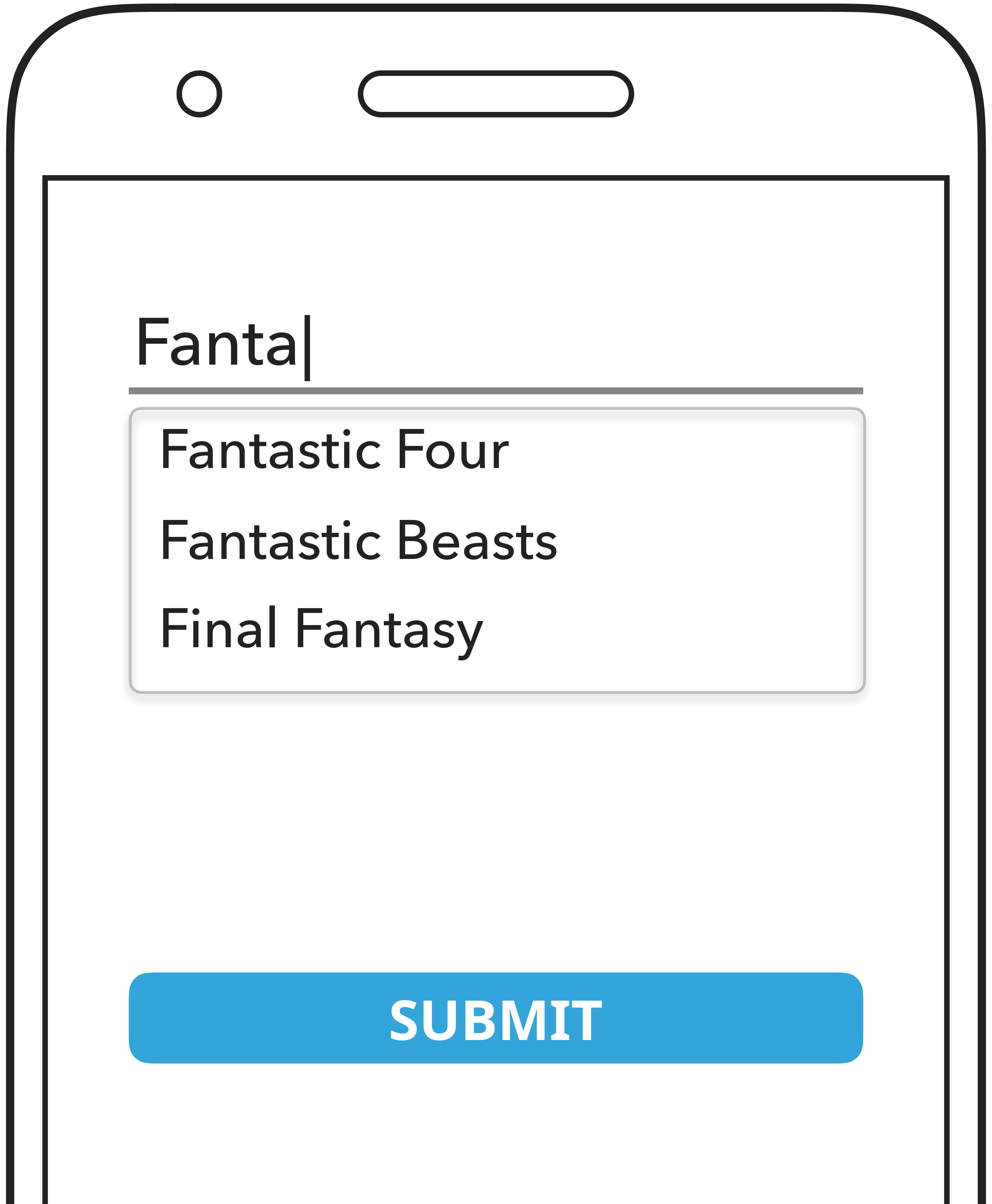
```
searchComponent.bind(actions).subscribe(::render)
searchComponent.bind(actions).subscribe(::render)

render( state( actions() ) )
```

What if we have more complex logic?

What if we have more complex logic?

How about two network calls?

REACTIVE STATE



```
sealed class UiAction : Action {
  class SearchAction(val query: String) : UiAction()
}
```

```kotlin
sealed class UiAction : Action {
  class SearchAction(val query: String) : UiAction()
  class LoadSuggestionsAction(val query: String) : UiAction()
}
```

```kotlin
sealed class UiState {
  object Loading : UiState()
  class Success(val data: Data) : UiState()
  class Failure(val error: Throwable) : UiState()
}
```

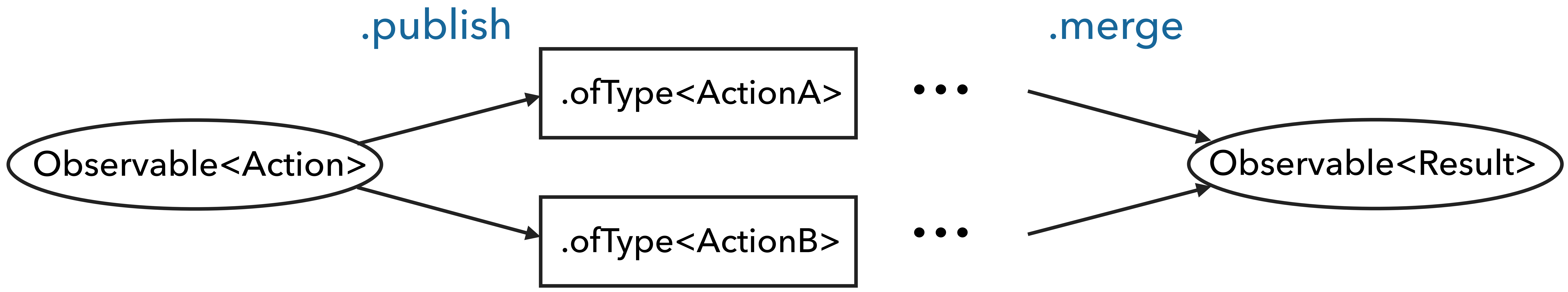
```kotlin
class UiState(
    val loading: Boolean = false,
    val data: String? = null,
    val error: Throwable? = null,
    val suggestions: List<String>? = null
)
```

```kotlin
sealed class InternalAction : Action {
  object SearchLoadingAction : InternalAction()
  class SearchSuccessAction(val data: String) : InternalAction()
  class SearchFailureAction(val error: Throwable) : InternalAction()
  class SuggestionsLoadedAction(val suggestions: List<String>) : InternalAction()
}
```

