ORACLE TECH DAYS

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Welcome to Oracle Week 2024

we will start
in a few mins

C:\ngrx new

Redux with Signal Stores

Angular + NgRx

Hi, I'm...

Kobi Hari

- Freelancer
- Developer, Instructor and Consultant
- Angular, Async development, .NET core

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Courses on Udemy: https://www.udemy.com/user/kobi-hari/

My Angular Channel: https://www.youtube.com/@kobihari

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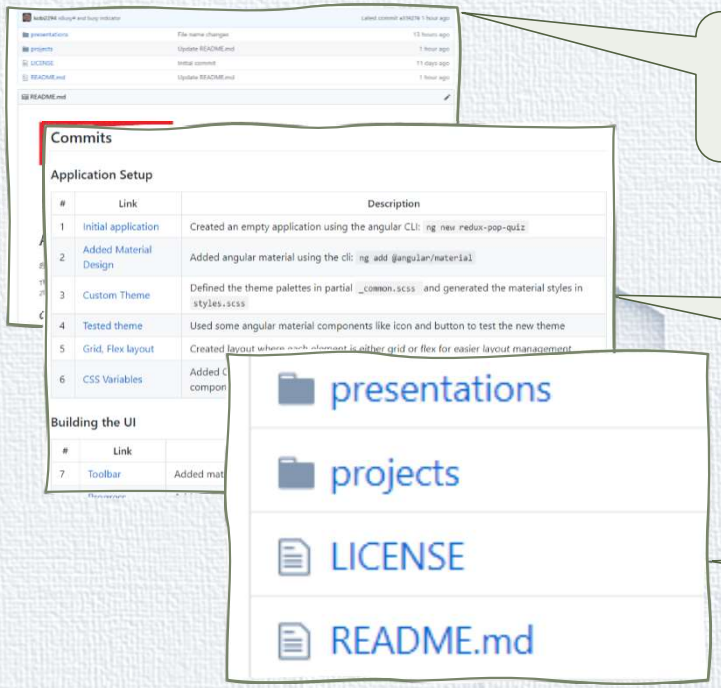
We have a GitHub Repository!

kobi-hari-courses/2411-oracle-tech-days-ngrx



Session Summary

Project Code with Commits Summary

This presentation and other Useful Links

SCAN ME

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This seminar is based on signals...

