aarixa

> ict and business optimization

Angular Advanced
State management and @ngrx/store

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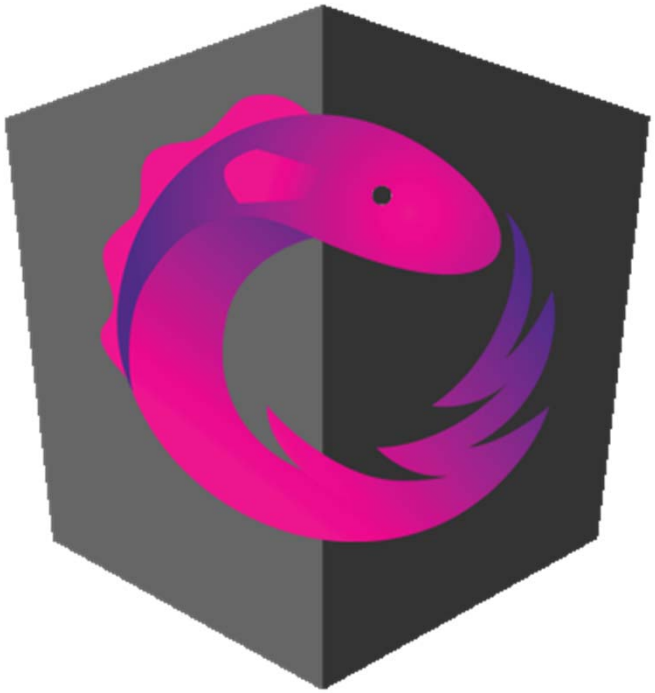
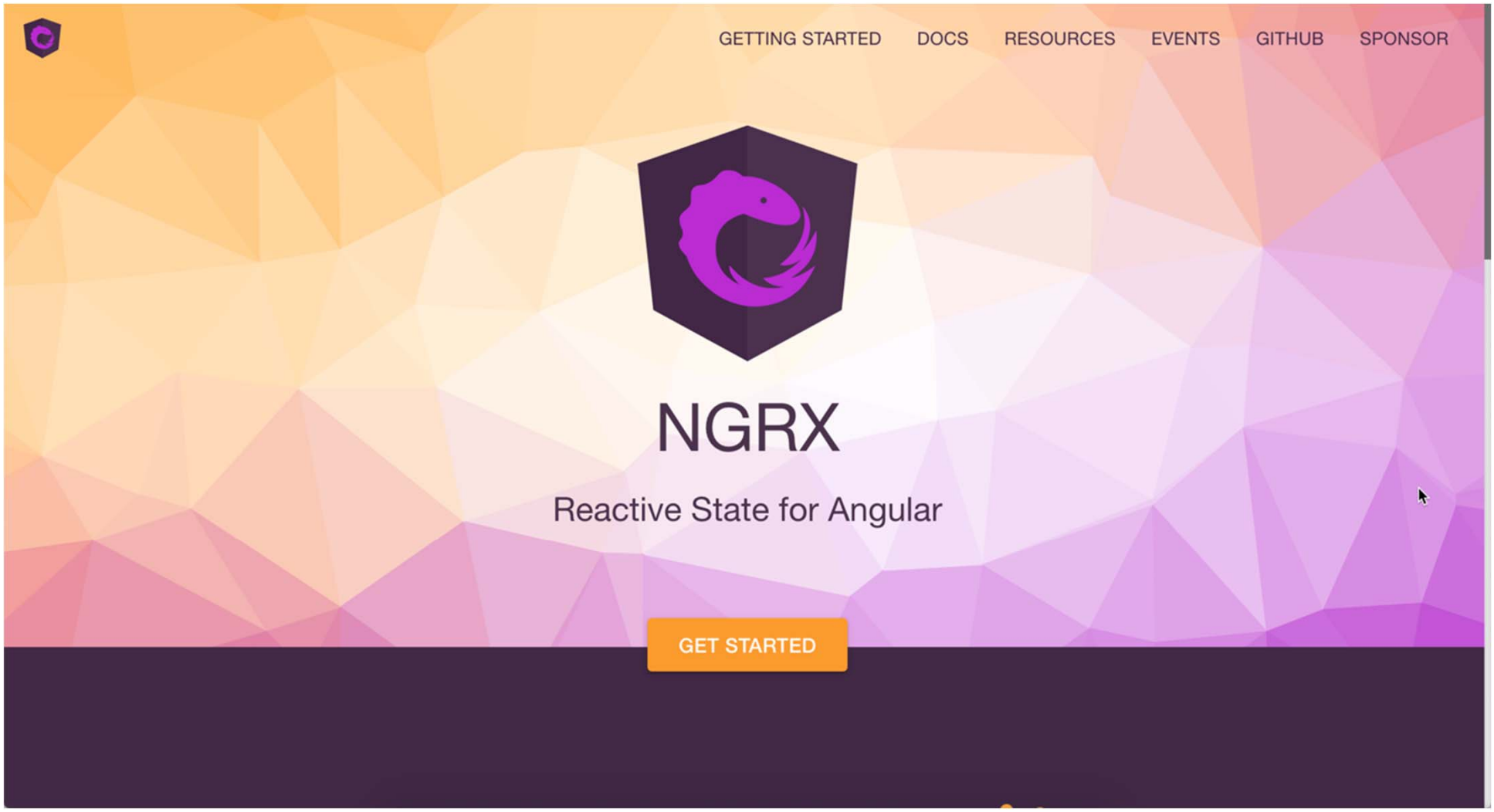
What is State Management?

- Various design patterns, used for managing *state* (data in its broadest sense!) in your application.
- Multiple solutions possible – depends on application & framework



https://ngrx.io/

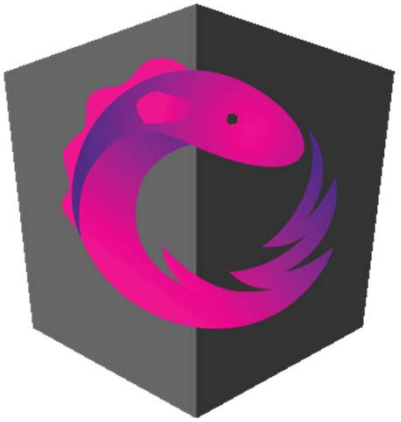


What is ngrx?

"Ngrx provides reactive state management for Angular apps inspired by Redux"

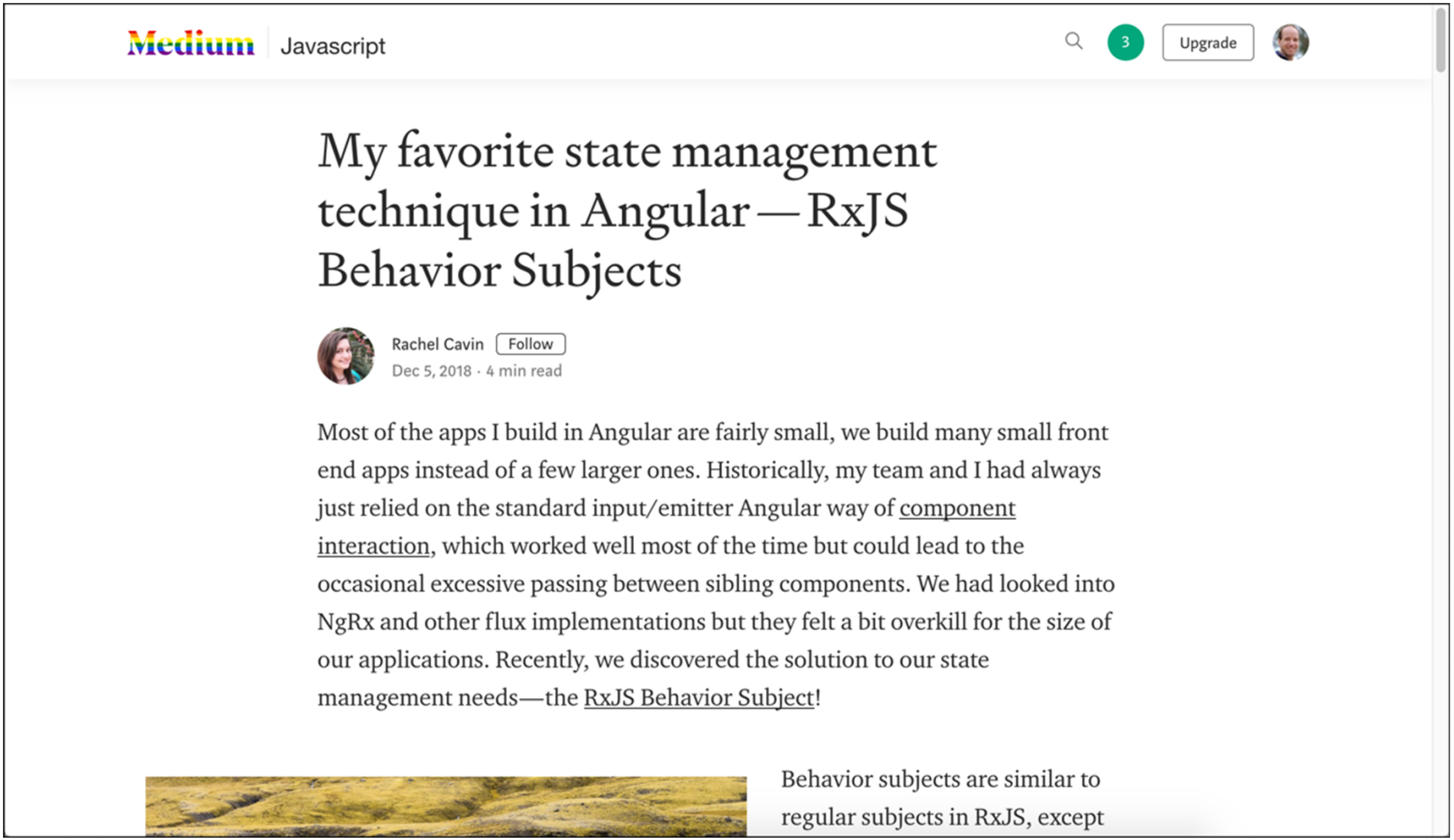
@ngrx/store – 3 generations

- Generation #1 – Angular 2
  - Creator: Rob Wormald
  - Simple implementation, (almost) all hand coded
- Generation #2 – Angular 4-7
  - Action Creators, custom payload
  - `@Effects`
- Generation #3 – Angular 8+
  - `createAction()`, `createReducer()` and more
  - (they try to make it) less complex…
  - …if you know the principles and where to look



