



State Management with Redux und @ngrx/store

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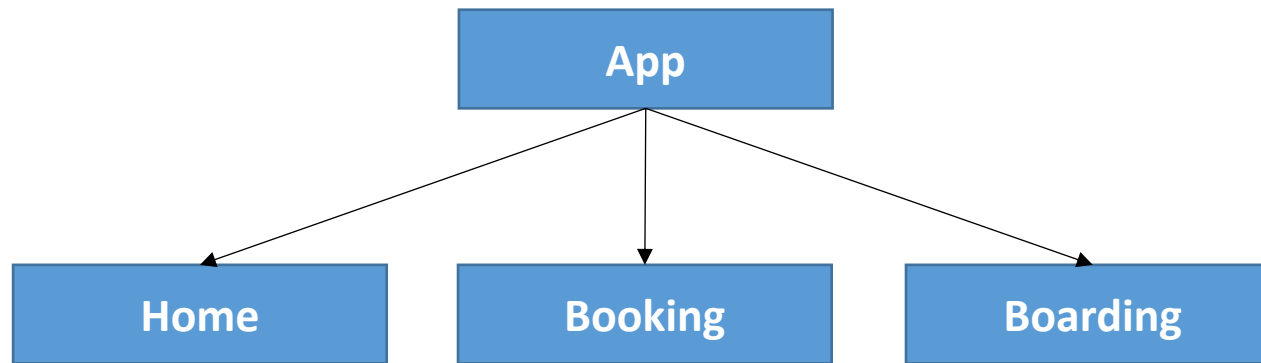
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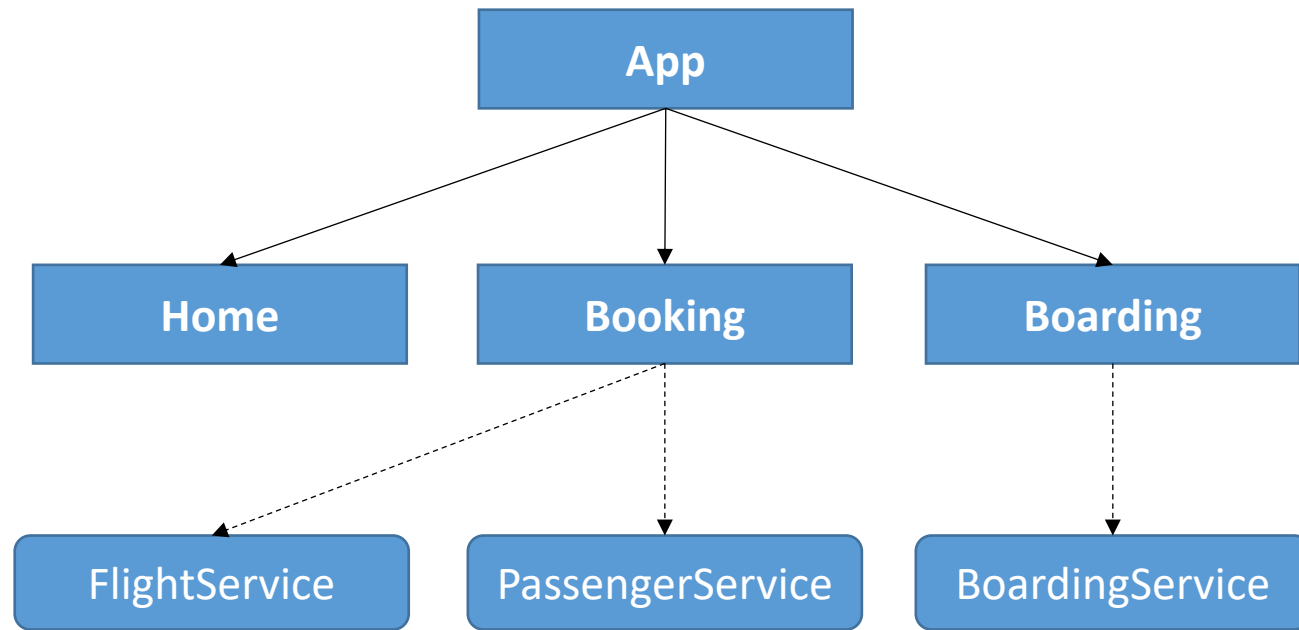


