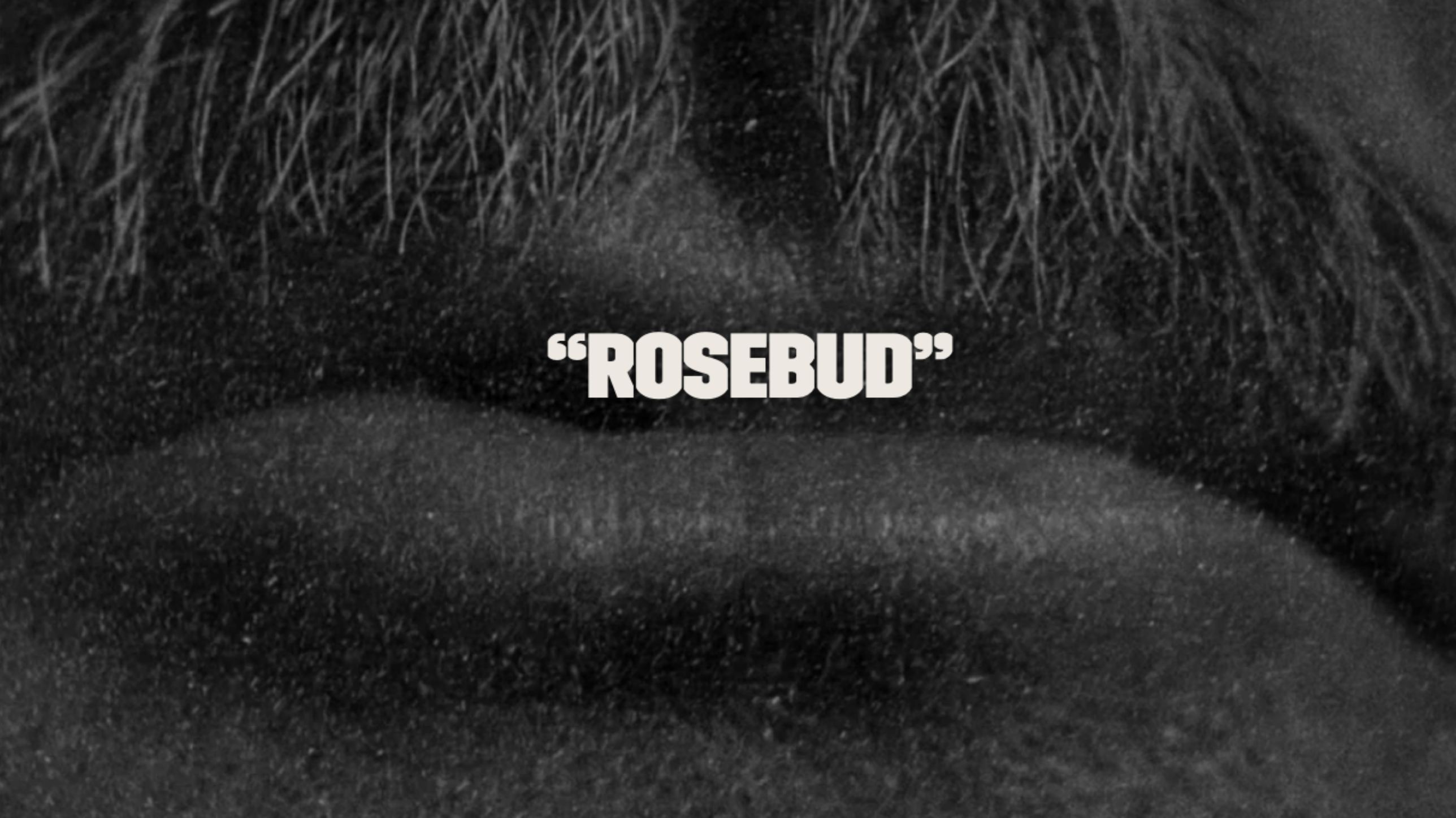
THE REACTIVE CODE THAT BROKE MY BRAIN

AND CHANGED MY MIND (JUST IN TIME FOR COMBINE)

Lou Franco
@loufranco


“ROSEBUD”


"I LOVE YOU
HONEY BUNNY"

THE CODE THAT CHANGED MY MIND

```
let output = viewModel.transform(input)
```

```swift
protocol IOViewModelType {
    associatedtype Input
    associatedtype Output

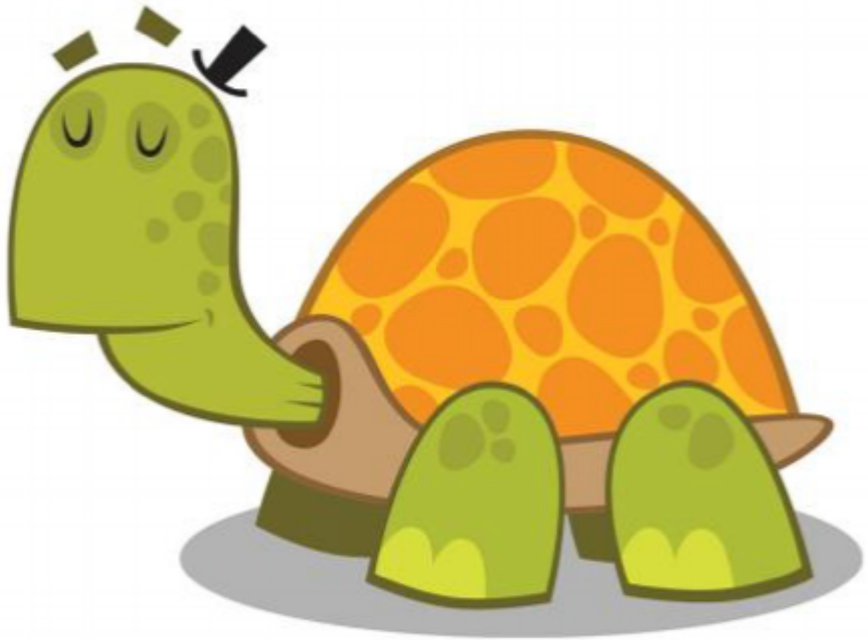
    func transform(_ input: Input) -> Output
}
```

FIVE YEARS EARLIER ...

The Pragmatic Programmers

Swift Style

An Opinionated Guide to an Opinionated Language



Erica Sadun

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Taylor Swift - Style - YouTube

https://www.youtube.com/watch?v=-CmadmM5cOk


“WE USE REACTIVE COCOA HERE”

MY INTRO TO REACTIVE PROGRAMMING

```
RACSignal *countSignal =
  [self.textField.rac_textSignal map:^id(NSString *text) {
    return [NSString stringWithFormat:@"%i", text.length];
  }];
RAC(self.countLabel, text) = countSignal;
```

REACTIVE PROGRAMMING

SEQUENCE TYPES

» Sequence: source of values

» Iterator: pull the values

SEQUENCE TYPES

» Sequence: source of values

» Iterator: pull the values

```
// values: [Int]

var sumOfOdds = 0
for v in values {
  if v % 2 == 1 {
    sumOfOdds += v
  }
}
print(sumOfOdds)
```

REACTIVE TYPES

» Publisher/Observable: source of values

» Subscriber/Observer: asynchronously pushed values

REACTIVE TYPES

» Publisher/Observable: source of values

» Subscriber/Observer: asynchronously pushed values

```
// values: AnyPublisher<Int, Never>

var sumOfOdds = 0
values.sink(receiveCompletion: { (_) in
    print(sumOfOdds)
}, receiveValue: { v in
    if v % 2 == 1 {
        sumOfOdds += v
    }
})
```

CONSEQUENCES OF ASYNCHRONY

- Time
- Order
- Threads
- Errors
- Cancellation

SEQUENCE EXAMPLE

```
// values: [Int]

var sumOfOdds = 0
for v in values {
  if v % 2 == 1 {
    sumOfOdds += v
  }
}
print(sumOfOdds)
```

SEQUENCE OPERATORS

```
sumOfOdds = values
  .filter { $0 % 2 == 1 }
  .reduce(0, +)
```

REACTIVE EXAMPLE

```
// values: AnyPublisher<Int, Never>

var sumOfOdds = 0
values.sink(receiveCompletion: { (_) in
    print(sumOfOdds)
}, receiveValue: { v in
    if v % 2 == 1 {
        sumOfOdds += v
    }
})
```

REACTIVE OPERATORS (COMBINE)

```
// values: AnyPublisher<Int, Never>
values
    .filter { $0 % 2 == 1 }
    .reduce(0, +)
    .sink { sumOfOdds = $0 }
```

REACTIVE OPERATORS (RXSWIFT)

```
// values: Observable<Int>
values
    .filter { $0 % 2 == 1 }
    .reduce(0, +)
    .subscribe { sumOfOdds = $0 }
```

OPERATORS ARE FAMILIAR

SEQUENCES	PUBLISHERS
map	map
flatMap	flatMap
filter	filter
reduce	reduce / scan
first	first

COMBINE AND RXSWIFT

COMBINE	RXSWIFT
Publisher	Observable
Subscriber	Observer
Subject	Subject
map/filter/reduce/scan	map/filter/reduce/scan
merge/flatMap/combineLatest	merge/flatMap/combineLatest
debounce/delay/throttle	debounce/delay/throttle

REACTIVE PROGRAMMING REPLACES

» Completion Closures

» KVO

» Target/Action calling

» Notification Center

» Delegates

» DataSources

with one model (using Subjects)

SO...