Modern Angular 19 with Signals - The missing guide

by Kobi Hari

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And coming up soon…

NgRx Signal Store - The missing guide

by Kobi Hari

Our Agenda

The Redux Pattern

NgRx Store – Selectors, Actions, Reducers

NgRx Effects – Reactivity On Steroids

NgRx Signals Store – The new approach

Angular + NgRx

The “Redux” Pattern

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The Redux Pattern

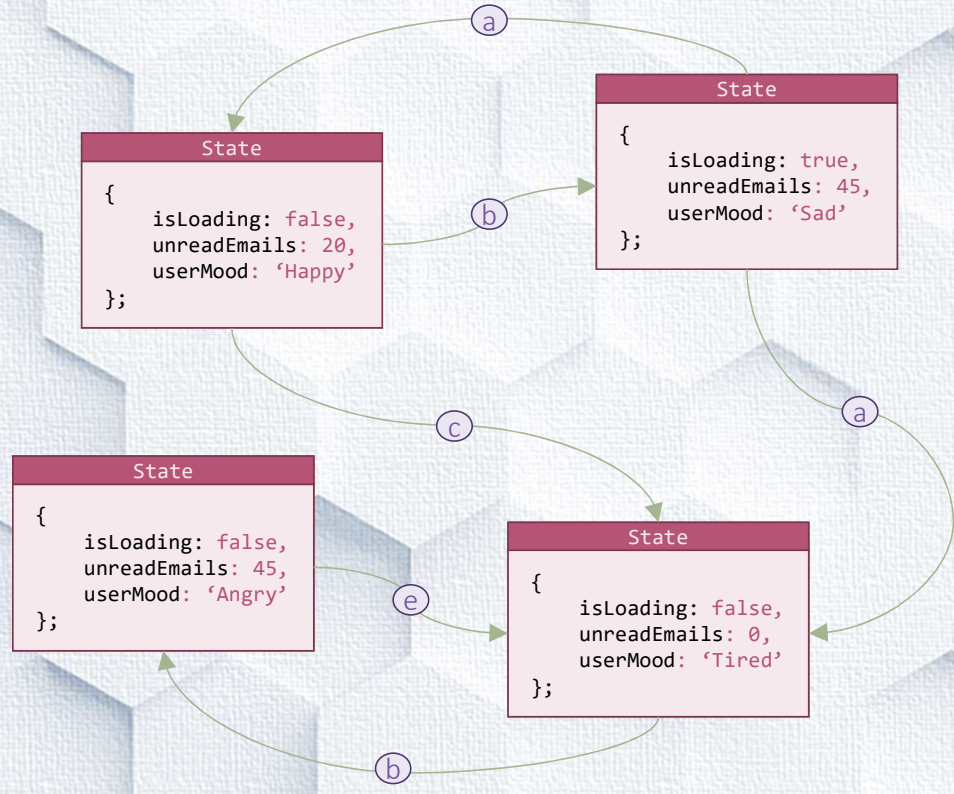
Single Point of Truth

Immutability

Pure functions - Reducers

What is a “State”

- State is an object holding all the changeable data in the application
- Any change to data means that you move from one state to another
- State is replaced as a result of an Action