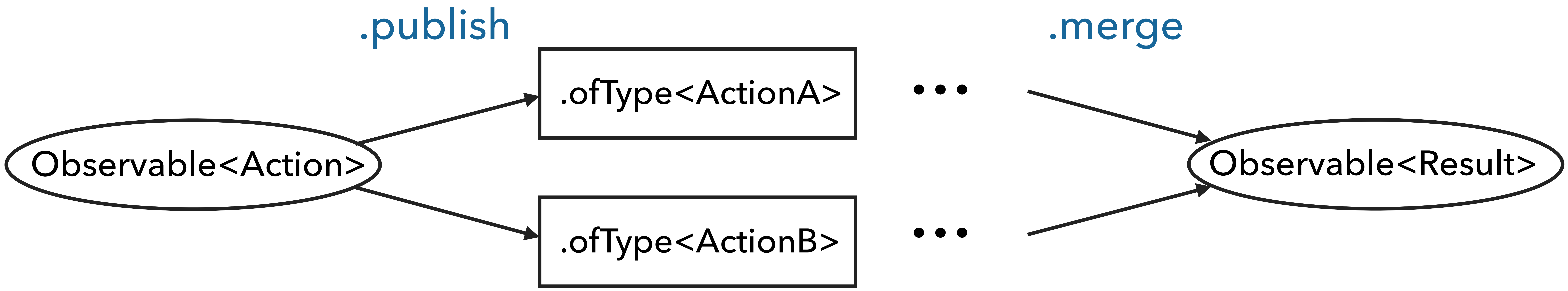
```
sealed class InternalAction : Action {
  object SearchLoadingAction : InternalAction()
  class SearchSuccessAction(val data: String) : InternalAction()
  class SearchFailureAction(val error: Throwable) : InternalAction()
  class SuggestionsLoadedAction(val suggestions: List<String>) : InternalAction()
}
```

```kotlin
fun bind(actions: Observable<Action>): Observable<UiState> {
   ...
}
```

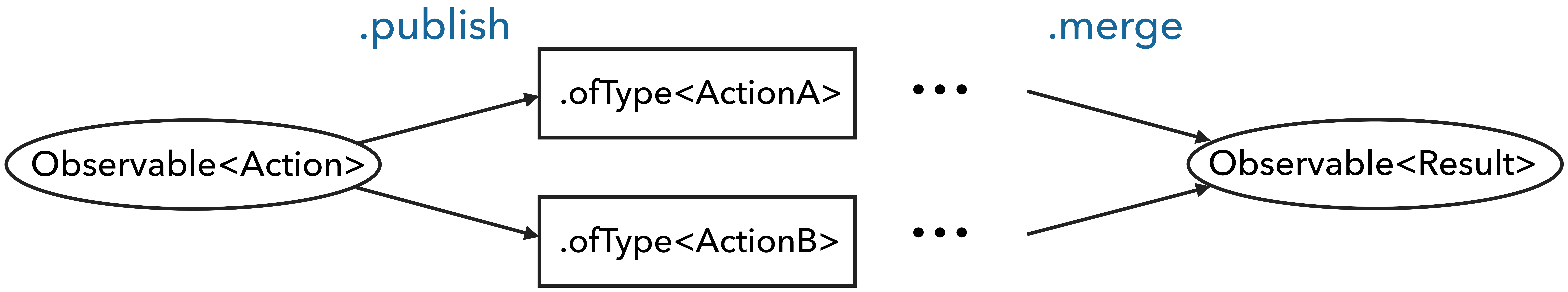
```
fun bind(actions: Observable<Action>): Observable<UiState> {
    ...
}
```



```
fun bind(actions: Observable<Action>): Observable<UiState> {
  return actions.publish { shared ->
        Observable.merge<Action>()
      }
}
```



```
fun bind(actions: Observable<Action>): Observable<UiState> {
  return actions.publish { shared ->
        Observable.merge<Action>(
           bind(shared.ofType<SearchAction>()),
           bind(shared.ofType<LoadSuggestionsAction>()))
      }
}
```



```kotlin
fun bind(actions: Observable<SearchAction>): Observable<InternalAction> {
  return actions.flatMap { action ->
    api.search(action.query)
        .map { result -> SearchSuccessAction(result) }
        .onErrorReturn { e -> SearchFailureAction(e) }
        .observeOn(uiScheduler)
        .startWith(SearchLoadingAction)
  }
}

fun bind(actions: Observable<LoadSuggestionsAction>): Observable<InternalAction> {
  return actions.flatMap { action ->
    api.suggestions(action.query)
        .onErrorReturnItem(emptyList())
        .map { result -> SuggestionsLoadedAction(result) }
        .observeOn(uiScheduler)
  }
}
```

```
fun bind(actions: Observable<SearchAction>): Observable<InternalAction> {
  return actions.flatMap { action ->
    api.search(action.query)
        .map { result -> SearchSuccessAction(result) }
        .onErrorReturn { e -> SearchFailureAction(e) }
        .observeOn(uiScheduler)
        .startWith(SearchLoadingAction)
  }
}

fun bind(actions: Observable<LoadSuggestionsAction>): Observable<InternalAction> {
  return actions.flatMap { action ->
    api.suggestions(action.query)
        .onErrorReturnItem(emptyList())
        .map { result -> SuggestionsLoadedAction(result) }
        .observeOn(uiScheduler)
  }
}
```

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fun bind(actions: Observable<Action>): Observable<UiState> {
  return actions.publish { shared ->
      Observable.merge<Action>(
           bind(shared.ofType<SearchAction>()),
           bind(shared.ofType<LoadSuggestionsAction>()))
      }
}
```

```
fun bind(actions: Observable<Action>): Observable<UiState> {
  return actions.publish { shared ->
      Observable.merge<Action>(
           bind(shared.ofType<SearchAction>()),
           bind(shared.ofType<LoadSuggestionsAction>()))
      }
      .scan(UiState()) { state, action ->
       ...
      }
}
```

```
            bind(shared.ofType<LoadSuggestionsAction>()))
        }
        .scan(UiState()) { state, action ->
          when (action) {
            SearchLoadingAction -> state.copy(
                loading = true,
                error = null,
                suggestions = null)

            is SearchSuccessAction -> state.copy(
                loading = false,
                data = newData,
                error = null,
                suggestions = null)

            is SearchFailureAction -> state.copy(
                loading = false,
                error = action.error)

            is SuggestionsLoadedAction -> state.copy(
                suggestions = action.suggestions)

            is SearchAction, is LoadSuggestionsAction -> state
          }
        }
  }
```

```
            bind(shared.ofType<LoadSuggestionsAction>()))
        }
        .scan(UiState()) { state, action ->
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            SearchLoadingAction -> state.copy(
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              suggestions = null)

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          is SearchFailureAction -> state.copy(
              loading = false,
              error = action.error)

          is SuggestionsLoadedAction -> state.copy(
              suggestions = action.suggestions)

          is SearchAction, is LoadSuggestionsAction -> state
        }
      }
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           bind(shared.ofType<LoadSuggestionsAction>()))
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              loading = false,
              data = newData,
              error = null,
              suggestions = null)

          is SearchFailureAction -> state.copy(
              loading = false,
              error = action.error)

          is SuggestionsLoadedAction -> state.copy(
              suggestions = action.suggestions)

          is SearchAction, is LoadSuggestionsAction -> state
        }
      }
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```

