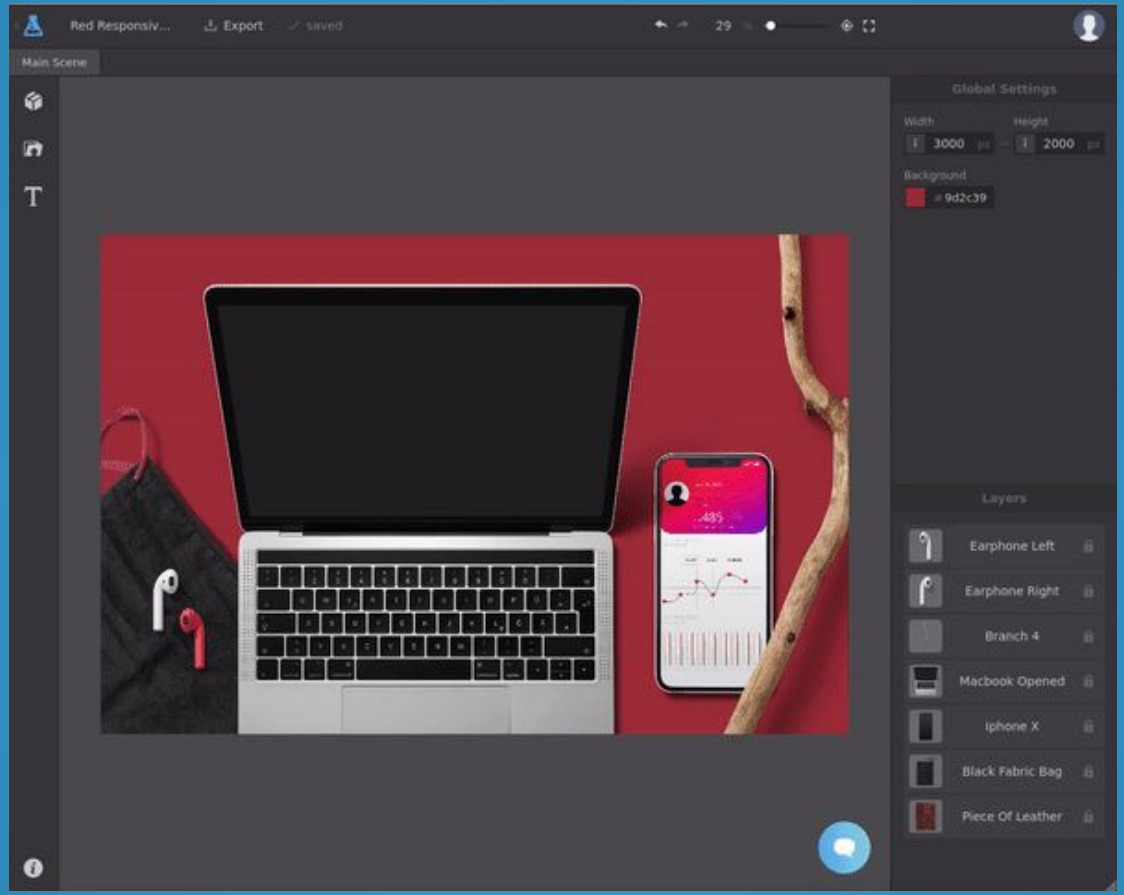
UNDO-REDO WITH ANGULAR & NGRX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Export
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Main Scene
Global Settings
