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State Management With NgRx

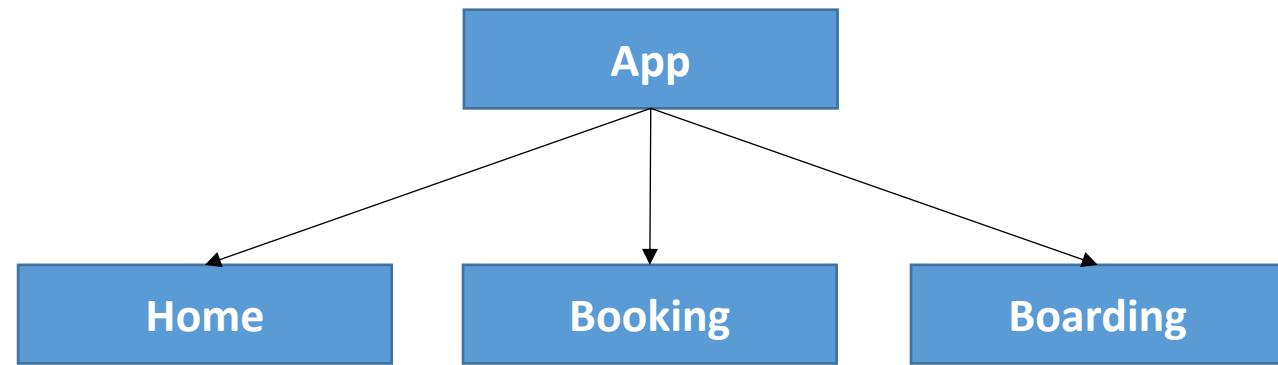
Alex Thalhammer

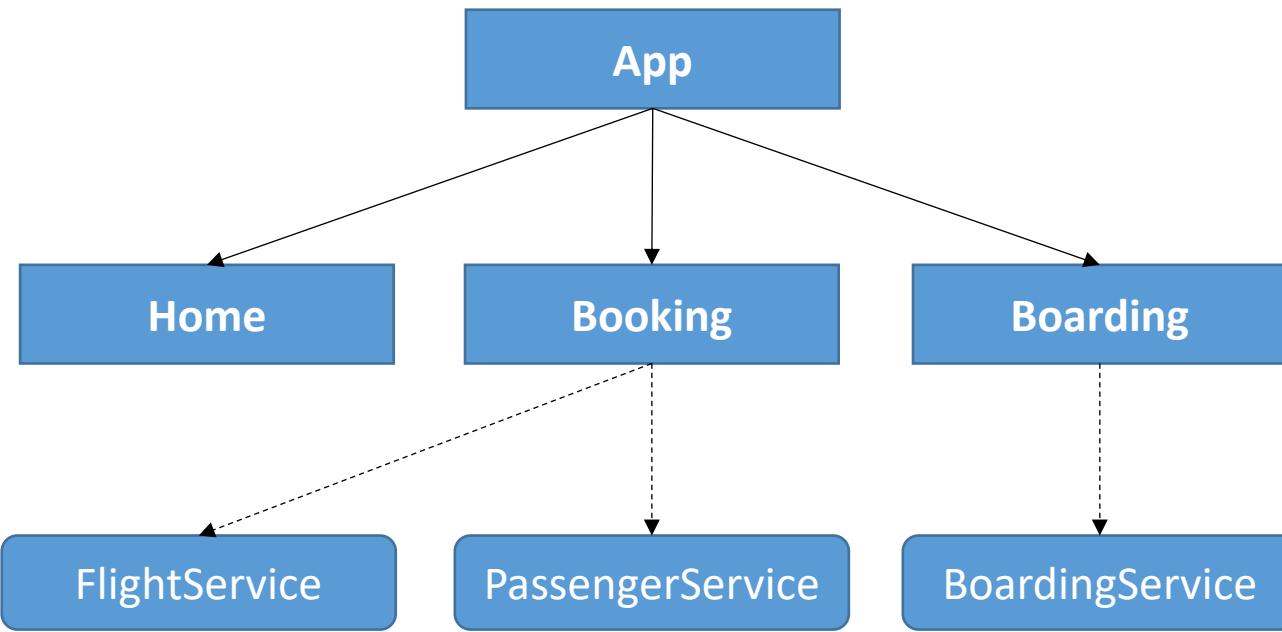
Outline

- Motivation
- State
- Actions
- Reducer
- Store
- Selectors
- Effects

Motivation



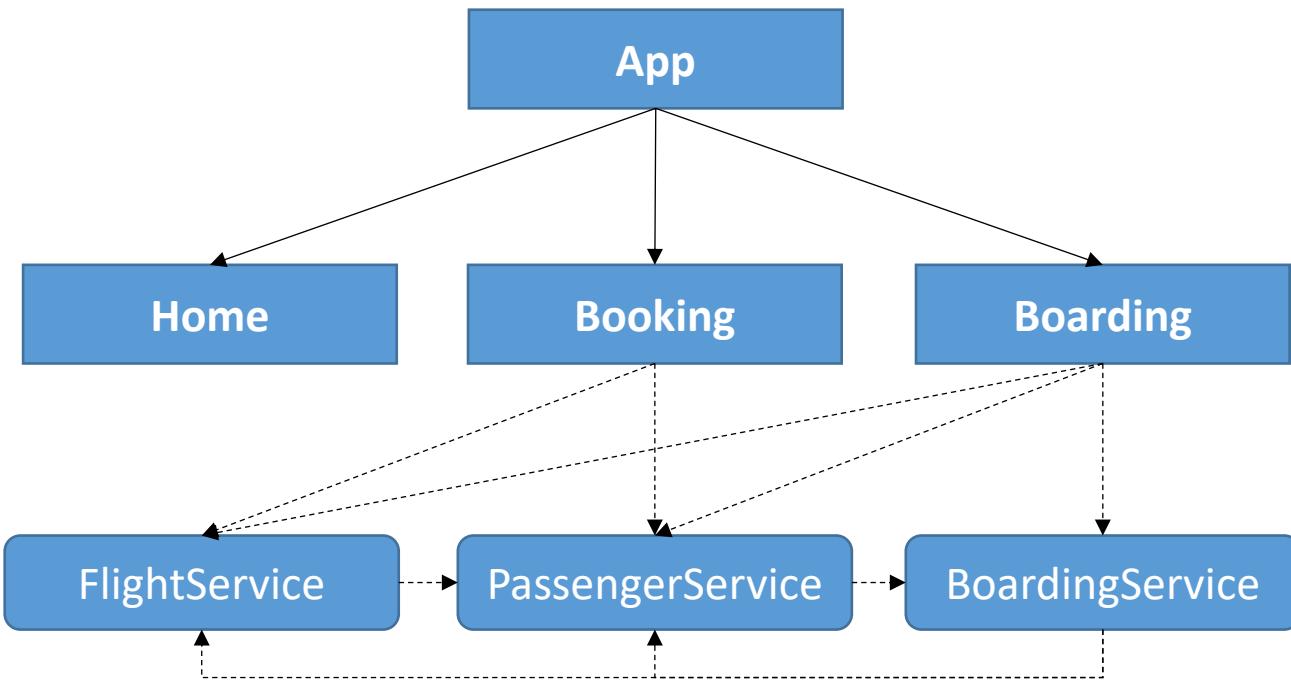