- » Publishers send values asynchronously
  - » Introducing time, order, threads, errors, and cancellation
- » Operators combine and transform Publishers
- » Rx replaces KVO, delegates, closures, etc
- » Subjects can adapt other models to Rx

MY INTRO TO REACTIVE PROGRAMMING

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    return [NSString stringWithFormat:@"%i", text.length];
  }];
RAC(self.countLabel, text) = countSignal;
```

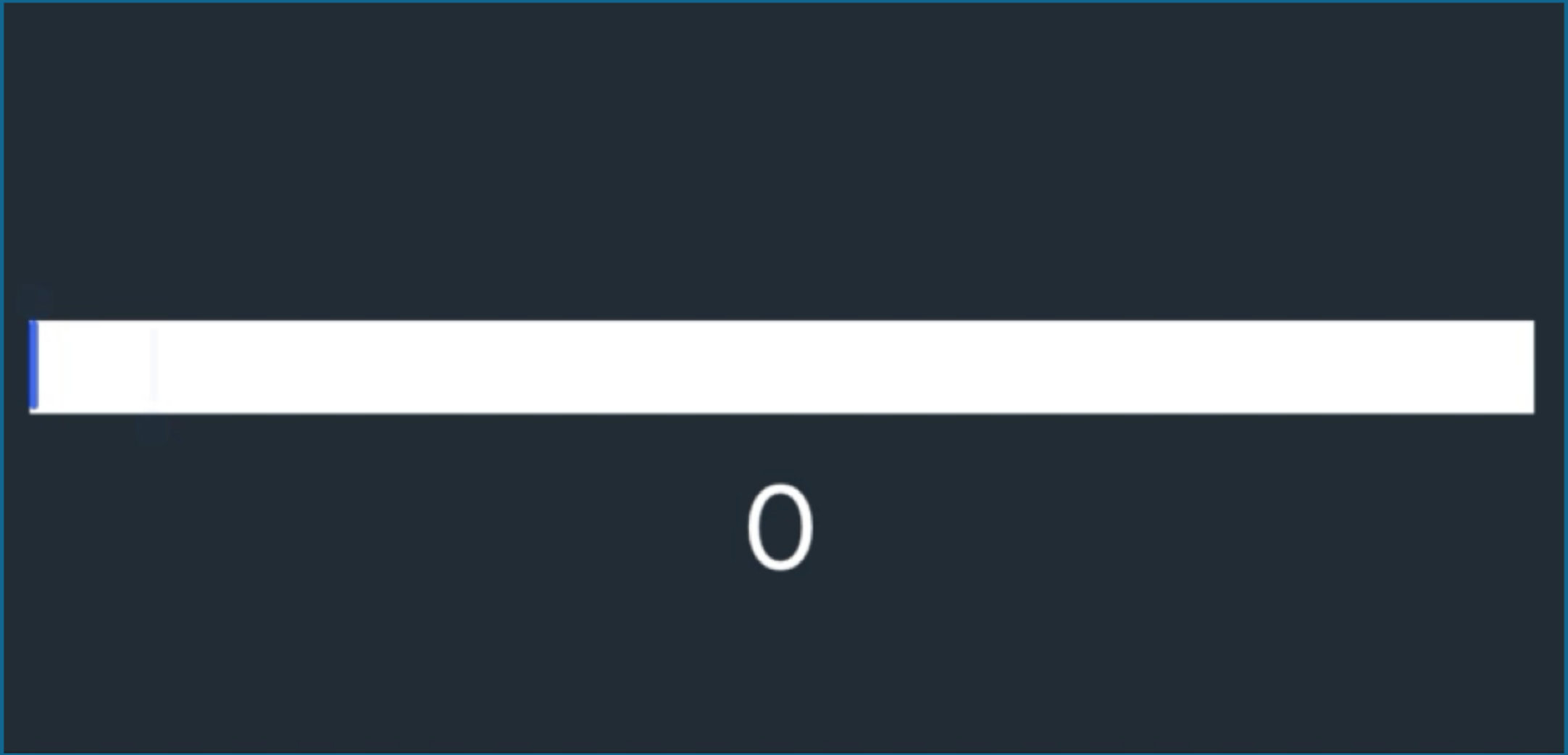
MY INTRO TO REACTIVE PROGRAMMING

```
RACSignal *countSignal =
  [self.textField.rac_textSignal map:^id(NSString *text) {
    return [NSString stringWithFormat:@"%i", text.length];
  }];
RAC(self.countLabel, text) = countSignal;
```

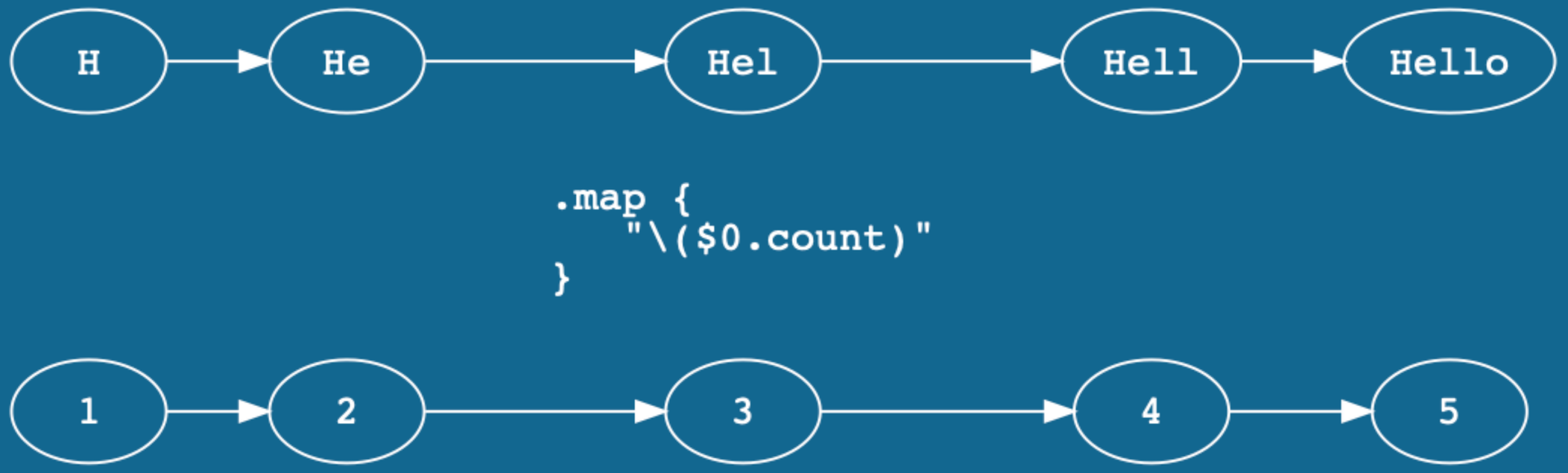
RXSWIFT EQUIVALENT

