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State Management with Redux und @ngrx/store

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ANGULARarchitects.io

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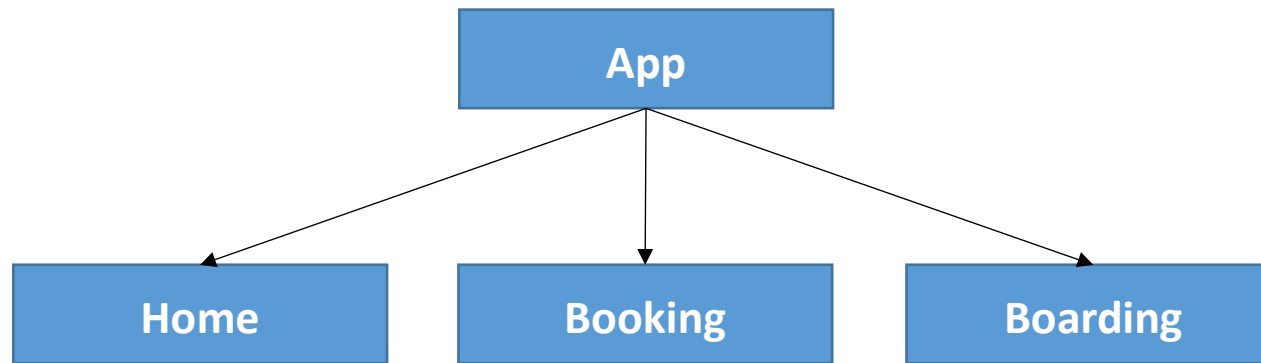
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A full-page background image showing a person standing on a rock in the middle of the ocean at sunset. The person's arms are outstretched, and their silhouette is reflected in the calm water. The sky is filled with colorful clouds in shades of orange, red, and blue. The sun is low on the horizon, creating a bright glow.