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Redux

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



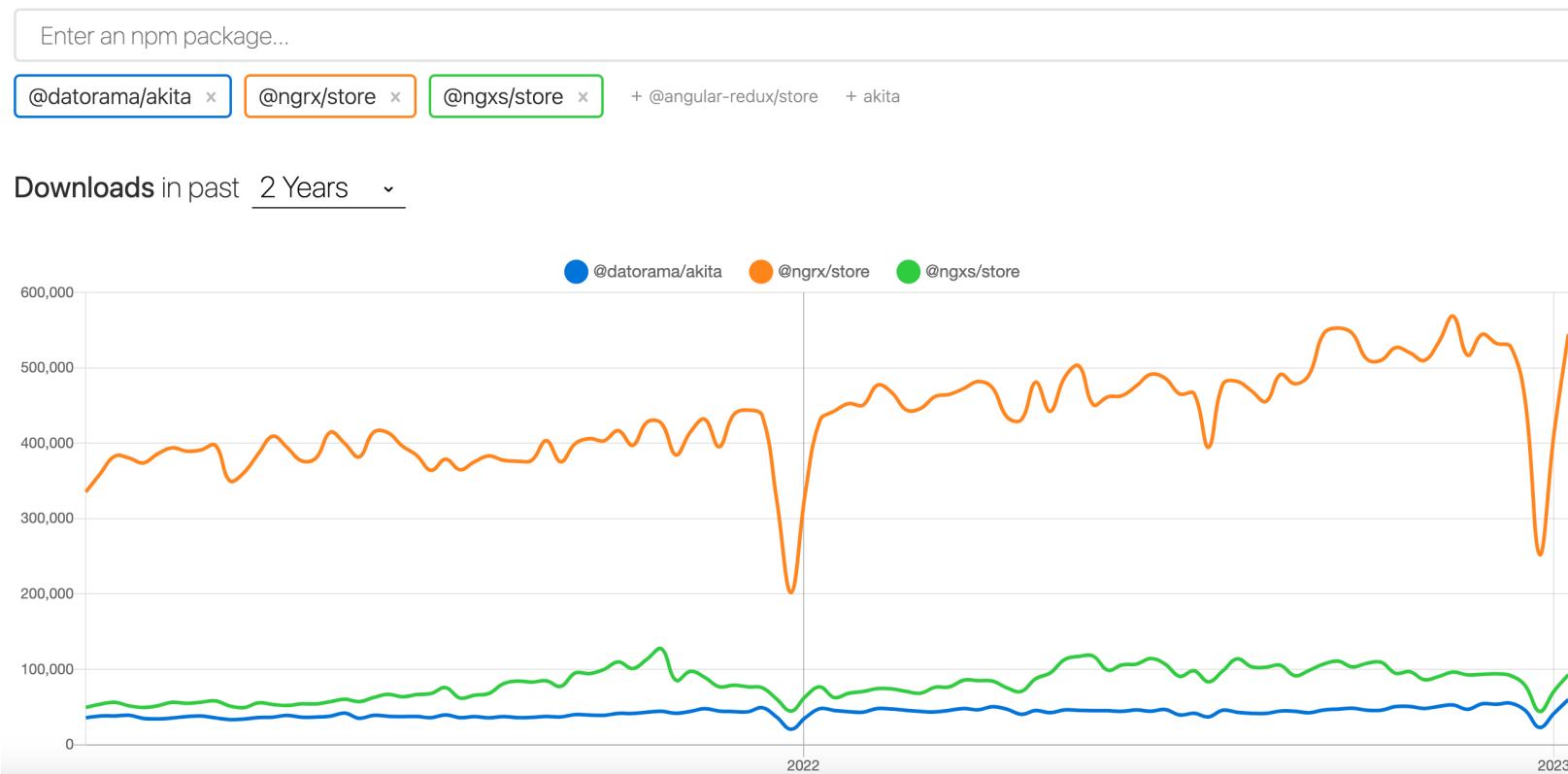
Alternatives

Alternatives

- NGXS
 - More Object-Oriented
 - Built-In Immutability
 - Reducer/Store also works with Asynchrony – no need for Effects