REACTIVE STATE

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class SearchComponent(private val api: Api, private val uiScheduler: Scheduler) {

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    return actions.publish { shared ->
          Observable.merge<Action>(
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              bind(shared.ofType<LoadSuggestionsAction>()))
        }
        .scan(UiState()) { state, action ->
          when (action) {
            SearchLoadingAction                       -> state.copy(...)
            is SearchSuccessAction                    -> state.copy(...)
            is SearchFailureAction                    -> state.copy(...)
            is SuggestionsLoadedAction                -> state.copy(...)
            is SearchAction, is LoadSuggestionsAction -> state
          }
        }
  }
}
```

UNIDIRECTIONAL DATA FLOW

UNIDIRECTIONAL DATA FLOW

- Redux

UNIDIRECTIONAL DATA FLOW

- Redux
- Cycle.js

UNIDIRECTIONAL DATA FLOW

- Redux
- Cycle.js
- Flux

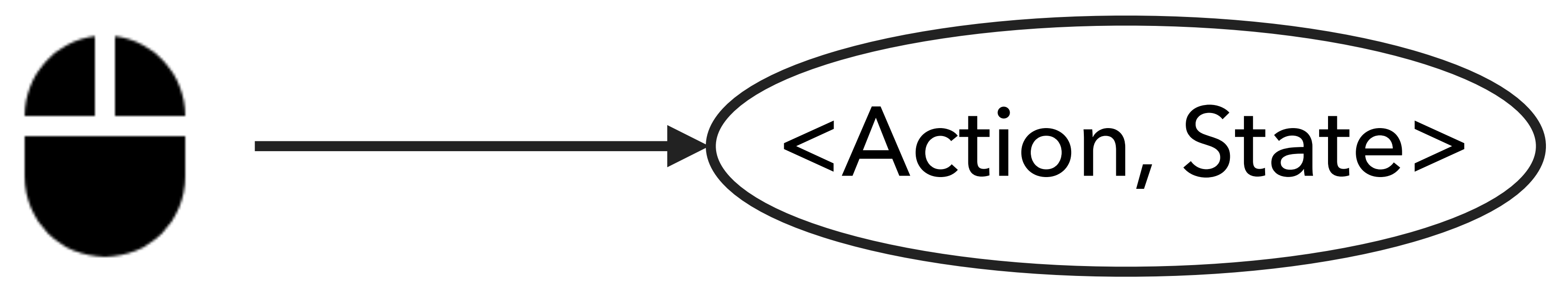
UNIDIRECTIONAL DATA FLOW

- Redux
- Cycle.js
- Flux
- Elm

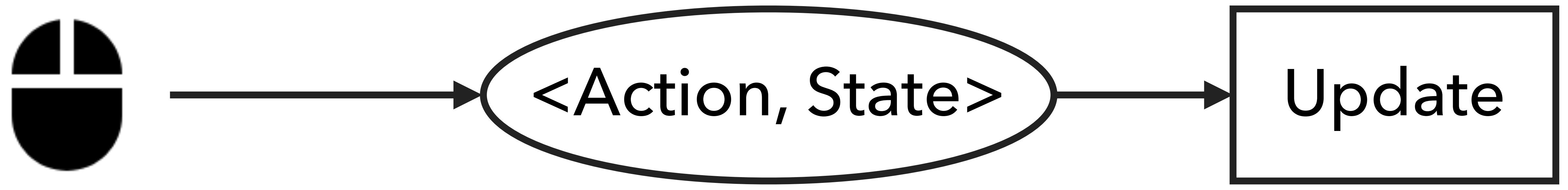
ELM COMPONENT

ELM COMPONENT

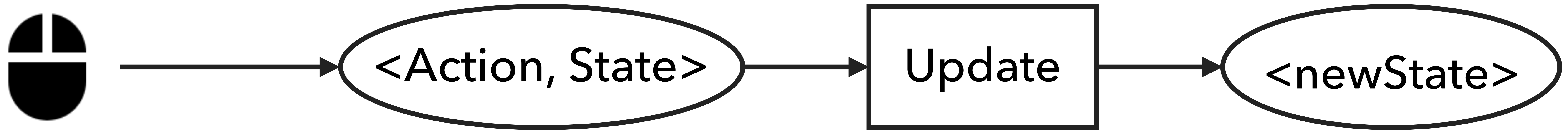
ELM COMPONENT



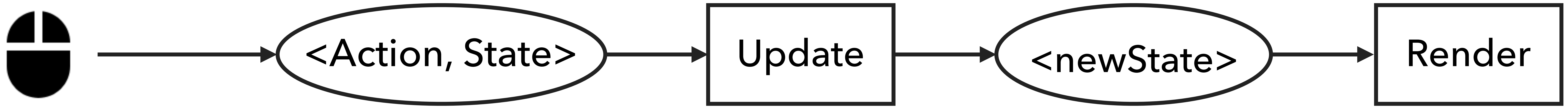
ELM COMPONENT



ELM COMPONENT



ELM COMPONENT



ELM COMPONENT

<Action, State>
Update
<newState>
Render

ELM COMPONENT

<Action, State>
Update
<newState>
Render
<SideEffect>

ELM COMPONENT

<Action, State>
Update
<newState>
Render
<SideEffect>
Call

ELM COMPONENT

<Action, State>
Update
<newState>
Render
<SideEffect>
Call
<Action>

ELM COMPONENT

<Action, State>
Update
<newState>
Render
<SideEffect>
Call
<Action>

ELM COMPONENT

<Action, State>
Update
<newState>
Render
<SideEffect>
Call
<Action>

ELM

ELM

- `Update`

ELM

- Update
- Call

ELM

- `Update`
- `Call`
- `Component`

ELM - REDUX

- `Update      ->  Reducer`
- `Call`
- `Component`

ELM - REDUX

- `Update     ->  Reducer`
- `Call       ->  Middleware`
- `Component`

ELM - REDUX

- `Update     ->  Reducer`
- `Call       ->  Middleware`
- `Component  ->  Store`

REACTIVE STATE

```
class SearchComponent(private val api: Api, private val uiScheduler: Scheduler) {

  fun bind(actions: Observable<Action>): Observable<UiState> {
    return actions.publish { shared ->
          Observable.merge<Action>(
              bind(shared.ofType<SearchAction>()),
              bind(shared.ofType<LoadSuggestionsAction>()))
        }
        .scan(UiState()) { state, action ->
          when (action) {
            SearchLoadingAction                            -> state.copy(...)
            is SearchSuccessAction                         -> state.copy(...)
            is SearchFailureAction                         -> state.copy(...)
            is SuggestionsLoadedAction                     -> state.copy(...)
            is SearchAction, is LoadSuggestionsAction -> state
          }
        }
  }
}
```

REACTIVE STATE