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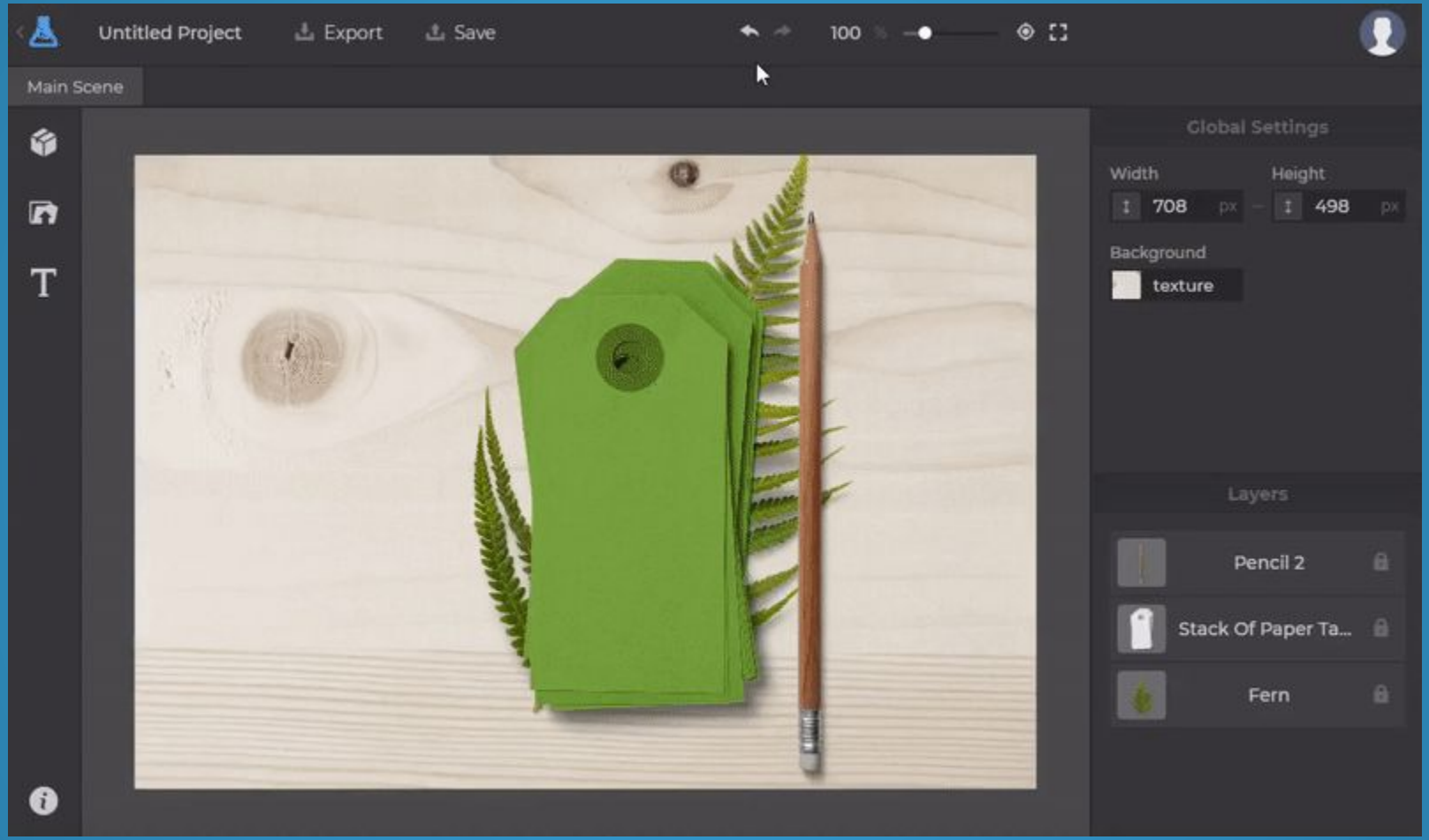
9d2c39
Layers
Earphone Left
Earphone Right
Branch 4
Macbook Opened
Iphone X
Black Fabric Bag
Piece Of Leather