- Akita
 - Not based on Redux, only RxJS
 - Works very similar to @ngrx/entity
 - Can be seen as a simplified subset of ngrx
 - Very limited in terms of customisation

Alternatives

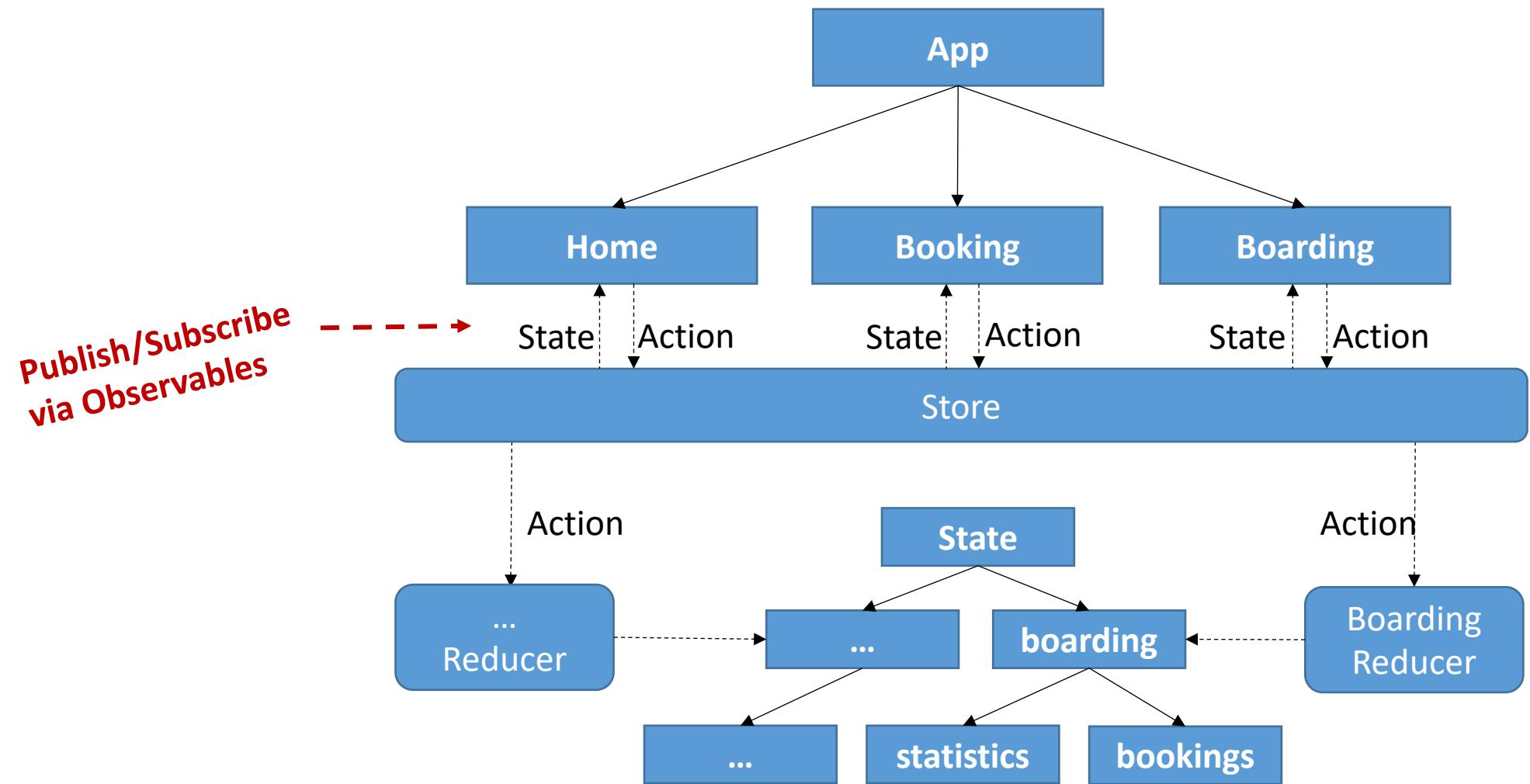
@datorama/akita vs @ngrx/store vs @ngxs/store