Maybe you don’t need a store…

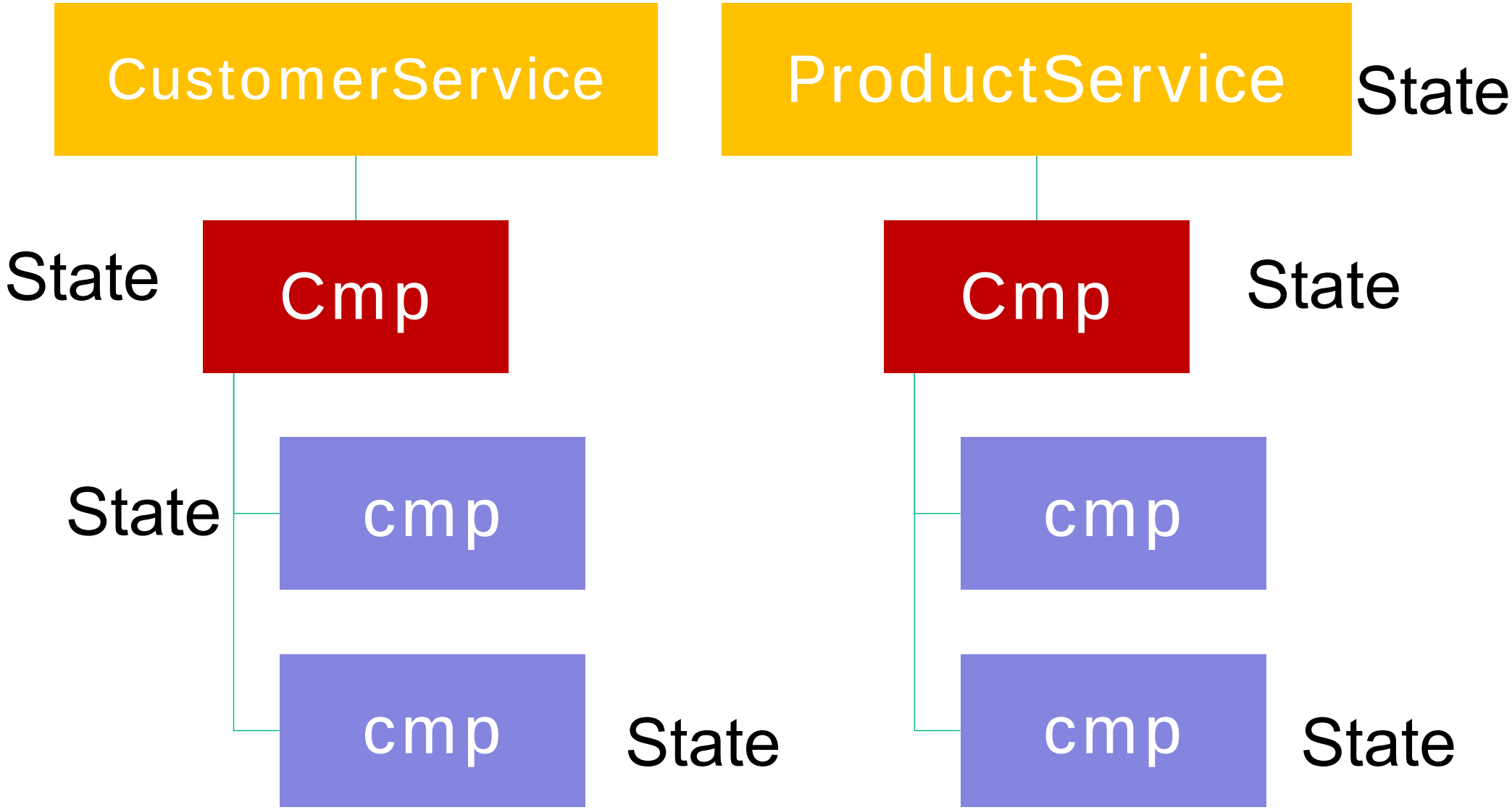
- https://medium.com/@rmcavin/my-favorite-state-management-technique-in-angular-rxjs-behavior-subjects-49f18daa31a7



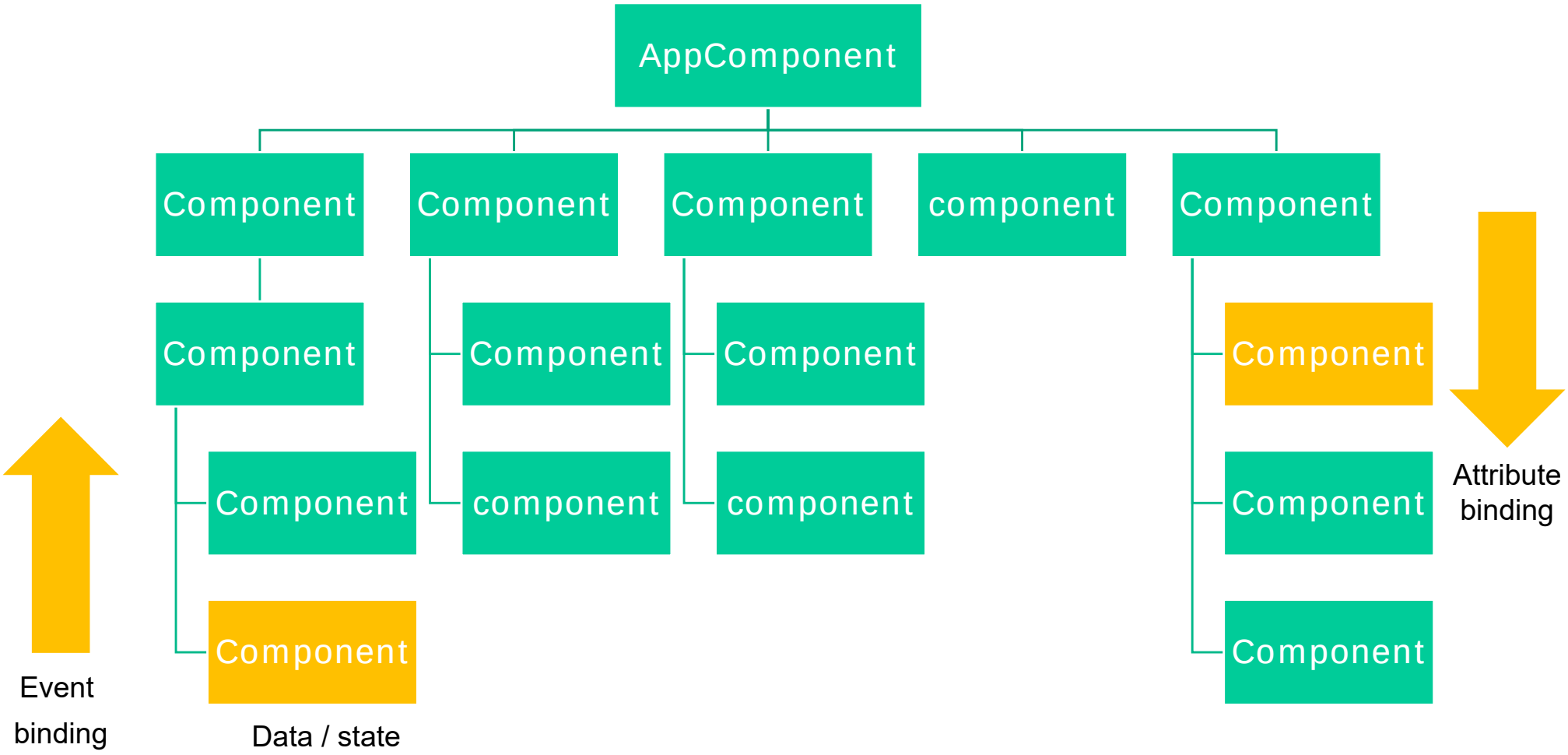
Why state management?

Why on earth would you need/want a Store ?