```
class SearchComponent(private val api: Api, private val uiScheduler: Scheduler) {

  fun bind(actions: Observable<Action>): Observable<UiState> {
    return actions.publish { shared ->
          Observable.merge<Action>(
              bind(shared.ofType<SearchAction>()),
              bind(shared.ofType<LoadSuggestionsAction>()))
        }
        .scan(UiState()) { state, action ->
          when (action) {
            SearchLoadingAction                              -> state.copy(...)
            is SearchSuccessAction                           -> state.copy(...)
            is SearchFailureAction                           -> state.copy(...)
            is SuggestionsLoadedAction                       -> state.copy(...)
            is SearchAction, is LoadSuggestionsAction -> state
          }
        }
  }
}
```

Reducer

REACTIVE STATE

```
class SearchComponent(private val api: Api, private val uiScheduler: Scheduler) {

  fun bind(actions: Observable<Action>): Observable<UiState> {
    return actions.publish { shared ->
          Observable.merge<Action>(                             Middleware
              bind(shared.ofType<SearchAction>()),
              bind(shared.ofType<LoadSuggestionsAction>()))
        }
        .scan(UiState()) { state, action ->                        Reducer
          when (action) {
            SearchLoadingAction                         -> state.copy(...)
            is SearchSuccessAction                      -> state.copy(...)
            is SearchFailureAction                      -> state.copy(...)
            is SuggestionsLoadedAction                  -> state.copy(...)
            is SearchAction, is LoadSuggestionsAction -> state
          }
        }
  }
}
```

REACTIVE STATE

Store

```
class SearchComponent(private val api: Api, private val uiScheduler: Scheduler) {

  fun bind(actions: Observable<Action>): Observable<UiState> {
    return actions.publish { shared ->
          Observable.merge<Action>(                                Middleware
              bind(shared.ofType<SearchAction>()),
              bind(shared.ofType<LoadSuggestionsAction>()))
        }
        .scan(UiState()) { state, action ->                        Reducer
          when (action) {
            SearchLoadingAction                          -> state.copy(...)
            is SearchSuccessAction                       -> state.copy(...)
            is SearchFailureAction                       -> state.copy(...)
            is SuggestionsLoadedAction                   -> state.copy(...)
            is SearchAction, is LoadSuggestionsAction -> state
          }
        }
  }
}
```

REDUCER

```kotlin
interface Reducer<S, A> {
  fun reduce(state: S, action: A): S
}
```

REDUCER

```
class SearchReducer : Reducer<UiState, Action> {
  override fun reduce(state: UiState, action: Action): UiState {
    return when (action) {
      SearchLoadingAction                           -> state.copy(...)
      is SearchSuccessAction                        -> state.copy(...)
      is SearchFailureAction                        -> state.copy(...)
      is SuggestionsLoadedAction                    -> state.copy(...)
      is SearchAction, is LoadSuggestionsAction -> state
    }
  }
}
```

MIDDLEWARE

```kotlin
interface Middleware<A, S> {
  fun bind(actions: Observable<A>, state: Observable<S>): Observable<A>
}
```

MIDDLEWARE

```
class SearchMiddleware(val api: Api) : Middleware<Action, UiState> {

  override fun bind(actions: Observable<Action>): Observable<Action> {
    return actions.ofType<SearchAction>()
        .flatMap { action ->
          api.search(action.query)
              .map<InternalAction> { result -> SearchSuccessAction(result) }
              .onErrorReturn { e -> SearchFailureAction(e) }
              .startWith(SearchLoadingAction)
        }
  }
}
```

REACTIVE STATE

```
class SearchMiddleware(val api: Api) : Middleware<Action, UiState> {

  override fun bind(actions: Observable<Action>, state: Observable<UiState>)
      : Observable<Action> {
    return actions.ofType<SearchAction>()
        .withLatestFrom(state) { action, currentState -> action to currentState }
        .flatMap { (action, state) ->
          api.search(action.query)
              .map<InternalAction> { result -> SearchSuccessAction(result) }
              .onErrorReturn { e -> SearchFailureAction(e) }
              .startWith(SearchLoadingAction)
        }
  }
}
```

REACTIVE STATE

```
class SearchMiddleware(val api: Api) : Middleware<Action, UiState> {

  override fun bind(actions: Observable<Action>, state: Observable<UiState>)
      : Observable<Action> {
    return actions.ofType<SearchAction>()
        .withLatestFrom(state) { action, currentState -> action to currentState }
        .flatMap { (action, state) ->
          api.search(action.query)
              .map<InternalAction> { result -> SearchSuccessAction(result) }
              .onErrorReturn { e -> SearchFailureAction(e) }
              .startWith(SearchLoadingAction)
        }
  }
}
```

STORE – SEARCH COMPONENT

STORE - SEARCH COMPONENT

```
private val state = BehaviorRelay.createDefault<UiState>(UiState())
private val actions = PublishRelay.create<Action>()
```

STORE – SEARCH COMPONENT

```kotlin
private val state = BehaviorRelay.createDefault<UiState>(UiState())
private val actions = PublishRelay.create<Action>()

fun wire(): Disposable {
  val disposable = CompositeDisposable()

  disposable += actions
      .withLatestFrom(state) { action, state ->
        SearchReducer().reduce(state, action)
      }
      .subscribe(state::accept)

  return disposable
}
```

STORE - SEARCH COMPONENT

```
private val state = BehaviorRelay.createDefault<UiState>(UiState())
private val actions = PublishRelay.create<Action>()

fun wire(): Disposable {
  val disposable = CompositeDisposable()

  disposable += actions
      .withLatestFrom(state) { action, state ->
        SearchReducer().reduce(state, action)
      }
      .distinctUntilChanged()
      .subscribe(state::accept)

  return disposable
}
```

STORE - SEARCH COMPONENT

```
private val state = BehaviorRelay.createDefault<UiState>(UiState())
private val actions = PublishRelay.create<Action>()

fun wire(): Disposable {
  val disposable = CompositeDisposable()

  disposable += actions
      .withLatestFrom(state) { action, state ->
        SearchReducer().reduce(state, action)
      }
      .distinctUntilChanged()
      .subscribe(state::accept)

  disposable += Observable.merge<Action>(
      SearchMiddleware(api).bind(actions, state),
      SuggestionsMiddleware(api).bind(actions, state)
  ).subscribe(actions::accept)

  return disposable
}
```

STORE – SEARCH COMPONENT

```
private val state = BehaviorRelay.createDefault<UiState>(UiState())
private val actions = PublishRelay.create<Action>()

fun wire(): Disposable {
  val disposable = CompositeDisposable()

  disposable += actions
      .withLatestFrom(state) { action, state ->
        SearchReducer().reduce(state, action)
      }
      .distinctUntilChanged()
      .subscribe(state::accept)

  disposable += Observable.merge<Action>(
      SearchMiddleware(api).bind(actions, state),
      SuggestionsMiddleware(api).bind(actions, state)
  ).subscribe(actions::accept)

  return disposable
}
```

STORE

```
fun bind(actions: Observable<Action>, render: (UiState) -> Unit): Disposable {
  val disposable = CompositeDisposable()
  disposable += state.observeOn(uiScheduler).subscribe(render)
  disposable += actions.subscribe(actions::accept)
  return disposable
}
```

STORE