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Single Immutable State Tree

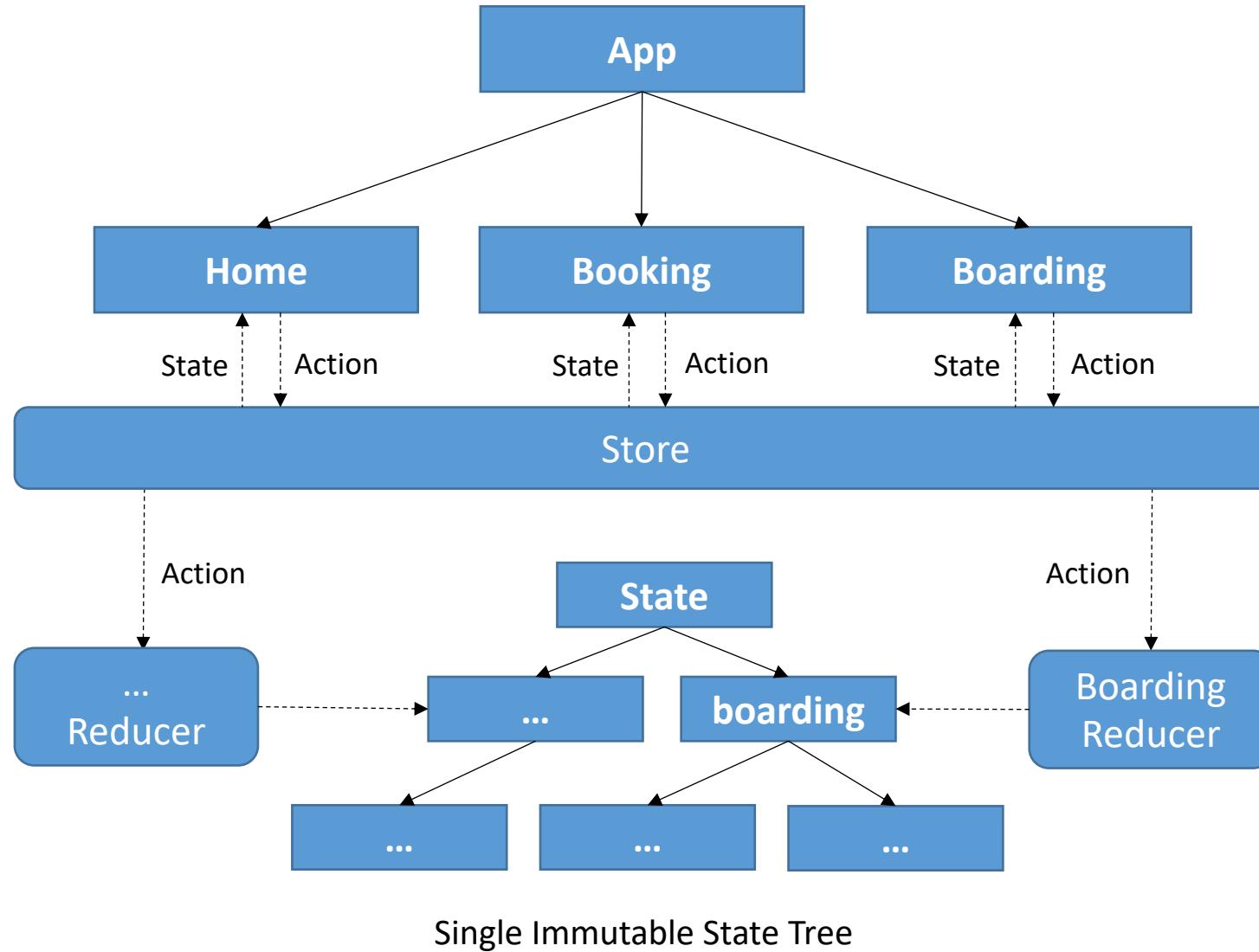


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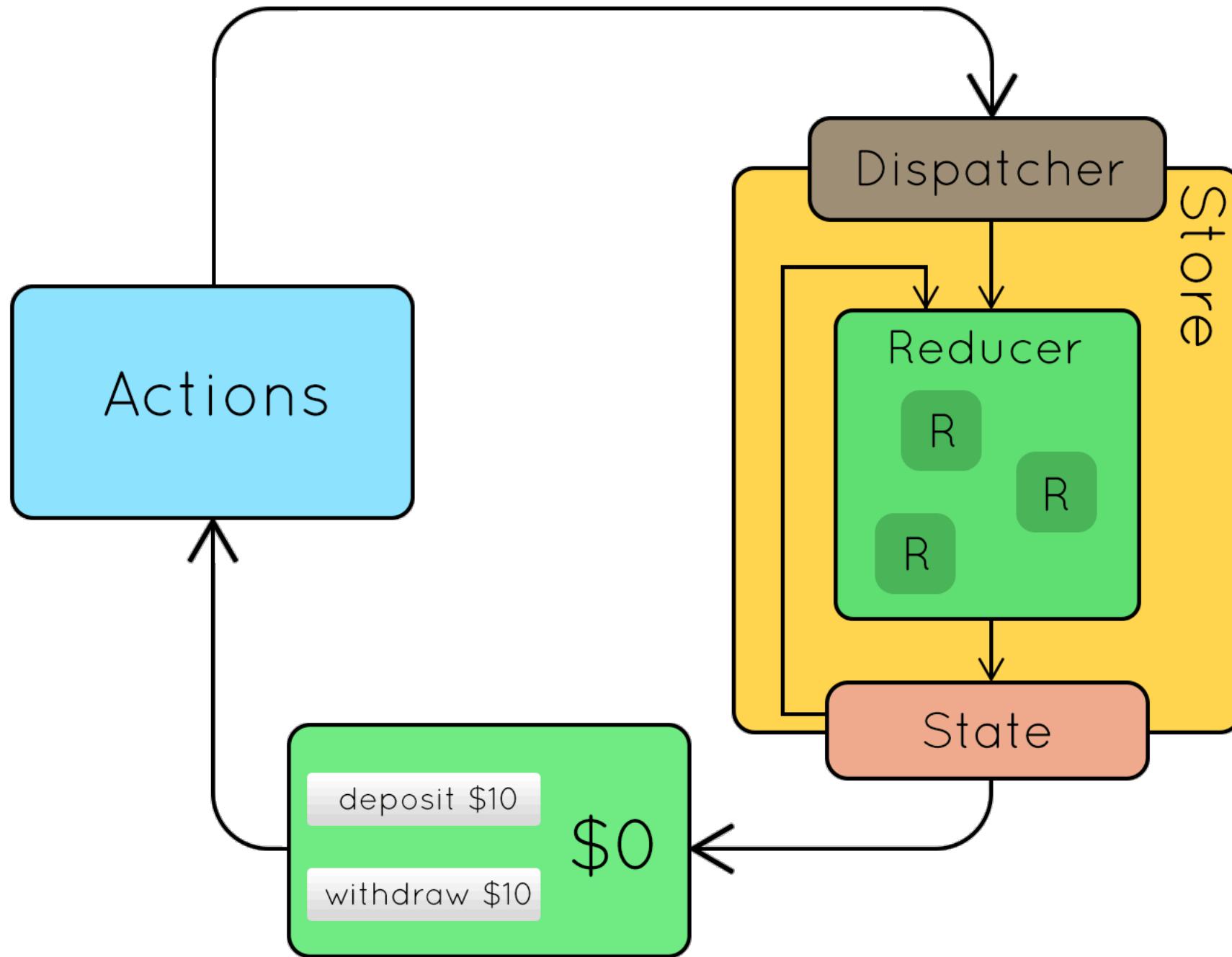
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- One "source of truth"
- Prevents Cycles
- Easy to debug
- Structured
- Performance
 - Observables
 - Immutables