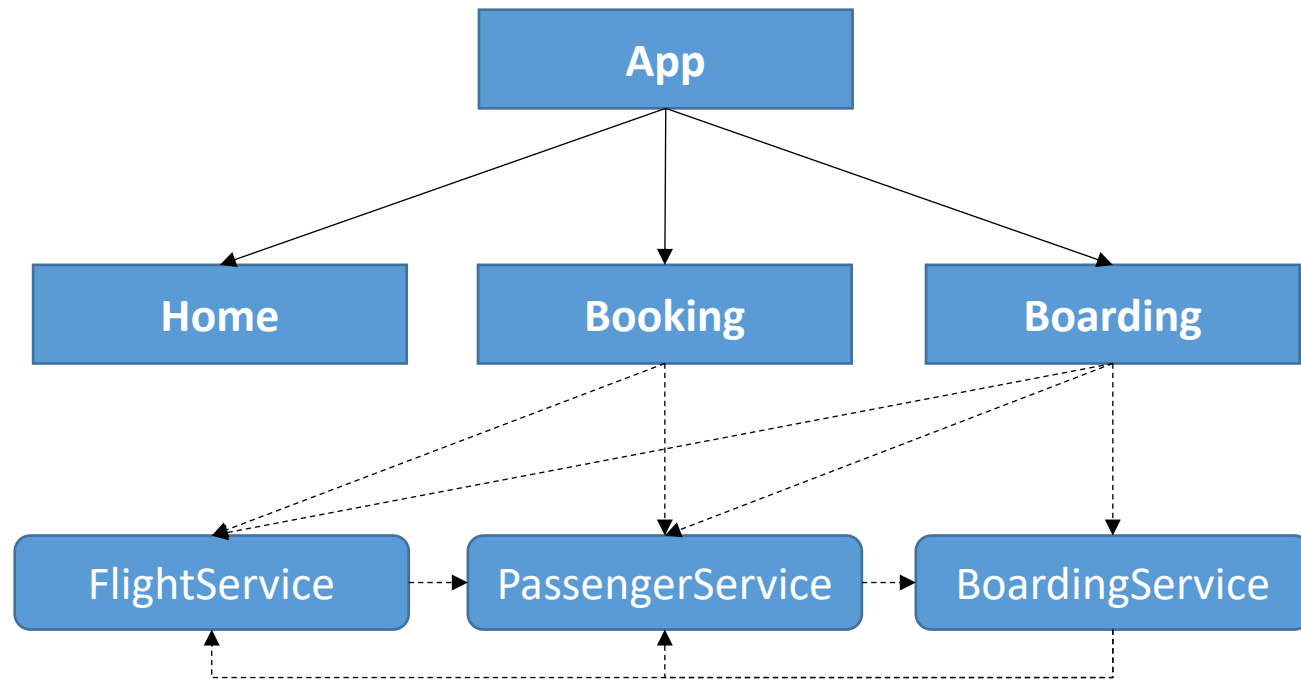
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A full-page background image featuring a silhouette of a person standing on a rock in the middle of the ocean at sunset. The person's arms are outstretched horizontally, mirroring the horizon line. The sky is filled with dramatic, colorful clouds in 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







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Redux

- Redux makes complex UI manageable
- Origin: React Ecosystem
- Implementation used here: `@ngrx/store`

`npm install @ngrx/store --save`



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Alternatives



@ngrx/store vs @ngxs/store

Enter an npm package...