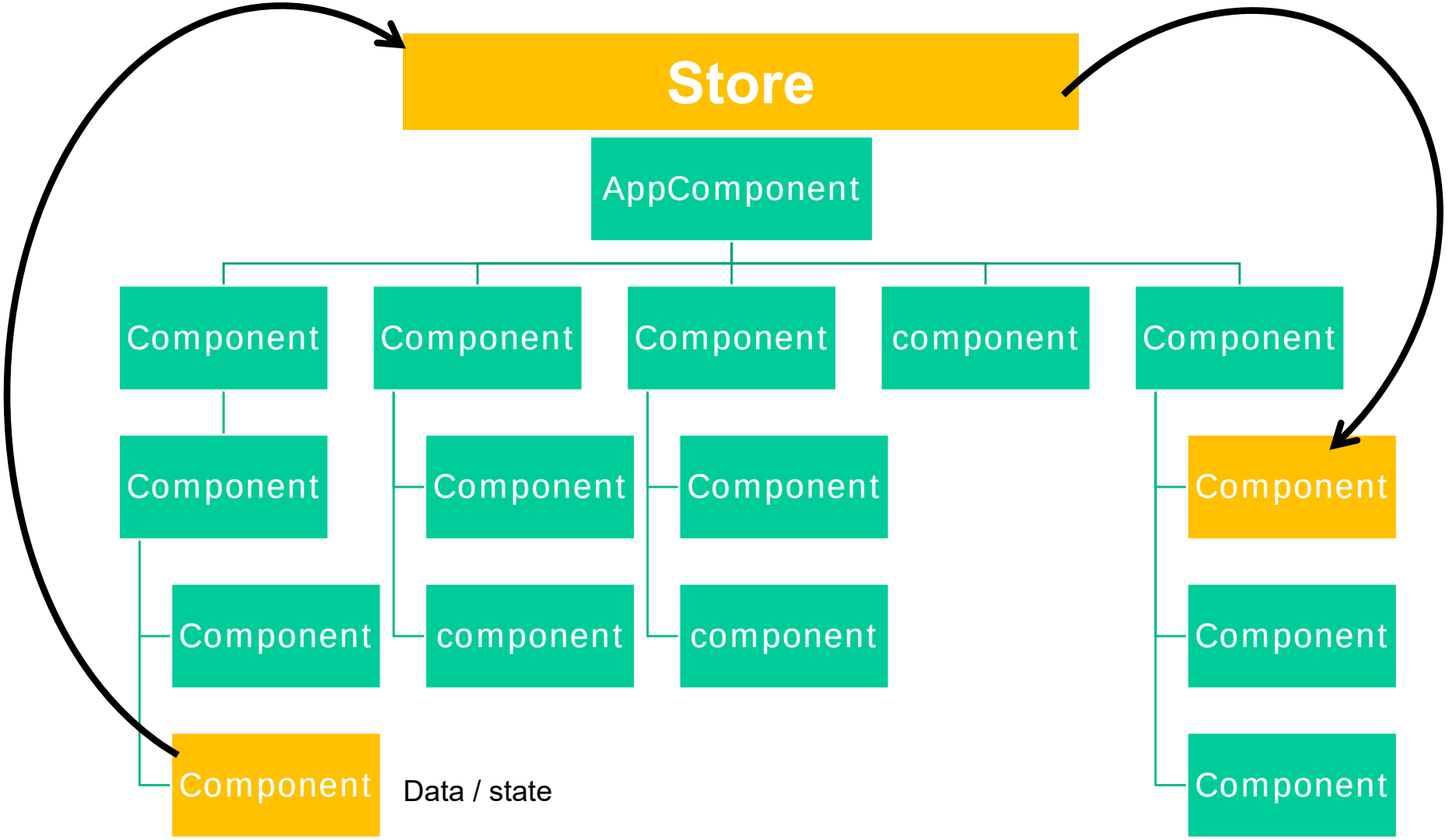
State management without a store



Data flow in complex applications



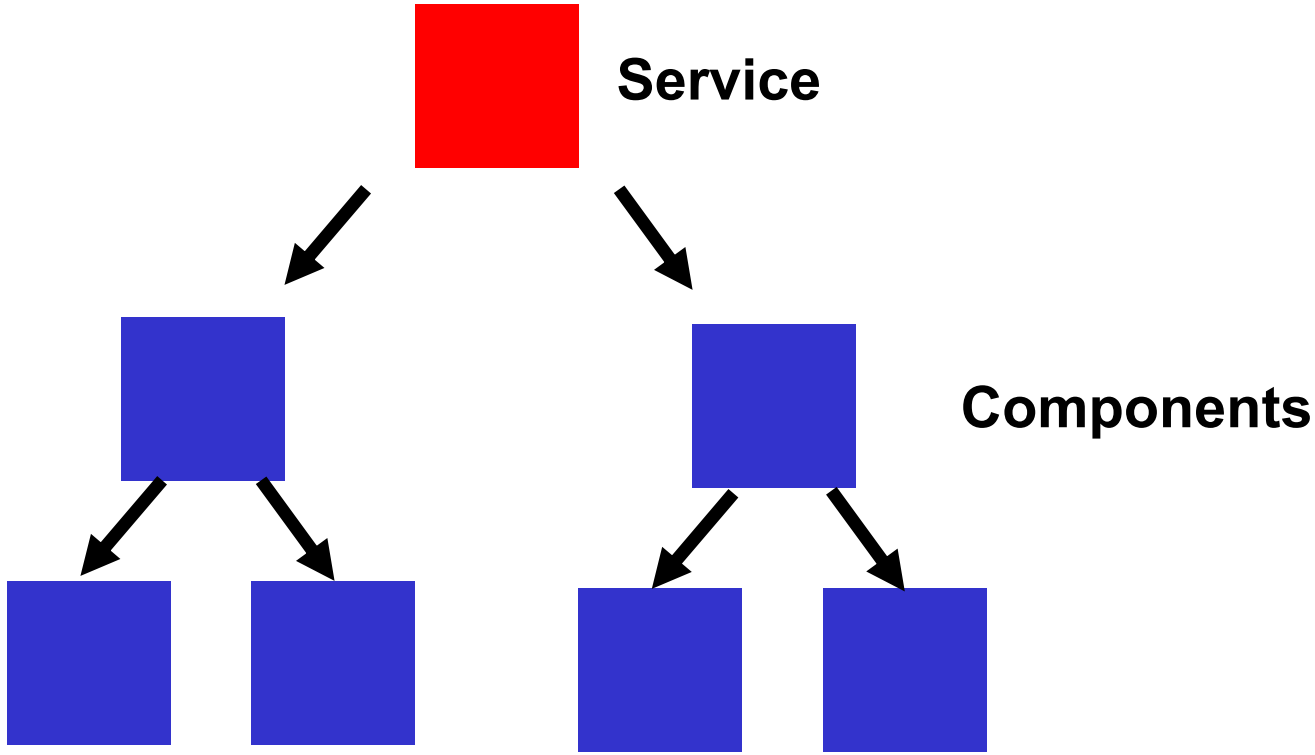
State management *with* a store



Benefits of using a store

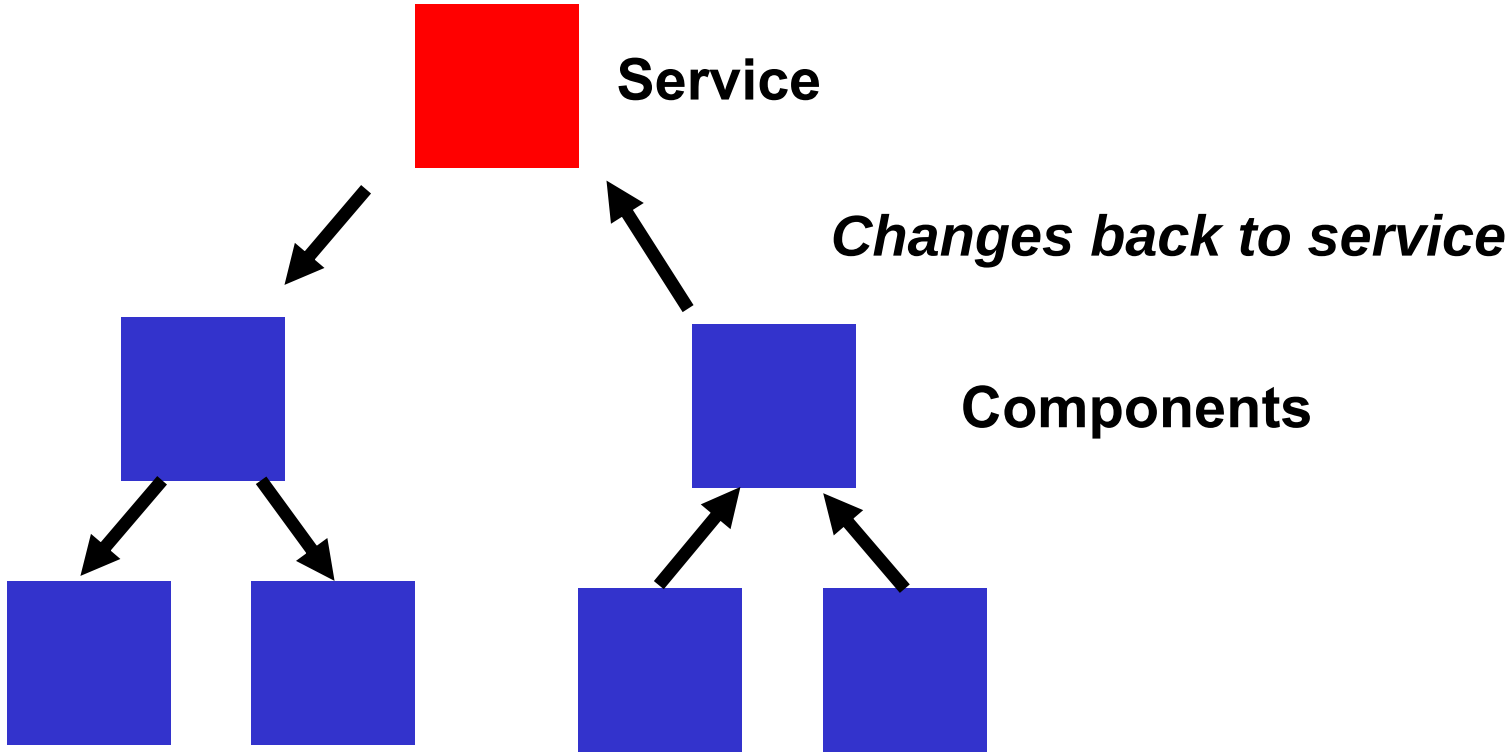
- State is only changed in a controlled way
- Component state is also driven from the store
- Based on immutable objects – b/c they are predictable
- In Angular – immutability is fast
  - Because no changes can appear, no change detection is needed!
- Developer tools available to debug and see how the store changes over time
  - “Time travelling Developer tools”

Store architecture - #2 - traditional

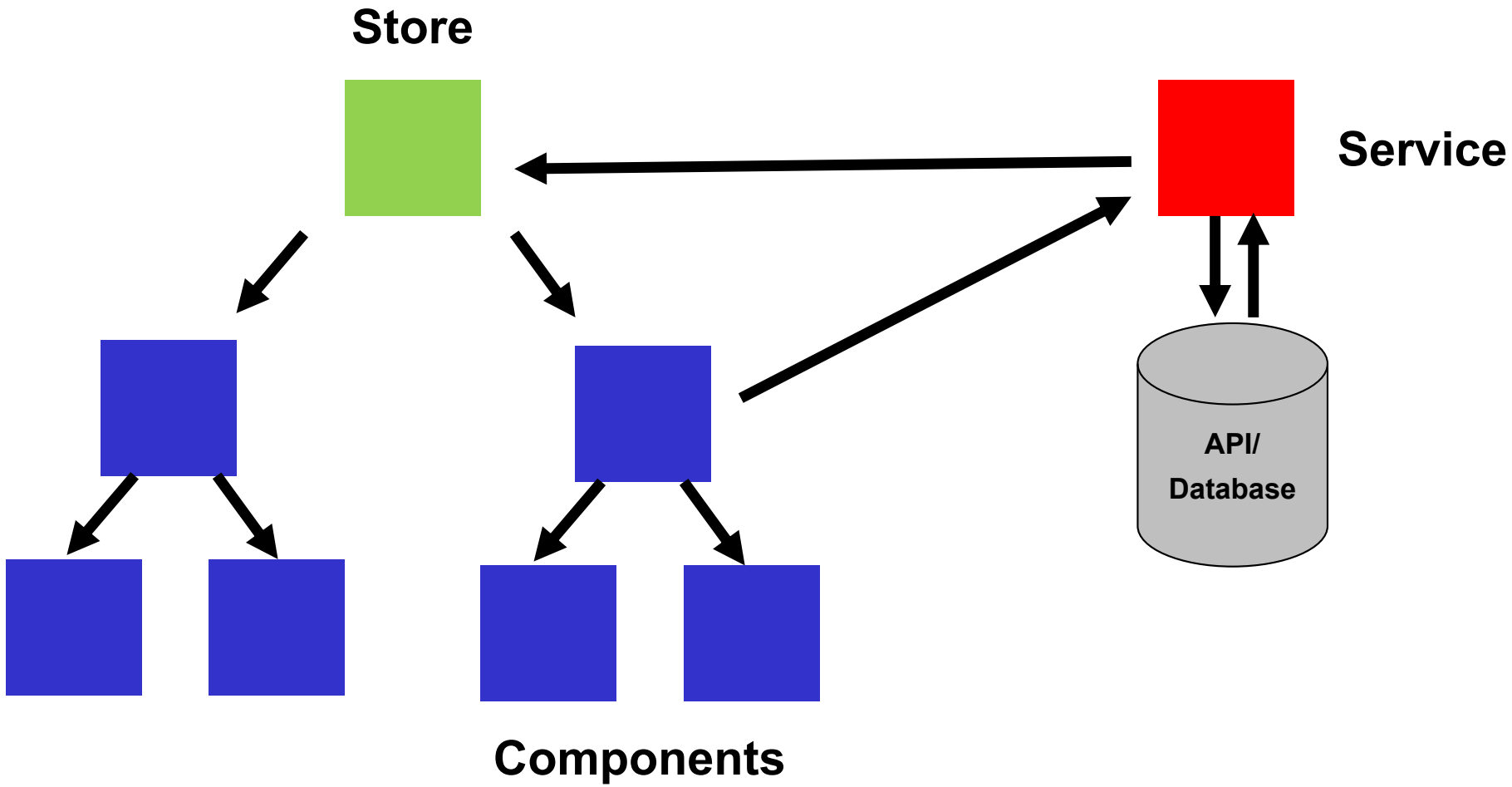


https://ultimateangular.com/angular-pro

Store architecture - #2



Store architecture - #2 with a store



Angular State Management

- Simple applications - In the component
  - `counter : number = 0;`
  - `this.counter += 1;`
- Intermediate applications - In a service
  - `counter : number = 0;`
  - `this.counter = this.counterService.increment(1);`
  - Cache `counter` value in the service