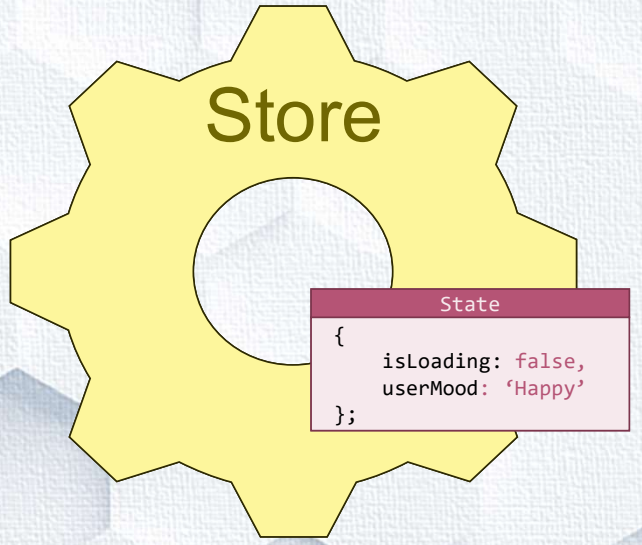


NgRx Store

Selectors, Actions and Reducers

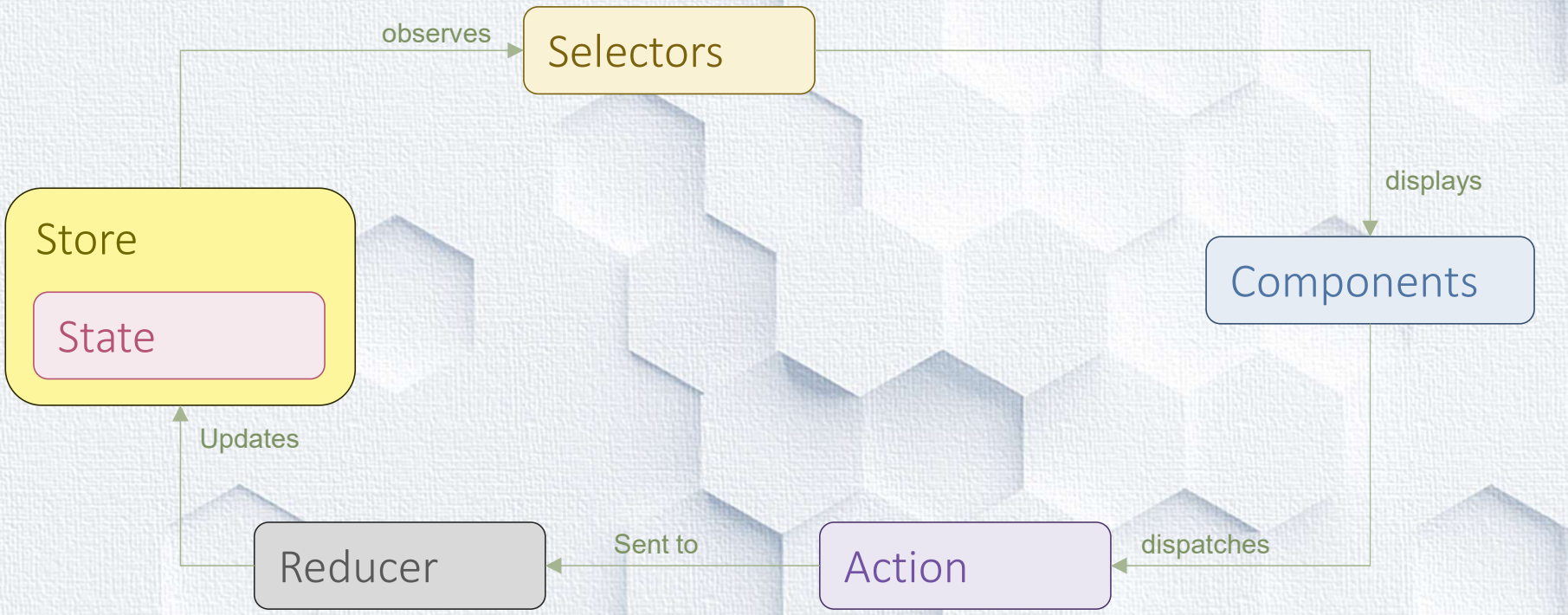
The Store

- The store is a service that holds the state
- The structure of the state is private (!)
- Reading or Updating the state is done indirectly using `Selectors` and `Actions`



