# JIT Frontend Bootcamp

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# Agenda

1. JavaScript basics
2. JavaScript ecosystem tools
3. Introduction to react.js
4. React.js – (more) advanced concepts
5. App state management with redux
6. Advanced debugging techniques and testing*

# JavaScript is a single-threaded scripting programming language.

OOP? Functional programming?

Why not both?!

# Execution Environments

## Web

Both client- (~~interpreted~~ compiled by browsers to CLR nowadays) and server-side (executed by node.js environment)

## Non-web

* Embedded scripting language (e.g. browsers extensions)
* General purpose scripting language
* Used as an application platform

# OOP

- Creating objects directly from other objects
- Behaviour delegation
- Composability
- Extending objects dynamically

## OLOO* („CAN DO")

* OBJECTS-LINKED-TO-OTHER-OBJECTS

- Tightly couples base class with inherited ones
- Must know the desired properties of inherited object before instantiation

## INHERITANCE („IS A")

# Behaviour delegation

## Include a utility method if needed

```
var Task = {
  setID: function (ID) { this.id = ID },
  outputID: function () { console.log(this.id) },
}

// make `XYZ` delegate to `Task`
var XYZ = Object.create(Task)

XYZ.prepareTask = function (ID, Label) {
  this.setID(ID)
  this.label = Label
}

XYZ.outputTaskDetails = function () {
  this.outputID()
  console.log(this.label)
}
```

Credits to: Kyle Simpson

# Functional programming

## Pure functions

Given the same input always gives the same output; makes composition easy as pie

## No shared state

Do not pass the properties of the object between scopes

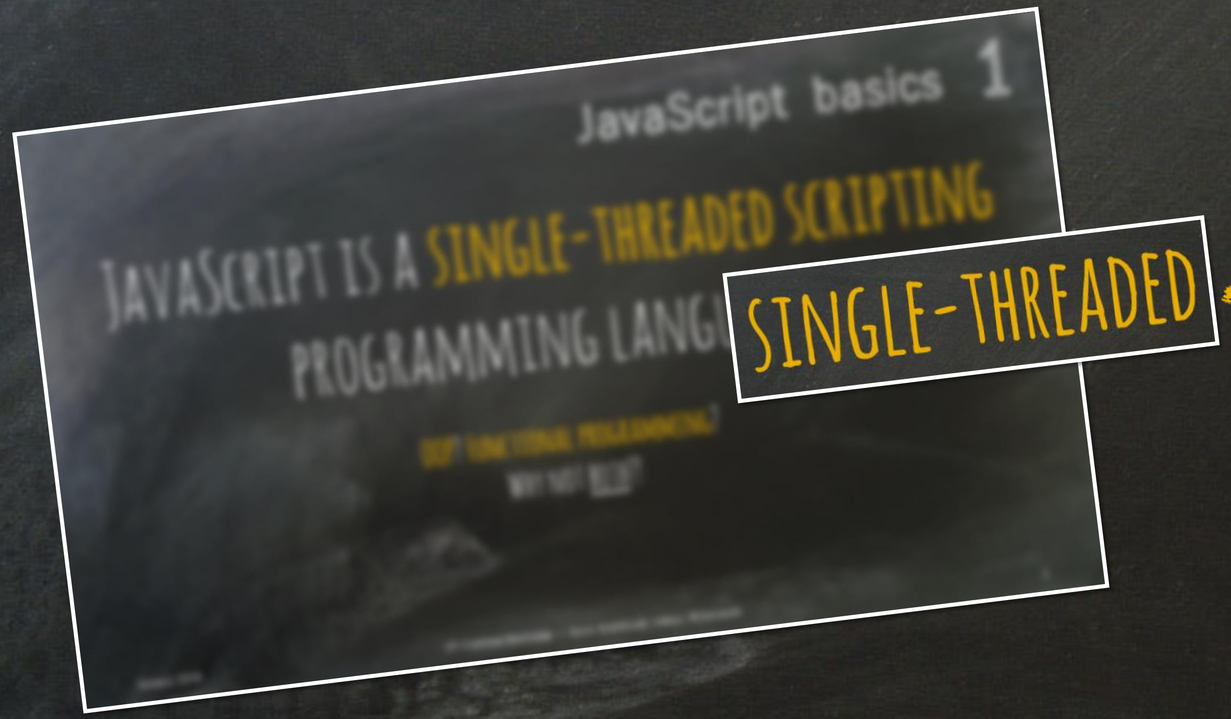
## No state mutations

Allows to track the transfomations and do *time-traveling*

## No side effects

Just be deterministic

# Asynchronous calls




WAIT, WHAT?