```
fun bind(actions: Observable<Action>, render: (UiState) -> Unit): Disposable {
  val disposable = CompositeDisposable()
  disposable += state.observeOn(uiScheduler).subscribe(render)
  disposable += actions.subscribe(actions::accept)
  return disposable
}
```

STORE

```kotlin
interface MviView<A, S> {
  val actions: Observable<A>
  fun render(state: S)
}


// SearchComponent
fun bind(actions: Observable<Action>, render: (UiState) -> Unit): Disposable {
  val disposable = CompositeDisposable()
  disposable += state.observeOn(uiScheduler).subscribe(render)
  disposable += actions.subscribe(actions::accept)
  return disposable
}
```

STORE

```
interface MviView<A, S> {
  val actions: Observable<A>
  fun render(state: S)
}


// SearchComponent
fun bind(view: MviView<Action, UiState>): Disposable {
  val disposable = CompositeDisposable()
  disposable += state.observeOn(uiScheduler).subscribe(view::render)
  disposable += view.actions.subscribe(actions::accept)
  return disposable
}
```

STORE

```kotlin
interface MviView<A, S> {
  val actions: Observable<A>
  fun render(state: S)
}


// SearchComponent
fun bind(view: MviView<Action, UiState>): Disposable {
  val disposable = CompositeDisposable()
  disposable += state.observeOn(uiScheduler).subscribe(view::render)
  disposable += view.actions.subscribe(actions::accept)
  return disposable
}
```

STORE

```
private val state = BehaviorRelay.createDefault<UiState>(UiState())
private val actions = PublishRelay.create<Action>()

fun wire(): Disposable {
  val disposable = CompositeDisposable()

  disposable += actions
      .withLatestFrom(state) { action, state ->
        SearchReducer().reduce(state, action)
      }
      .distinctUntilChanged()
      .subscribe(state::accept)

  disposable += Observable.merge<Action>(
      SearchMiddleware(api).bind(actions, state),
      SuggestionsMiddleware(api).bind(actions, state)
  ).subscribe(actions::accept)

  return disposable
}
```

STORE

```
private val state = BehaviorRelay.createDefault<UiState>(UiState())
private val actions = PublishRelay.create<Action>()

fun wire(): Disposable {
  val disposable = CompositeDisposable()

  disposable += actions
      .withLatestFrom(state) { action, state ->
        SearchReducer().reduce(state, action)
      }
      .distinctUntilChanged()
      .subscribe(state::accept)

  disposable += Observable.merge<Action>(
      SearchMiddleware(api).bind(actions, state),
      SuggestionsMiddleware(api).bind(actions, state)
  ).subscribe(actions::accept)

  return disposable
}
```

STORE

```
private val state = BehaviorRelay.createDefault<UiState>(initialState)
private val actions = PublishRelay.create<Action>()

fun wire(): Disposable {
  val disposable = CompositeDisposable()

  disposable += actions
      .withLatestFrom(state) { action, state ->
        reducer.reduce(state, action)
      }
      .distinctUntilChanged()
      .subscribe(state::accept)

  disposable += Observable.merge<Action>(
      middlewares.map { it.bind(actions, state) }
  ).subscribe(actions::accept)

  return disposable
}
```

STORE

```kotlin
class SearchComponent(
    private val reducer: Reducer<UiState, Action>,
    private val middlewares: List<Middleware<Action, UiState>>,
    private val initialState: UiState
)
```

STORE

```
class Store<A, S>(
    private val reducer: Reducer<S, A>,
    private val middlewares: List<Middleware<A, S>>,
    private val initialState: S
)
```

CORE

```kotlin
interface MviView<A, S> {
  val actions: Observable<A>
  fun render(state: S)
}

interface Reducer<S, A> {
  fun reduce(state: S, action: A): S
}

interface Middleware<A, S> {
  fun bind(actions: Observable<A>, state: Observable<S>): Observable<A>
}

class Store<A, S>(
    private val reducer: Reducer<S, A>,
    private val middlewares: List<Middleware<A, S>>,
    private val initialState: S
) {
  fun wire(): Disposable {}
  fun bind(view: MviView<Action, UiState>): Disposable {}
}
```

BIND IT ALL!

BIND IT ALL!

- Android Arch ViewModels

BIND IT ALL!

- Android Arch ViewModels
- DI Scopes

BIND IT ALL!

- Android Arch ViewModels
- DI Scopes
- Others

BIND IT ALL!

```
class SearchViewModel<A, S>
@Inject constructor (private val store: Store<A, S>) : ViewModel() {

  private val wiring = store.wire()
  private var viewBinding: Disposable? = null

  override fun onCleared() {
    wiring.dispose()
  }

  fun bind(view: MviView<A, S>) {
    viewBinding = store.bind(view)
  }

  fun unbind() {
    viewBinding?.dispose()
  }
}
```

BIND IT ALL!

```
class SearchViewModel<A, S>
@Inject constructor (private val store: Store<A, S>) : ViewModel() {

  private val wiring = store.wire()
  private var viewBinding: Disposable? = null

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    wiring.dispose()
  }

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    viewBinding = store.bind(view)
  }

  fun unbind() {
    viewBinding?.dispose()
  }
}
```

BIND IT ALL!

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class SearchViewModel<A, S>
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    viewBinding?.dispose()
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BIND IT ALL!

```kotlin
class SearchViewModel<A, S>
@Inject constructor (private val store: Store<A, S>) : ViewModel() {

  private val wiring = store.wire()
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  override fun onCleared() {
    wiring.dispose()
  }