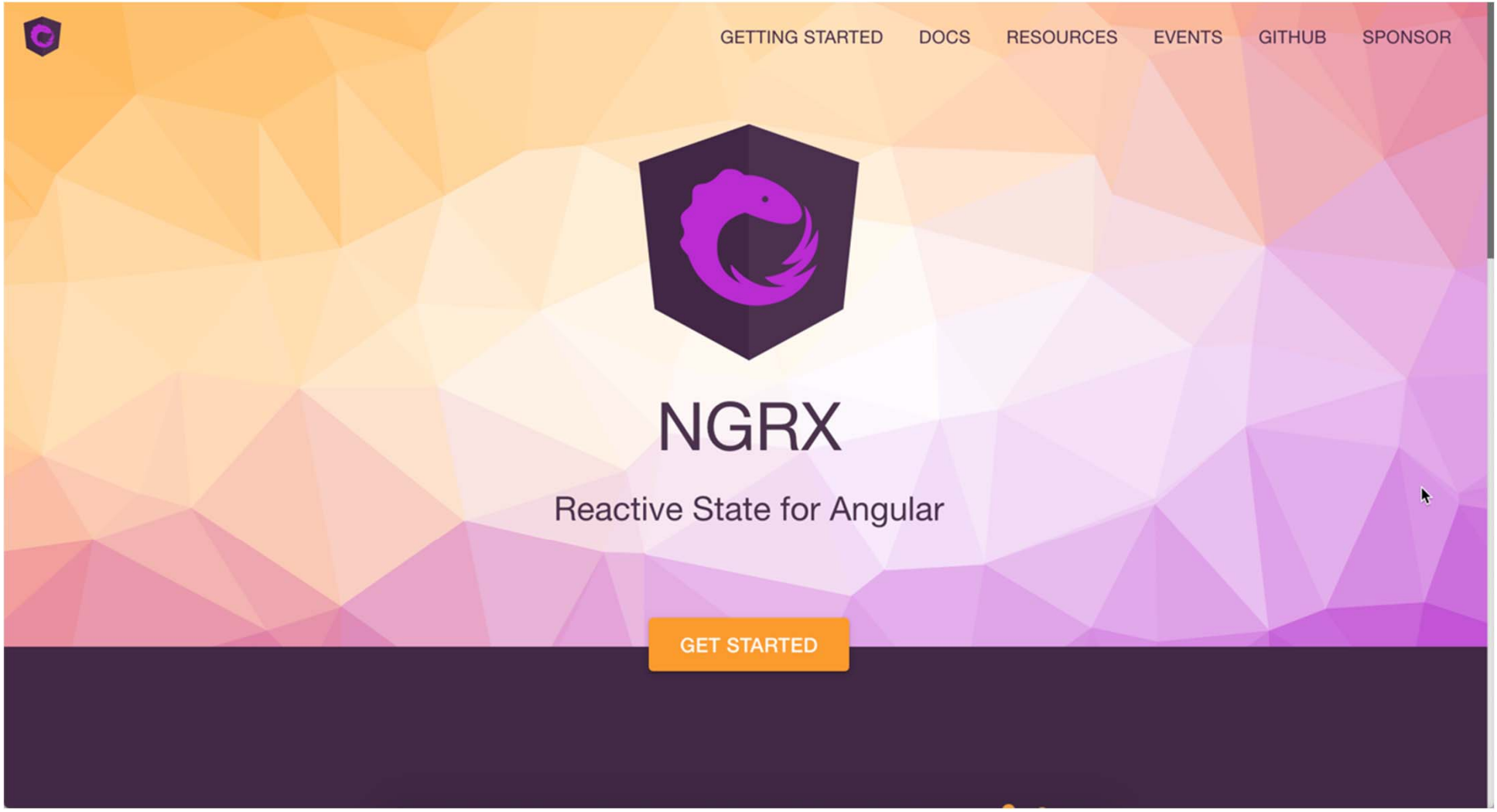
- Larger applications - In a data store – all based on observables

```
counter$: Observable<number>;

constructor(private store: Store<State>){
        this.counter$ = store.pipe(
           select('counter’)
        );
}

increment(){
        this.store.dispatch(counterIncrement());
}
```

@ngrx/store Terminology and concepts

Working with `@ngrx/store`, the officially endorsed state management library for Angular

https://ngrx.io/



Important Store terminology / concepts

Store

“The store can be seen as your client side database. But more importantly, it reflects the state of your application. You can see it as the single source of truth.”

“The store holds all the data. You modify it by dispatching ***actions*** *to it.”*

Actions

*“Actions are the payload that contains needed information to alter your store. Basically, an action has a **type** and a **payload** that your reducer function will take to alter the state.”*

Reducer

“Reducers are functions that know what to do with a given action and the previous state of your app.

Reducers will take the previous state from your store and apply a pure function to it. From the result of that pure function, you will have a new state. The new state is put in the store.”

Dispatcher

"Dispatchers are simply an entry point for you to dispatch your action. In Ngrx, there is a dispatch method directly on the store. I.e., you call `this.store.dispatch({…})`"

Source: https://www.toptal.com/angular-js/ngrx-angular-reaction-application

Reducers, Store and Components - The complete picture

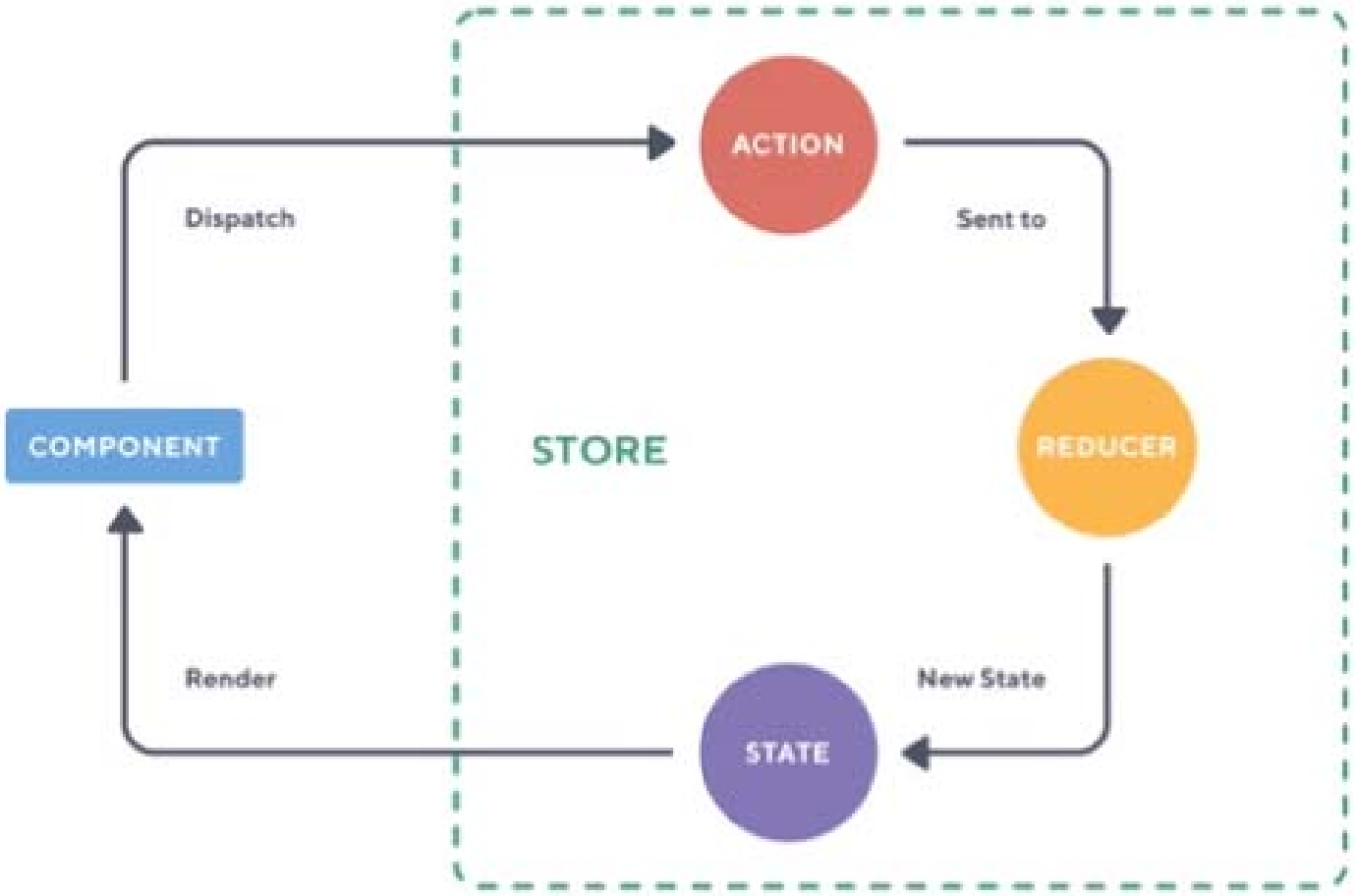
The **Component** first dispatches an Action. When the **Reducer** gets the Action, it will update the state(s) in the **Store**.

The Store has been injected to the Component, so the View will update based on the store state change (it is `subscribed`).

https://hongbo-miao.gitbooks.io/angular2-server/content/part4/add-ngrx-store.html