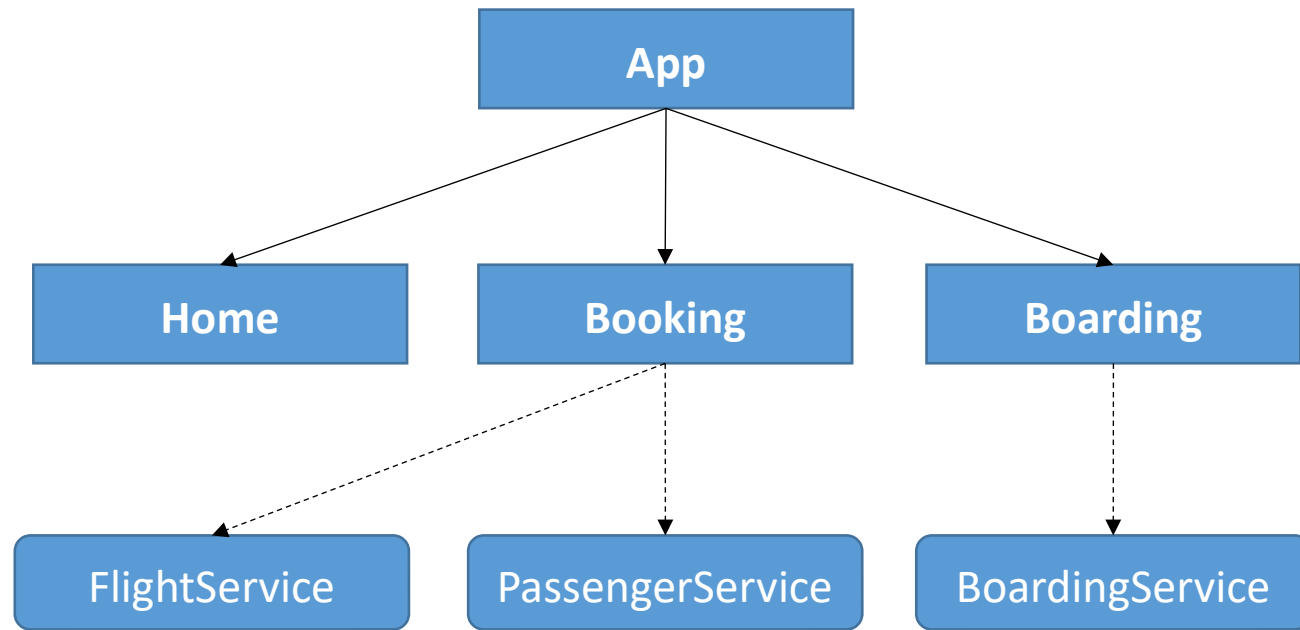
Motivation

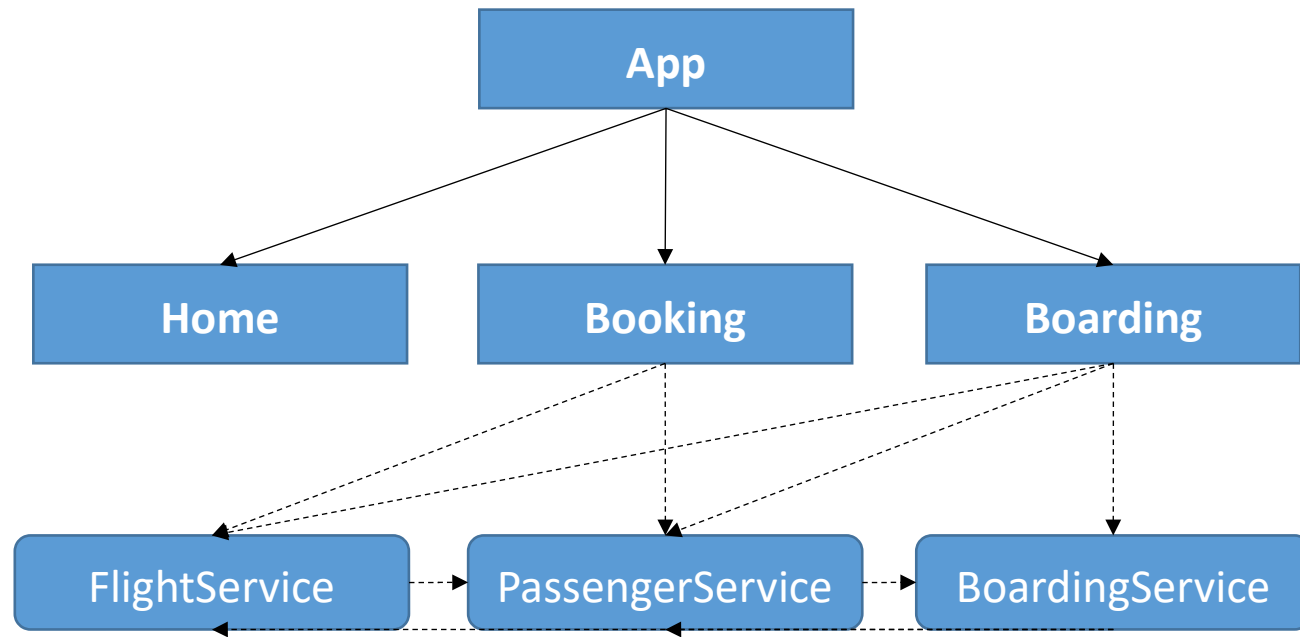


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Redux

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

ng add @ngrx/store



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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

