



# State Management with Redux und @ngrx/store

Alex Thalhammer

# Contents


- Motivation
- State
- Actions
- Reducer
- Store
- Immutables
- Effects
- Labs / Demo



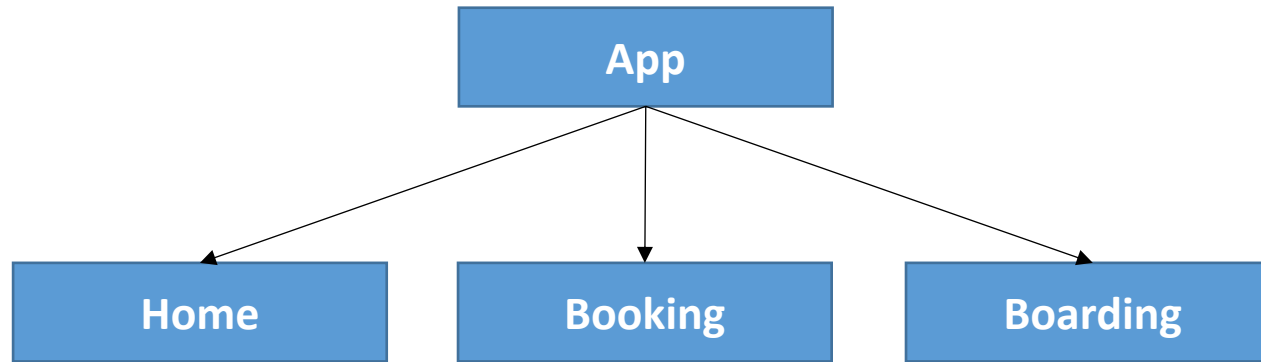
ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE

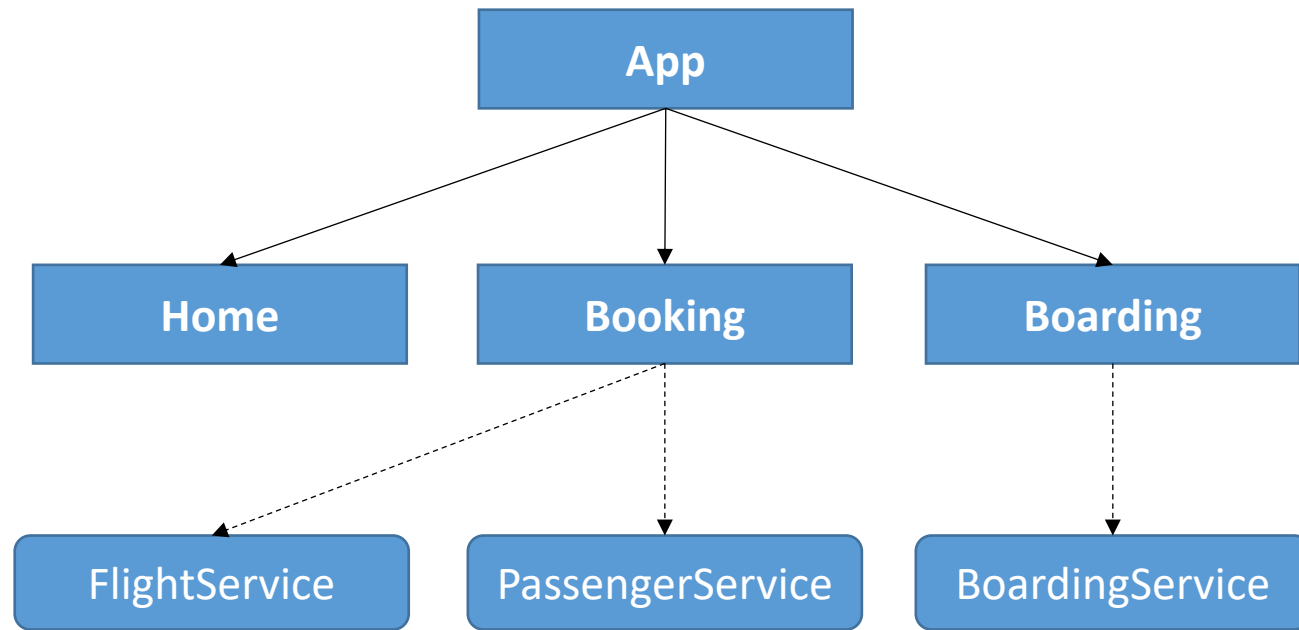


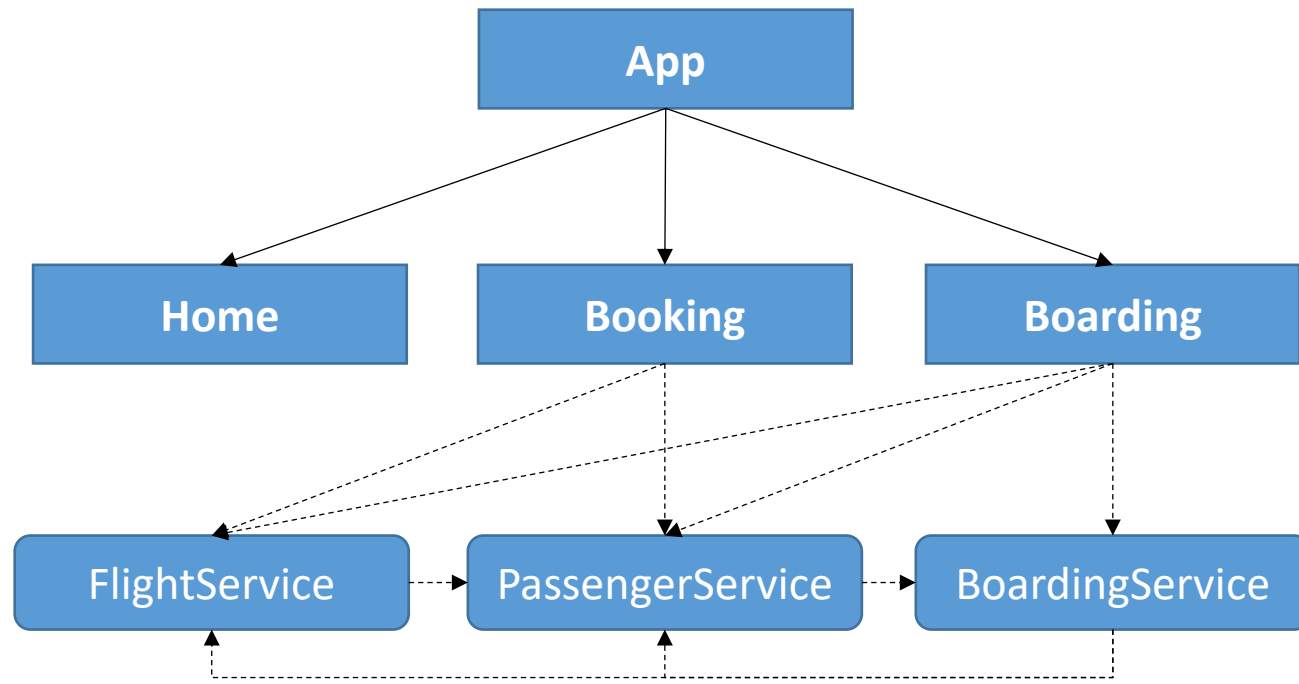
SOFTWARE  
**ARCHITECT**

A full-page background image featuring a silhouette of a person standing on a rock in the middle of the ocean at sunset. The person's arms are outstretched horizontally, mirroring the horizon line. The sky is filled with dramatic, colorful clouds in shades of orange, red, and blue. The sun is a bright point of light on the horizon, and its reflection is clearly visible in the calm water. The overall mood is one of tranquility and inspiration.

Motivation







# Redux

- Redux makes complex UI manageable
- Origin: React Ecosystem
- Implementation used here: @ngrx/store
- Alternative: @ngxs/store
- Or: @dataroma/akita

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



ANGULAR  
ARCHITECTS  
INSIDE KNOWLEDGE



SOFTWARE  
ARCHITECT

# Alternatives

@datorama/akita vs @ngrx/store vs @ngxs/store

Enter an npm package...