```
self.textField.rx.text
  .map { "\($0.count)" }
  .bind(to: self.countLabel.rx.text)
```

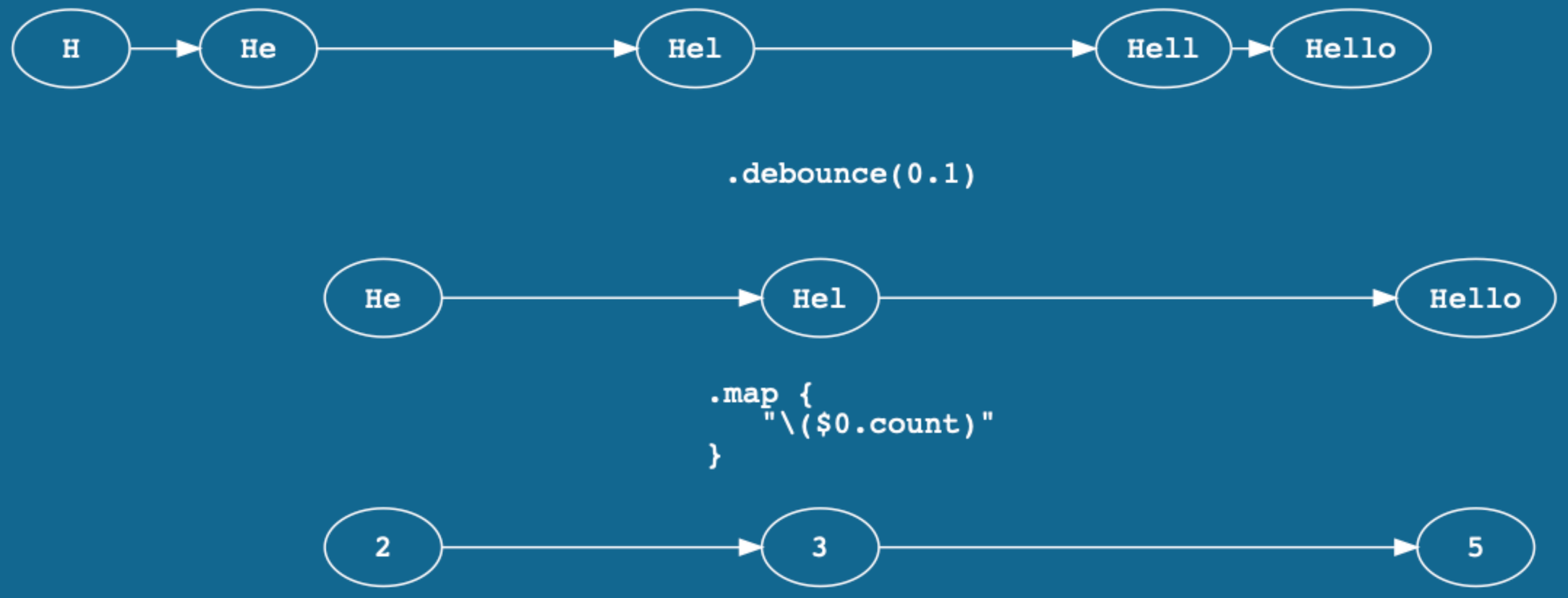
DEMO



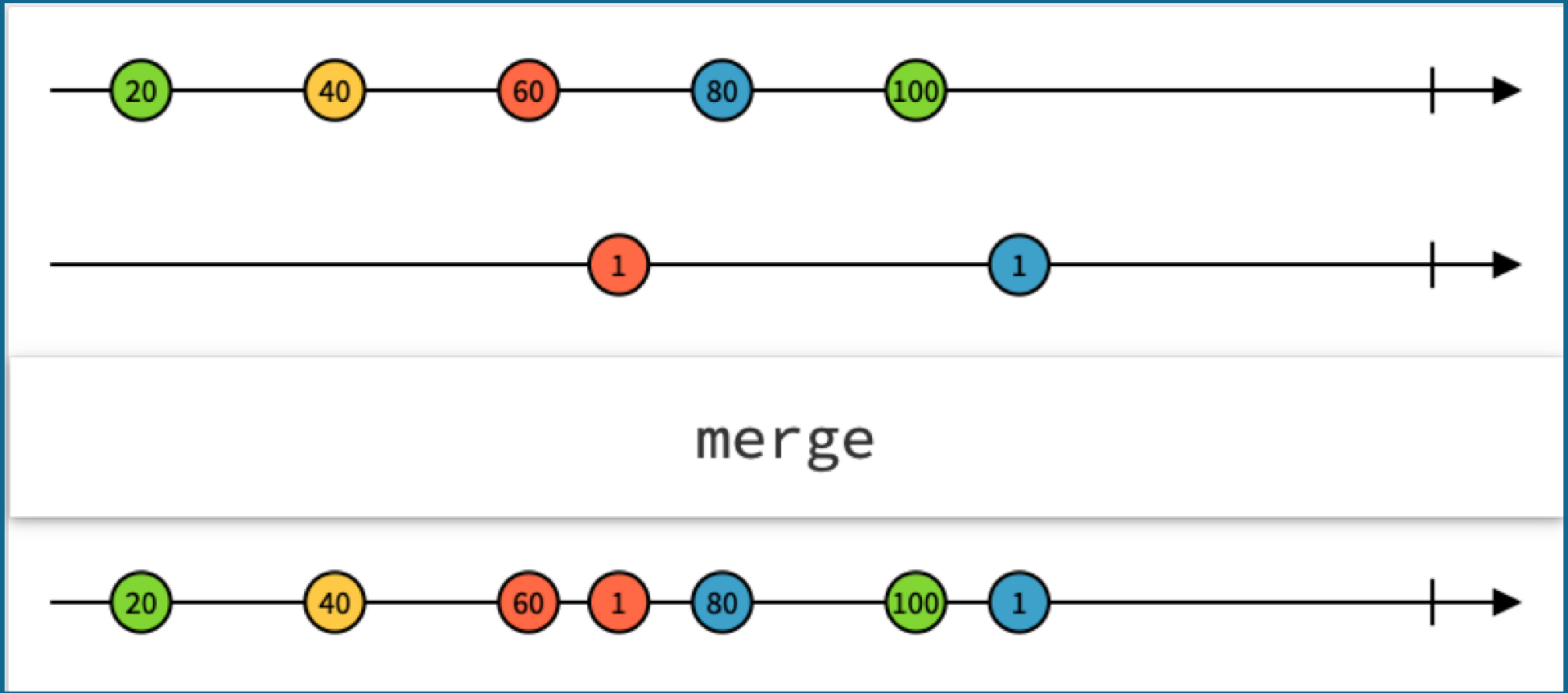
MARBLE DIAGRAM: MAP



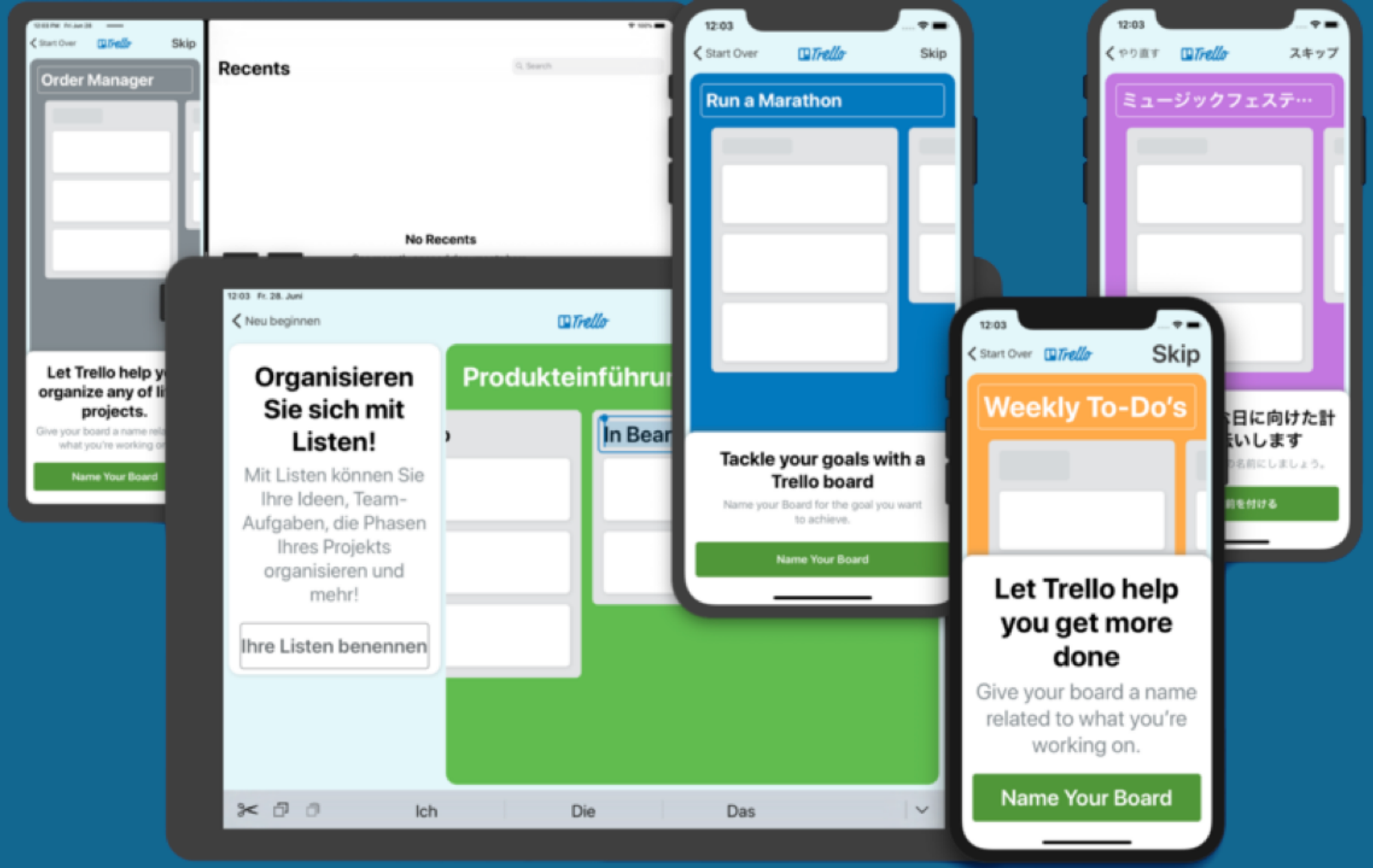
MARBLE DIAGRAM: DEBOUNCE

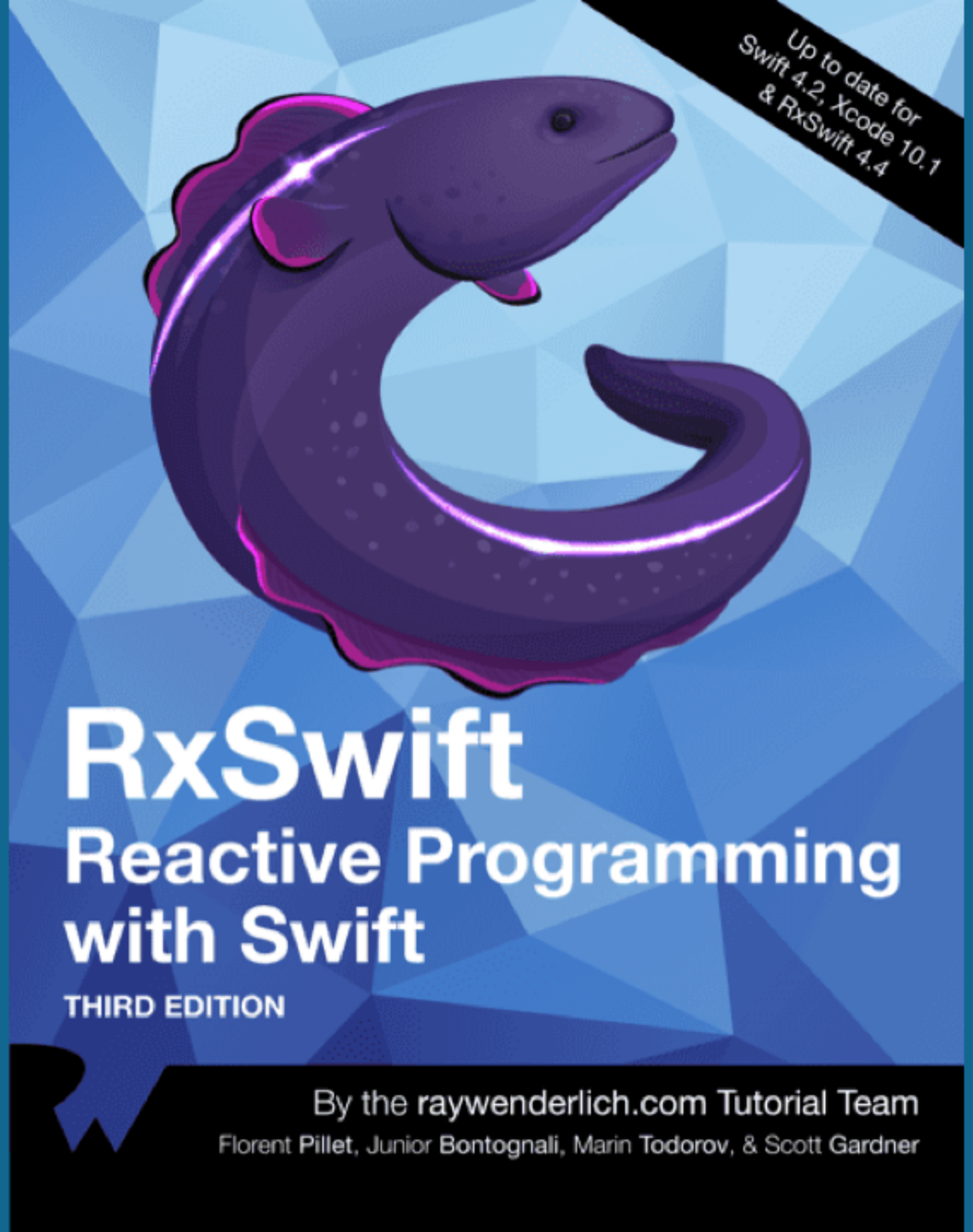


RXMARBLES.COM



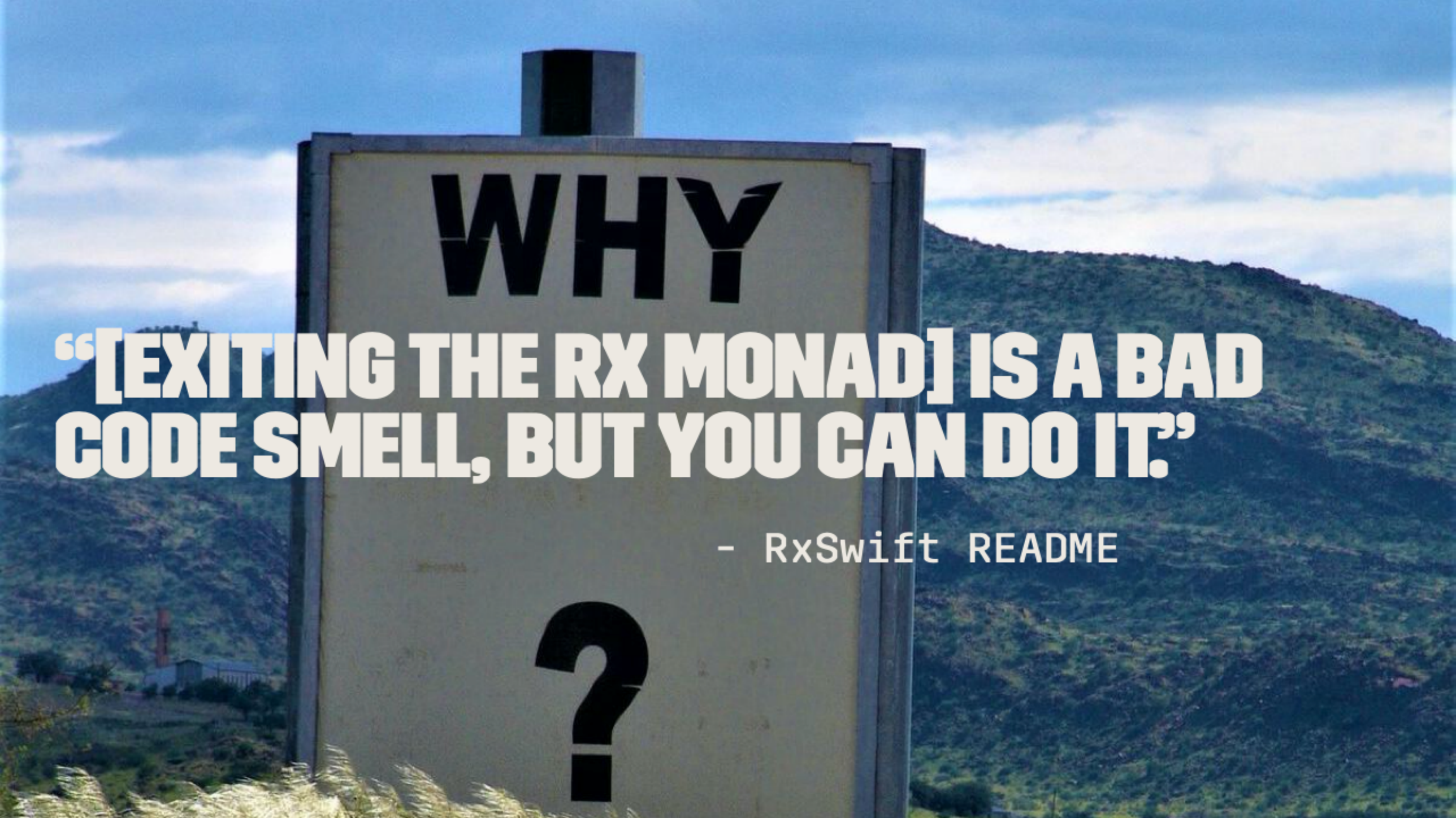

MY RX USAGE UP UNTIL 2019


Start Over
Trello
Skip
Order Manager
Let Trello help y
organize any of li
projects.
Name Your Board
Recents
No Recents
12:03 Fr. 28. Juni
Neu beginnen
Trello
Organisieren Sie sich mit Listen!
Mit Listen können Sie Ihre Ideen, Team-Aufgaben, die Phasen Ihres Projekts organisieren und mehr!
Ihre Listen benennen
Produkteinführu
In Bear
Ich
Die
Das
12:03