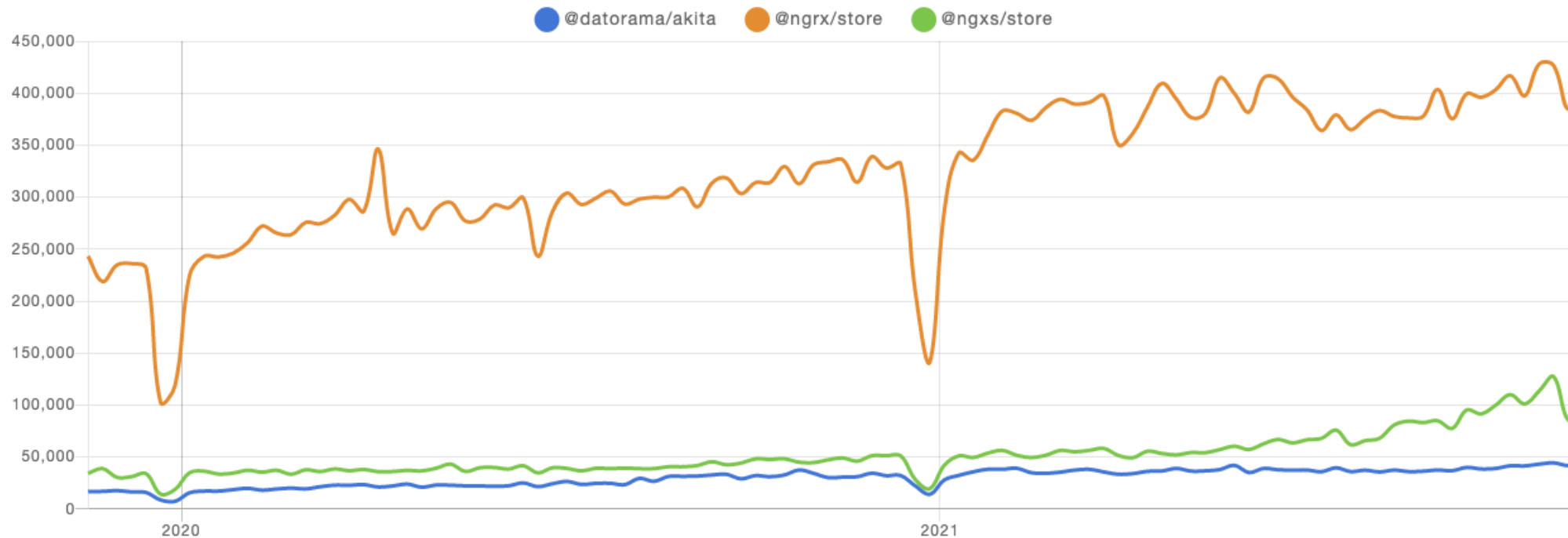
+ ngxs

+ akita

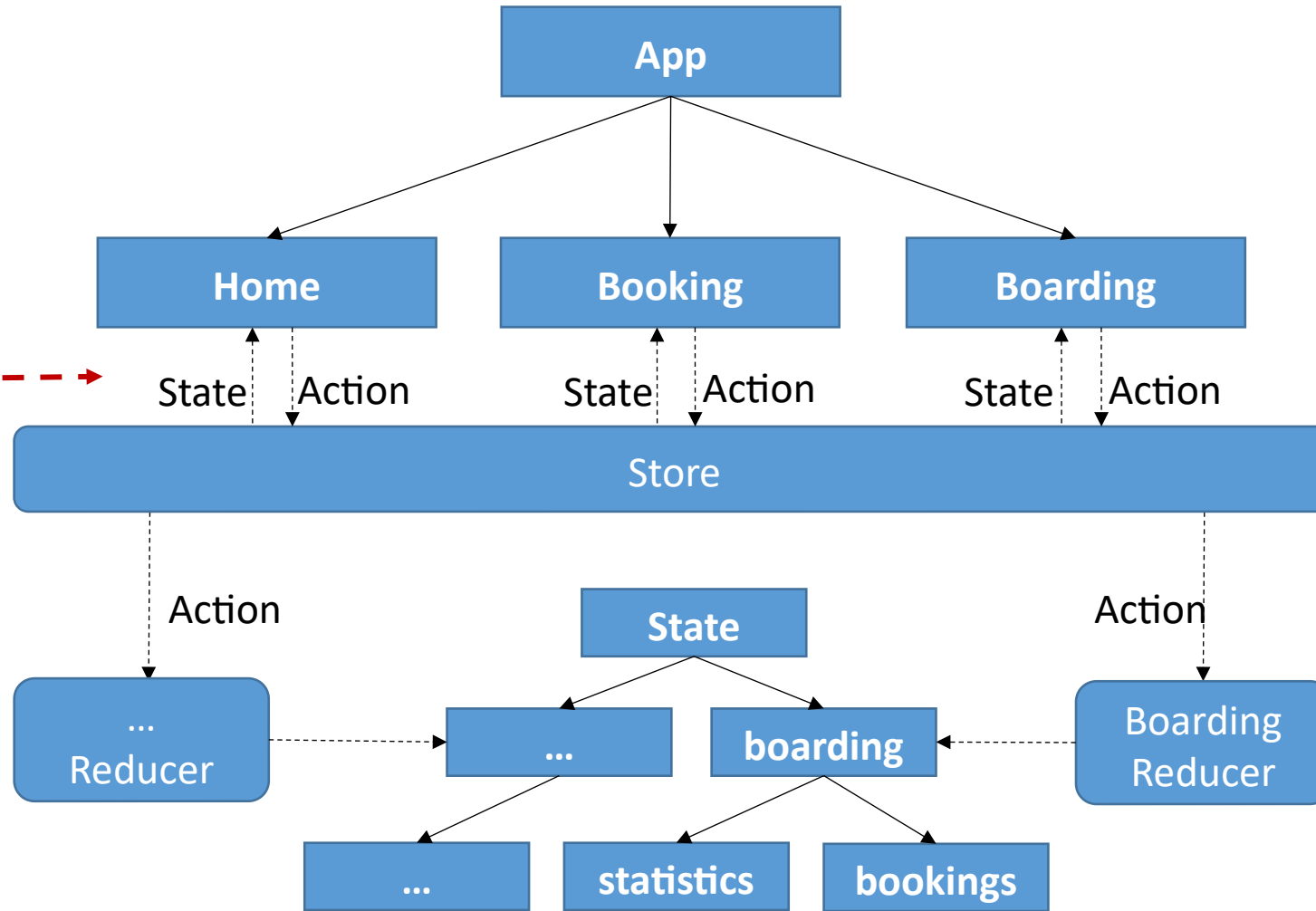
+ mobx

+ store2

Downloads in past 2 Years v



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via Observables*



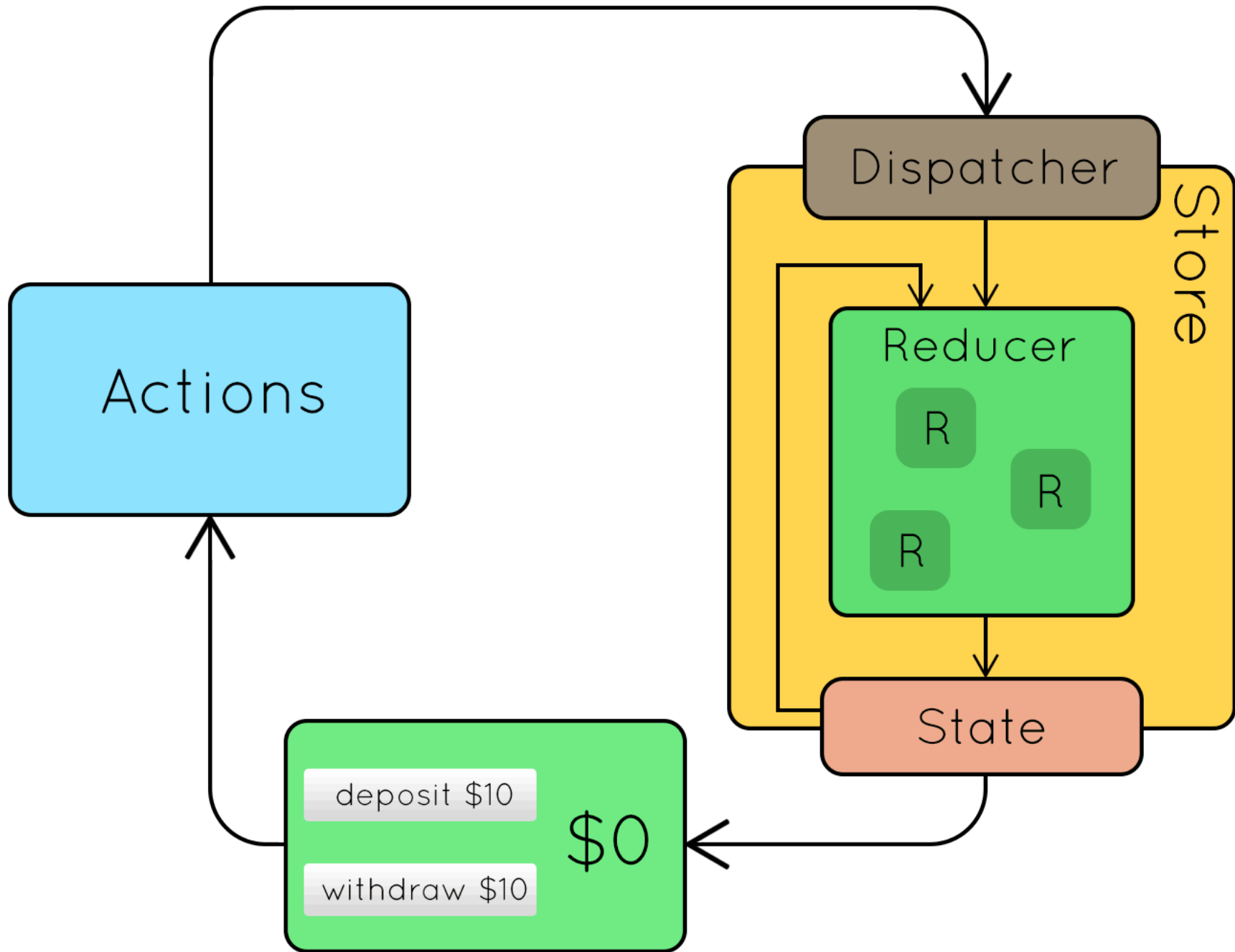
Single Immutable State Tree



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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

Actions

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



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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

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

(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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A photograph of three large, weathered wooden barrels standing in a row. The barrels are constructed from vertical wooden staves held together by horizontal metal hoops. The wood shows signs of age and wear, with varying shades of brown and grey. The lighting is dramatic, with strong highlights and deep shadows. A semi-transparent dark rectangle is overlaid on the lower-left portion of the image.

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 { }
```



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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

Registering @ngrx/Store

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

State branch for feature



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NgRx Store



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Selectors

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

Defining selectors

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



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Using selectors for manipulation (filtering)

```
export const selectFlightBookingState =  
  createFeatureSelector<fromFlightBooking.State>  
    (fromFlightBooking.flightBookingFeatureKey);  
  