State



State

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

State

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

AppState

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



Actions

Actions

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

Actions consist of

- Type (must have)
- Payload (optional)

Defining an Action

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

Reducer



Reducer

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

Reducer

- responsible for transitions in your application from current state -> next state
- Signature of "on"
(currentState, action) => newState

Reducer for FlightBookingState

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

A close-up photograph of several dark wooden barrels stacked together. The barrels have metal bands around them and some have circular holes. The wood shows signs of age and wear.

Store

Store

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

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

@ngrx/store-devtools

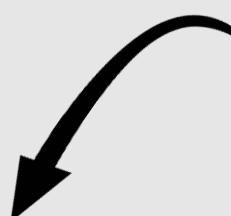
- Add Chrome / Firefox extension to use Store Devtools
 - Works with Redux & NgRx
 - <https://ngrx.io/guide/store-devtools>

A Curiosity rover is shown on the surface of Mars, performing a wheelie maneuver. The rover's body is tilted, with its front wheels lifted off the ground. A bright yellow spray of dust is visible at the point where the front wheels were in contact with the reddish-brown Martian soil. The background shows the vast, arid landscape of Mars under a hazy orange sky.

ngrx and Feature Modules

Registering @ngrx/Store

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



State branch for feature

Demo & Lab

NgRx Store

Selectors

Selectors

- pure functions for obtaining slices of store state (also "state streams")
- `select(tree => tree.flightBooking.flights): Observable<Flight[]>`
- We can use [createSelector](#) or [createFeatureSelector](#)

Using selectors for manipulation (filtering)

```
export const selectFlightBookingState =  
  createFeatureSelector<fromFlightBooking.State>  
  (fromFlightBooking.flightBookingFeatureKey);
```

```
export const selectFlights =  
  createSelector(selectFlightBookingState, (s) => s.flights);
```

Defining selectors with Payload

```
export const selectFlightsWithProps =  
  (props: { blackList: number[] }) =>  
    createSelector(selectFlights, (flights) =>  
      flights.filter((f) => !props.blackList.includes(f.id)));
```