@datorama/akita x

@ngrx/store x

@ngxs/store x

+ @angular-redux/store

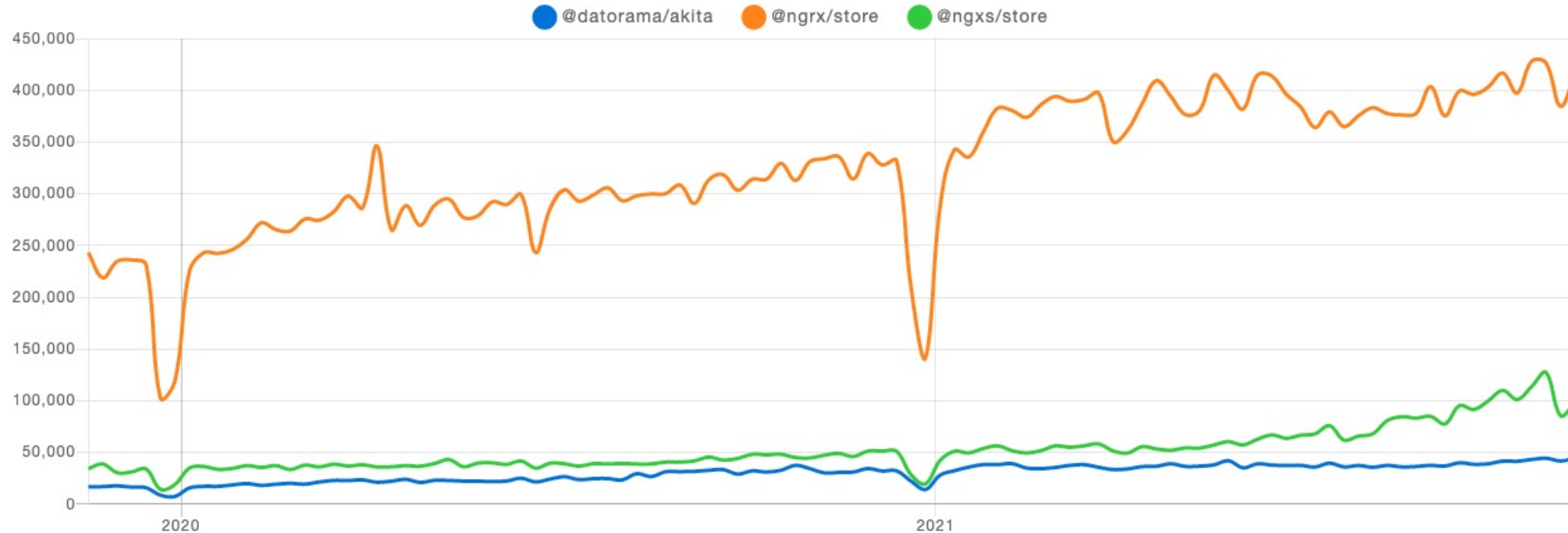
+ ngxs

+ akita

+ mobx

+ store2

Downloads in past 2 Years v





# GraphQL vs NgRx (I)

- GraphQL is a query language
- GraphQL is language/technology agnostic
- It's concerned with **data access**



ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE



SOFTWARE  
**ARCHITECT**

# GraphQL vs NgRx (II)

- Since GraphQL is just a data access technology, it means that NgRx doesn't really care whether you're using REST or GraphQL
- You can still use Angular's HttpClient to make a POST request to your GraphQL endpoint and let redux (NgRx) handle the data
- **BUT it reduces the complexity of state management in frontend**

# GraphQL vs NgRx (III)

- In some cases you will still need state management
  - **Cart**
  - **Drafts**
  - **Forms**
  - **Filters**
  - **Pagination**
  - ...