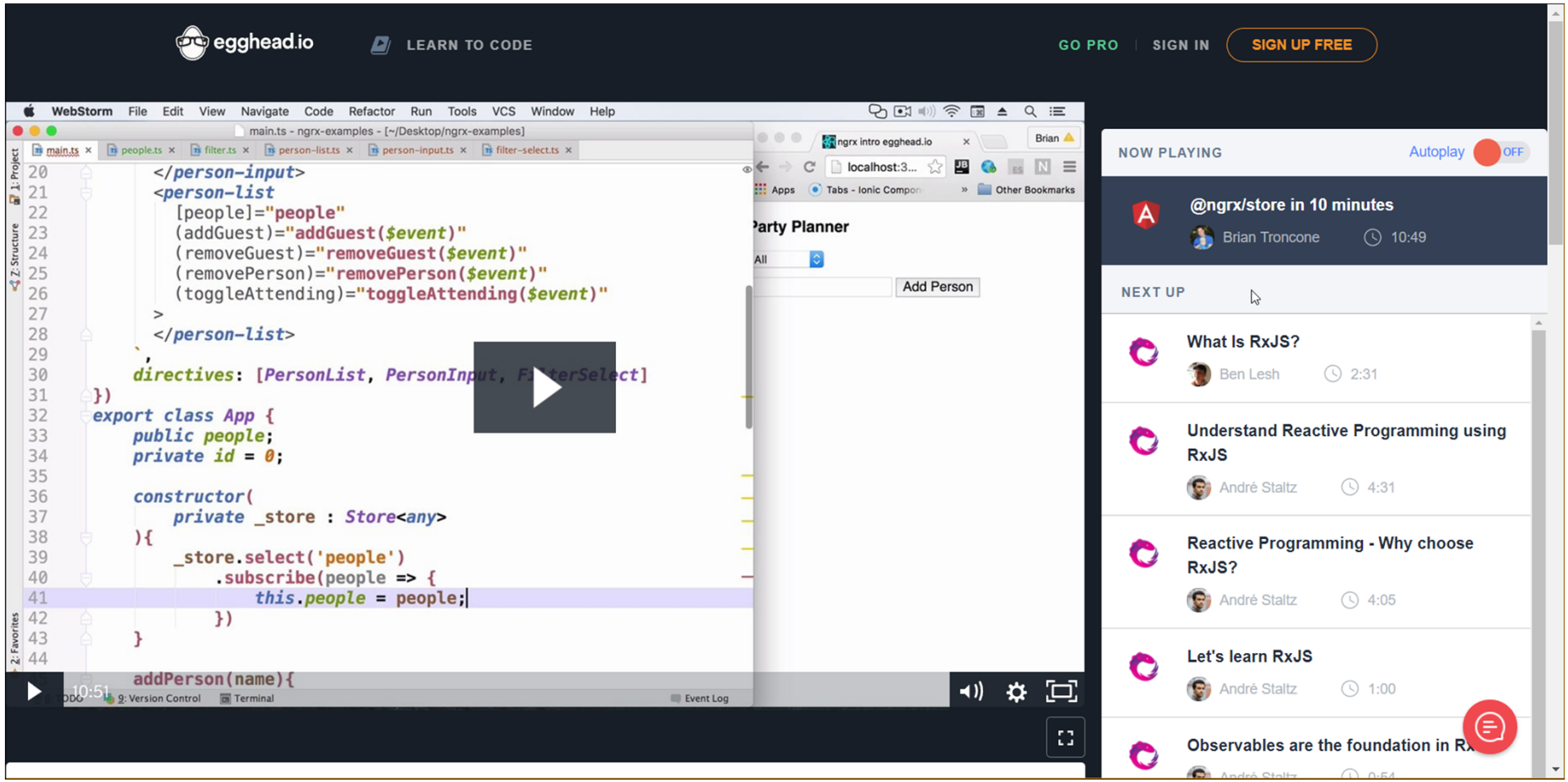
REDUX ARCHITECTURE

One-way dataflow



https://platform.ultimateangular.com/courses/ngrx-store-effects/lectures/3788532

Store concepts in a video (a little bit old now)



https://egghead.io/lessons/angular-2-ngrx-store-in-10-minutes

Setting up @ngrx/store

- Install core files & store files
- Create new project or add to existing project
- Via `npm install` or `ng add`
- Older versions have different installations!

```
npm install @ngrx/store --save
```

OR

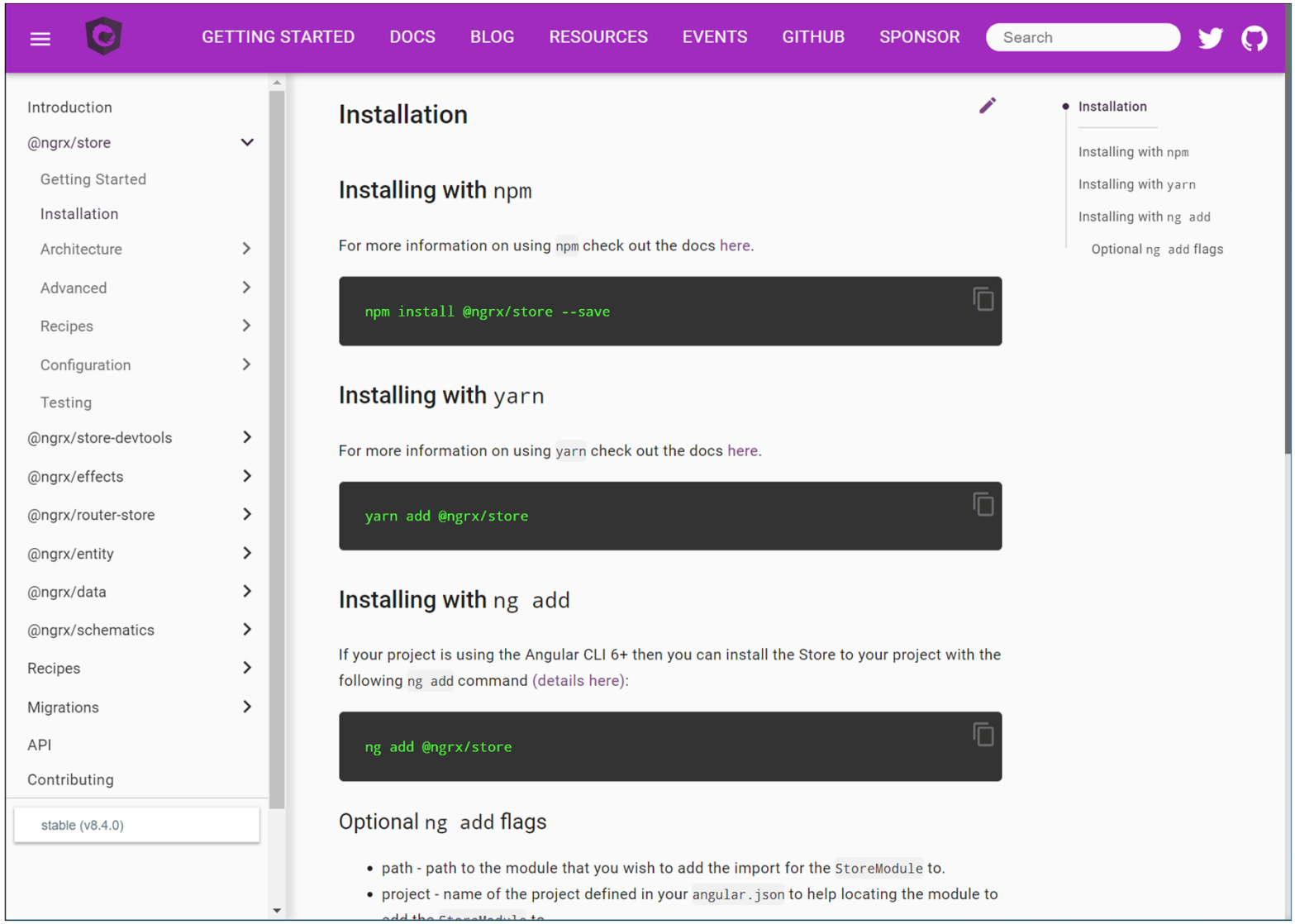
```
ng add @ngrx/store
```

Adding via Angular CLI

- **`ng add @ngrx/store`**
- Option flags, see https://ngrx.io/guide/store/install

- Adding via Angular CLI will do the following
  - Update dependencies in `package.json` and `npm install`
  - Create `src/app/reducers` folder.
  - Create `src/app/reducers/index.ts` file with an empty `State` interface, an empty reducers map, and an empty metaReducers array.
  - Update `src/app/app.module.ts`.

Installation docs



https://ngrx.io/guide/store/install

Creating your first store

Set up a simple store – explaining all the concepts

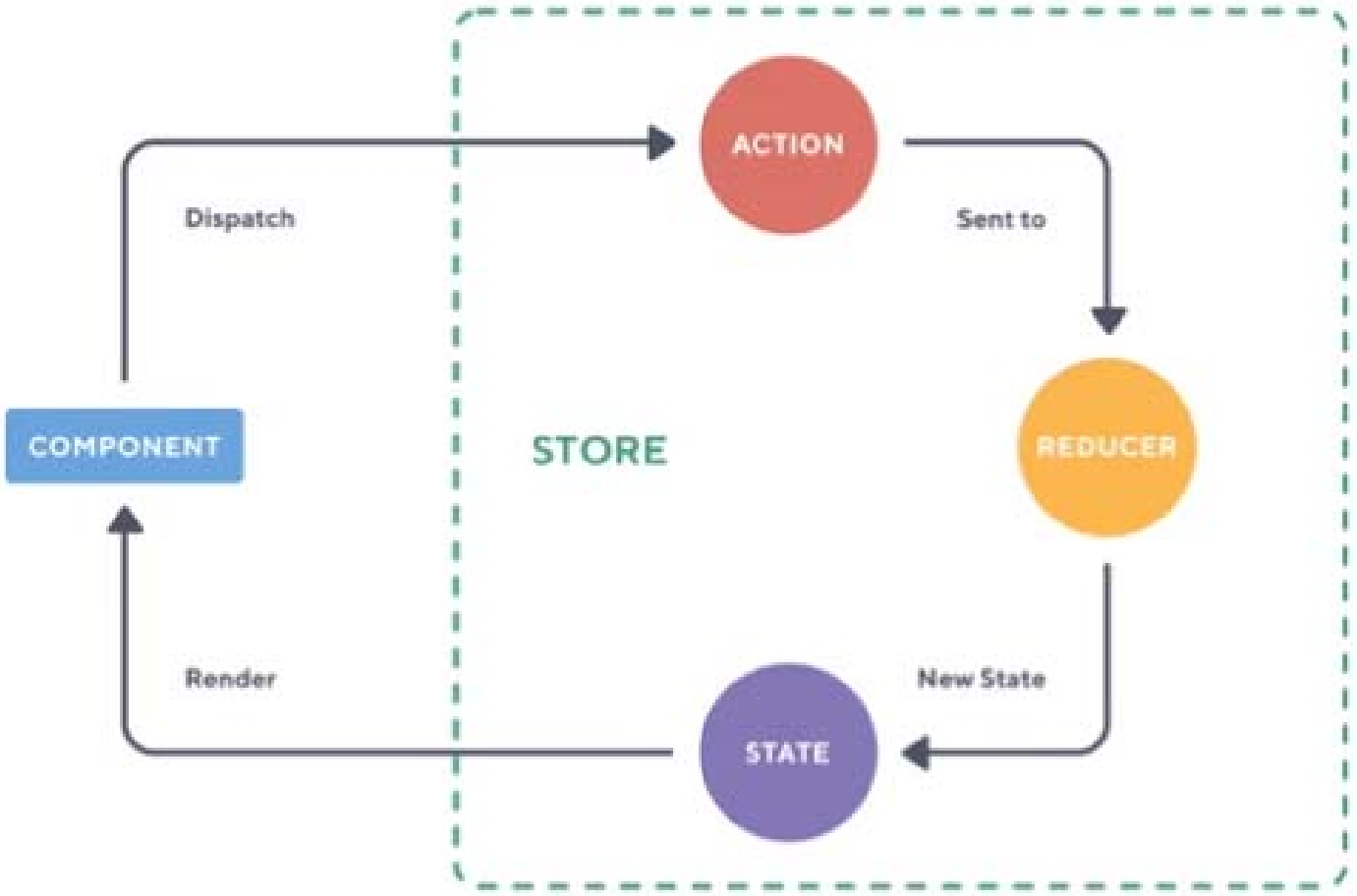
Step 0 – install core files

- We’re adding the store manually to explain all concepts

```
npm install @ngrx/store --save
```