@ngrx/store x

@ngxs/store x

+ @angular-redux/store

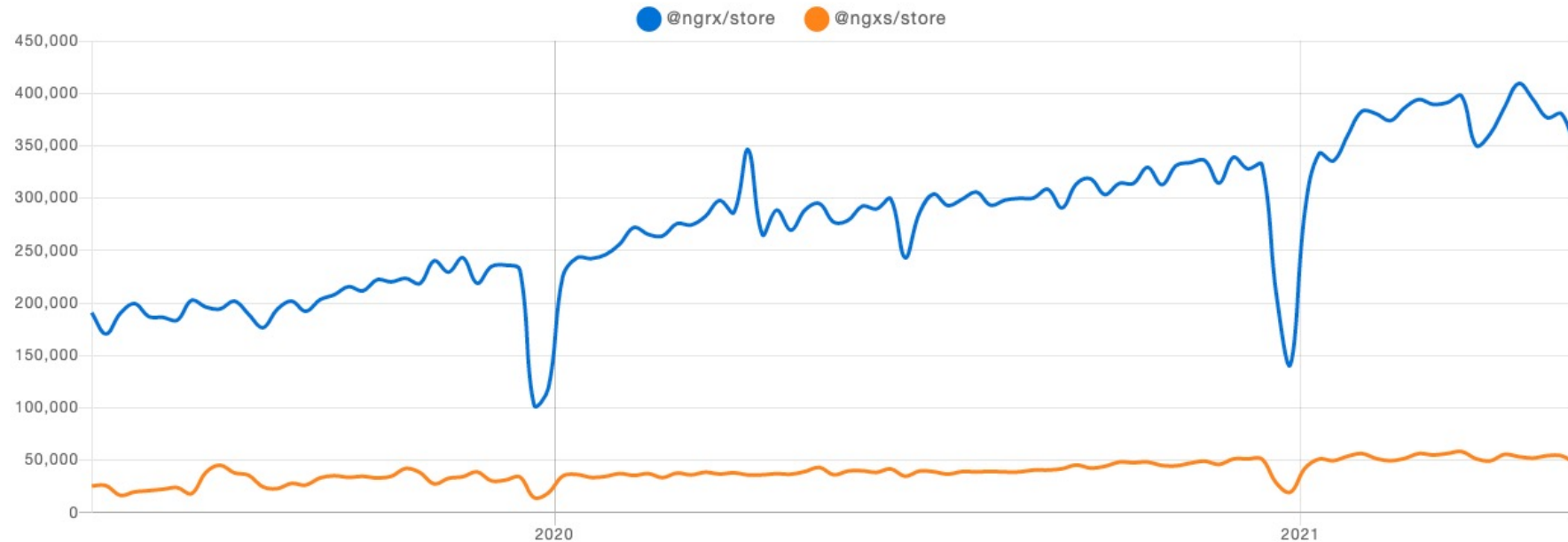
+ @datorama/akita

+ ngxs

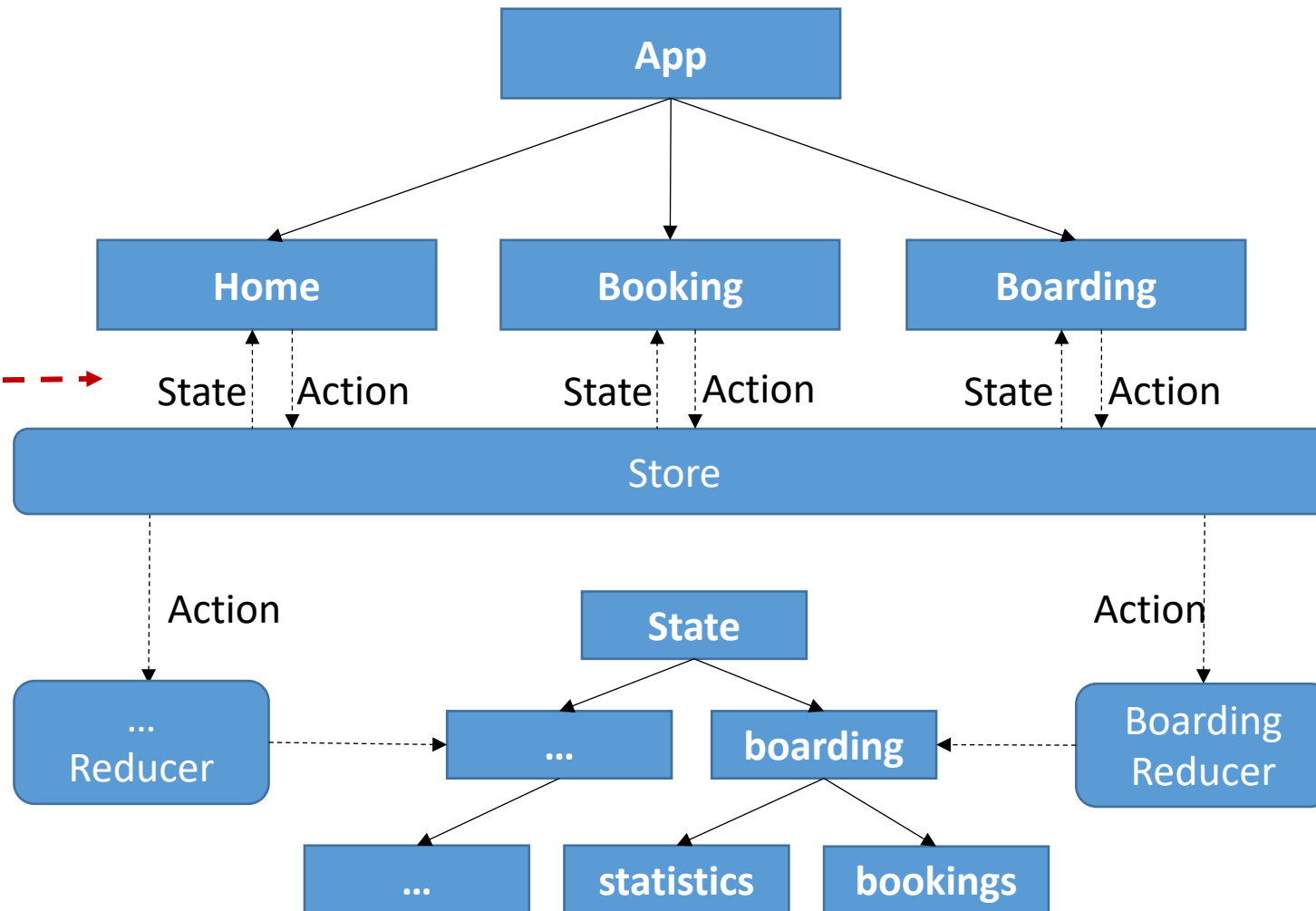
+ akita

+ mobx

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via Observables*



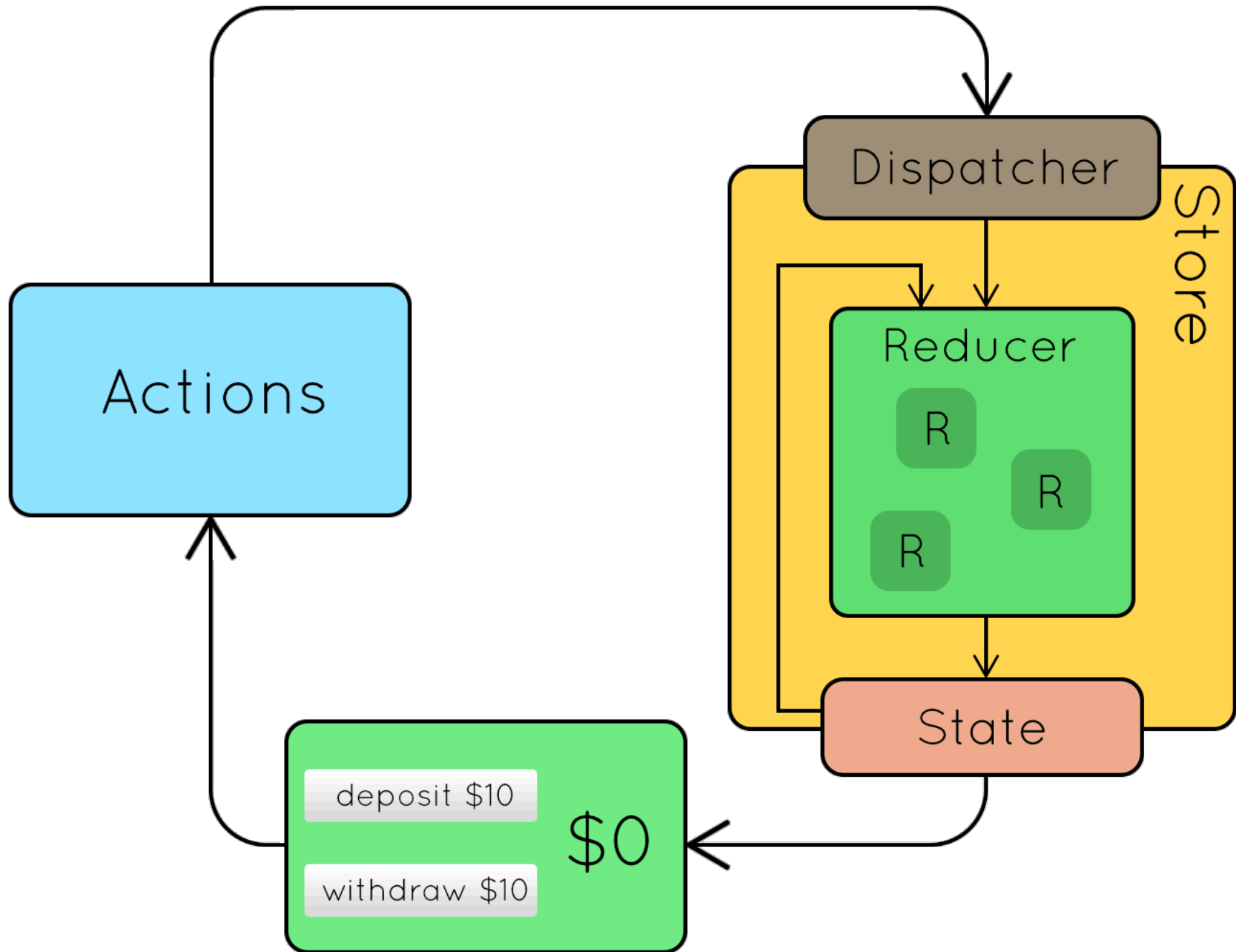
Single Immutable State Tree



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State

State

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



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State

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

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



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AppState

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



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Actions

Parts of an Action

- Type
- Payload



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Defining an Action

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



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Reducer



Reducer

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



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Reducer

(currentState, action) => newState



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Reducer for FlightBookingState

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



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Map Reducers to State Tree

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



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Store

Store

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



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Selectors

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



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Actions

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



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Registering @ngrx/store

Registering @ngrx/Store

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



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Registering @ngrx/Store

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

@ngrx/store-devtools



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ngrx and Feature Modules

Reducers

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



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Reducers for Shared State

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



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Reducers for Shared State

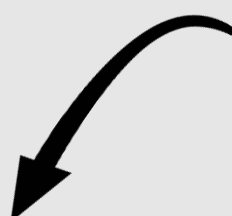
```
const reducers = {  
  flightBooking: flightBookingReducer,  
  currentUser: authReducer  
}
```