  fun bind(view: MviView<A, S>) {
    viewBinding = store.bind(view)
  }

  fun unbind() {
    viewBinding?.dispose()
  }
}
```

OUR UNIDIRECTIONAL DATA FLOW

OUR UNIDIRECTIONAL DATA FLOW

Reducer
::render
Middleware

OUR UNIDIRECTIONAL DATA FLOW

SearchAction
Reducer
::render
Middleware

OUR UNIDIRECTIONAL DATA FLOW

< SearchAction, State.Empty >
Reducer
::render
Middleware

OUR UNIDIRECTIONAL DATA FLOW

<SearchAction, State.Empty>
State.Empty
Reducer
::render
Middleware

OUR UNIDIRECTIONAL DATA FLOW

< SearchAction, State.Empty >
State.Empty
Reducer
::render
Middleware
SearchLoadingAction

OUR UNIDIRECTIONAL DATA FLOW

<SearchLoadingAction , State.Empty>
Reducer
::render
Middleware

OUR UNIDIRECTIONAL DATA FLOW

<SearchLoadingAction , State.Empty>
State(loading = true)
Reducer
::render
Middleware

OUR UNIDIRECTIONAL DATA FLOW

<SearchLoadingAction,
State(loading = true)>
Reducer
::render
Middleware

OUR UNIDIRECTIONAL DATA FLOW

<SearchLoadingAction,
State(loading = true)>
Reducer
::render
Middleware

OUR UNIDIRECTIONAL DATA FLOW

<SearchLoadingAction,
State(loading = true)>
Reducer
::render
Middleware
SearchSuccessAction

OUR UNIDIRECTIONAL DATA FLOW

< SearchSuccessAction ,
State(loading = true)>
Reducer
::render
Middleware

OUR UNIDIRECTIONAL DATA FLOW

< SearchSuccessAction ,
State(loading = true)>
Reducer
State(loading = false,
data = newData)
::render
Middleware

BACK TO REALITY

BACK TO REALITY

- Rendering Overflow

ANY PROBLEMS WITH UI?

ANY PROBLEMS WITH UI?

- Lots of State updates

ANY PROBLEMS WITH UI?

- Lots of State updates
- May cause lots of redundant UI rerendering

ANY PROBLEMS WITH UI?

- Lots of State updates
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- …

ANY PROBLEMS WITH UI?

- Lots of State updates
- May cause lots of redundant UI rerendering
- …
- Domic!

WHAT IS DOMIC

WHAT IS DOMIC

- Diffing changes

WHAT IS DOMIC

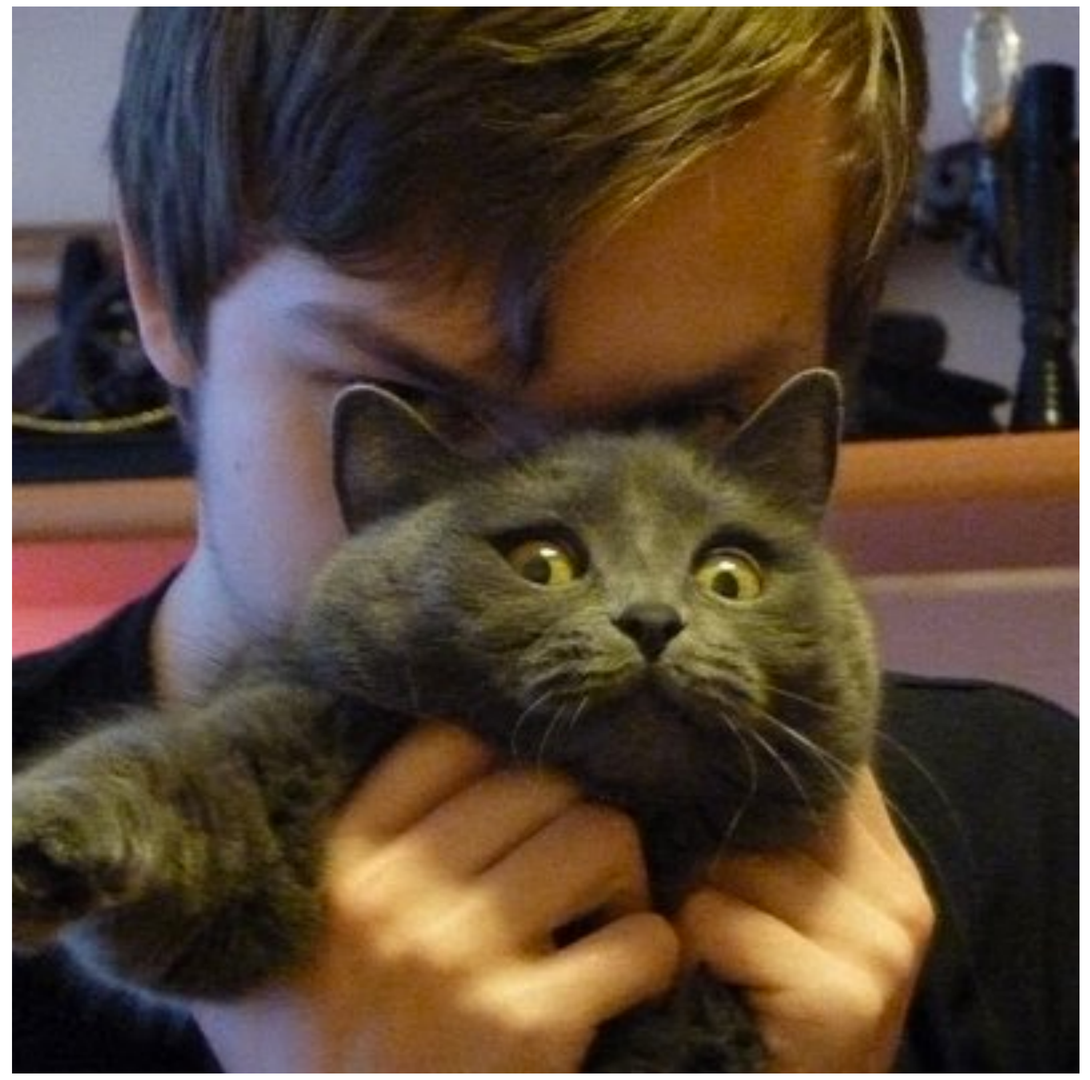
- Diffing changes
- Same Android Widgets

WHAT IS DOMIC

- Diffing changes
- Same Android Widgets
- Threading

WHAT IS DOMIC

- Diffing changes
- Same Android Widgets
- Threading



BACK TO REALITY

- Rendering Overflow
- Testing

TESTING

TESTING VIEW

```kotlin
// In
val observer = TestObserver.create<UiAction>()
realView.actions.subscribe(observer)

onView(withId(R.id.search_edit)).perform(typeText("Query"))
onView(withId(R.id.submit_btn)).perform(click())
observer.assertValue(SearchAction("Query"))



// Out
val uiState = UiState(loading = false, data = "TestData")
realView.render(uiState)
takeScreenshot()
```

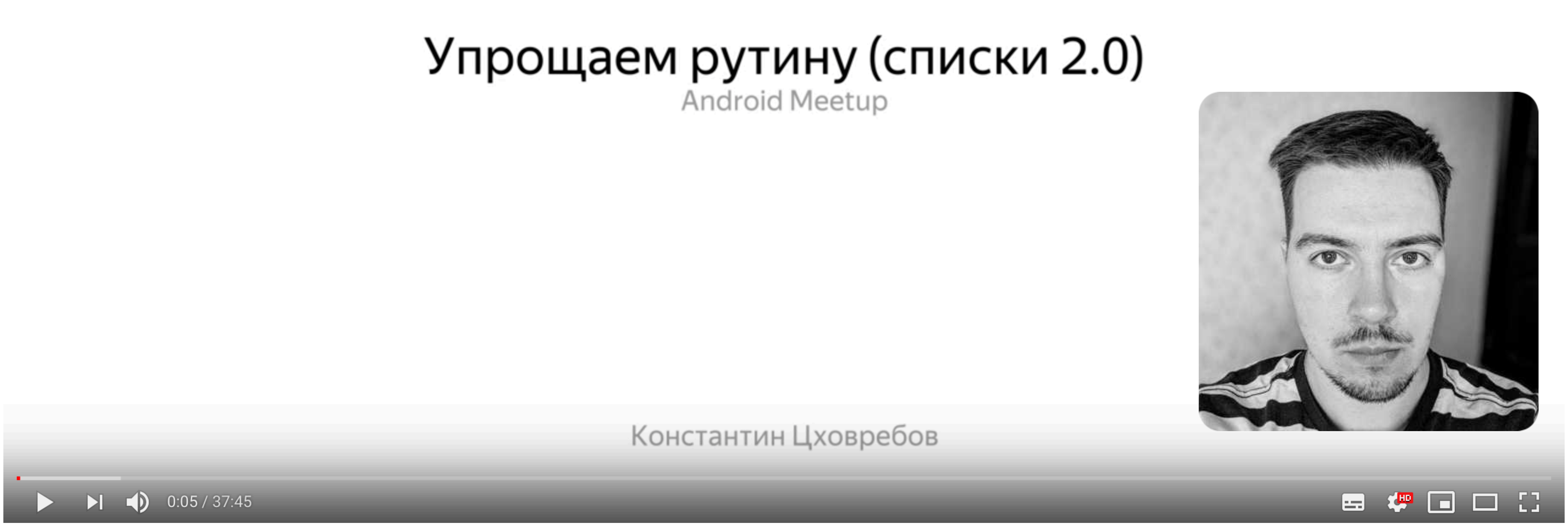
TESTING LOGIC