REDUX ARCHITECTURE

One-way dataflow

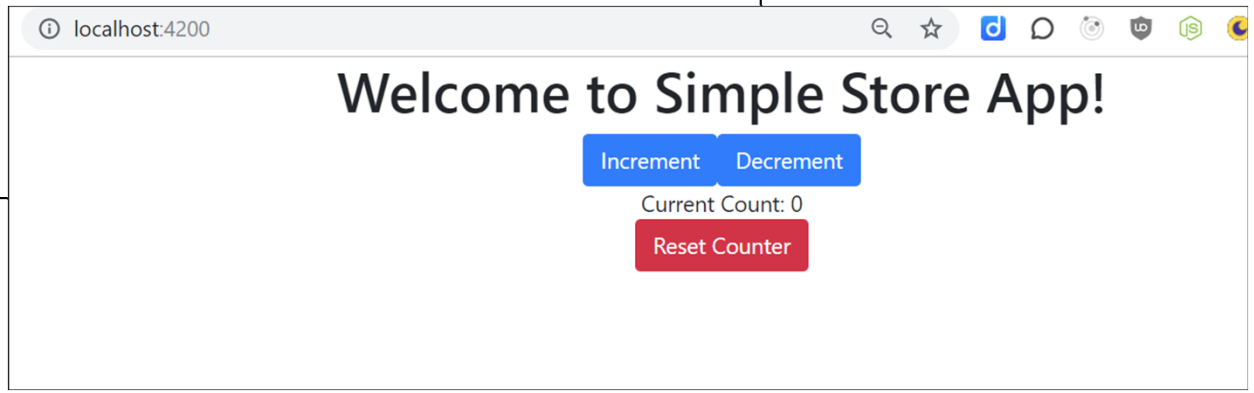


https://platform.ultimateangular.com/courses/ngrx-store-effects/lectures/3788532

Start somewhere, then work clockwise

- 1. For instance, first create a **component**

```
<!-- Simple Component, holding a counter store -->
<div>
  <h1>
    Welcome to {{ title }}!
  </h1>
  <button (click)="increment()">Increment</button>
  <button (click)="decrement()">Decrement</button>
  <div>Current Count: {{ count$ | async }}</div>

  <button class="btn btn-danger" (click)="reset()">
    Reset Counter
  </button>
</div>
```



2. Create your actions

- Create a new file, `../store/counter.actions.ts`
- The architecture can be complex, with nested (sub) folders etc, but it doesn't matter for the internals

```
// counter.actions.ts - the Actions for our counter
import {createAction} from '@ngrx/store';

// export our actions as constants
export const increment = createAction('COUNTER - increment');
export const decrement = createAction('COUNTER - decrement');
export const reset = createAction('COUNTER - reset');
```

3. Create your reducers

- A reducer is simply an exported function with a name.
- It takes two parameters:
  - Current `state`, or otherwise empty object/initial state
  - `action`, of type `Action`
- We're going to create more complex actions, with `payload` later on
- You'll need the exported reducer function to support AOT-compiling
- https://ngrx.io/guide/store/reducers

```
// Import store stuf and available actions
import {Action, createReducer, on} from '@ngrx/store';
import {decrement, increment, reset} from './counter.actions';

// Initial state: counter=0
export const initialState = 0;

// Internal variable/function with reducers. It receives a state from
// the actual (exported) counterReducer below
const reducer = createReducer(initialState,
  on(increment, state => state + 1),
  on(decrement, state => state - 1),
  on(reset, state => 0)
);


// The exported reducer function is necessary
// as function calls are not supported by the AOT compiler.
export const counterReducer = (state = 0, action: Action) => {
  return reducer(state, action);
};
```

4. Adding store and reducer to module

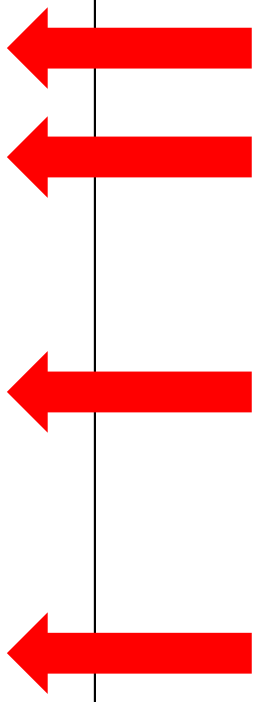
- Register the state container with your application.
- Import reducers
- Use `StoreModule.forRoot()` to add it to the module
- More complex: we can have a *map* of reducers, or child modules holding their own stores
  - `metaReducer`: https://ngrx.io/guide/store/metareducers

```
…
// 1. import store stuff
import {StoreModule} from '@ngrx/store';
import {counterReducer} from './store/counter.reducer';

@NgModule({
  declarations: [
    AppComponent,
    …
  ],
  imports: [
    BrowserModule,
    // 2. Add the StoreModule to the AppModule,
    // to make the store known inside the application
    StoreModule.forRoot({count: counterReducer}),
  ],
  providers: [],
  bootstrap: [AppComponent]
})
export class AppModule {
}
```

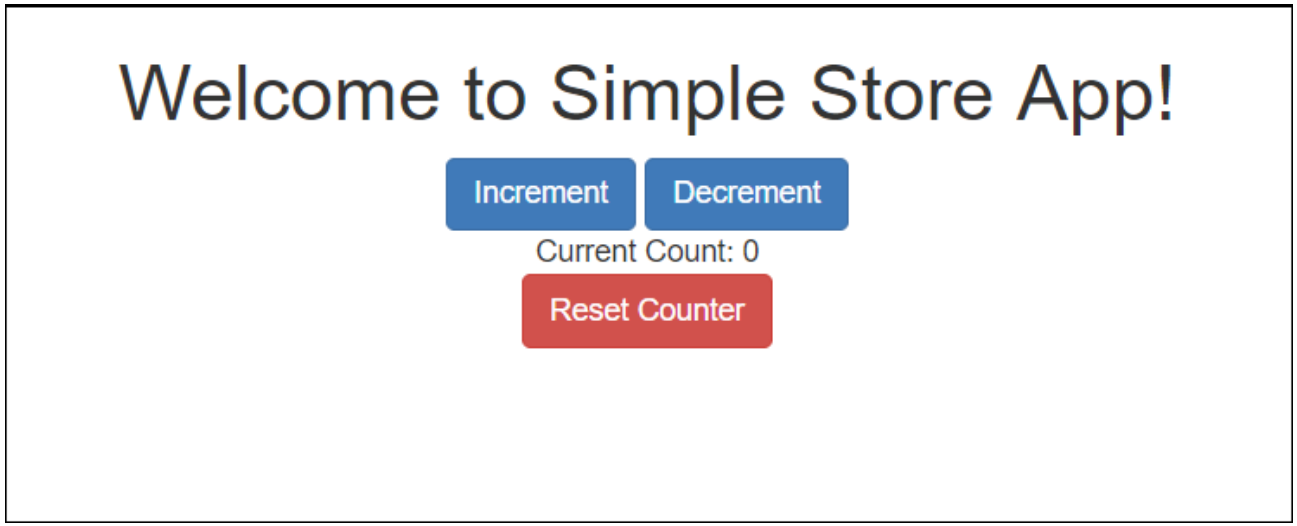
5. Using / calling the Store in component

- Import and inject the `Store` service to components
- Initialize the store with correct Type
  - More complex: create a custom `AppState` interface
- Use `store.pipe(select())` to select slice(s) of the state
- Add methods to dispatch actions
  - `increment()`
  - `decrement()`
  - `etc..`

```
// app.component.ts
import {Component, OnInit} from '@angular/core';
import {Observable} from 'rxjs';
import {Store, select} from '@ngrx/store';

// Import all possible actions
import {increment, decrement, reset} from './store/counter.actions';

@Component({
  selector: 'app-root',
  templateUrl: './app.component.html'
})
export class AppComponent implements OnInit {
  title = 'Simple Store App';
  count$: Observable<number>;

  constructor(private store: Store<{ count: number }>) {}

  ngOnInit() {
    // Select the 'count' property from the store and
    // assign it to count$ variable.
    this.count$ = this.store.pipe(
      select('count')
    );
  }

  // dispatch actions for the store. They are imported above
  increment() {
    this.store.dispatch(increment());
  }
  …
}
```



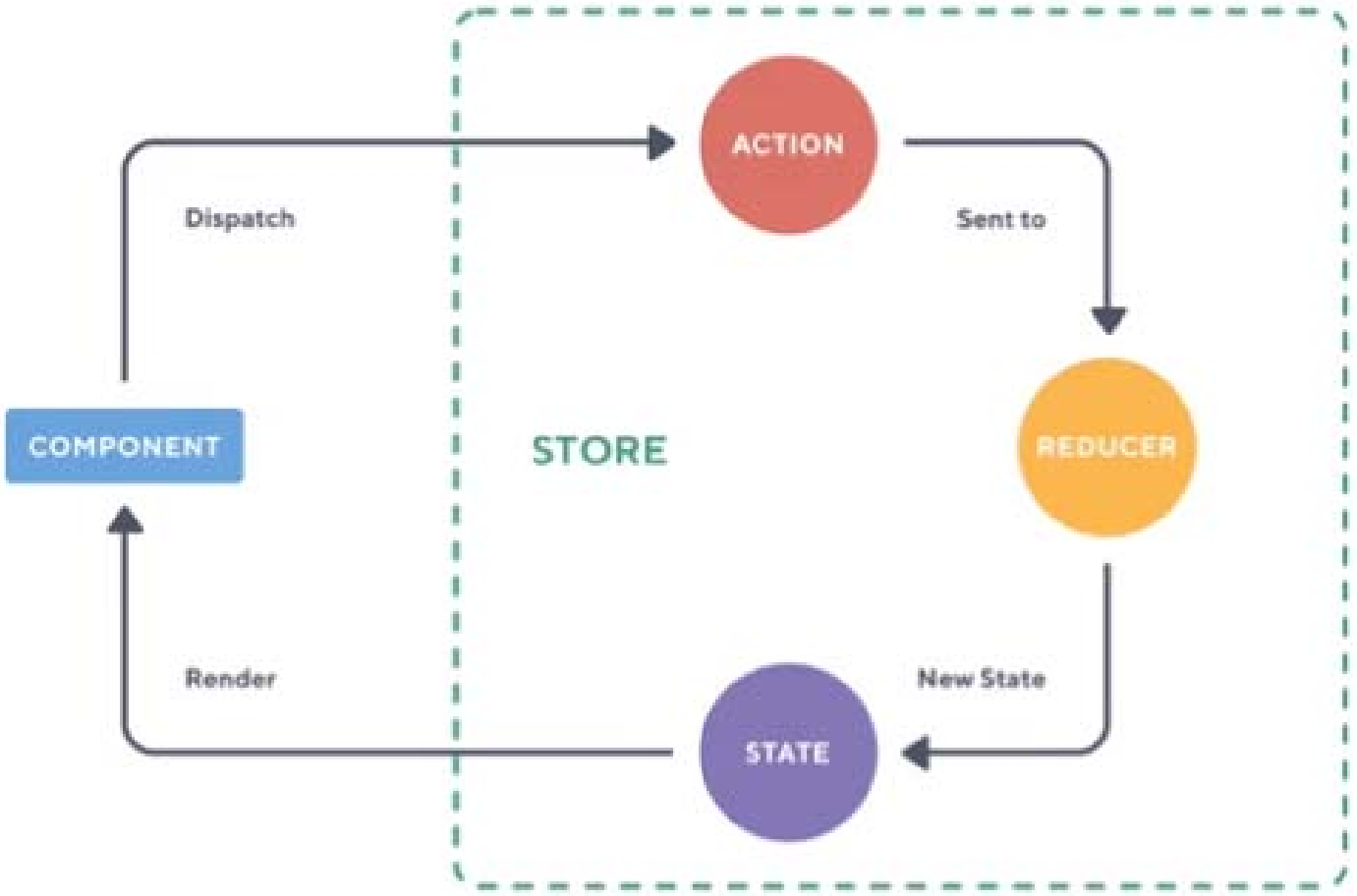
Run the app



Add new components, subscribe to store, enhance store, etc.