Start Over
Trello
Skip
Run a Marathon
Tackle your goals with a Trello board
Name your Board for the goal you want to achieve.
Name Your Board
12:03
やり直す
Trello
スキップ
ミュージックフェステ…
日に向けた計
いします
前を付ける
12:03
Start Over
Trello
Skip
Weekly To-Do's
Let Trello help you get more done
Give your board a name related to what you're working on.
Name Your Board


Up to date for
Swift 4.2, Xcode 10.1
& RxSwift 4.4
RxSwift
Reactive Programming
with Swift
THIRD EDITION
By the raywenderlich.com Tutorial Team
Florent Pillet, Junior Bontognali, Marin Todorov, & Scott Gardner

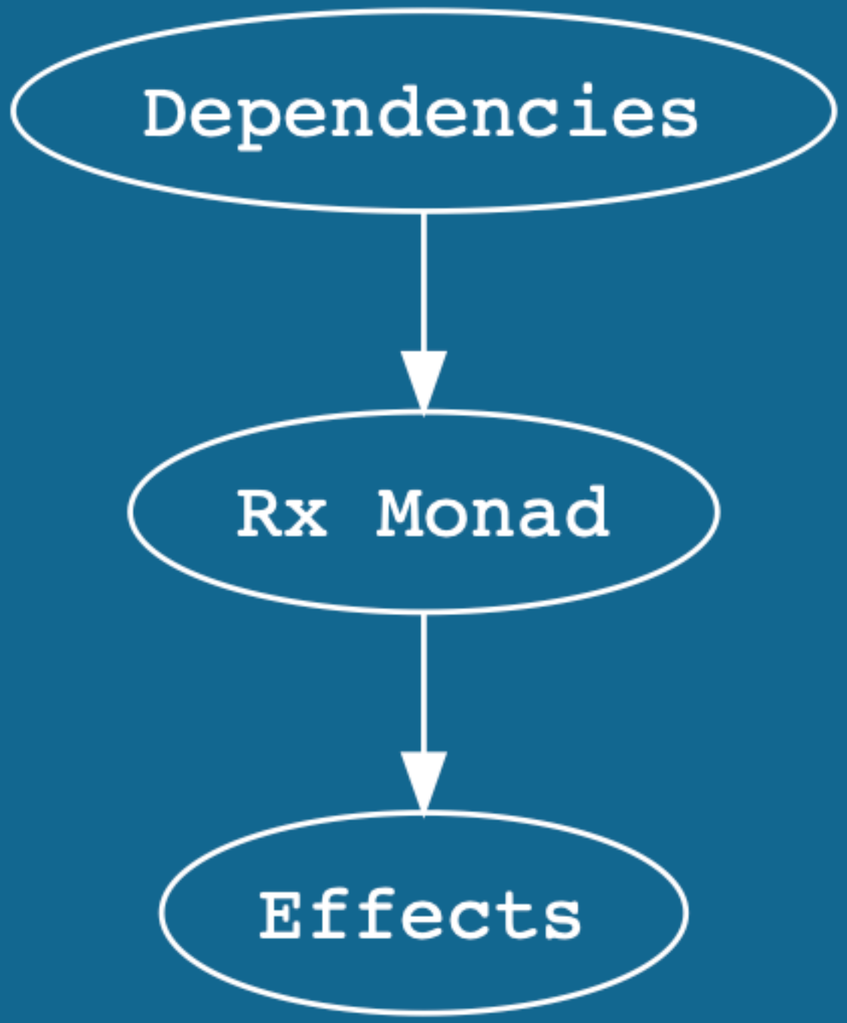

objc ↑↓
App
Architecture
iOS Application Design Patterns in Swift
By Chris Eidhof, Matt Gallagher, and Florian Kugler

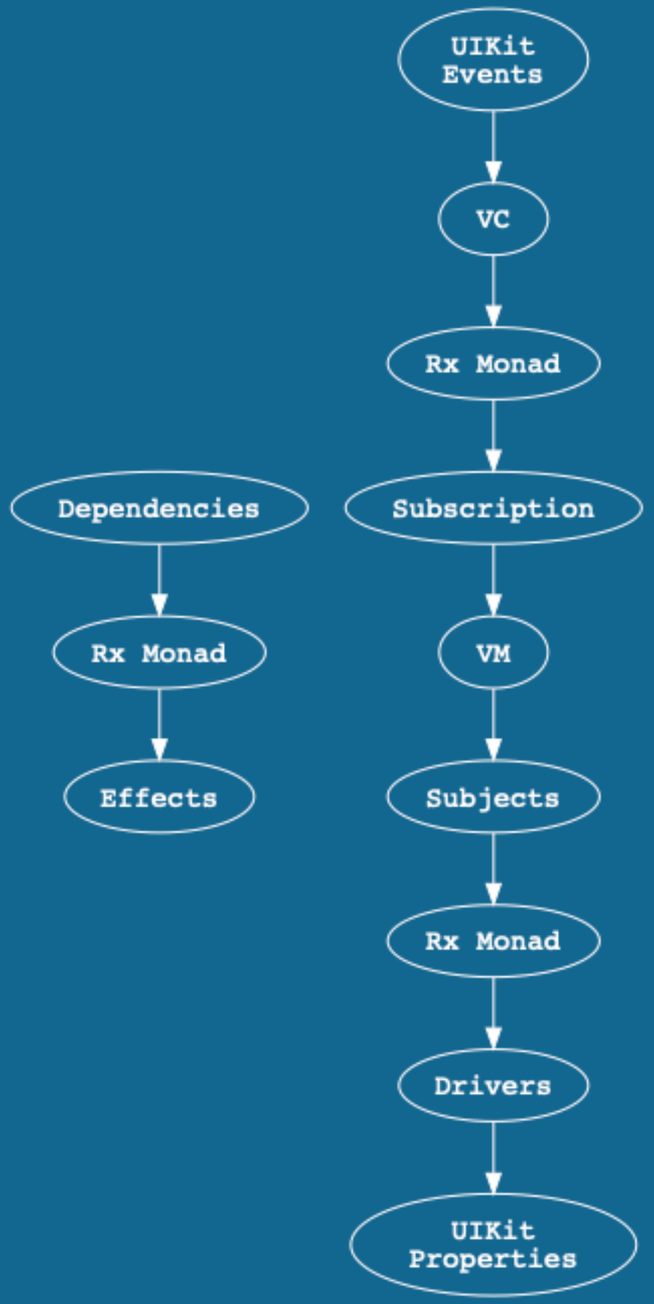