Minimize opportunity for error, but accept that mistakes will happen


Untitled Project
Export
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Layers
Pencil 2
Stack Of Paper Ta...
Fern

HEY

NILS MEHLHORN

freelance software engineer

founder of scenelab.io

www nils-mehlhorn.de

@n_mehlhorn

NGRX BOOK

Pay what you want for the complete learning resource

gum.co/angular-ngrx-book

ERROR TOLERANCE = USER-FRIENDLY DESIGN

- users have different backgrounds
- ease onboarding

→ confidence & creativity

⚠ browser supports only some interactions

KEYBOARD SHORTCUTS: CONSIDERATIONS

- common combinations: Ctrl + Z / Ctrl + Shift + Z
- provide legend and/or tooltips
- consider existing browser shortcuts
- consider internationalization

KEYBOARD SHORTCUTS: IMPLEMENTATION

- Key Event Bindings
- EventManager
- NgRx Effect

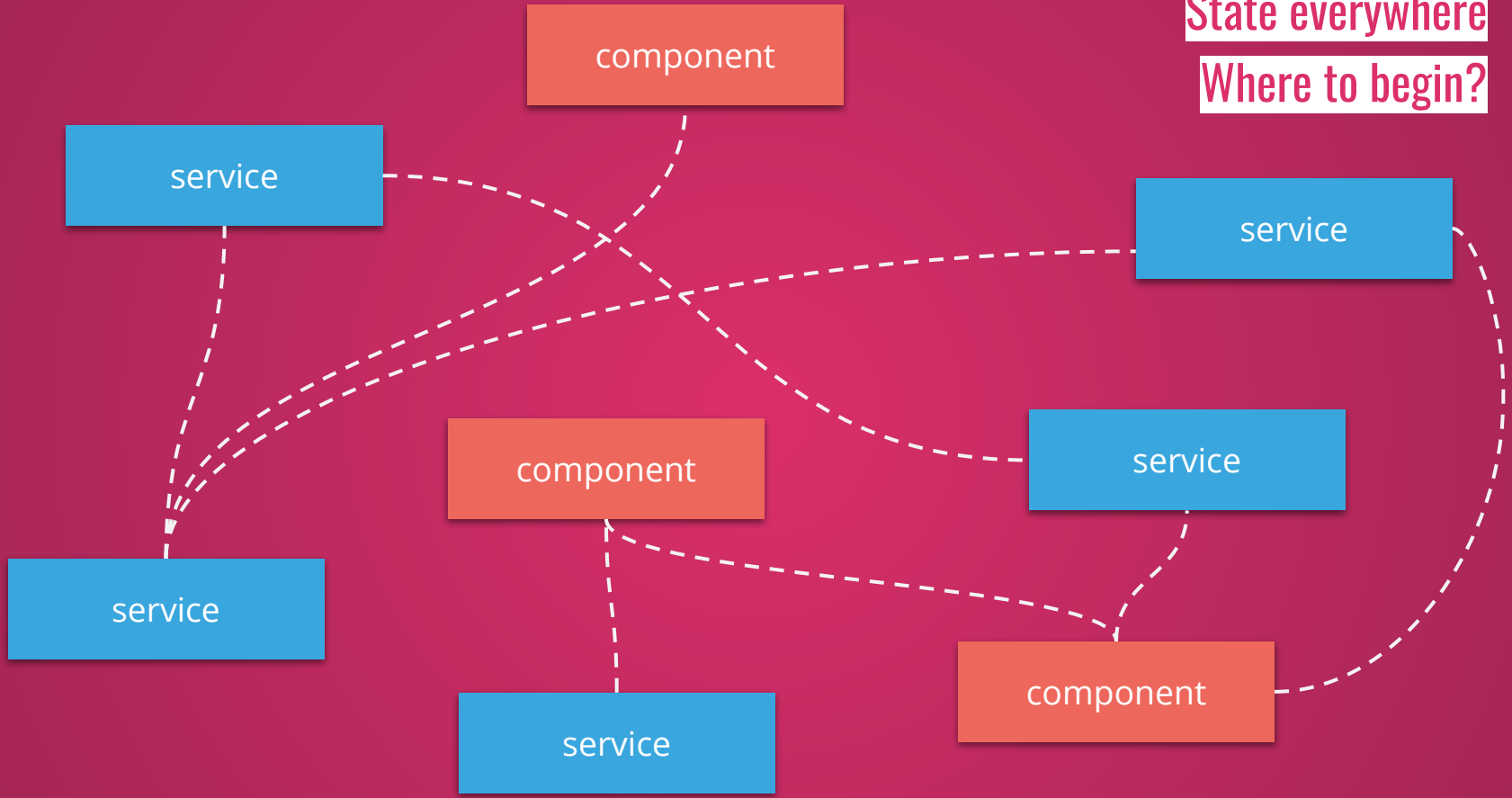
```
<div (keydown.control.z)="undo()"
     (keydown.control.shift.z)="redo()”>
</div>
```