Registering @ngrx/Store

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

State branch for feature



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Lab

NgRx Store & Selectors



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Effects



Challenge

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

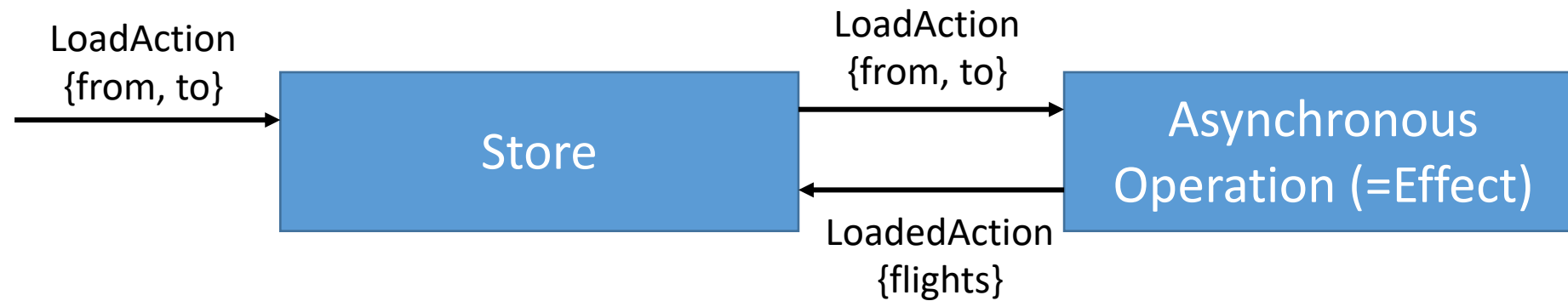


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Solution: Effects



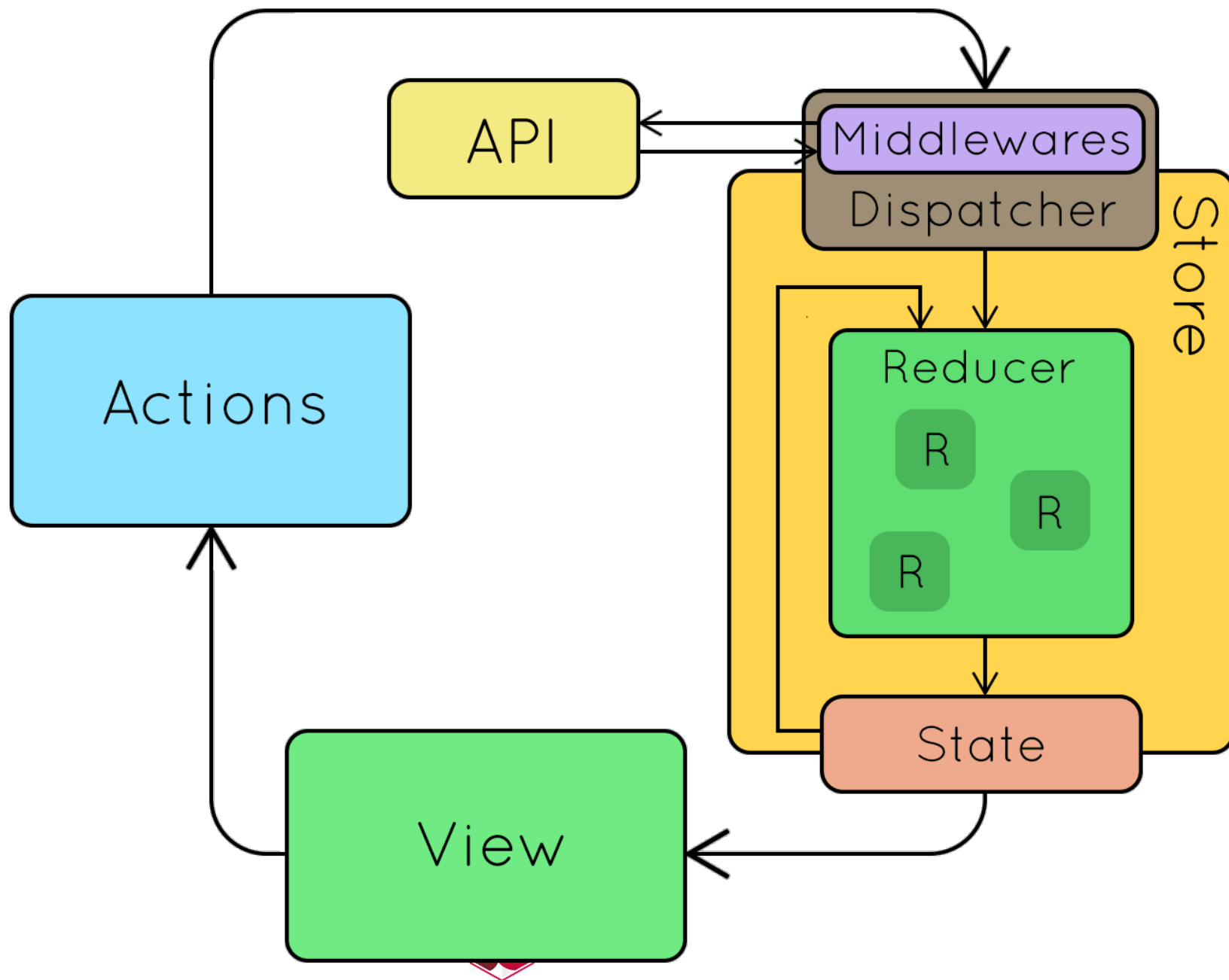
ng add @ngrx/effects



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Effects are Observables



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Implementing Effects

```
@Injectable()
export class FlightBookingEffects {

  [...]

}
```



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Implementing Effects

```
@Injectable()
export class FlightBookingEffects {

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

  [...]

}
```