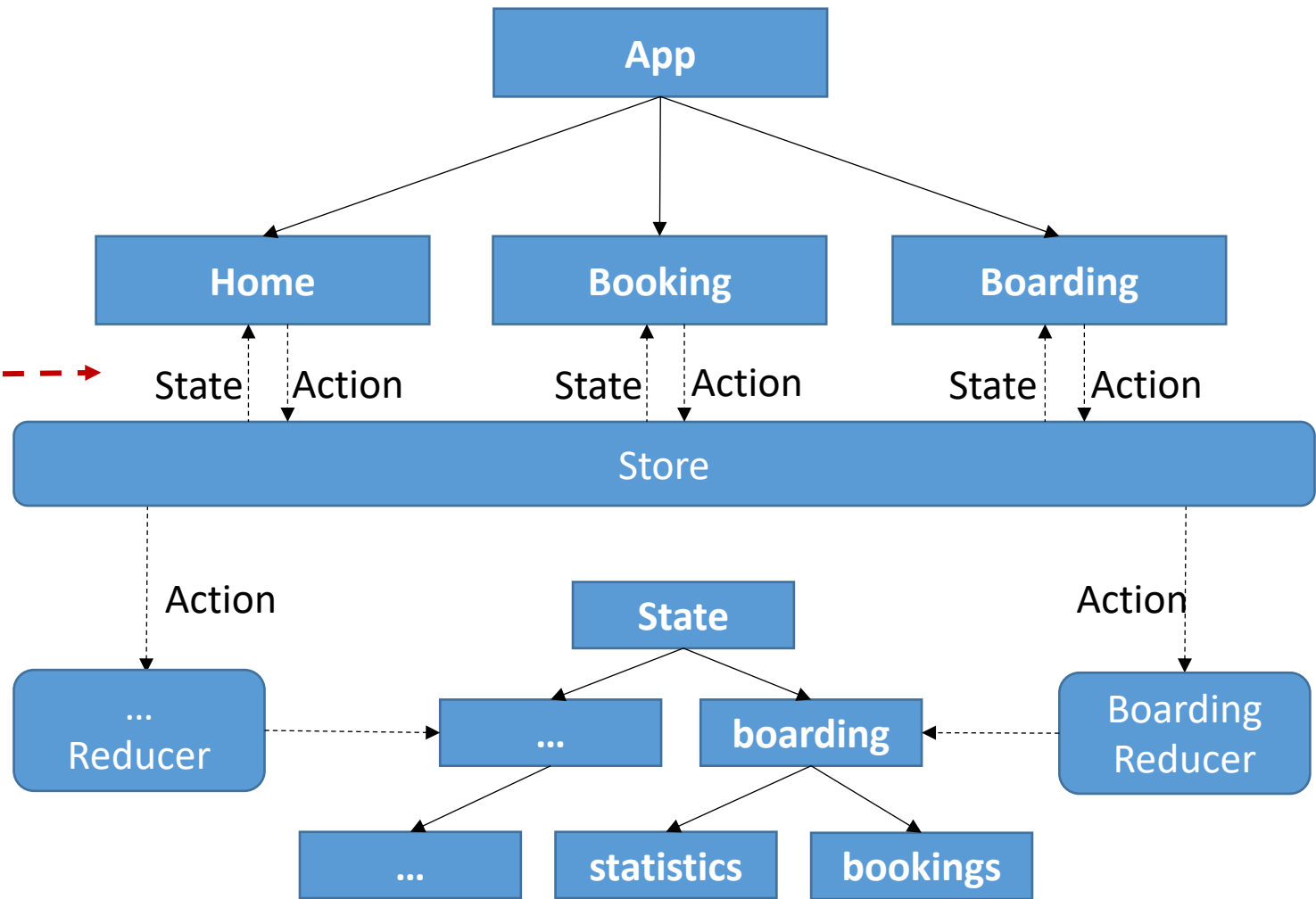


ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE



SOFTWARE  
**ARCHITECT**

*Publish/Subscribe  
via Observables*



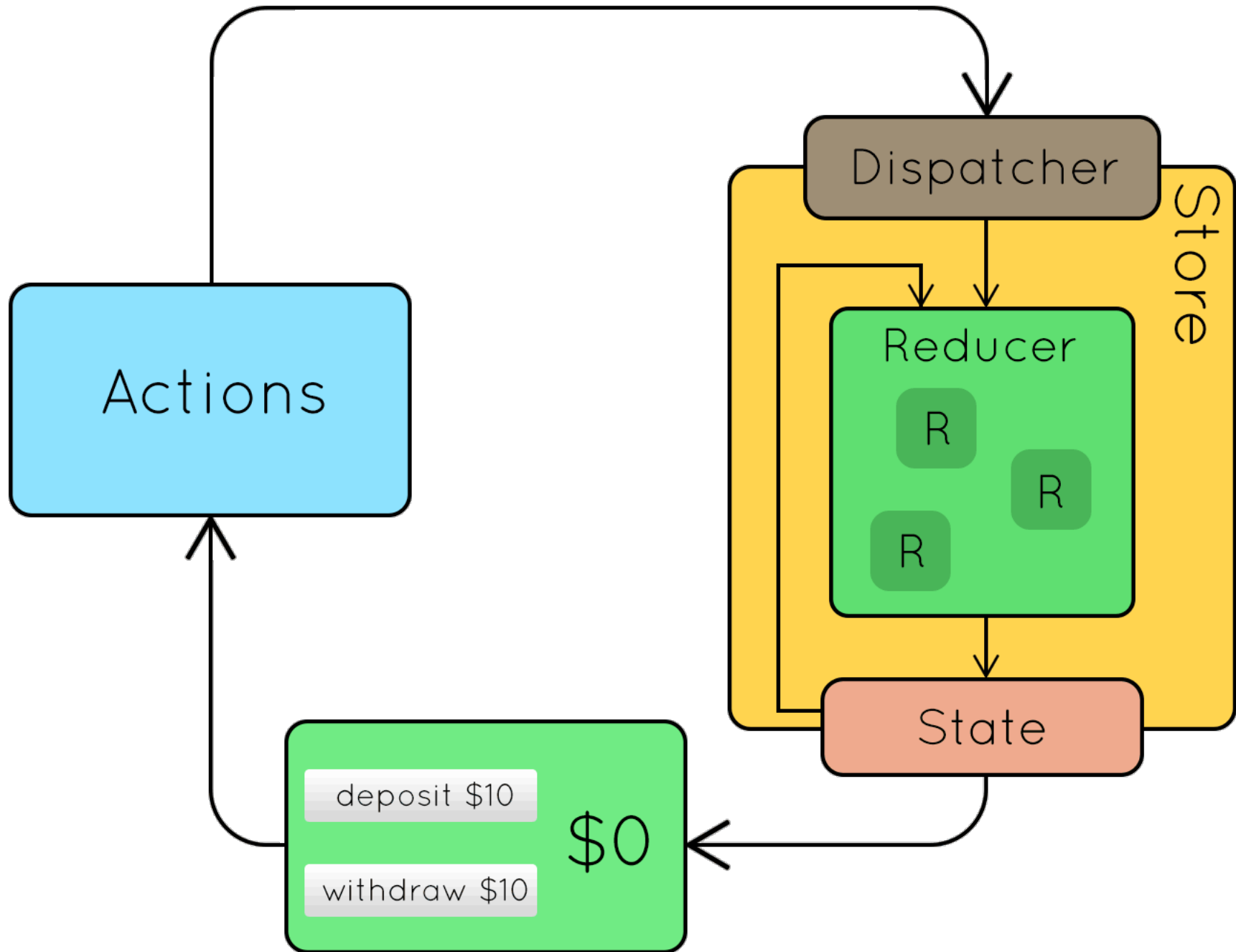
Single Immutable State Tree



ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE



SOFTWARE  
**ARCHITECT**



# State

# State

```
export interface FlightBookingState {  
  flights: Flight[];  
  statistics: FlightStatistics;  
  basket: object;  
}
```



ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE



SOFTWARE  
**ARCHITECT**

# State

```
export interface FlightBookingState {  
  flights: Flight[];  
  statistics: FlightStatistics;  
}
```

```
export interface FlightStatistics {  
  countDelayed: number;  
  countInTime: number;  
}
```



ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE



SOFTWARE  
**ARCHITECT**



# AppState

```
export interface AppState {  
  flightBooking: FlightBookingState;  
  currentUser: UserState;  
}
```



ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE



SOFTWARE  
**ARCHITECT**



Actions

# Parts of an Action

- Type
- Payload



ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE



SOFTWARE  
**ARCHITECT**

# Defining an Action

```
export const flightsLoaded = createAction(  
  '[FlightBooking] FlightsLoaded',  
  props<{flights: Flight[]}>()  
);
```



ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE



SOFTWARE  
**ARCHITECT**



Reducer



# Reducer

- Function that executes Action
- Pure function (stateless, etc.)
- Each Reducer gets each Action
  - Check whether Action is relevant
  - This prevents cycles



ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE



SOFTWARE  
**ARCHITECT**

# Reducer

**(currentState, action) => newState**



ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE



SOFTWARE  
**ARCHITECT**



# Reducer for FlightBookingState

```
export const flightBookingReducer = createReducer(  
  initialState,  
  
  on(flightsLoaded, (state, action) => {  
    const flights = action.flights;  
    return { ...state, flights };  
  })  
)
```