Demo & Lab

NgRx Selectors

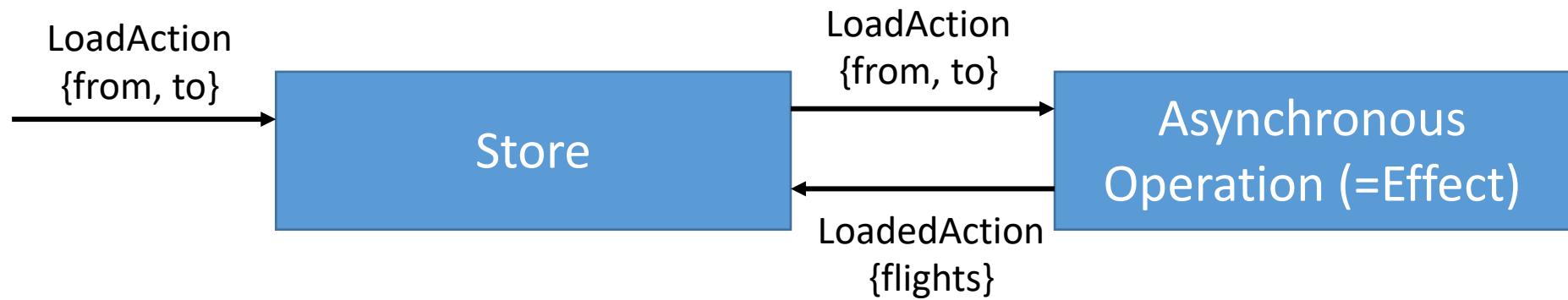
Effects



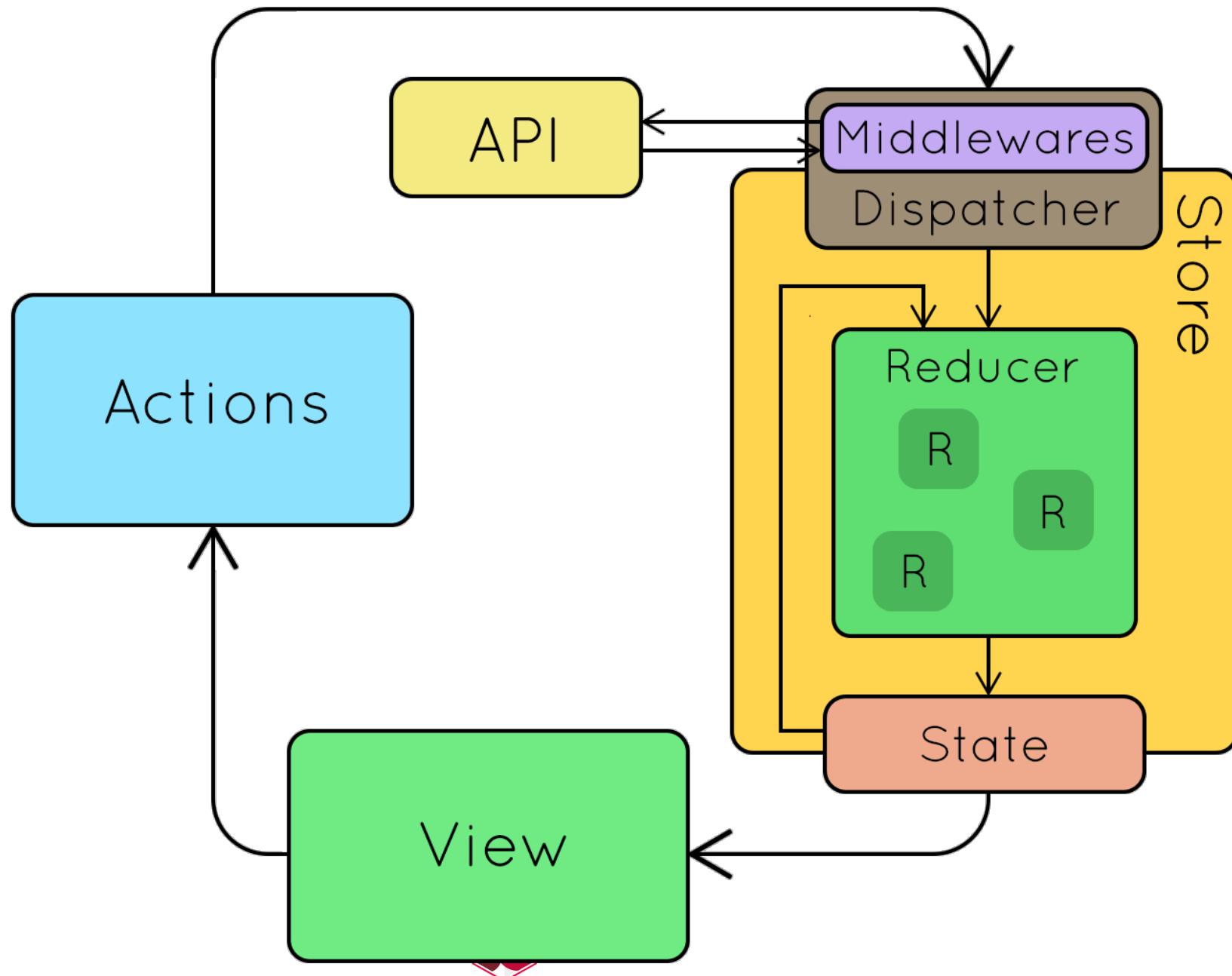
Challenge

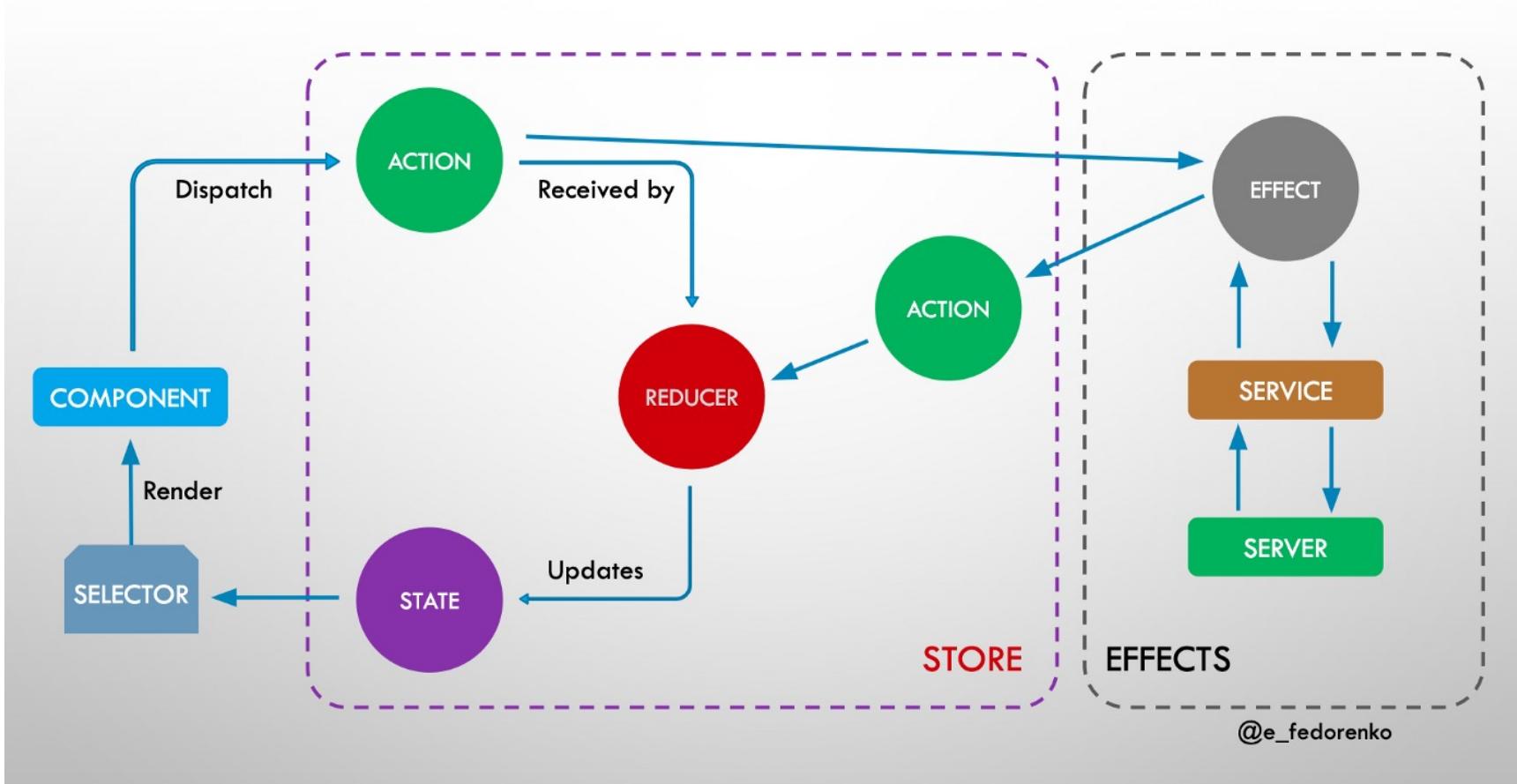
- Reducers are synchronous by definition