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Implementing Effects

```
@Injectable()
export class FlightBookingEffects {

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

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



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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)))));
}
```



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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})))));
}
```



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Implementing Effects

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



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Implementing Effects

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



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NgRx Effects



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@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



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DEMO



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@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



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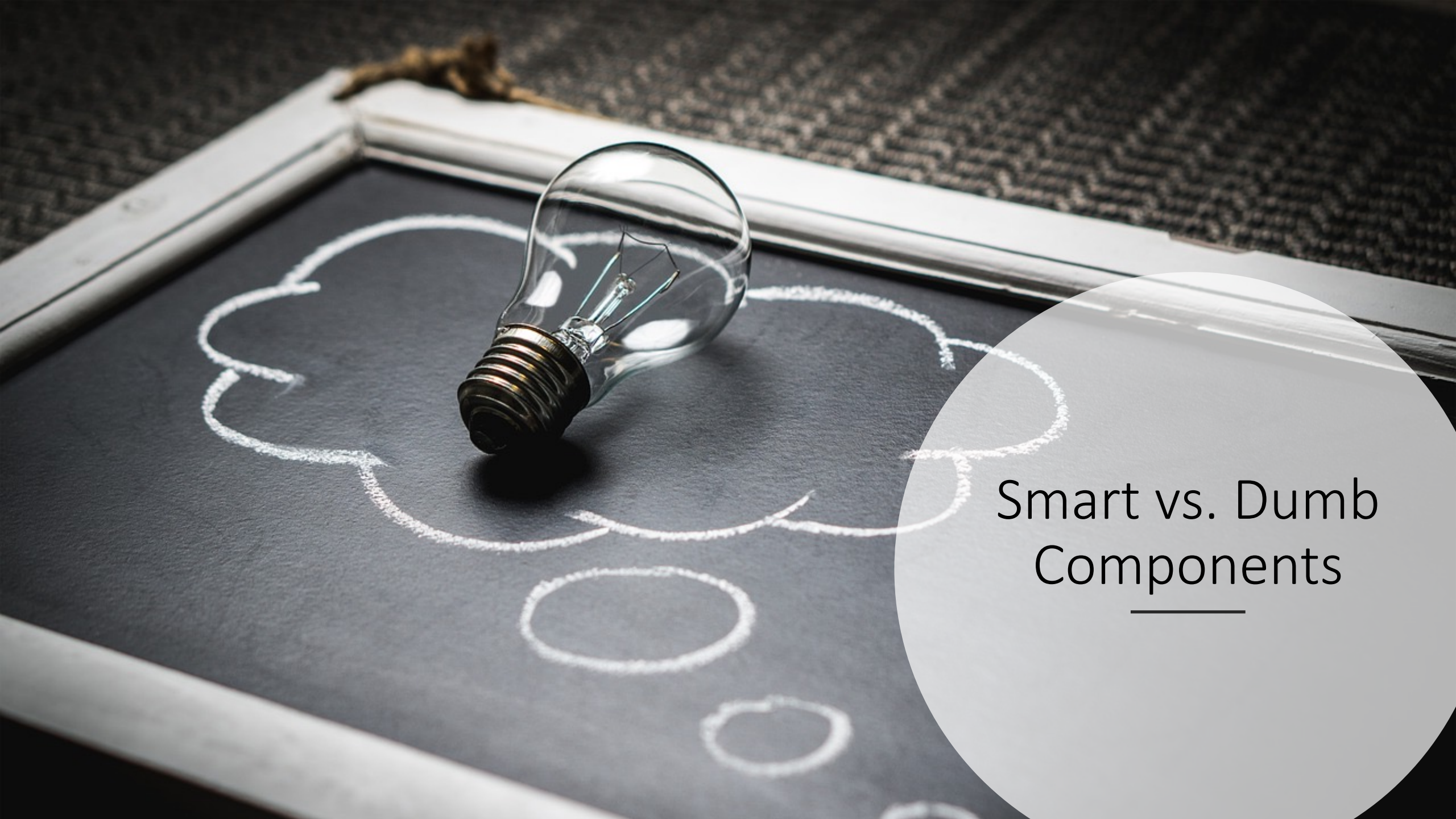
DEMO



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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?



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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/>



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