ANGULAR  
ARCHITECTS  
INSIDE KNOWLEDGE



SOFTWARE  
ARCHITECT



# Map Reducers to State Tree

```
const reducers = {  
  "flightBooking": flightBookingReducer,  
  "currentUser": authReducer  
}
```



ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE



SOFTWARE  
**ARCHITECT**



Store



# Store

- Manages state tree
- Allows to read state (via Selectors / Observables)
- Allows to modify state by dispatching actions



ANGULAR  
ARCHITECTS  
INSIDE KNOWLEDGE



SOFTWARE  
ARCHITECT

# Selectors

- Selectors are pure functions used for obtaining slices of store state
- `select(tree => tree.flightBooking.flights): Observable<Flight[]>`



ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE



SOFTWARE  
**ARCHITECT**

# Actions

- Actions express *events* that happen throughout your application
- `dispatch(flightsLoaded({ flights })))`



ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE



SOFTWARE  
**ARCHITECT**





Registering @ngrx/store



# Registering @ngrx/Store

```
@NgModule{  
  imports: [  
    [...]  
    StoreModule.forRoot(reducers)  
  ],  
  [...]  
}  
export class AppModule { }
```

# Registering @ngrx/Store

```
@NgModule({  
  imports: [  
    [...]  
    StoreModule.forRoot(reducers),  
    !environment.production ? StoreDevtoolsModule.instrument() : []  
  ],  
  [...]  
})  
export class AppModule { }
```

**@ngrx/store-devtools**



ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE



SOFTWARE  
**ARCHITECT**





# ngrx and Feature Modules

---

# Reducers

- Reducers are responsible for handling transitions from one state to the next state in your application
- Receive Actions



ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE



SOFTWARE  
**ARCHITECT**

# Reducers for Shared State

```
const reducers = {  
  flightBooking: flightBookingReducer,  
  currentUser: authReducer  
}
```



ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE



SOFTWARE  
**ARCHITECT**

# Reducers for Shared State

```
const reducers = {  
  flightBooking: flightBookingReducer,  
  currentUser: authReducer  
}
```



ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE

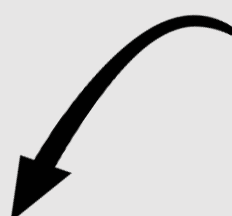


SOFTWARE  
**ARCHITECT**

# Registering @ngrx/Store

```
@NgModule({  
  imports: [  
    [...]  
    StoreModule.forFeature('flightBooking', flightBookingReducer)  
  ],  
  [...]  
})  
export class FlightBookingModule { }
```

*State branch for feature*



ANGULAR  
ARCHITECTS  
INSIDE KNOWLEDGE



SOFTWARE  
ARCHITECT

# Lab

NgRx Store & Selectors



ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE



SOFTWARE  
**ARCHITECT**



Effects



# Challenge

- Reducers are synchronous by definition
- What to do with asynchronous operations?



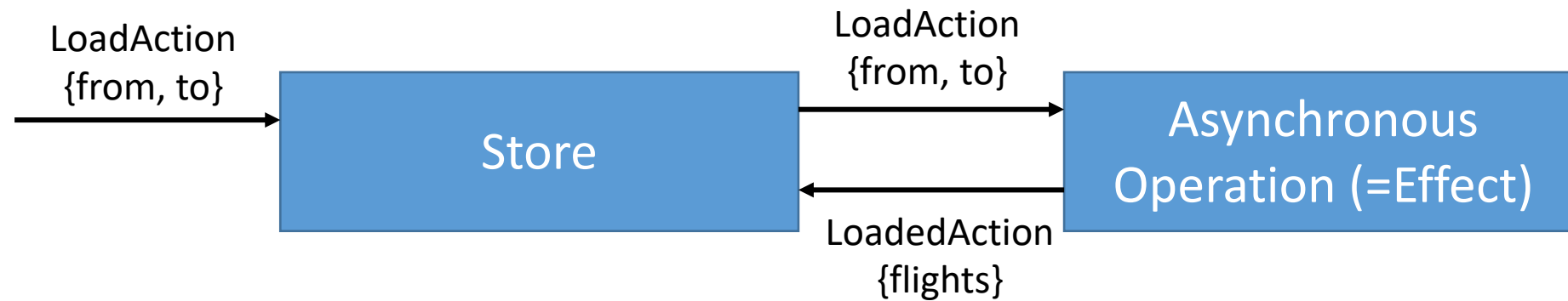
ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE



SOFTWARE  
**ARCHITECT**



# Solution: Effects



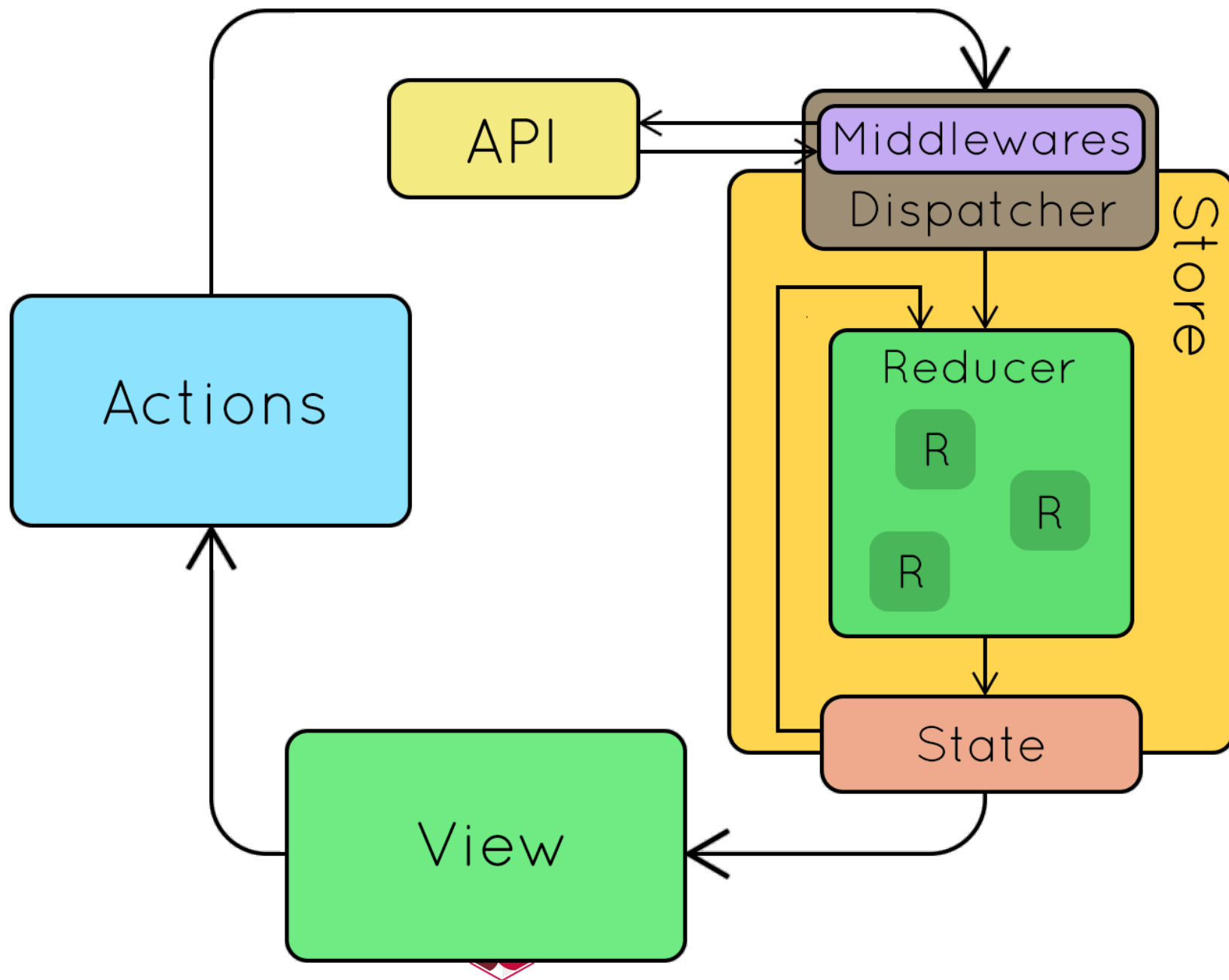
**ng add @ngrx/effects**



ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE



SOFTWARE  
**ARCHITECT**



# Effects are Observables



ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE



SOFTWARE  
**ARCHITECT**

# Implementing Effects

```
@Injectable()
export class FlightBookingEffects {

  [...]

}
```



ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE



SOFTWARE  
**ARCHITECT**

# Implementing Effects

```
@Injectable()
export class FlightBookingEffects {

  constructor(
    private flightService: FlightService, private actions$: Actions) {
  }

  [...]

}
```



ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE



SOFTWARE  
**ARCHITECT**

# Implementing Effects

```
@Injectable()
export class FlightBookingEffects {

  constructor(
    private flightService: FlightService, private actions$: Actions) {
  }

  myEffect$ = createEffect(() => this.actions$.pipe(
    ofType(loadFlights)));
}
```



ANGULAR  
ARCHITECTS  
INSIDE KNOWLEDGE



SOFTWARE  
ARCHITECT

# Implementing Effects

```
@Injectable()
export class FlightBookingEffects {

  constructor(
    private flightService: FlightService, private actions$: Actions) {
  }

  myEffect$ = createEffect(() => this.actions$.pipe(
    ofType(loadFlights),
    switchMap(a => this.flightService.find(a.from, a.to, a.urgent)))));
}
```



ANGULAR  
ARCHITECTS  
INSIDE KNOWLEDGE



SOFTWARE  
ARCHITECT



# Implementing Effects

```
@Injectable()
export class FlightBookingEffects {

  constructor(
    private flightService: FlightService, private actions$: Actions) {
  }

  myEffect$ = createEffect(() => this.actions$.pipe(
    ofType(loadFlights),
    switchMap(a => this.flightService.find(a.from, a.to, a.urgent)),
    map(flights => flightsLoaded({flights})))));
}
```



ANGULAR  
ARCHITECTS  
INSIDE KNOWLEDGE



SOFTWARE  
ARCHITECT

# Implementing Effects

```
@NgModule({  
  imports: [  
    StoreModule.provideStore(appReducer, initialState),  
    EffectsModule.forRoot([SharedEffects]),  
    StoreDevtoolsModule.instrument()  
  ],  
  [...]  
})  
export class AppModule { }
```



ANGULAR  
ARCHITECTS  
INSIDE KNOWLEDGE



SOFTWARE  
ARCHITECT

# Implementing Effects

```
@NgModule({  
  imports: [  
    [...]  
    EffectsModule.forFeature([FlightBookingEffects])  
  ],  
  [...]  
})  
export class FeatureModule {  
}
```



# Lab

NgRx Effects



ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE



SOFTWARE  
**ARCHITECT**

# @ngrx/entity and @ngrx/schematics

- ng add @ngrx/entity
- ng add @ngrx/schematics
- ng g module passengers
- ng g entity Passenger --module passengers.module.ts



ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE



SOFTWARE  
**ARCHITECT**



# DEMO



ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE



SOFTWARE  
**ARCHITECT**

# @ngrx/store-devtools

- Add Chrome / Firefox extension to use Store Devtools
  - Works with Redux & NgRx
  - <https://ngrx.io/guide/store-devtools>
- Also available for MobX
  - MobX Developer Tools



ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE



SOFTWARE  
**ARCHITECT**

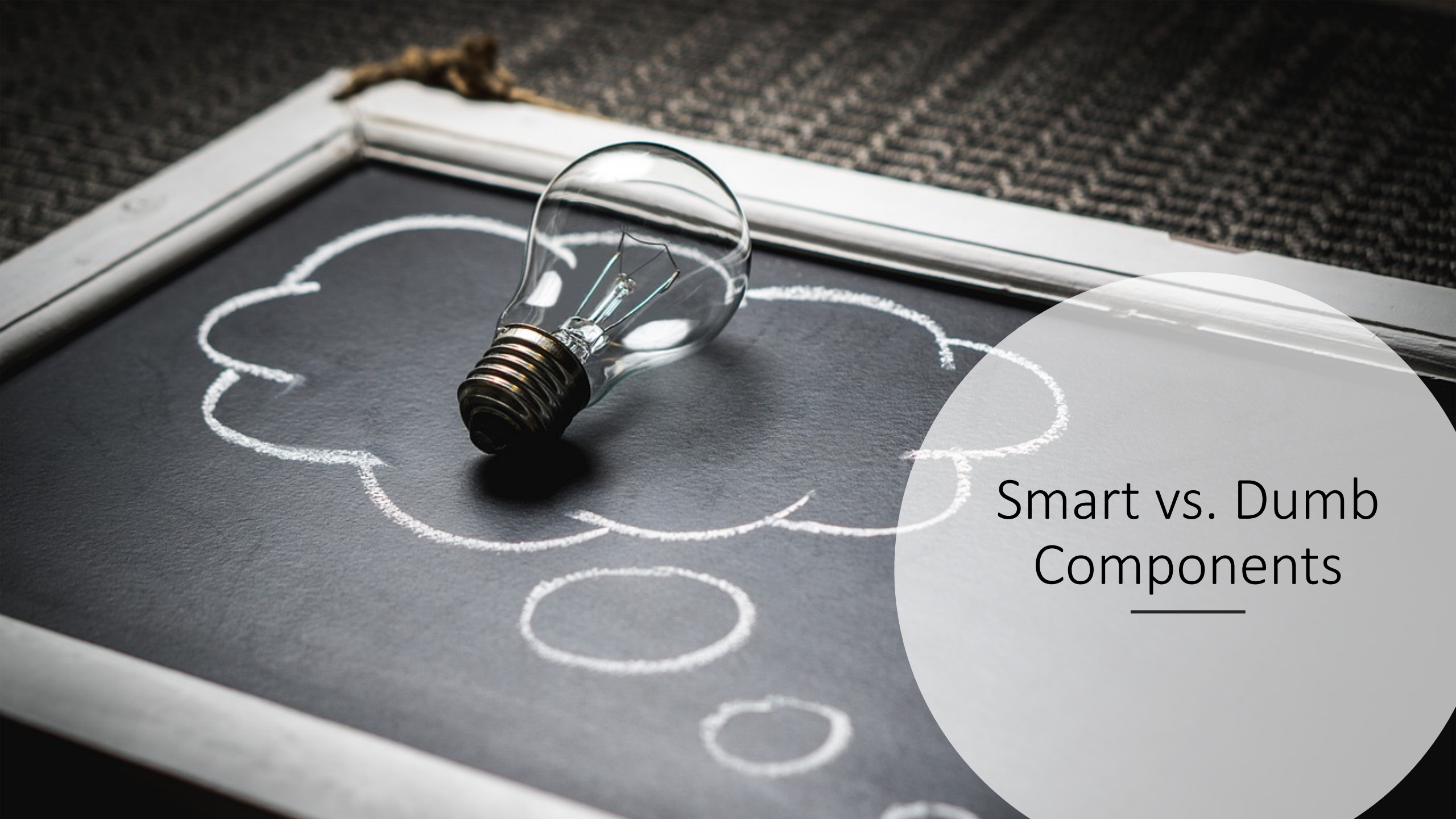
# DEMO



ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE



SOFTWARE  
**ARCHITECT**



## Smart vs. Dumb Components

# Thought experiment

- What if <flight-card> would directly talk with the store?
  - Querying specific parts of the state
  - Triggering effects
- Traceability?
- Performance?
- Reuse?



ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE



SOFTWARE  
**ARCHITECT**

# Smart vs. Dumb Components

## Smart Component

- Drives the "Use Case"
- Usually a "Container"

## Dumb

- Independent of Use Case
- Reusable
- Usually a "Leaf"





Like this topic?

Check out the NgRx Guide

<https://ngrx.io/guide/>