REDUX ARCHITECTURE

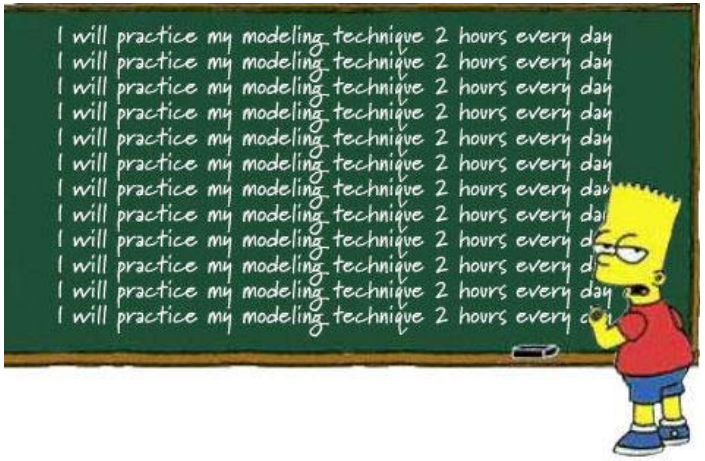
One-way dataflow



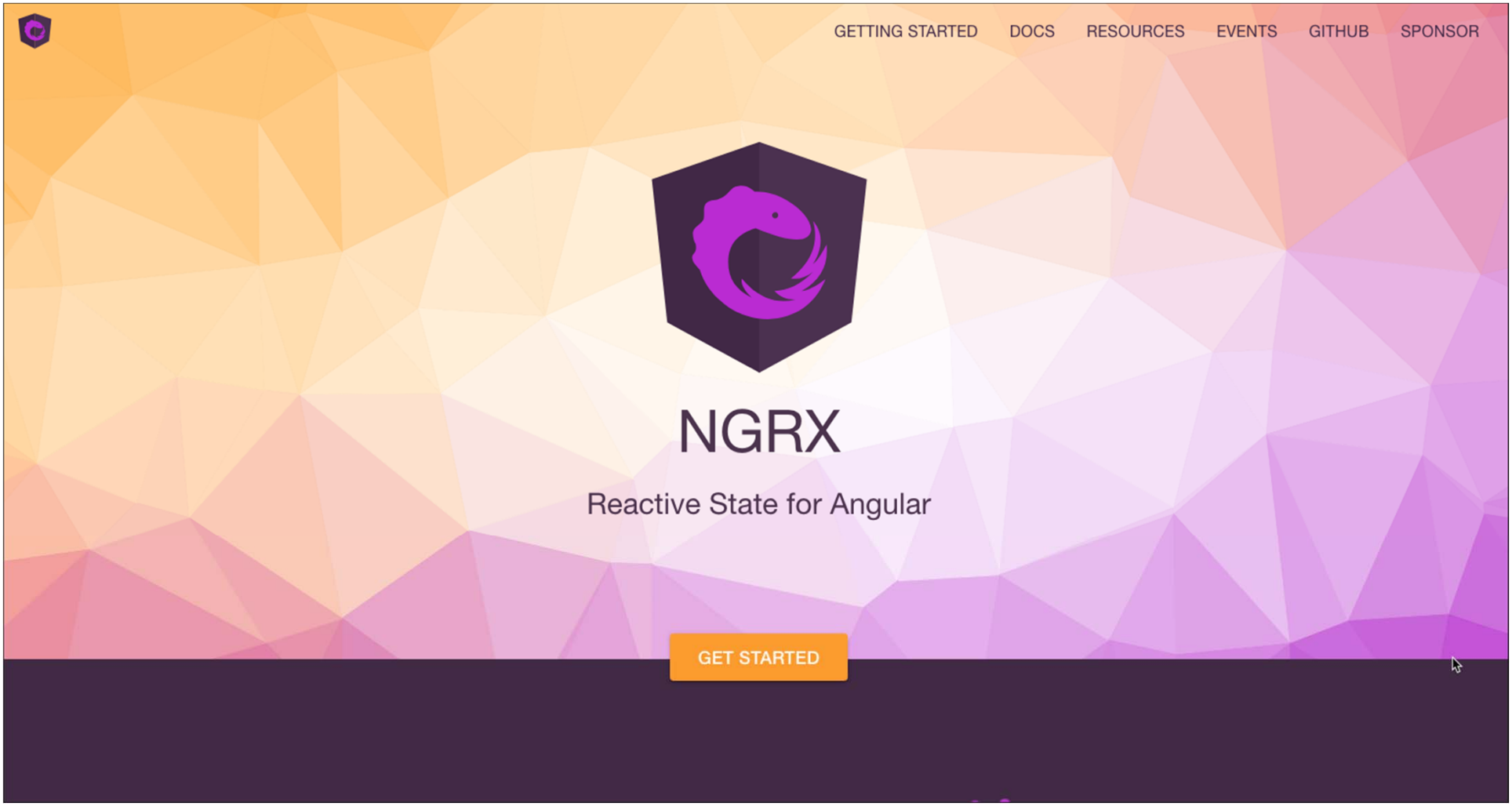
https://platform.ultimateangular.com/courses/ngrx-store-effects/lectures/3788532

Workshop

- Create a new app, follow the previous steps to add a Store
- OR: Start from `../200-ngrx-simple-store`
- Make yourself familiar with the store concepts and data flow. Study the example code.
- Create some extra actions on the reducer. For example:
  - Add +5 with one click
  - Subtract `-5` with one click
  - Reset counter to 0 if `counter >= 25;`