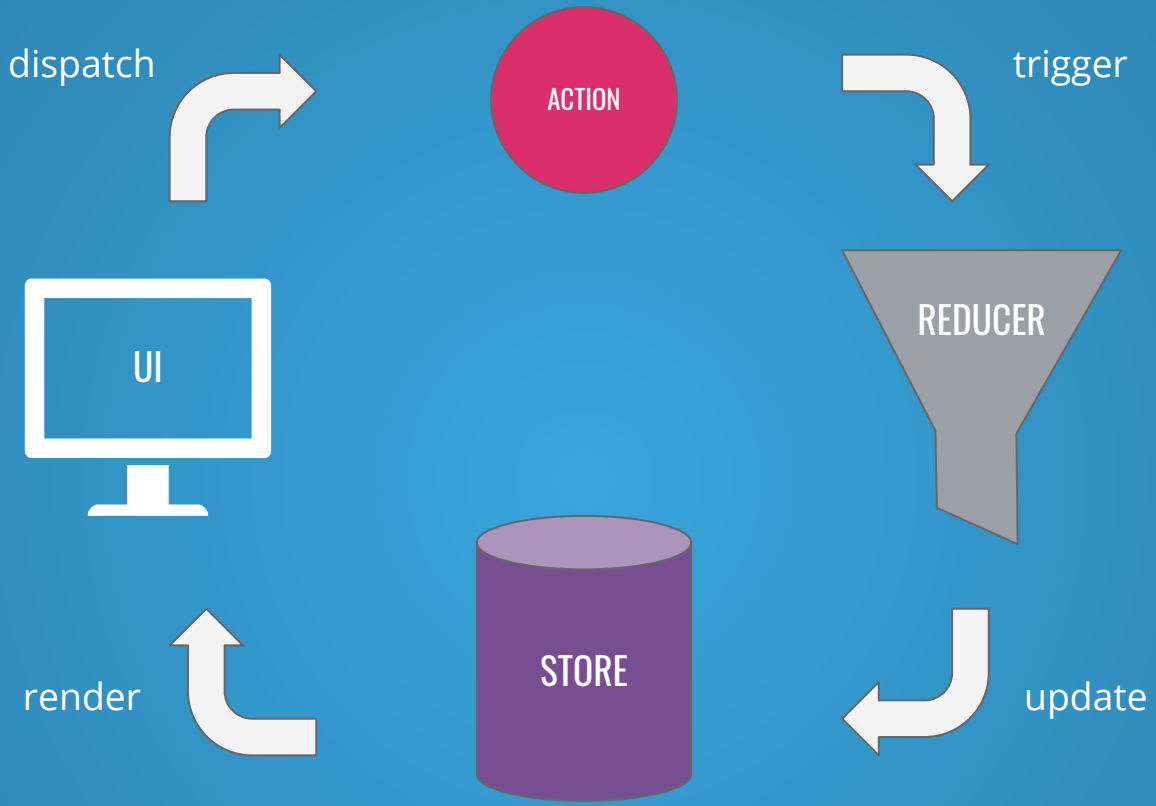
Recommended Read
Keyboard Shortcuts in Angular -- Netanel Basal

```
shortcut$ = createEffect(() =>
    fromEvent(document, ‘keydown’)
        .pipe(...)
)
```

State everywhere

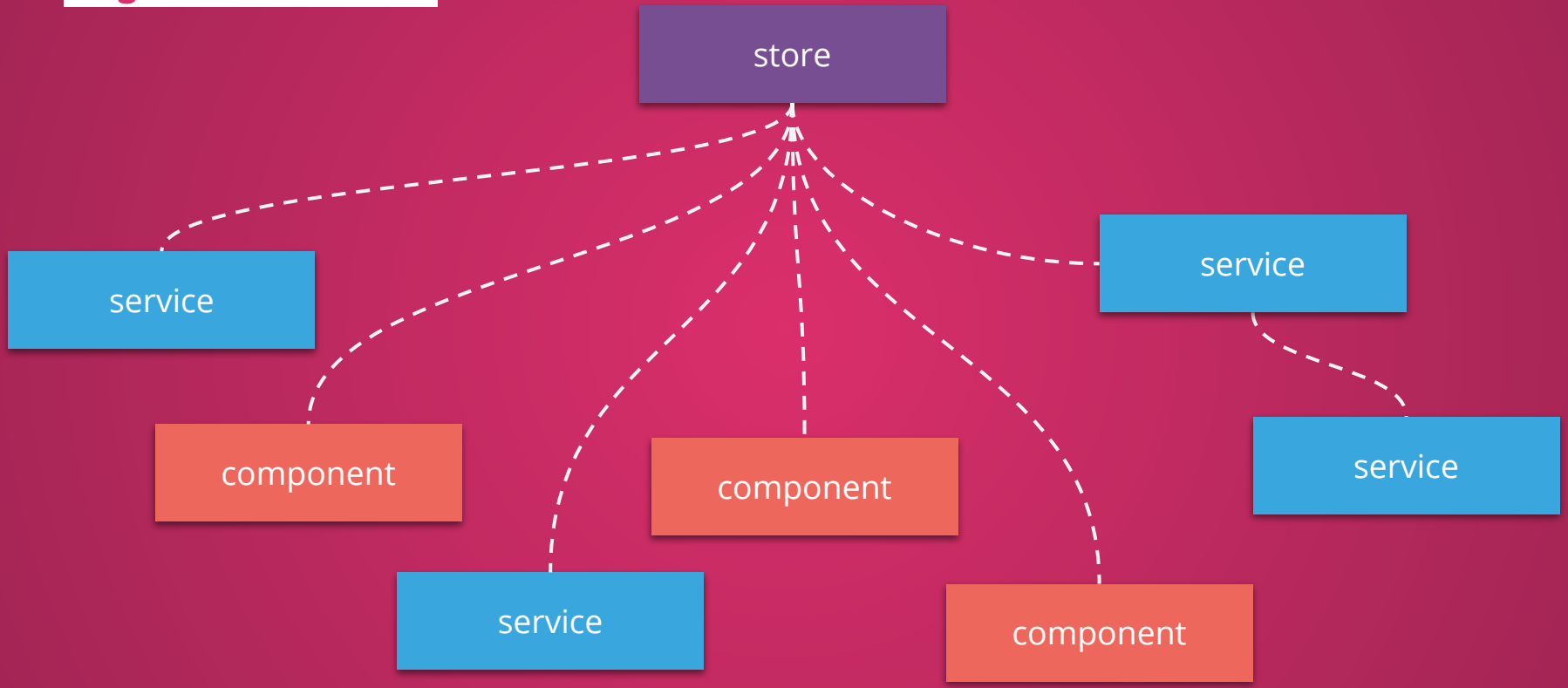
Where to begin?