Angular + NgRx

The Circle of Life

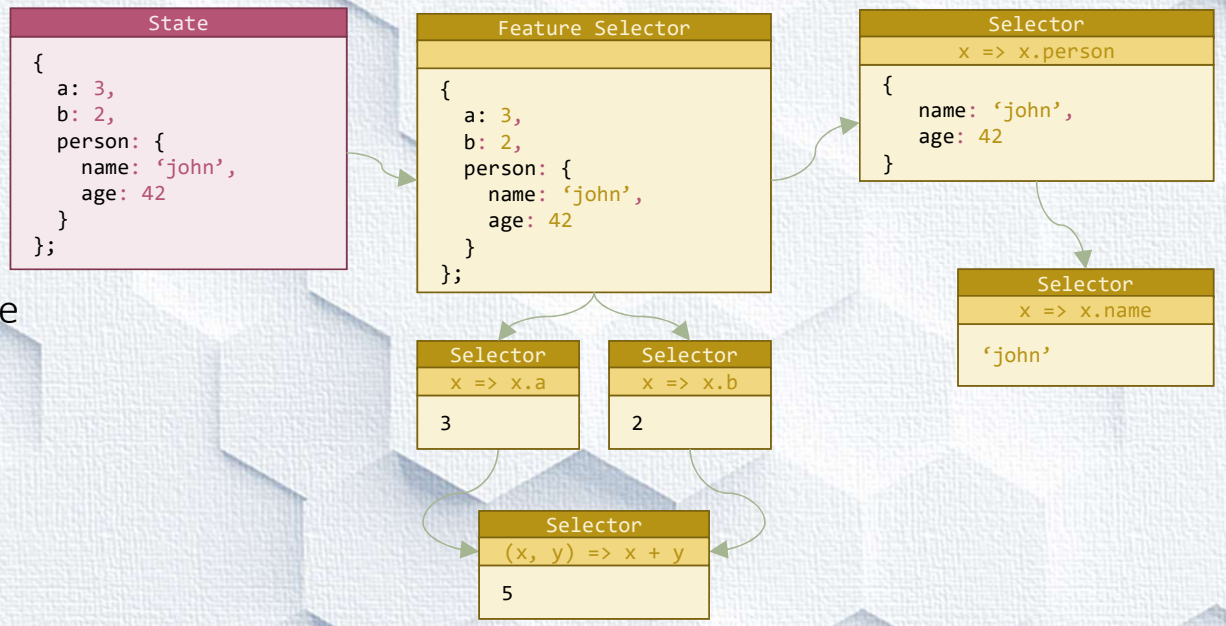


Angular + NgRx

Demo - Setting up the Store

- ✓ Installing the packages
- ✓ Creating State and Store
- ✓ Instrumenting The dev-tools
- ✓ Creating features
- ✓ Providing the feature

Selectors



- Selectors select a piece of the state
- A selector is based on:
  - Parent selector (or many)
  - Projection function
- They can also select "calculated expression" of the state

Selecting from the store

- Selectors are used to create observables
- These observables are memoized and optimized

Angular + NgRx

Demo – Using Selectors

- ✓ Atomic Selectors
- ✓ Adding Extra Selectors
- ✓ Deriving Selectors from multiple sources
- ✓ Using selectors in Components

Actions

- Action is a simple JSON
- It must contain a "`type`" property
- It may contain additional properties (called the "`payload`")
- NgRx provides "Action Creators"
- Actions describe `events`.
- By convention the `type` should look like this:

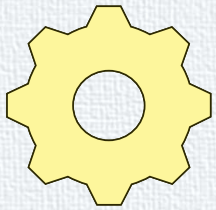
  `'[SOURCE] name'`

Action

```
{
   type: '[USER] set loading',
   value: true
};
```

Dispatching Actions

- Use the `Store` to dispatch actions



```
store.dispatch( )
```

Action

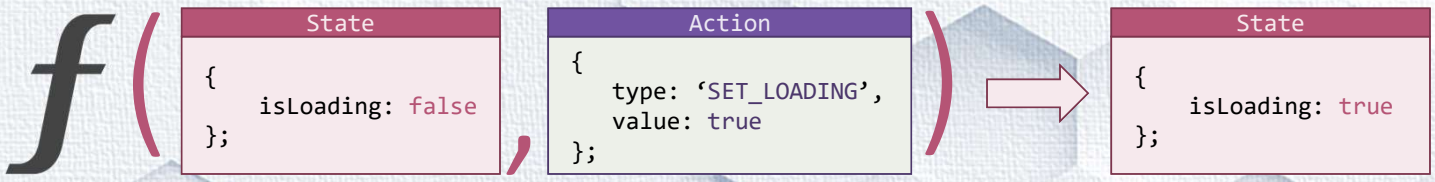
```
{
   type: '[USER] set loading',
   value: true
};
```

Action Groups

- NgRx 16 now has a new concept for actions: `Action Group`
- `Action Groups` are used to group together actions from the same source
- Angular uses Typescript Templates to pull some neat compiler tricks

Reducers

- Reducer is a “Pure Function”
- It calculates new state from old state, and an action



Demo – Using Action Groups and Reducers

- ✓ Creating Action groups
- ✓ Using the `props` functions to define payload
- ✓ Dispatching actions
- ✓ Implementing the Reducers