export const selectFlights =  
  createSelector(selectFlightBookingState, (s) => s.flights);
```



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NgRx Store & Selectors



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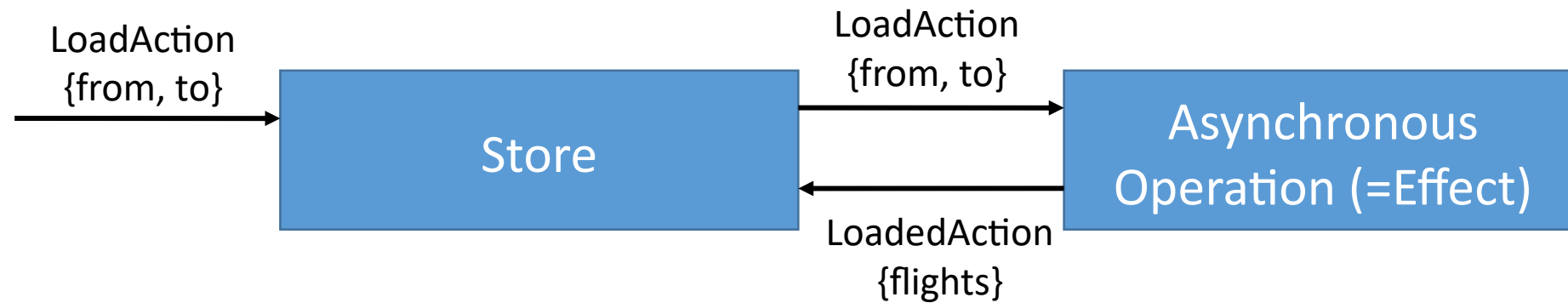
Effects



Challenge

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

Solution: Effects



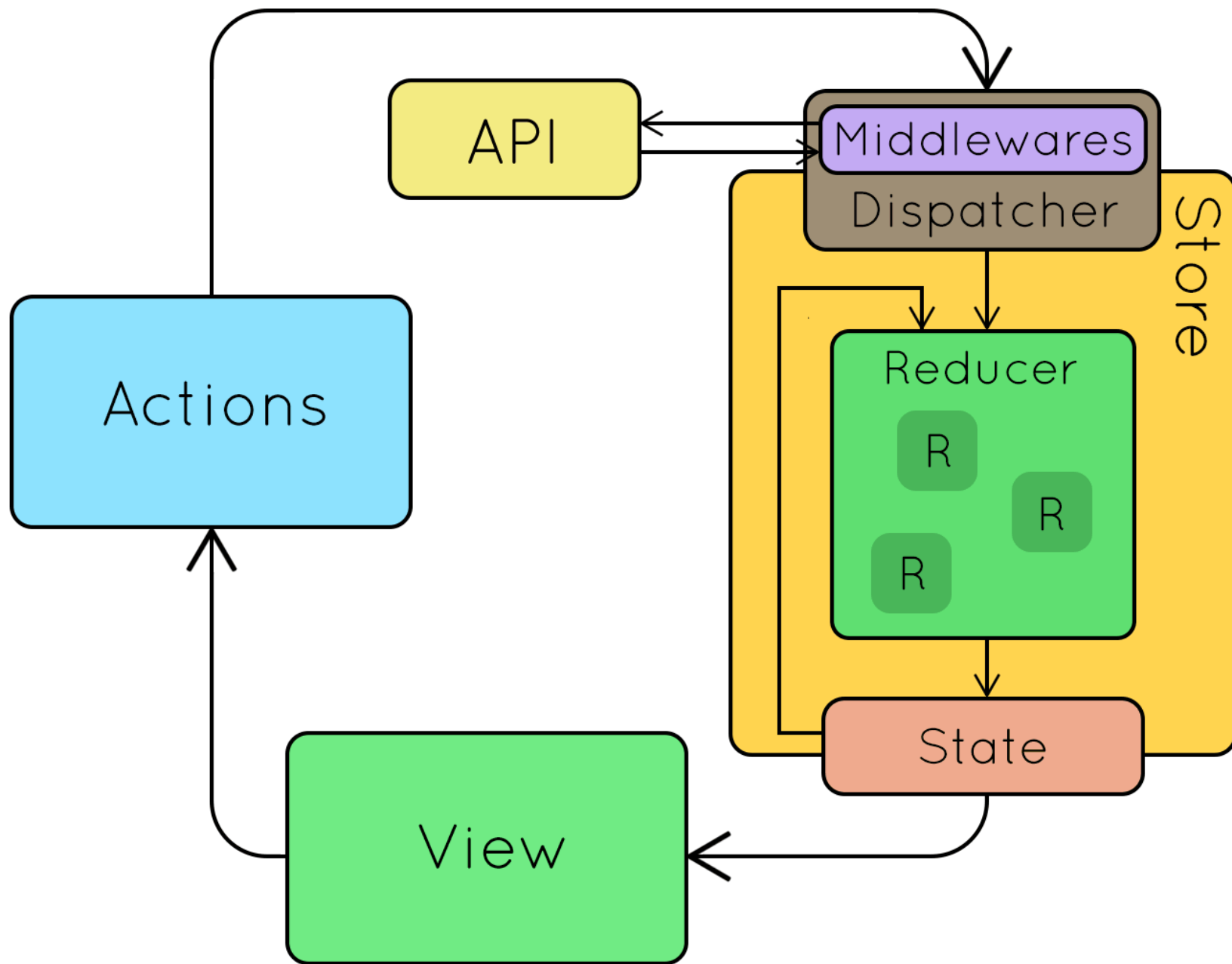
ng add @ngrx/effects



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Effects are Observables