REACTIVE MVVM



“[EXITING THE RX MONAD] IS A BAD CODE SMELL, BUT YOU CAN DO IT.”

- RxSwift README


Dependencies
Rx Monad
Effects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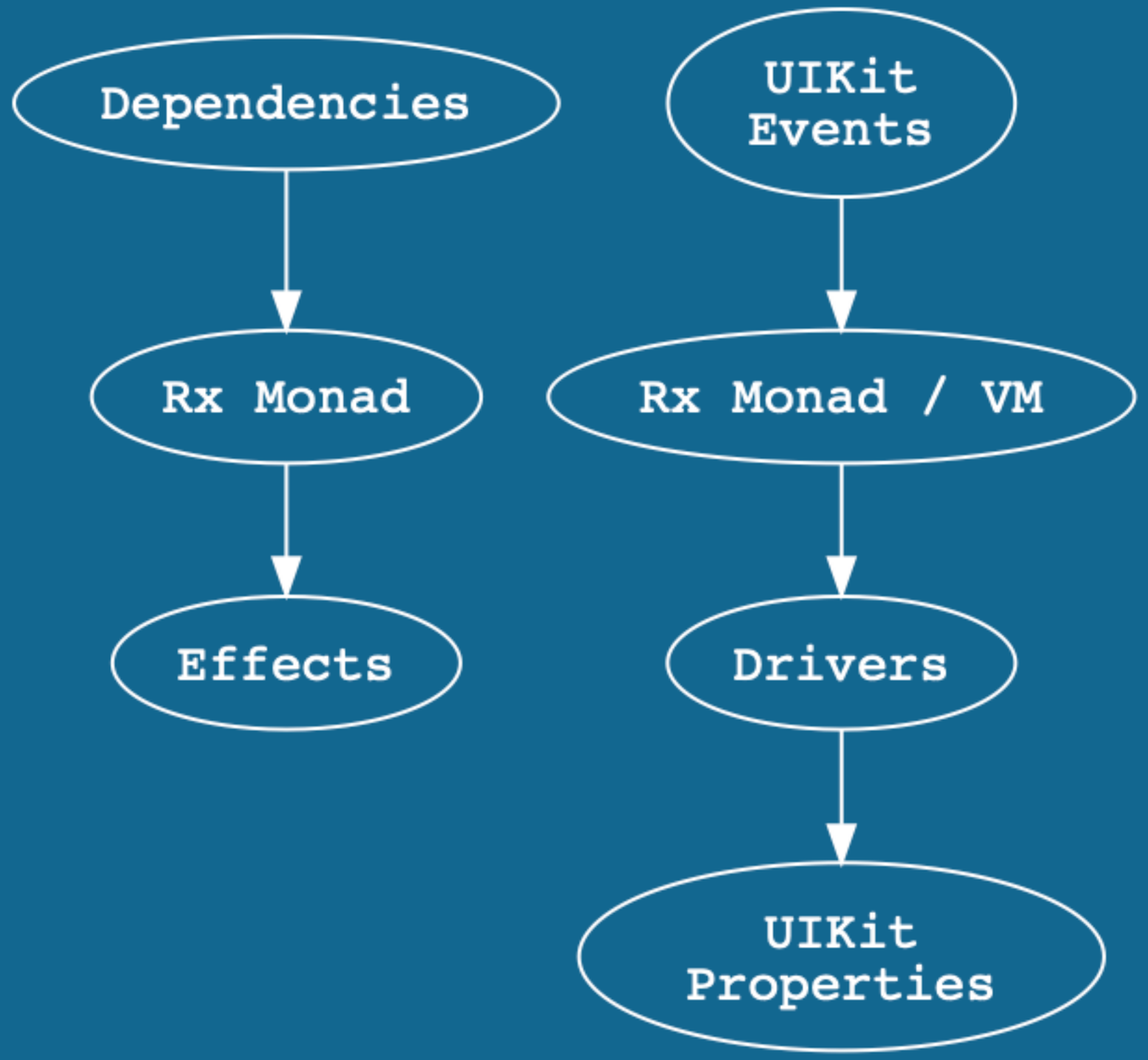
VC
Rx Monad
Subscription
VM
Subjects
Rx Monad
Drivers
UIKit Properties
Dependencies
Rx Monad
Effects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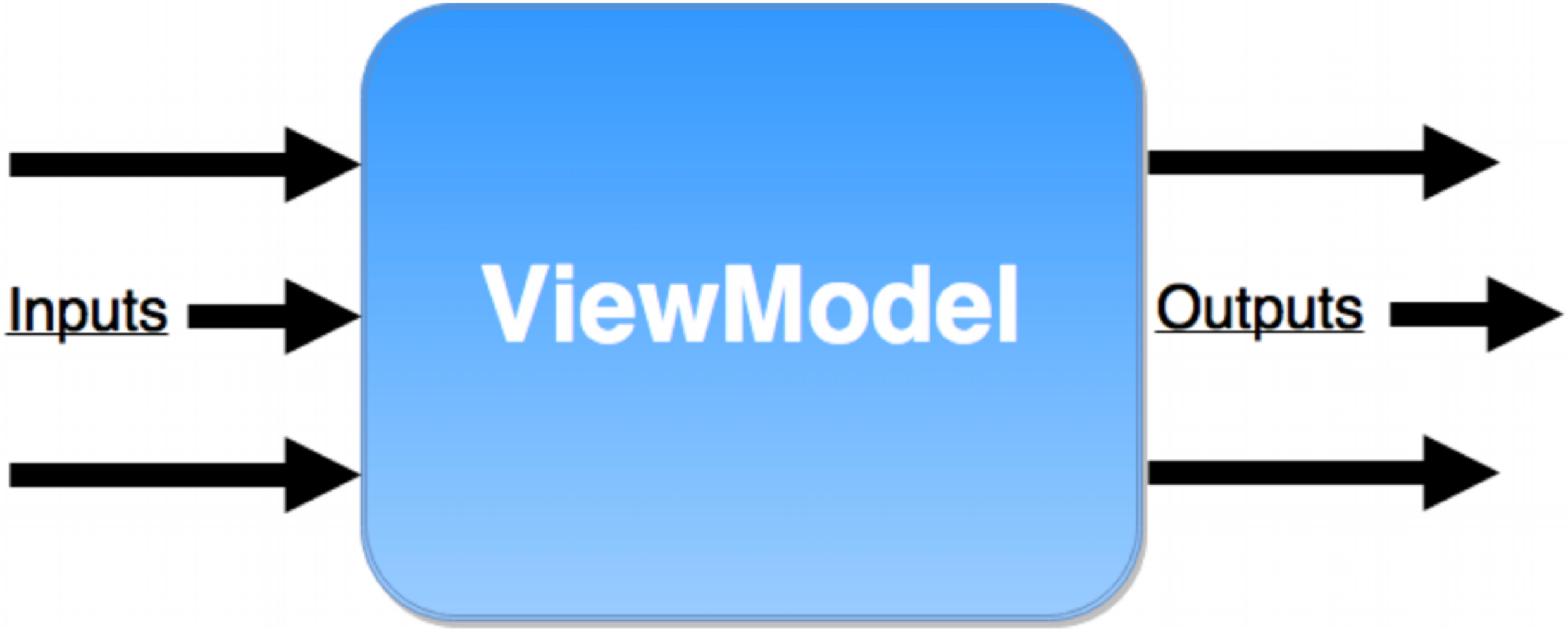
Rx Monad
Effects
UIKit Events
Rx Monad / VM
Drivers
UIKit Properties

RxSwift + MVVM: how to feed ViewModels

Martin Moizard Follow

Sep 27, 2017 · 6 min read


Inputs
ViewModel
Outputs

VIEWMODEL PUBLIC INTERFACE

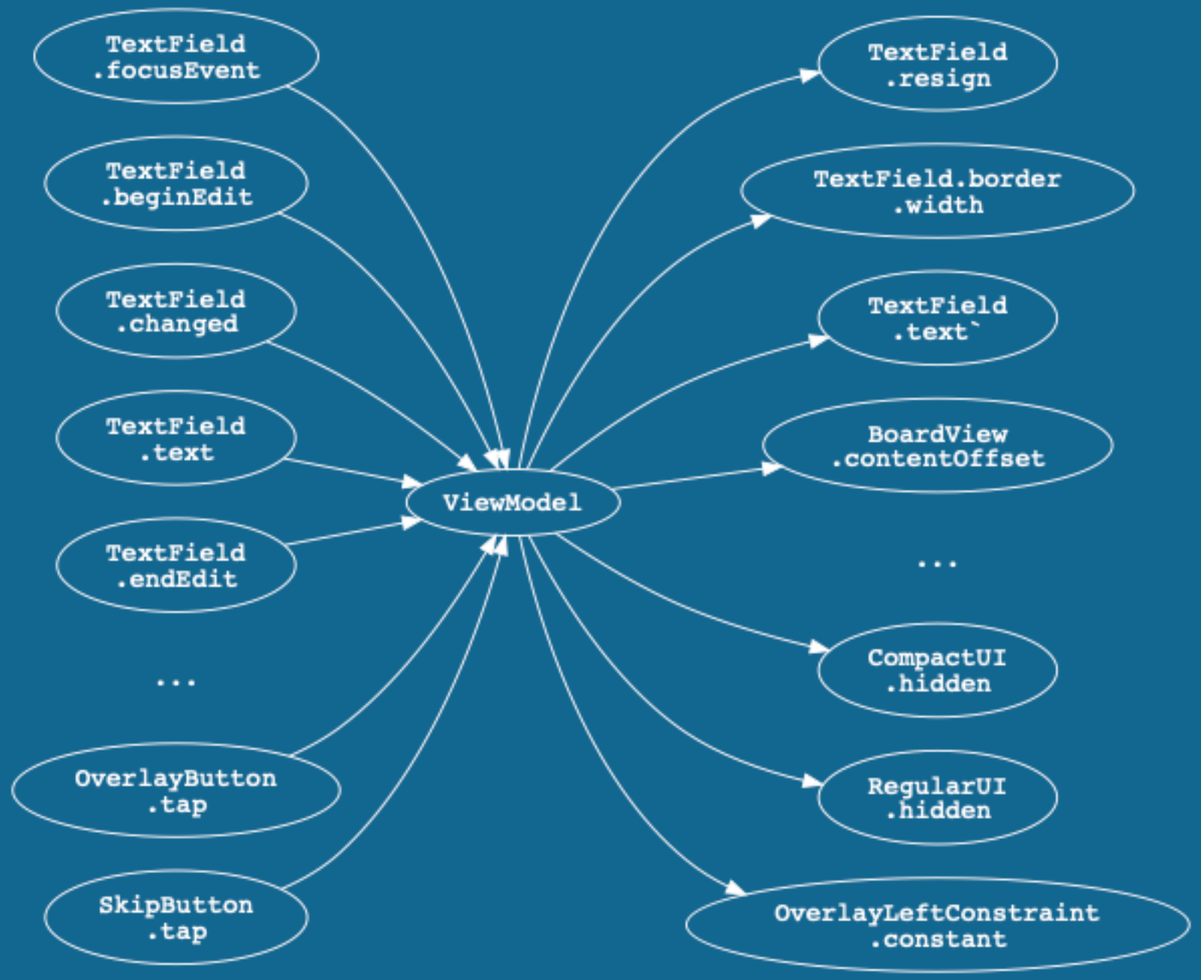
```
protocol IOViewModelType {
    associatedtype Input
    associatedtype Output