Angular + NgRx

NgRx Effects

Reactivity On Steroids

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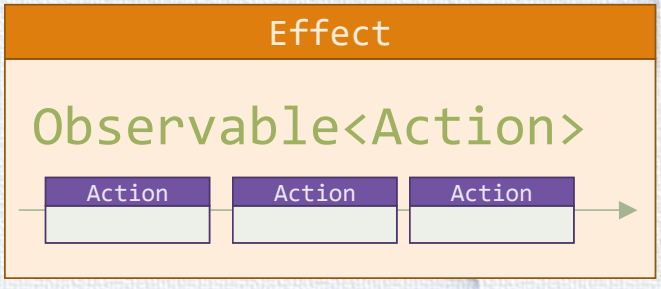
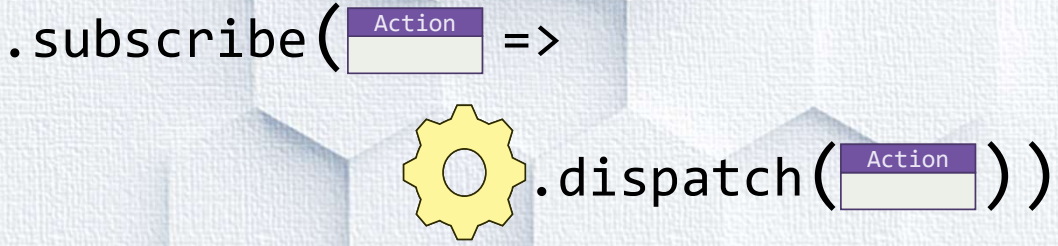
What are "Effects"

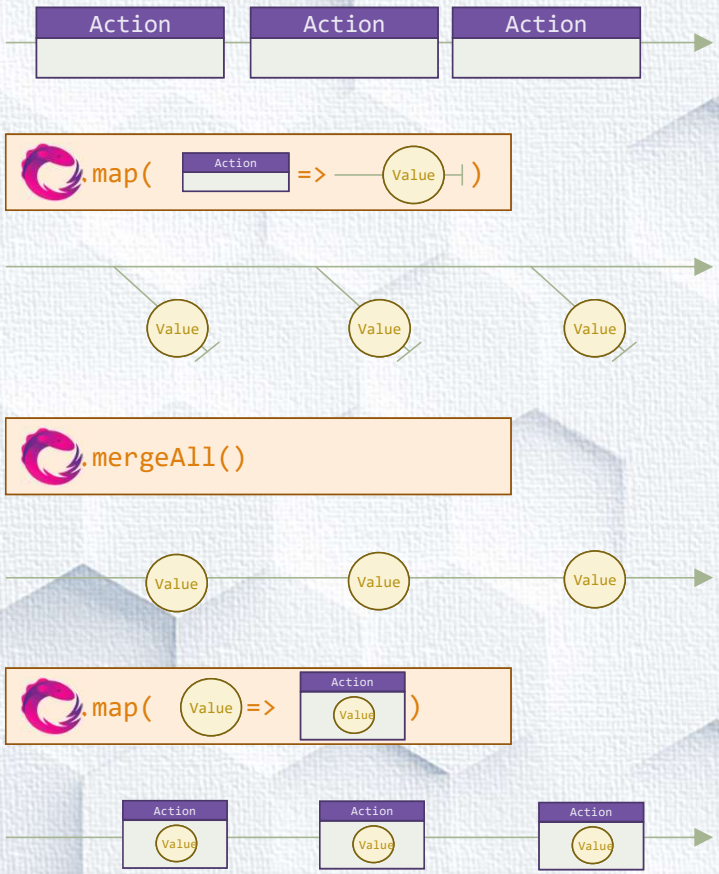
- Effects are Observables
  - That the store subscribes to
  - That yield actions
  - That get dispatched automatically