```
val viewModel = provide<SearchViewModel<Action, UiState>>

viewModel.bind(fakeView)
actions.onNext(SearchAction("Query"))
states.assertValue(UiState(loading = true))

viewModel.unbind()
actions.onNext(SearchAction("AnotherQuery"))
states.assertNoValues()
```

BACK TO REALITY

- Rendering Overflow
- Testing
- Paging

PAGING


Упрощаем рутину (списки 2.0)

Android Meetup

Константин Цховребов

youtu.be/h5afEeuI0GQ

BACK TO REALITY

- Rendering Overflow
- Testing
- Paging
- SingleLiveEvents

SINGLE LIVE EVENTS

SINGLE LIVE EVENTS

<Action, State>
Update
<newState>
Render
<SideEffect>
Call
<Action>

SINGLE LIVE EVENTS

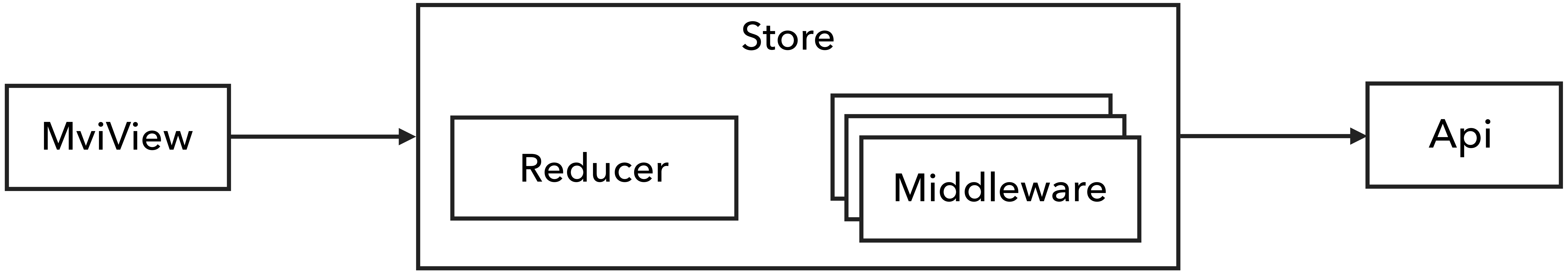
<Action, State>
Update
<newState>
Render
<SideEffect>
Call
<Action>
Subscriptions

BACK TO REALITY

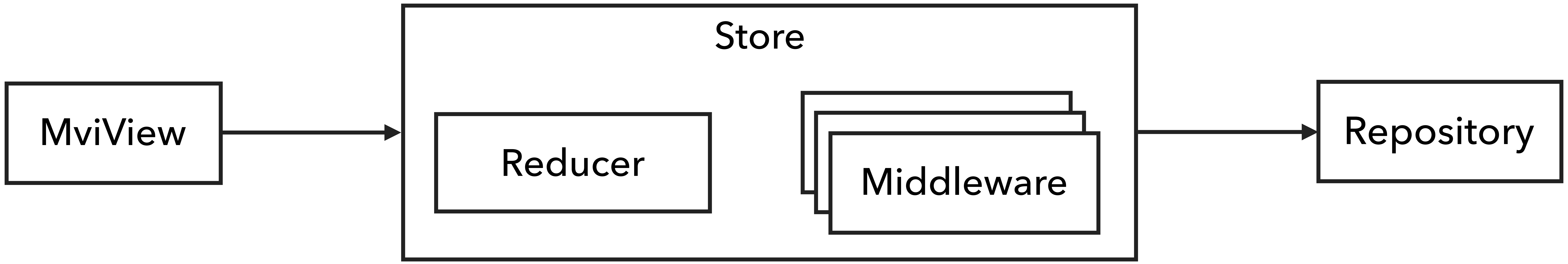
- Rendering Overflow
- Testing
- Paging
- SingleLiveEvents
- Clean Architecture

DO YOU EVEN CLEAN?

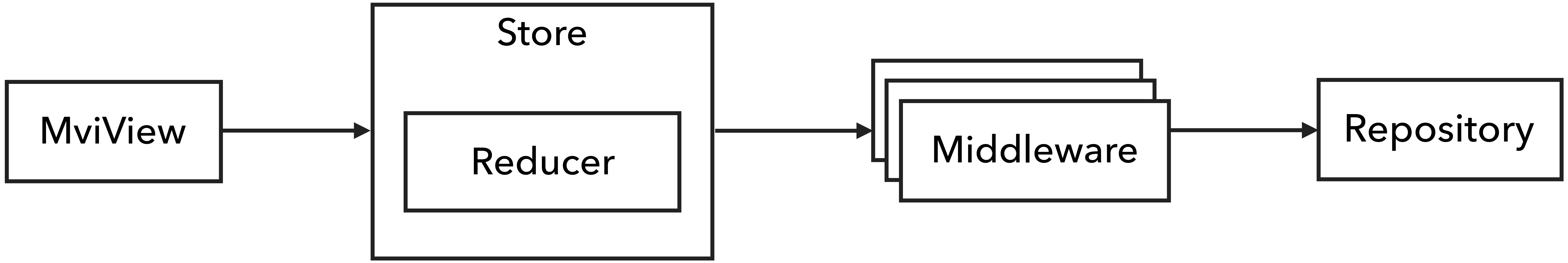
DO YOU EVEN CLEAN?



DO YOU EVEN CLEAN?



DO YOU EVEN CLEAN?



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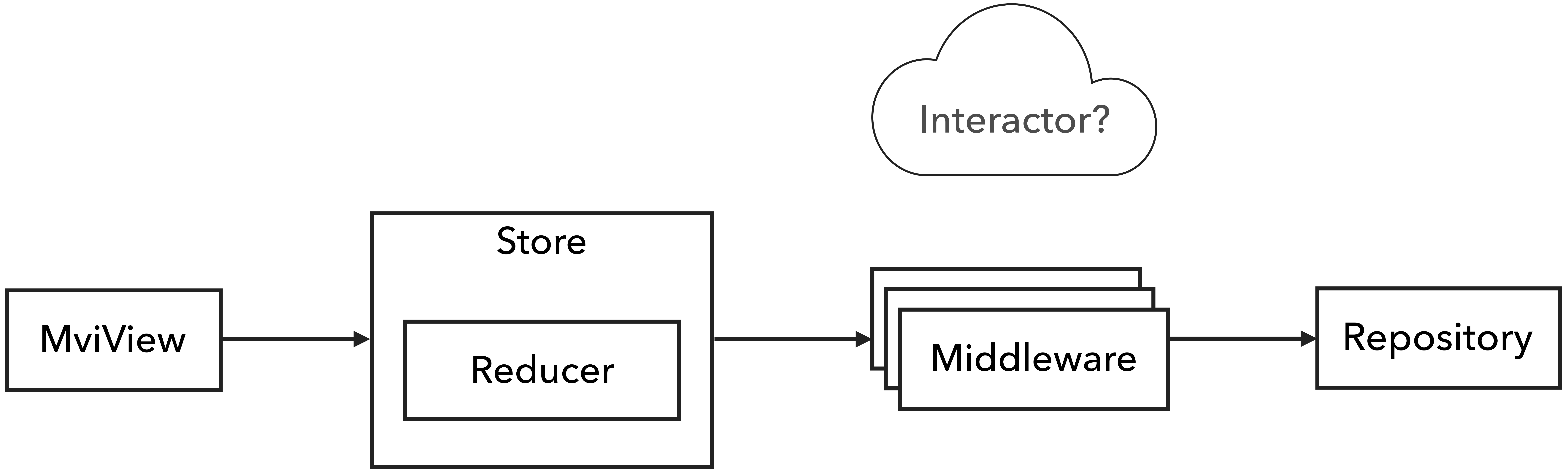

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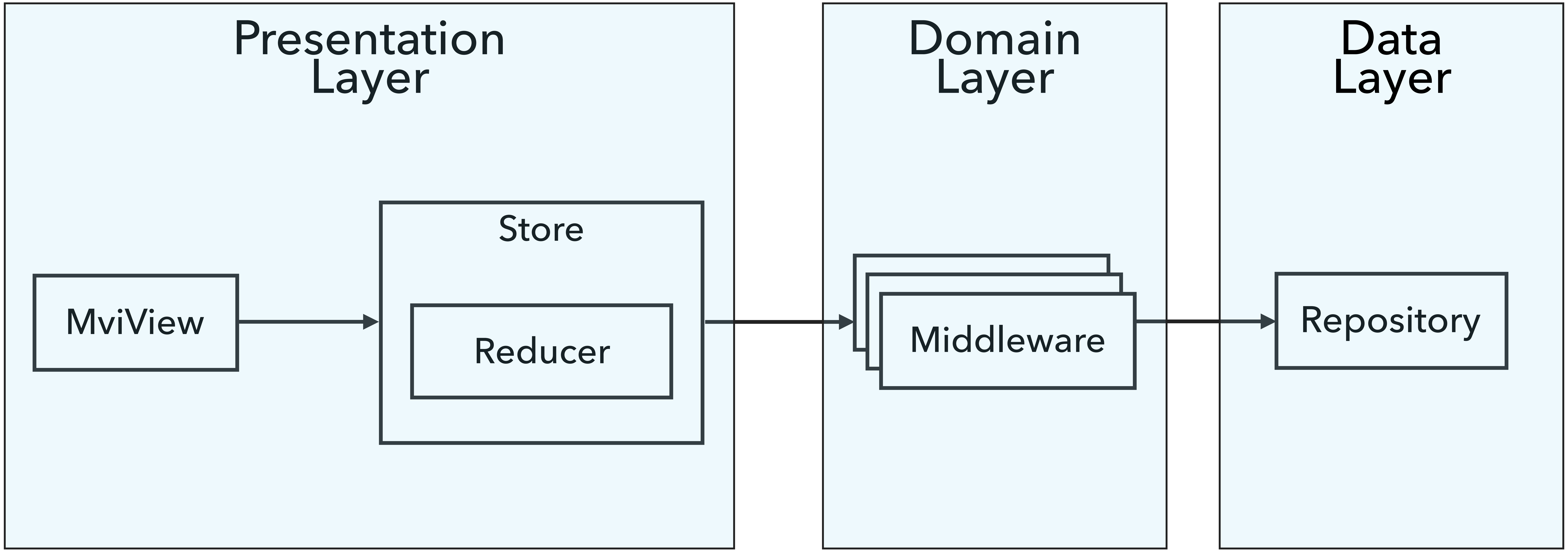

TO WRAP UP

TO WRAP UP

- MVI is about presentation logic

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- Reactive flow

TO WRAP UP

- MVI is about presentation logic
- Reactive flow
- Sealed classes for Actions & States

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- Time Travel Debugger

UNIDIRECTIONAL DATA FLOW LIBS