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Implementing Effects

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



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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@ngrx/store-devtools

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

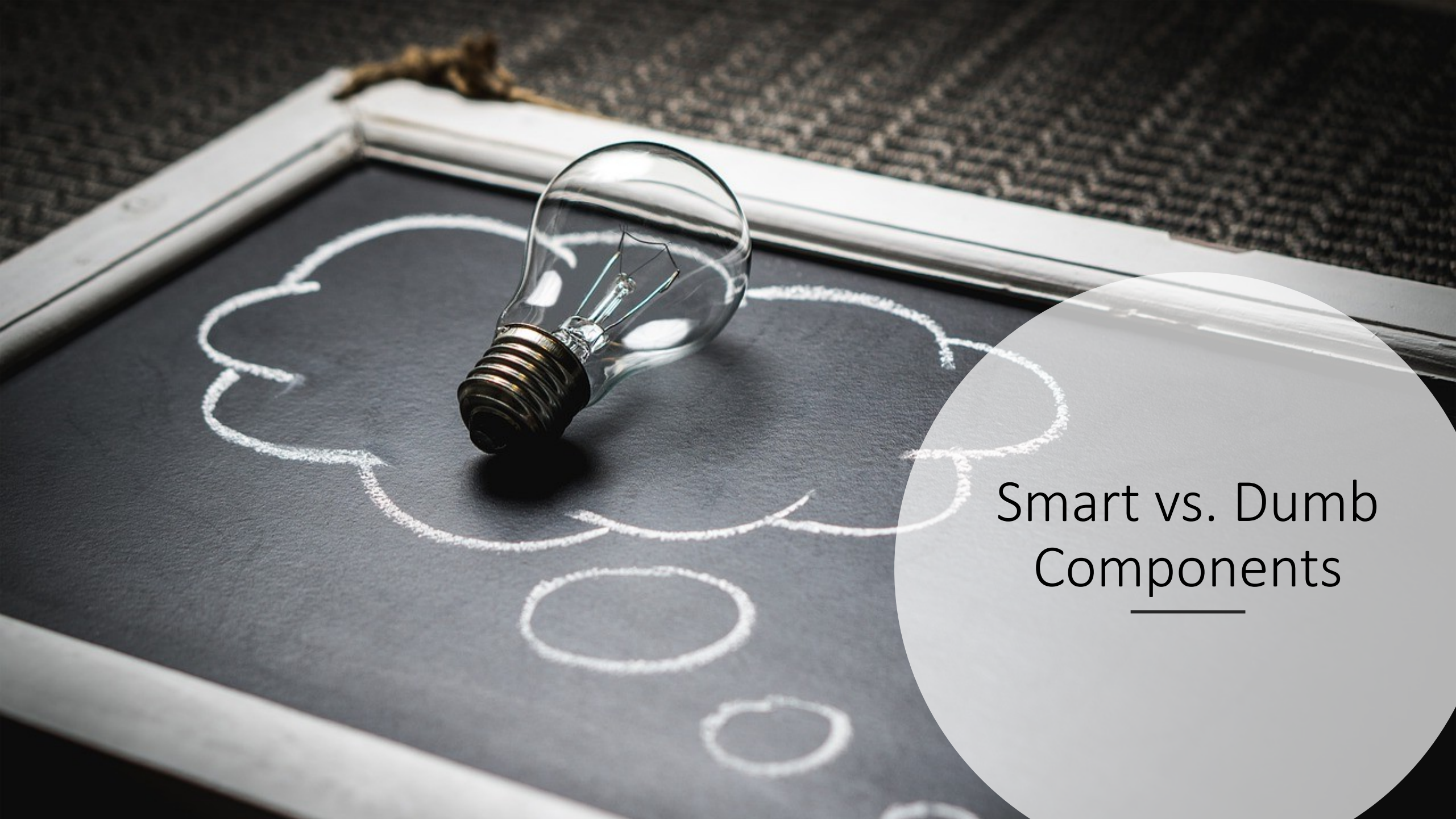
DEMO



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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/store> and
- <https://ngrx.io/guide/data/architecture-overview>