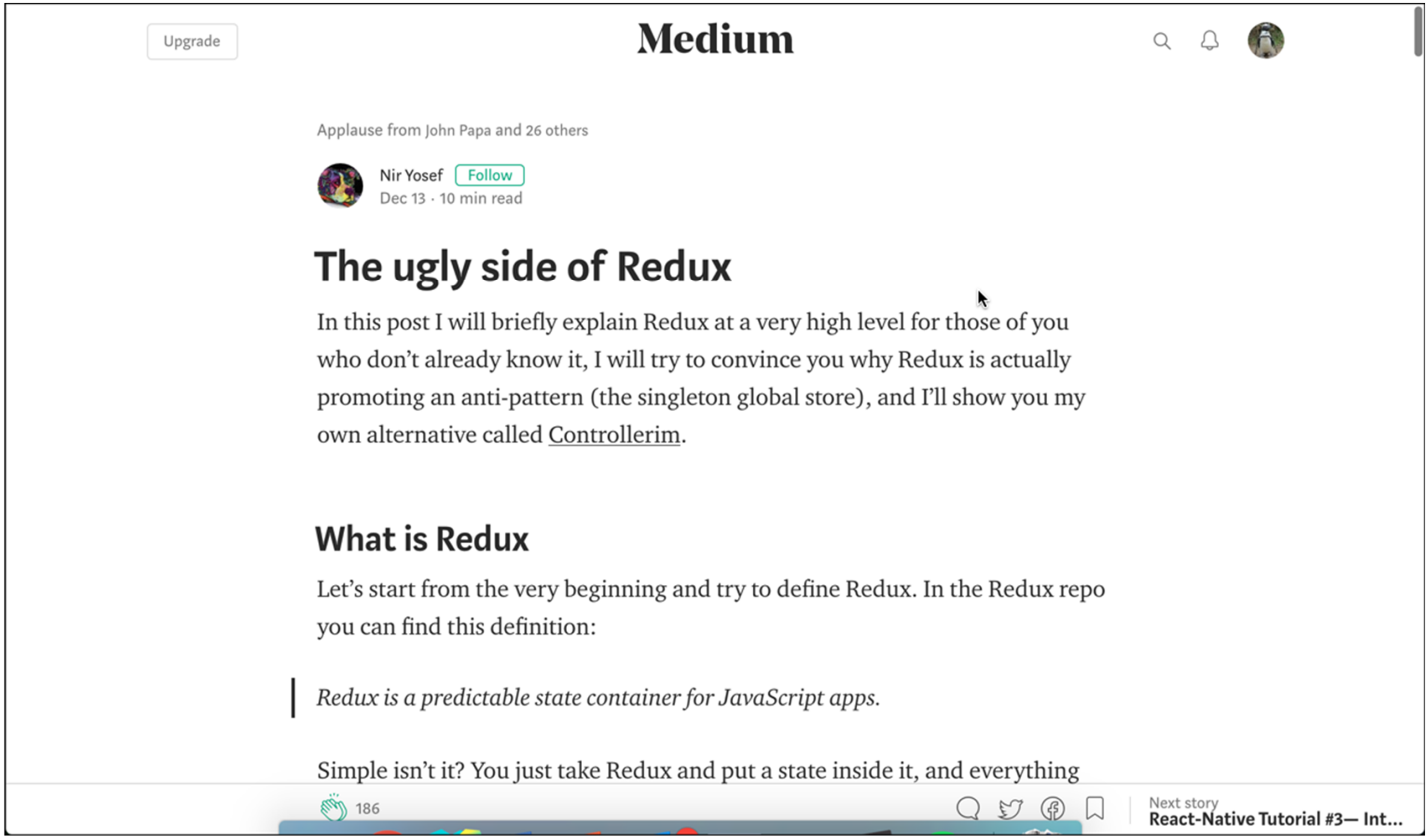


Official site



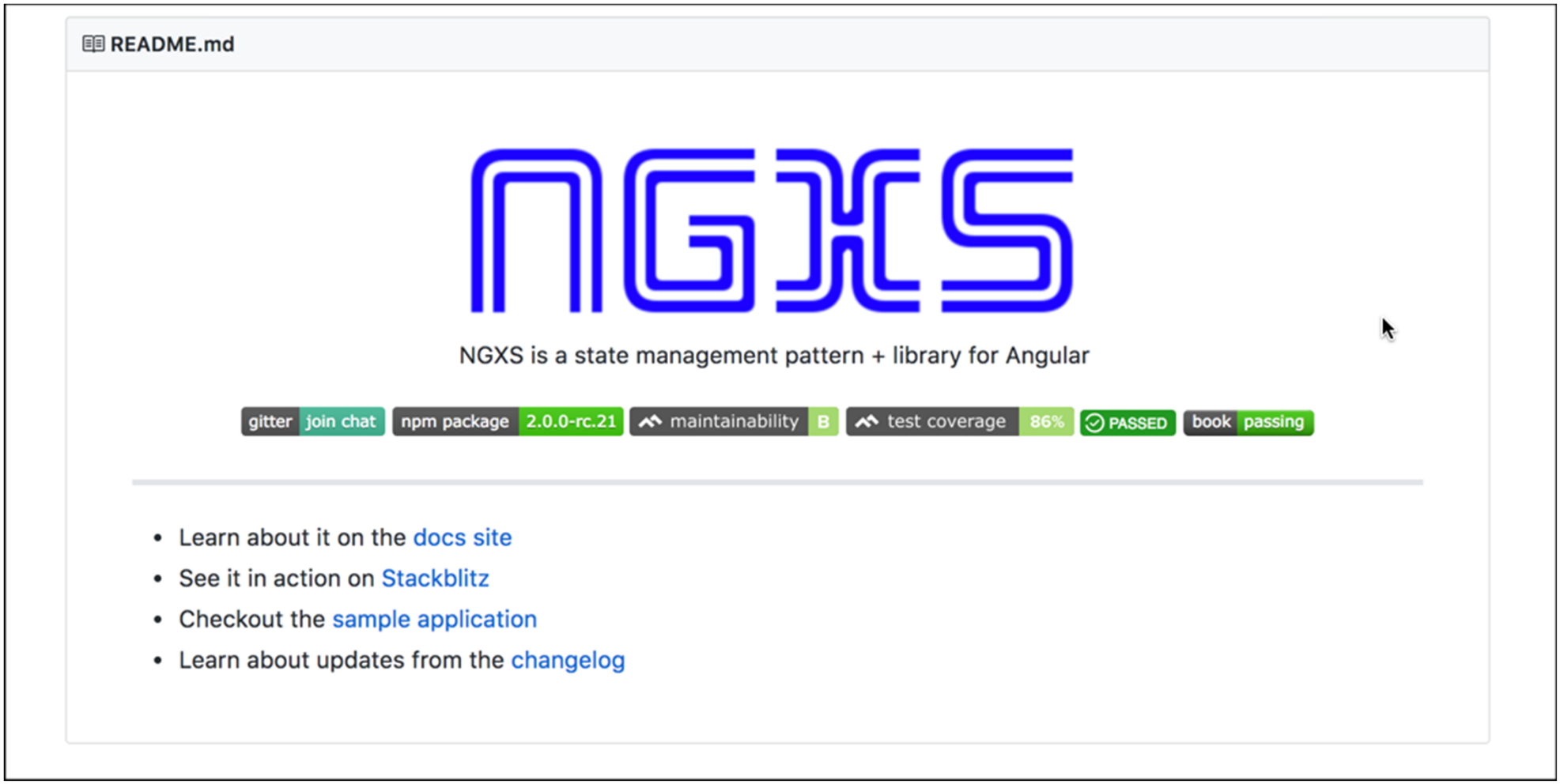
https://ngrx.io/

Think about this – “The Ugly side of Redux”



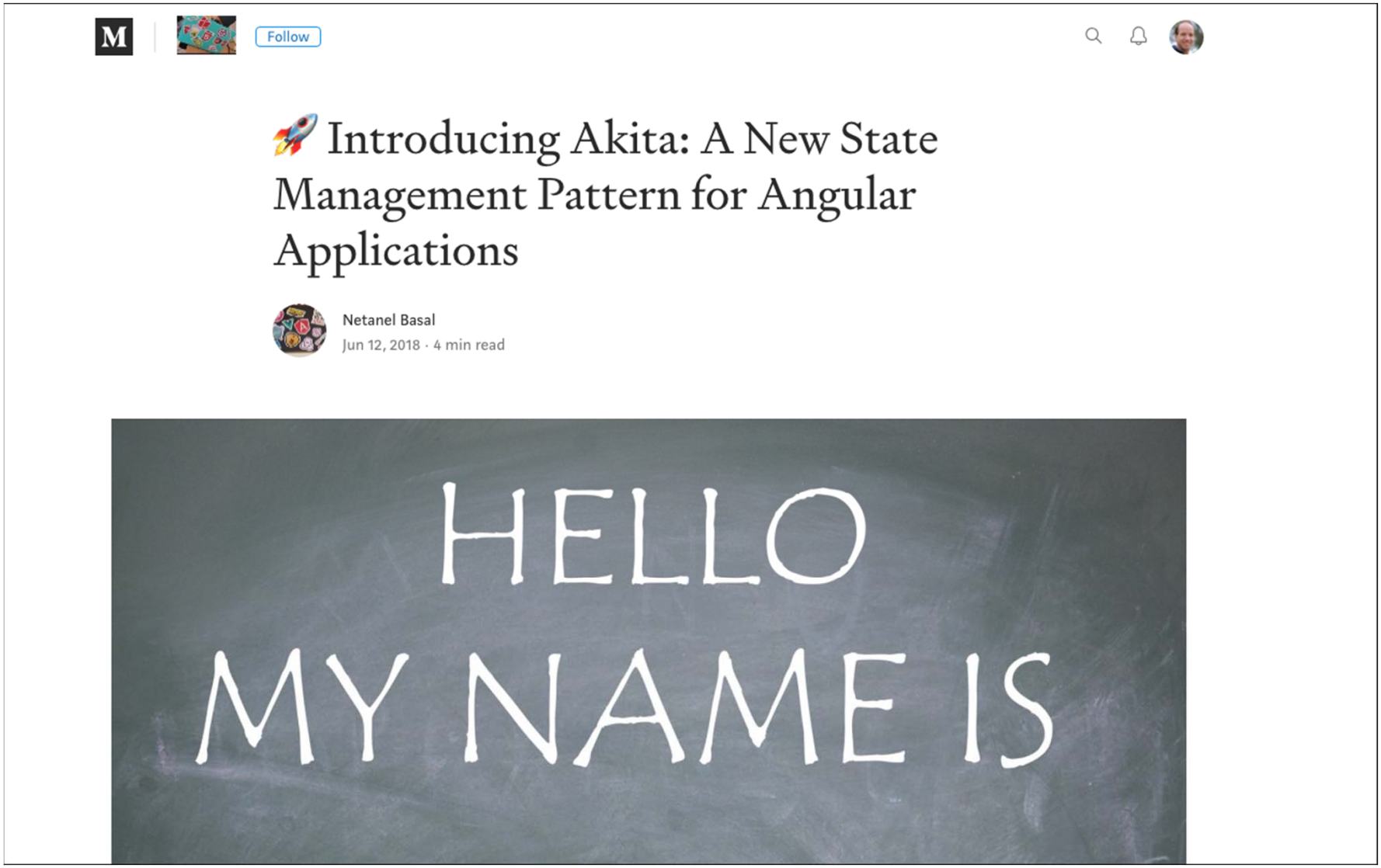
https://medium.com/@niryo/the-ugly-side-of-redux-6591fde68200

Alternative State Management solution



https://github.com/amcdnl/ngxs

Akita – another state management alternative



https://netbasal.com/introducing-akita-a-new-state-management-pattern-for-angular-applications-f2f0fab5a8

Next Steps

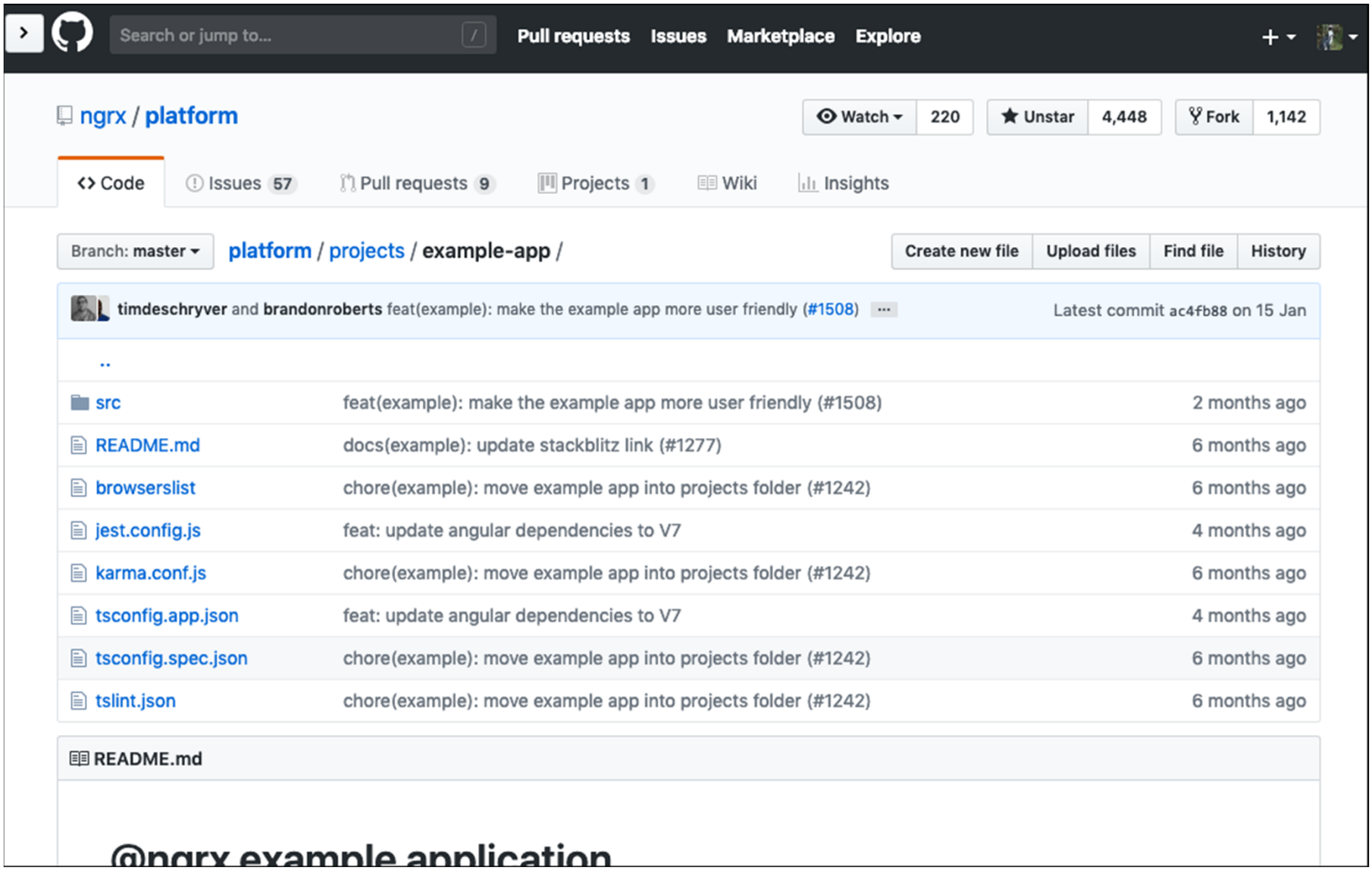
- @ngrx/effects - Side Effect model for @ngrx/store to model event sources as actions.
- @ngrx/router-store - Bindings to connect the Angular Router to @ngrx/store
- @ngrx/store-devtools - Store instrumentation that enables a powerful time-travelling debugger
- @ngrx/entity - Entity State adapter for managing record collections.
- @ngrx/schematics - Scaffolding library for Angular applications using NgRx libraries

https://ngrx.io/docs

Sample Store apps

Some study material

Ngrx store platform sample app



https://github.com/ngrx/platform/tree/master/projects/example-app

More info

https://medium.com/@gregor.woiwode/ngrx-8-meet-the-new-upcoming-factory-methods-of-the-next-major-release-a97a079cc089