    func transform(_ input: Input) -> Output
}
```

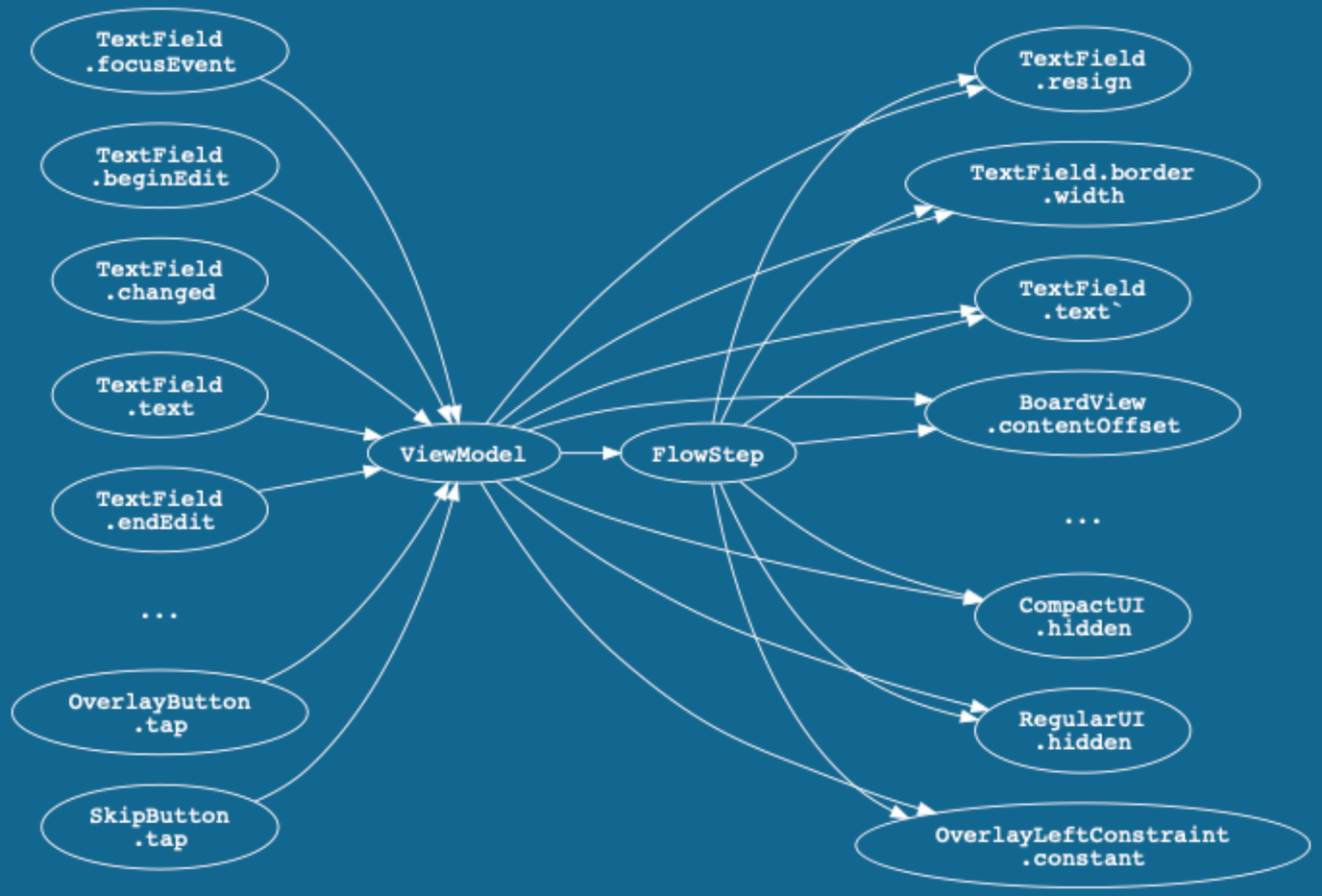
VIEWCONTROLLER USE