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- RxRedux / Freeletics   github.com/freeletics/RxRedux

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- RxRedux / Freeletics github.com/freeletics/RxRedux
- Mobius / Spotify github.com/spotify/mobius

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- Grox / Groupon github.com/groupon/grox

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- MvRx / AirBnb github.com/airbnb/MvRx
- MVICore / Badoo github.com/badoo/MVICore
- Grox / Groupon github.com/groupon/grox
- Suas / Zendesk github.com/zendesk/Suas-Android

MVICORE

MVICORE

- `Wish`

MVICORE

- `Wish`
- `Effect`

MVICORE

- `Wish`
- `Effect`
- `Actor`

MVICORE

- Wish
- Effect
- Actor
- News

MVICORE

- `Wish`
- `Effect`
- `Actor`
- `News`
- `Feature`

MVICORE

- `Wish     ->  Action`
- `Effect`
- `Actor`
- `News`
- `Feature`

MVICORE

- Wish -> Action
- Effect -> Internal Action
- Actor
- News
- Feature

MVICORE

Wish	->	Action
Effect	->	Internal Action
Actor	->	Middleware
News		
Feature		

MVICORE

- Wish -> Action
- Effect -> Internal Action
- Actor -> Middleware
- News -> Subscriptions
- Feature

MVICORE

Wish	->	Action
Effect	->	Internal Action
Actor	->	Middleware
News	->	Subscriptions
Feature	->	Store

LINKS

- **Managing State with RxJava** by Jake Wharton
  youtu.be/0IKHxjkgop4
- **The Reactive Workflow Pattern** by Ray Ryan
  youtu.be/mvBVkU2mCF4
- **Domic – Reactive Virtual DOM** by Artem Zinnatullin
  youtu.be/Ce6phlHfKR8
- **Domic repo**
  github.com/lyft/domic
- **Reagent repo**
  github.com/JakeWharton/Reagent

How to cook a well done MVI for Android

Sergey Ryabov
@colriot