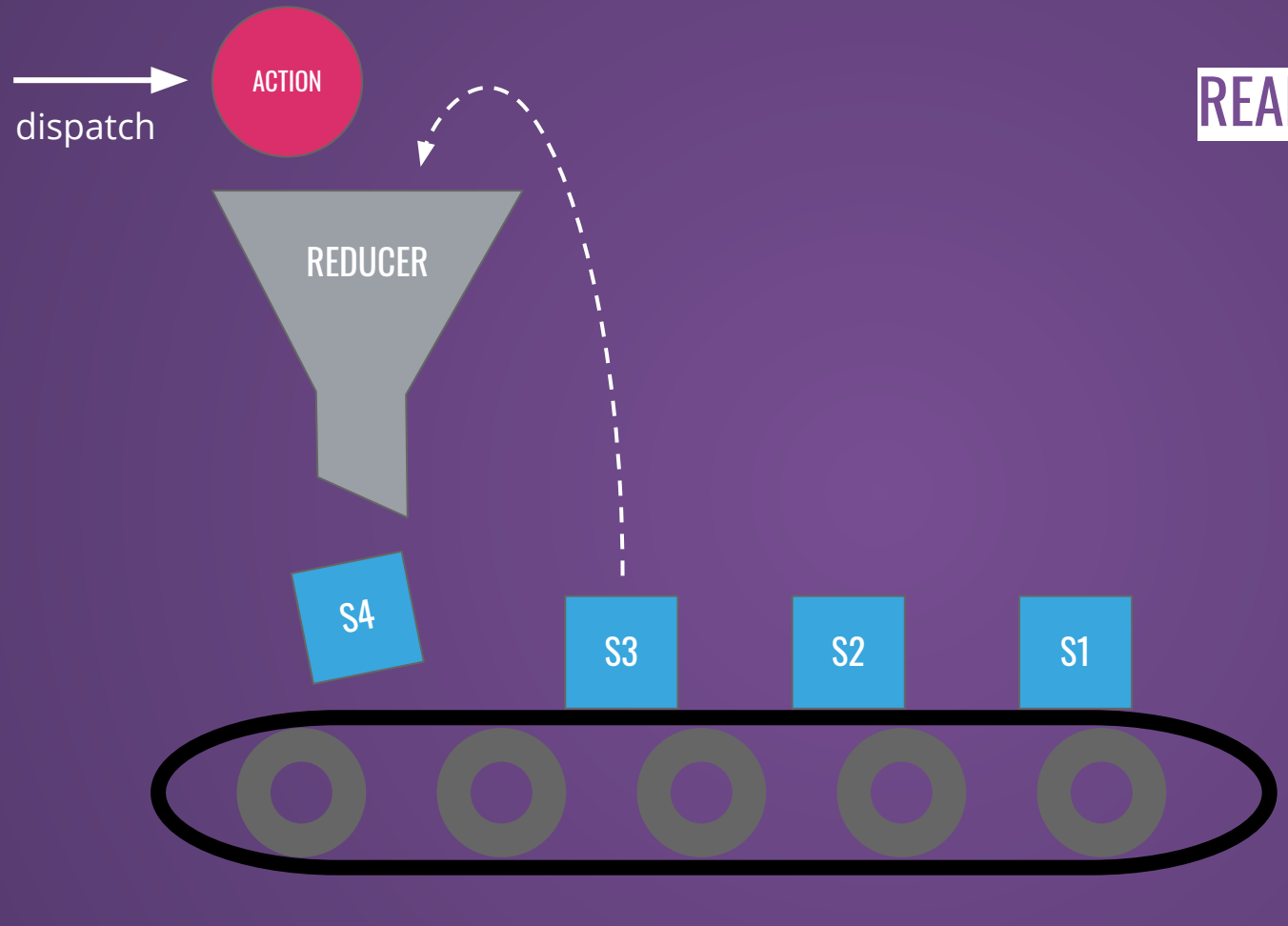


REDUX / NGRX ARCHITECTURE

Single Source of Truth



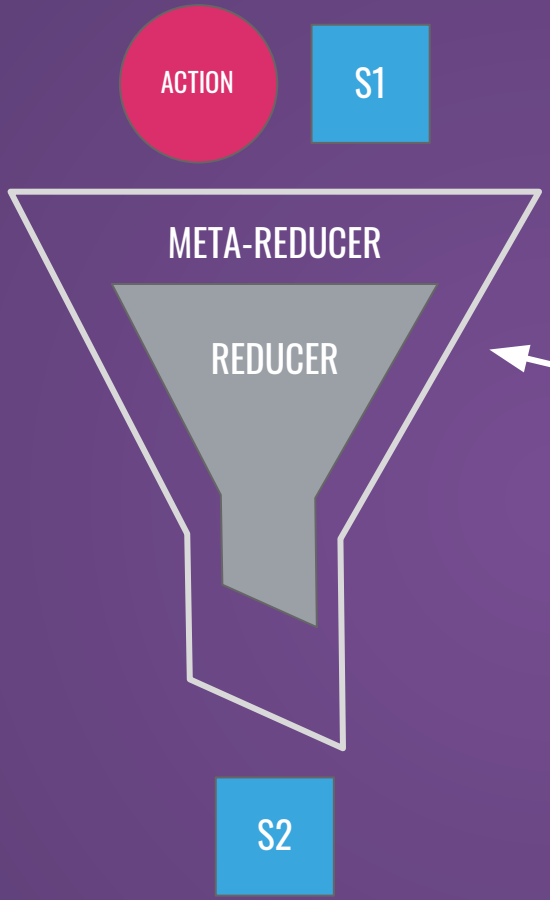
READ-ONLY STATES



Services
Components

Undo-Redo
History?

PURE FUNCTIONS



Put Undo-Redo
Logic here

```
interface History {
  past: Array<State>
  present: State
  future: Array<State>
}
```

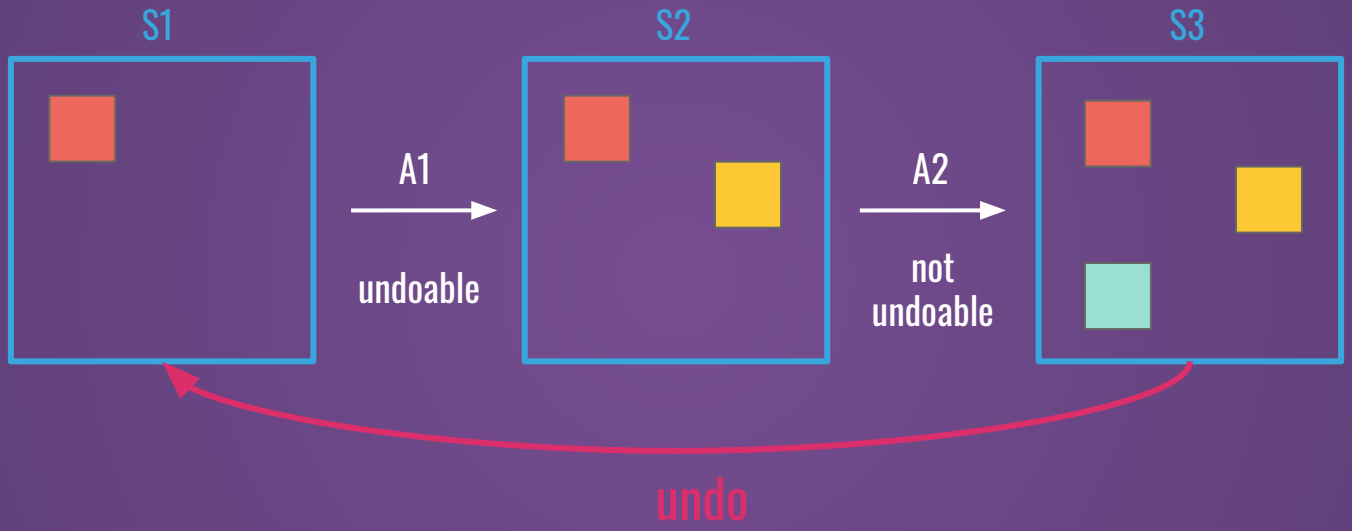
```
default:
  const newPresent = reducer(state, action)
  history = {
    past: [history.present, ...history.past],
    present: newPresent,
    future: [] // clear future
  }
  return newPresent
```

```
case 'UNDO':
  const previous = history.past[0]
  const newPast = history.past.slice(1)
  history = {
    past: newPast,
    present: previous,
    future: [history.present, ...history.future]
  }
  return previous
```

HISTORY OF STATES

HISTORY OF STATES

- 👍 intuitive implementation
- 👍 most libraries do this
- 👎 it can get big
- 👎 it’s all or nothing