- What to do with **asynchronous** operations?

Solution: Effects



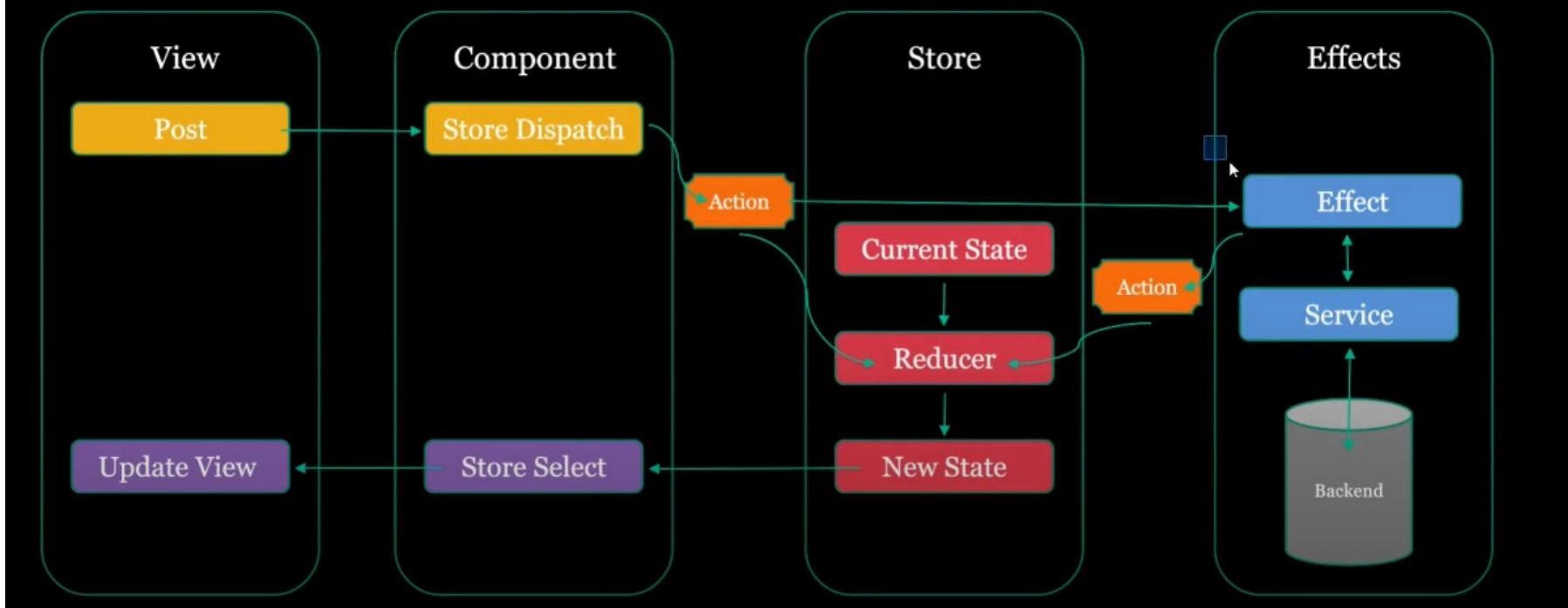
ng add @ngrx/effects





<https://medium.com/angular-in-depth/how-i-wrote-ngrx-store-in-63-lines-of-code-dfe925fe979b>