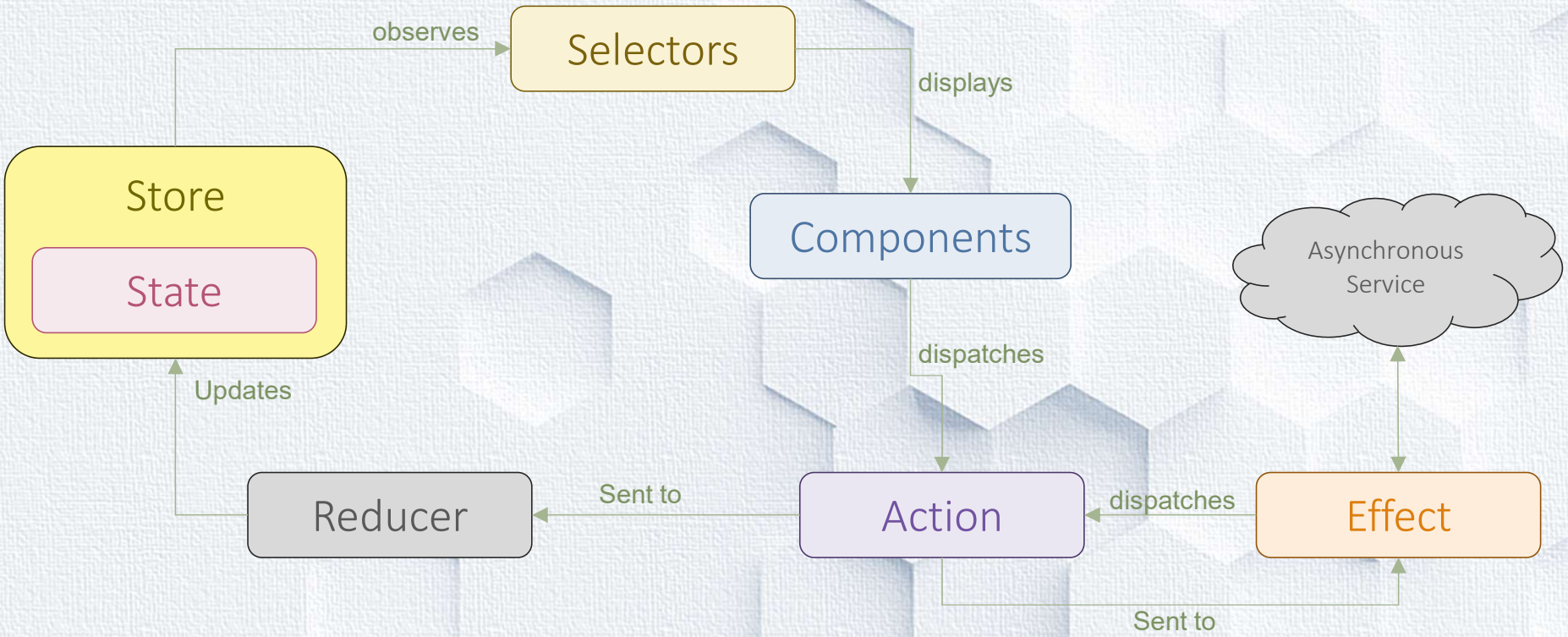


Fun facts about `Effects`

- They are usually created from other observables of `actions`
- They are built using `RxJS operators`
- They are often mapped to asynchronous values
- They often cause…. Side effects (AH HA!!!!)



The Circle of Life – with effects



Actions drive the app

- `Actions` are not just for the store
- In the “Reactive” thinking, everything that can happen in the application is an `action`.
- `Effects` handle `Actions` by performing operations that are translated into other actions
- `Reducers` handle `Actions` by changing the current state of the application

Demo – Using Effects

- ✓ Installing the @ngrx/effects package
- ✓ Writing Effects as functions
- ✓ Reacting to Actions or State
- ✓ Invoking and Flattening async methods
- ✓ Handling Errors
- ✓ Registering the Effects