```
let output = viewModel.transform(input)
```

```
let output = viewModel.transform(input)
```



```
let flowStep = flowStep(input)
let textFieldResign = textFieldResign(input, flowStep)
```



FLOWSTEP

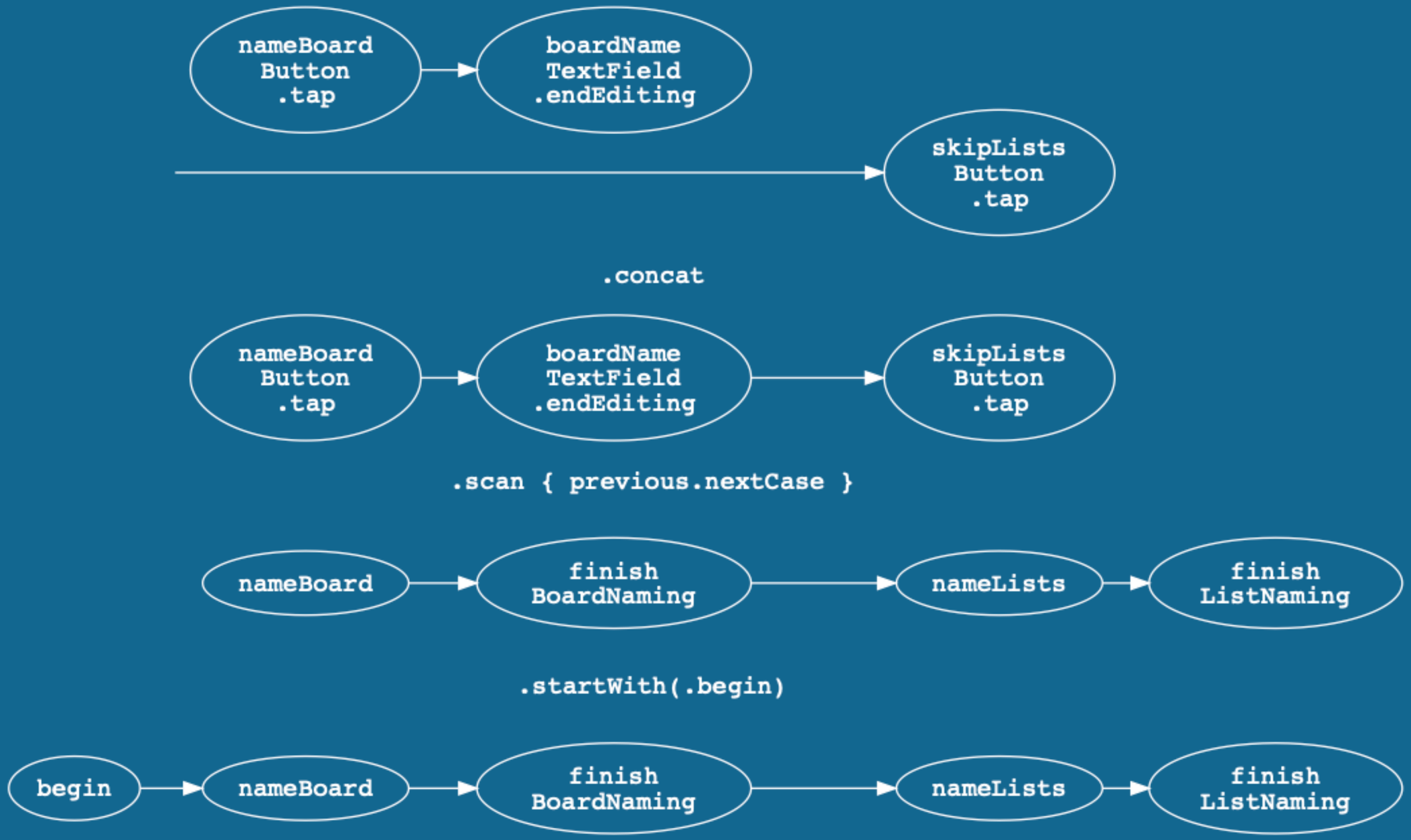

begin
name Board
finish BoardNaming
name Lists
finish ListNaming
name Cards
finish CardNaming
create Board
END

STATE MACHINE IN RX

```
enum FlowStep: Int, CaseIterable, Comparable {
    case begin
    case nameBoard
    case finishBoardNaming
    case nameLists
    case finishListNaming
    case nameCards
    case finishCardNaming
    case createBoard
}
```

STATE MACHINE IN RX