NGRX Data Flow



Quelle: unbekannt

Effects are Observables



Implementing Effects

```
@Injectable()  
export class FlightBookingEffects {  
  
    [...]  
  
}
```

Implementing Effects

```
@Injectable()
export class FlightBookingEffects {

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

  [...]

}
```

Implementing Effects

```
@Injectable()
export class FlightBookingEffects {

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

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

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)));
}
```

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})));
}

}
```

Implementing Effects

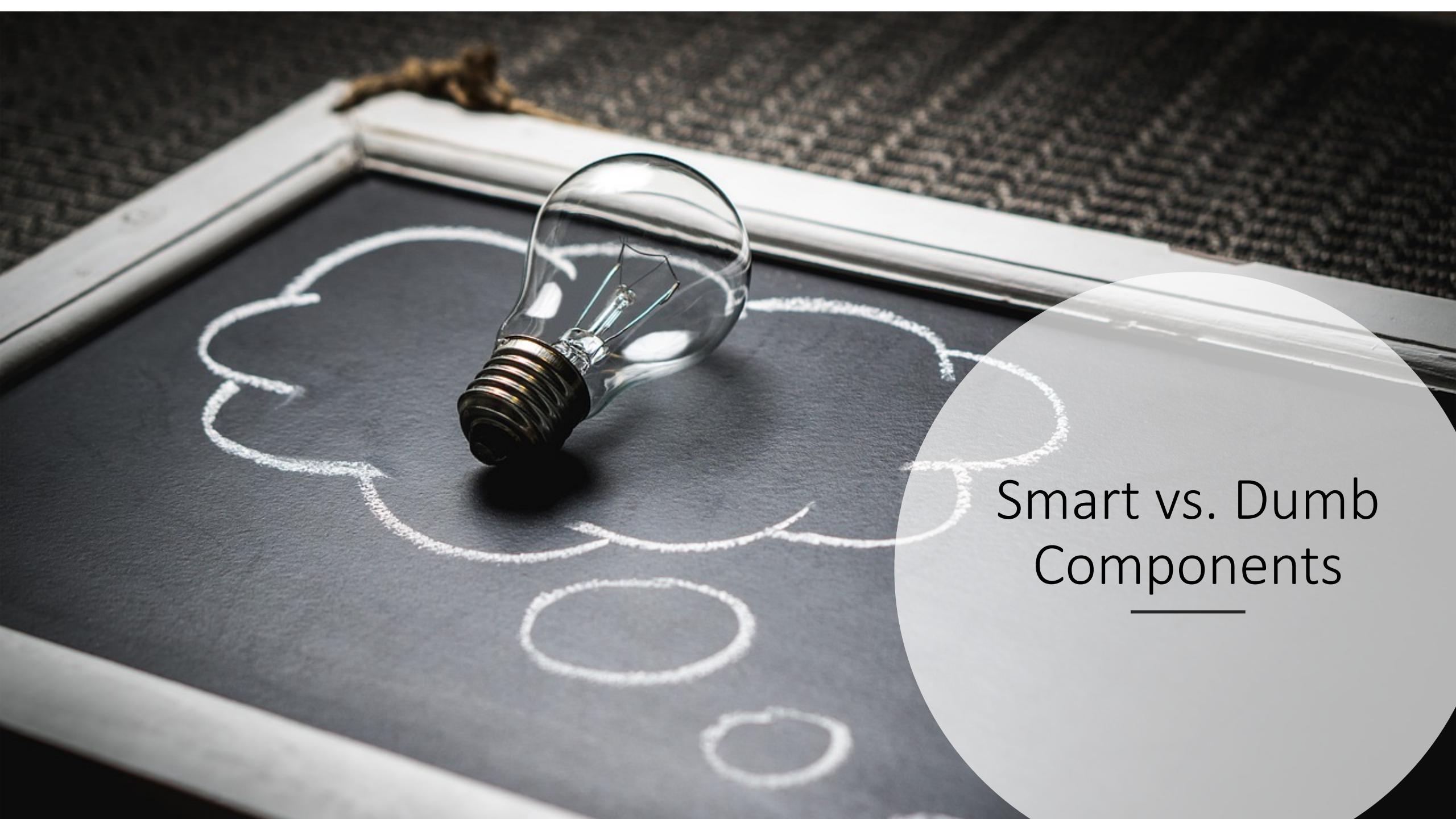
```
@NgModule({
  imports: [
    StoreModule.provideStore(appReducer, initialState),
    EffectsModule.forRoot([SharedEffects]),
    StoreDevtoolsModule.instrument()
  ],
  [...]
})
export class AppModule { }
```

Implementing Effects

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

Demo & Lab

NgRx Effects

A photograph of a clear incandescent lightbulb lying on a dark surface. A white chalk outline of a cloud with three smaller circles inside is drawn on the surface. In the background, a piece of chalk lies across the top of the board.

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?

Smart vs. Dumb Components

Smart Component

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

Dumb

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



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Like this topic?

- Check out the NgRx Guide
- <https://ngrx.io/guide/store> and
- <https://ngrx.io/guide/component-store/comparison>