Angular + NgRx

NgRx Signal Store

Signal based store as a service

Signal Store

- Signal Store is a service
- It is provided by a component
- It is usually tied to the life-cycle of the component
- It is like a “baby” store
  - It has “`selectors-like`” signals
  - It has “`reducer-like`” methods
  - It has “ `effects-like` ” methods
  - It has no `actions` (!!!)
  - It has “`custom features`” (wait and see!!!)
  - It is completely based on functional programming
  - It is based on Signals instead of Observables

Signal State – The baby store

- Define a state: `T`
- Call the `signalState<T>` function
- What you get is the signal of the entire state.
  - But it also has sub property for each sub property of the state.
  - Each such property is a signal of that property
- In the example:
  - `this.state()` returns the entire object (as a signal)
  - `this.state.x()` returns 50 (as a signal)
  - `this.state.y.y1()` returns 10 (as a signal)
- Signal State is a nice utility around signals

```
@Component({selector: 'app-my', template: 'x = {{state.x()}}'})
0 references
export class MyComponent {
    1 reference
    state = signalState({
        x: 50,
        y: {
            y1: 10, y2: 20
        }
    })

    0 references
    changeX() {
        patchState(this.state, state => ({x: state.x + 1}));
    }
}
```

Signal Store

- Signal stores are full blown services
- They have properties, methods.
- You can use them as real stores
- But… they have no class. They are fully functional.
  - You create one by calling the `signalStore` function
  - You enhance it by calling `withXXX` functions as parameters. Each such function builds more functionality into the function.
    - Yes, that was absolutely a valid English sentence in functional programming, get used to it ☺
  - The `signalStore` function, returns a newly created type.
  - You can then use it as injection token.

```
1 reference
export const initialState: QuizState = {
    questions: QUESTIONS,
    answers: []
};
3 references
export const QuizStore = signalStore(
    withState(initialState)
    );
```

Consuming the store

- The `signalStore` function, returns a newly created type.
- You can then use it as injection token.
  - Make sure to provide it at the proper level
  - Then just inject the type.
- Just like signalState
  - it exposes a set of signals you can bind to.
  - You can call `patchState` to modify it.
  - But don't, at least not like this…

```
@Component({
  selector: 'app-view',
  template: `Number of questions:
              {{store.questions().length}}`,
  providers: [QuizStore]
})
0 references
export class ViewComponent {
  0 references
  store = inject(QuizStore);
}
```

Angular + NgRx

Demo – Using Signal Store

- ✓ Installing the @ngrx/signals package
- ✓ Creating a signal store service
- ✓ Initializing the state
- ✓ Providing it in the component
- ✓ Injecting it into the component
- ✓ Consuming the state

Computed Signals replace Selectors

- The angular signals allow you to derive **`computed`** signals from them.
- In signal store, this is how you replace selectors.
- Use the `withComputed` method to define a set of computed signals
- The signals may receive properties already defined as parameters and use them to compute the value

```
1 reference
export const initState = {x: 10, y: 20};
0 references
export const XyStore = signalStore(
    withState(initState),
    withComputed(({x, y}) => ({
        sum: computed(() => x() + y()),
        diff: computed(() => x() - y())
    }))
)
```

Demo – Signal Store `withComputed`

- ✓ Creating Computed Signals
- ✓ Deriving signals from other signals
- ✓ Binding to computed values

Setting the state

- You can use `patchState` to modify the current state.
  - patchState is a function, so it is called independently
  - The first parameter you pass is the store
  - Then you have 2 options
    - Pass a partial new state
    - Pass a function that takes the current state and returns a partial new state
- It's all very functional…

```
export class ViewComponent {
  1 reference
  store = inject(XyStore);

  0 references
  incX() {
    patchState(this.store, state => ({x: state.x + 1}));
  }
}
```