ALL OR NOTHING: GOING BACK MEANS LOSING THE GREEN SQUARE

HISTORY OF STATES

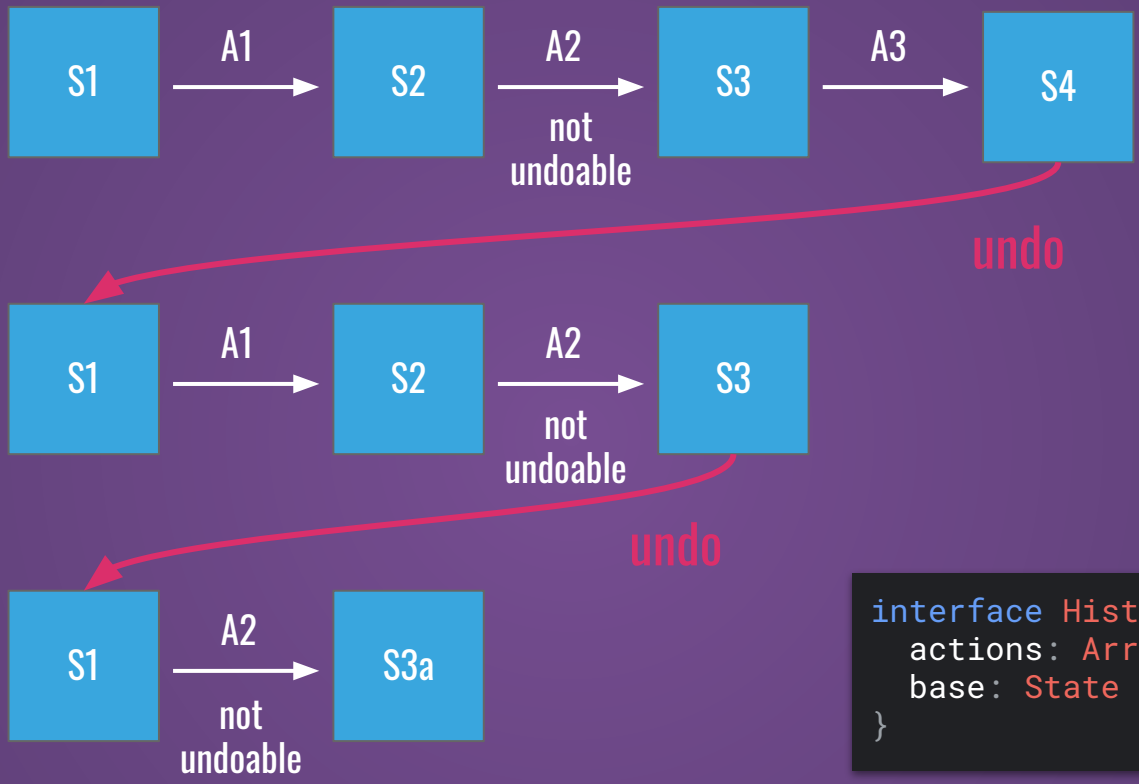
👍 intuitive implementation

👍 most libraries do this

👎 it can get big

👎 it’s all or nothing

⚠️ careful reducer composition required




```
interface History {
  actions: Array<Action>
  base: State
}
```

HISTORY OF ACTIONS

```
interface History {
  actions: Array<Action>
  base: State
}
```

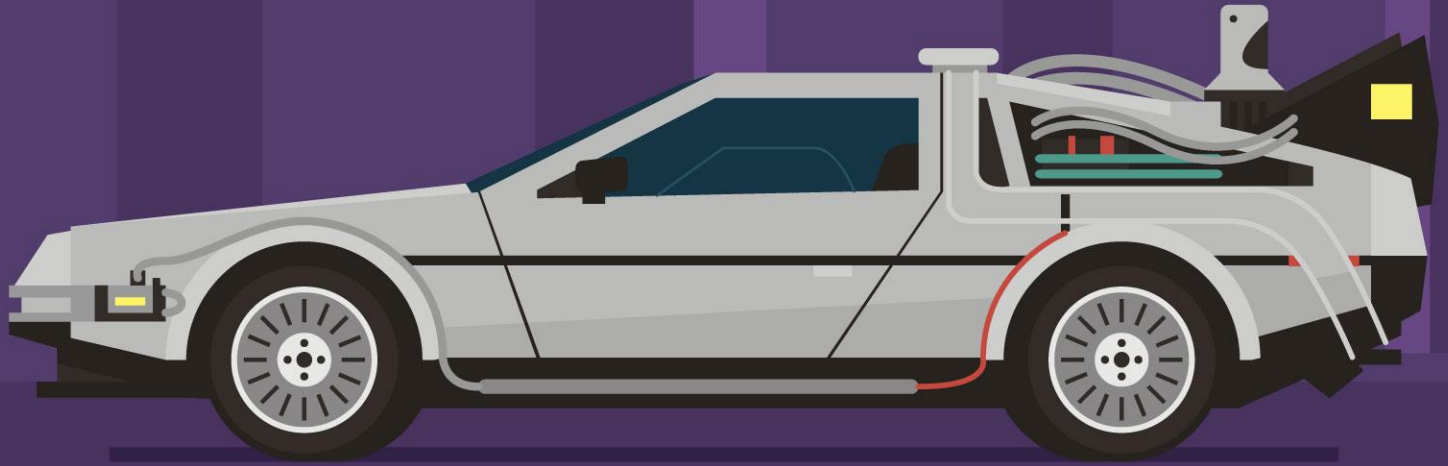
```
const lastState = history.actions
    .slice(0, -1) // every action except the last one
    .reduce(
        (state, action) => reducer(state, action),
        history.base
    )
```