```
let stateMachine: Observable<FlowStep> =
  boardNameSteps
  .concat(listNameSteps)
  .concat(cardNameSteps)
  .concat(createBoardSteps)
  .scan(FlowStep.begin) { (previous, _) -> FlowStep in
      return previous.nextCase
  }
  .startWith(.begin)
```


nameBoard Button .tap
boardName TextField .endEditing
skipLists Button .tap
.concat
nameBoard Button .tap
boardName TextField .endEditing
skipLists Button .tap
.scan { previous.nextCase }
nameBoard
finish BoardNaming
nameLists
finish ListNaming
.startWith(.begin)
begin
nameBoard
finish BoardNaming
nameLists
finish ListNaming

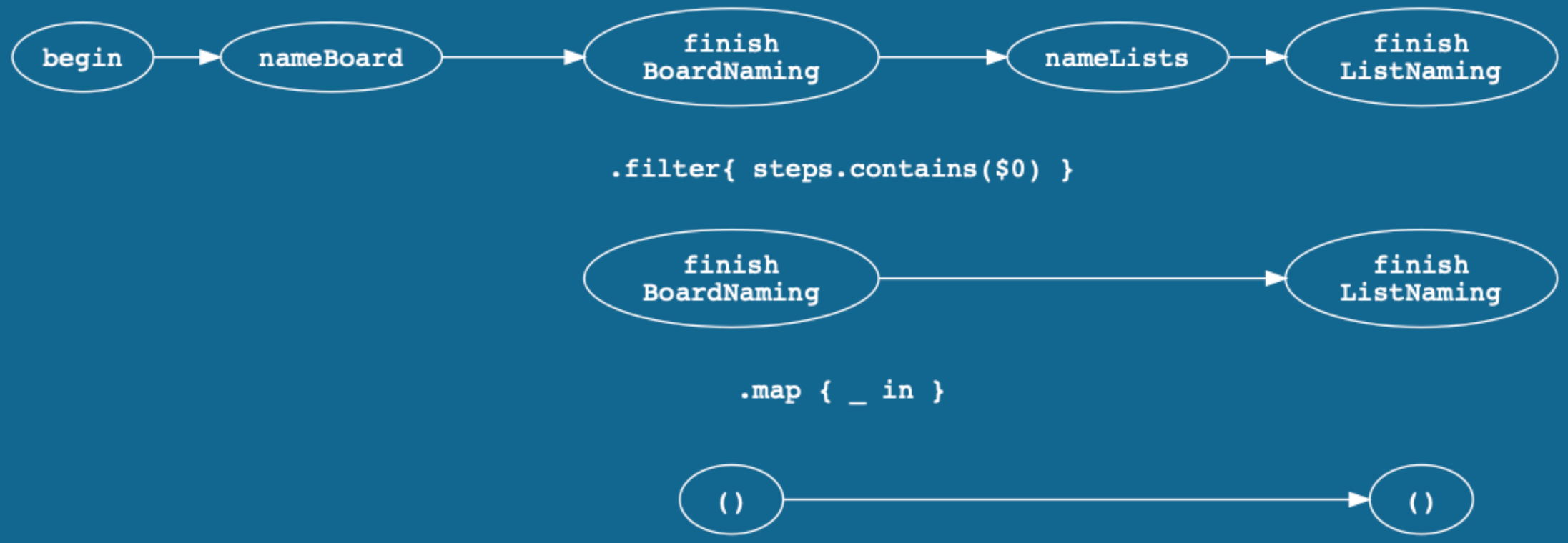
EXAMPLE: BUTTON ENABLING

```
let boardNamingButtonEnabled: Driver<Bool> =
    flowStep
        .filter { $0 > .begin }
        .map { _ in false }
        .take(1)
```

EXAMPLE: SCROLL BOARD

```
let scrollBoard: Driver<Void> =
  flowStep
    .filter {
      return [.finishBoardNaming,
              .finishListNaming,
              .finishCardNaming].contains($0)
    }
    .map { _ in }
```

SCROLL BOARD



EXAMPLE: SIZE ADAPTATION

```
func compactUIHidden(_ input: Input) -> Driver<Bool> {
    return input
      .traitCollection
      .map { $0.horizontalSizeClass != .compact }
}

func regularUIHidden(_ compactUIHidden: Driver<Bool>) -> Driver<Bool> {
    return compactUIHidden.not()
}

func boardLeadingConstraint(_ compactUIHidden: Driver<Bool>) -> Driver<CGFloat> {
    return compactUIHidden.map { [weak self] in
       $0 ? self.overlayWidth : 0
    }
}
```

INPUT

```
let input = OnboardingViewModel.Input(
    boardNameText: boardNameTextField.rx.text.orEmpty,
    boardNameEditingDidBegin: boardNameTextField.rx.controlEvent(.editingDidBegin),
    boardNameEditingChanged: boardNameTextField.rx.controlEvent(.editingChanged),
    boardNameEditingDidEnd: boardNameTextField.rx.controlEvent(.editingDidEnd),
    boardNameEditingDidEndOnExit: boardNameTextField.rx.controlEvent(.editingDidEndOnExit),
    ...
```

OUTPUT

```
let output = viewModel.transform(input)
```

TRANSFORM

```
let flowStep: Observable<FlowStep> = self.flowStep(input)

let boardNameDisplayText: Driver<String> = self.boardNameDisplayText(input, flowStep)
let focusBoardNameTextField: Driver<Bool> = self.focusBoardNameTextField(input)
let boardNameTextFieldSelectAllText: Driver<Void> = self.boardNameTextFieldSelectAllText(input)
let boardNameTextFieldShowActiveBorder: Driver<Bool> = self.boardNameTextFieldShowActiveBorder(input)
let boardNameTextFieldShowHintBorder: Driver<Bool> = self.boardNameTextFieldShowHintBorder(flowStep)
...
return Output(
  boardZeroContentOffset: boardZeroContentOffset,
  boardViewZoomOut: boardViewZoomOut,
  overlayLeadingConstraintConstant: overlayLeadingConstraintConstant,
  overlayFadeAnimations: overlayFadeAnimations,
  boardNamingOverlayButtonEnabled: boardNamingOverlayButtonEnabled,
  ...
```

DRIVE

```
...
/* Board name */
output.boardNameDisplayText.drive(boardNameTextField.rx.text)
output.focusBoardNameTextField.drive(boardNameTextField.rx.isFirstResponder)
output.boardNameTextFieldShowActiveBorder.drive(boardNameTextField.rx.showBorder)
output.boardNameTextFieldShowHintBorder.drive(boardNameTextField.rx.showHintBorder)
output.boardNameTextFieldSelectAllText.drive(boardNameTextField.rx.selectAll())
...
/* Compact/Regular UI */
output.compactUIHidden.drive(self.compactUI.rx.isHidden)
output.regularUIHidden.drive(self.regularUI.rx.isHidden)
output.boardLeadingConstant.drive(self.boardViewLeadingConstraint.rx.constant)
output.boardBottomConstant.drive(self.boardViewBottomConstraint.rx.constant)
...
```

BENEFITS

» Stateless ViewModel

» Declarative ViewModel / ViewController

» Very easy to make UX Tweaks

» Bugs very localized

» Testing

TEST: MOCK UI WITH SUBJECTS

```
override func setUp() {
  super.setUp()
  self.boardNameText = PublishSubject<String>()
  self.boardNameEditingDidBegin = PublishSubject<Void>()
  self.boardNameEditingChanged = PublishSubject<Void>()
  self.boardNameEditingDidEnd = PublishSubject<Void>()
  self.boardNameEditingDidEndOnExit = PublishSubject<Void>()
  ...
  self.output = self.viewModel.transform(input)
}
```

TEST

```
func testHintBorderShownOnBoardNameTextField() {
    var shown = true

    output.boardNameTextFieldShowHintBorder.drive(onNext: { (isShown) in
        shown = isShown
    }).disposed(by: disposeBag)

    self.boardNameOverlayGoButtonTap.onNext(())
    self.boardNameEditingDidBegin.onNext(())

    XCTAssertFalse(shown)
}
```

THE CODE THAT CHANGED MY MIND

```
let output = viewModel.transform(input)

func transform(_ input: Input) -> Output {
    let flowStep: Observable<FlowStep> = self.flowStep(input)
    // ...
}
```

THANKS / Q&A

» Slides and links at loufranco.com/rx-presentation

» RxSwift + MVVM: how to feed ViewModels
by Martin Moizard
https://medium.com/blablacar-tech/rxswift-mvvm-66827b8b3f10

» Trello iOS Assisted Onboarding
https://github.com/trello/trello-ios-assisted-onboarding

» RxMarbles

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