Creating an Updater method

- While the previous method is possible it is not recommended
  - We like our updates to be encapsulated in the store, to make sure only valid states are created
- Updater is replacing "`action` + `reducer`"
- The `updater` method creates a function
- Calling the function is like dispatching an `action` that updates the state
- We create method using the `withMethods` function
  - It takes a function that takes the store
  - The function returns an object full of methods
  - These are added to the store

```
export const XyStore = signalStore(
    withState(initState),
    withComputed(({x, y}) => ({
        sum: computed(() => x() + y()),
        diff: computed(() => x() - y())
    })),
    withMethods(store => ({
        incX() { patchState(store, state =>
            ({x: state.x + 1}))},
        incY() { patchState(store, state =>
            ({y: state.y + 1}))},
        reset() { patchState(store, initState)}
    }))
)
```

Consuming an Updater

- Updater methods are called like any class method
- Easy…
- Of course, you have this nice feature were all the signals get automagically updated

```
onIncX() {
  this.store.incX();
}
```

Demo – Signals store `Updater methods`

- ✓ `Using patchState`
- ✓ `Passing callbacks to patchState`
- ✓ `Defining an Updater`
- ✓ `Using the Updater`

Creating RxMethods

- Rx Methods are replacement for effects.
- They are asynchronous methods that are triggered like observables.
- Rx methods can be called in various ways.
  - Imperatively – like any other method
  - Reactively by passing an observable, or signal
- They are implemented like an observable that gets a “next” whenever the method is called.

```
withMethods((store, userService = inject(UserService)) => ({
  loadFromServer: rxMethod<string>(
      pipe(
          tap(() => patchState(store, {isLoading: true}))
          exhaustMap(str => userService.getNumber(str)).pipe(
              tapResponse({
                  next: num => patchState(store, {x: num}),
                  error: console.error,
                  finalize: () => patchState(store, {isLoading: false})
              })
          )
      )
  )
}))
```

Consuming `rxMethods`

- An `rxMethod` is a function just like normal method
- Calling it is like dispatching an action that is handled by an effect
- You can call it imperatively or declaratively
- It may receive
  - Value
  - Observable
  - Signal.

```
myStr = signal('Hi');
subj$ = new Subject<string>();

ngOnInit() {
  this.store.loadFromServer(this.myStr);
  this.store.loadFromServer(this.subj$);
}

loadAbc() {
  this.store.loadFromServer('abc');
}
```

Angular + NgRx

Demo – Signal store `rxMethod`

- ✓ `Creating rxMethod`
- ✓ `Using tapResponse`
- ✓ `Consuming rxMethods imperatively`
- ✓ `Consuming rxMethods declaratively`

Signal Store Hooks

- You can hook to signal store events just like you can with components and services

```
withHooks({
    onInit(store) {
        store.loadFromServer('initial')
    },
    onDestroy(store) {
        console.log('Good bye');
    }
})
```

Signal Store Custom Features

- Probably the best feature of signal store is the fact that you can add your own "withXXX" features.

```
export type CallState = 'init' | 'loading' | 'loaded' | { error:
string };

export function withCallState() {
  return signalStoreFeature(
    withState<{ callState: CallState }>({ callState: 'init' }),
    withComputed(({ callState }) => ({
      loading: computed(() => callState() === 'loading'),
      loaded: computed(() => callState() === 'loaded'),
      error: computed(() => {
        const state = callState();
        return typeof state === 'object' ? state.error : null
      }),
    }))
  );
}
```

```
export const XyStore = signalStore(
    withState(initState),
    withComputed(({x, y}) => ({
        sum: computed(() => x() + y()),
        diff: computed(() => x() - y())
    })),
    withCallState()
);
```

Angular + NgRx

Demo – Signal store `customFeatures`

- ✓ Creating a simple custom feature
- ✓ Realizing that we do not have the dev-tools
- ✓ Understanding how the dev-tools work
- ✓ Let's get crazy
- ✓ Creating withDevTools - a custom feature that connects the store to redux dev-tools

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Thank You