HISTORY OF ACTIONS

HISTORY OF ACTIONS

- 👍 actions < states
- 👍 ignore some actions
- 👎 tricky implementation
- 👎 expensive recalculation

There’s another way back to the future



Delorean Vectors by Vecteezy

```
// initial state
const state = { "firstname": "John" }

// JSON Patch representing what reducer did to change the state
const patch = [
  { "op": "add", "path": "/lastname", "value": "Doe" }
]

// result state when applying patch to S1
const next = { "firstname": "John", "lastname": "Doe" }
```

JSON Patch

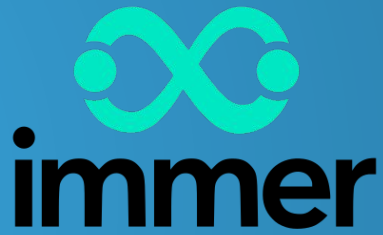
```
// result state from before
const next = { "firstname": "John", "lastname": "Doe" }

// JSON Patch representing the reverse
// of what reducer did to change the state
const inversePatch = [
  { "op": "remove", "path": "/lastname" }
]

// resulting initial state when applying inversePatch to S2
const state = { "firstname": "John" }
```

Inverse JSON Patch

immer

COPY-ON-WRITE

```
import produce, {applyPatches} from "immer"

const state = { "firstname": "John" }

let undoPatches

const next = produce(
        state,
        draft => {
          draft.lastname = "Doe"
        },
        (patches, inversePatches) => {
          undoPatches = inversePatches
        }
)

const patched = applyPatches(next, undoPatches)

expect(patched).toEqual(state)
```



PATCHES WITH IMMER

HISTORY OF PATCHES

- 👍 lightweight
- 👍 ignore some actions
- 👍 feasible implementation
- 👍 no recalculation

- 👉 requires Immer

NGRX-WIEDER

- patch-based undo-redo
- ignore actions
- merge actions
- segmentation

DEMO

THANKS

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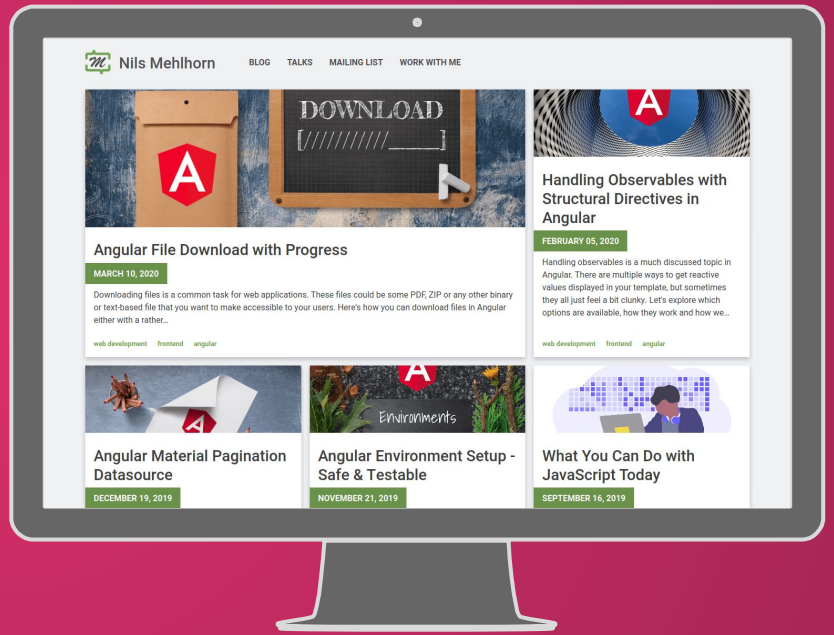

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