# ONE THREAD == ONE STACK == ONE THING AT A TIME

EXCEPT NOT REALLY.

# JavaScript basics 8

```
console.log("Hello")

setTimeout(function cb() {
  console.log(":)")
}, 5000)

console.log("World!")
```

stack

threads (WebAPIs)

console

event loop

tasks queue

# JavaScript basics 8

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log(“:)”)

cb

threads (WebAPIs)

console

Hello
World
:)

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tasks queue

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:)

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stack

threads (WebAPIs)

console

Hello
World
:)

event loop

tasks queue

# JavaScript basics 9

## XHR*

Since 1999

Registering callbacks for particular events (onload, onerror)

## Promises

since 2012

Objects representing async actions result; there are three different states of Promises: fulfilled, rejected, pending

## Fetch API

Since 2015 (Chrome v40+)

Wraps HTTP requests with a Promise; still not widely supported by browsers

* XMLHttpRequest

# ECMAScript 2015

6th version of standardized scripting-language specification

Initially created to standardize JavaScript.

# Arrow functions

No need to bind "this" anymore

```
// Previously
var _this = this
button.click(function (event) {
  _this.sendData()
})

// Now
button.click((event) => {
  this.sendData()
})
```

# JavaScript basics 12

```
// Previously
var processData = function (length, width, color) {
  // Be careful with zeros!
  var length = length || 100
  var width = width || 20
  var color = color || "blue"

  // function body here
}

// Now
var processData = function (length = 100, width = 20, color = "blue") {
  // function body here
}
```

## Default parameters

Get rid of "or" evaluations

# String literals

Put variables in a string directly

```
// Previously
var greetings = "Hello " + firstName + " " + lastName
  + "\n" + "Your cart contains: " + itemsNo + " items."

// Now
var greetings = `Hello ${firstName} ${lastName}
  Your cart contains: ${itemsNo} items.`
```

```
// Previously
var response = callApi(params)
var body = response.body,
  status = response.status

var listContent = [1, 5, 10, 12]
var first = listContent[0],
  third = listContent[2]

// Now
var response = callApi(params)
var { body, status } = response

var listContent = [1, 5, 10, 12]
var [first, , third] = listContent
```

# Destructuring assignment

It's a kind of magic

# Rest/Spread operator

## Destructuring made even simpler

```
// Now
var details = {
  firstName: "John",
  lastName: "Doe",
  age: 34,
}

var { age, ...rest } = details
console.log(rest) // { firstName: "John", lastName: "Doe" }
var copiedDetails = { ...details }
```

# JavaScript basics 16

```
// Previous
var x = 1000
if (true) {
  var x = 200
  console.log(x) // 200
}
console.log(x) // 200

// New
let x = 1000
if (true) {
  let x = 200
  console.log(x) // 200
}
console.log(x) // 1000
```

## Block-scoped "let"...

Couples variables with the scope

# ...and "const"

## Disallows reassignments

```
// Previous
var x = 1000
if (true) {
  var x = 200
  console.log(++x) // 201
}
console.log(x) // 201

// New
const x = 1000
if (true) {
  const x = 200
  console.log(++x) // TypeError: Assignment to constant variable.
}
console.log(x)
```

```
// Previous
  // module.js
  var port = 3000

  // main.js
  var service = require("module.js")
  console.log(service.port)

// New
  // module.js
  export var port = 3000

  // main.js
  import { port } from "module"
  console.log(port)
```

# Modules

Import only what's really needed

# For-of loops

Because every language has them :)

```
// Previous
var iterable = [1, 2, 3, 4, 5, 7]
for (var i = 0; i < iterable.length; ++i) {
  console.log(iterable[i])
}

// New
var iterable = [1, 2, 3, 4, 5, 7]
for (var i of iterable) {
  console.log(i)
}
```

# JavaScript ecosystem tools 1

## Choice

taken to the

## extreme

(chaos)

# Package managers:
# NPM vs YARN

# JavaScript ecosystem tools 3

## NPM

* Package manager
* Public package repository
* Private packages
* self-hosting repository (npm Enterprise)

# Yarn

* "just" a Package manager
* Optimized for performance, package caching
* Lock file

# JavaScript ecosystem tools 5

Both use

**package.json**

```
{
  "name": "test",
  "version": "1.0.0",
  "description": "description",
  "main": "index.js",
  "scripts": {
    "test": "echo 1"
  },
  "dependencies": {
    "jquery": "3.2.1"
  },
  "license": "ISC"
}
```

# Task Runners:

## Grunt, Gulp, DIY scripts

# JavaScript ecosystem tools 7

## Grunt

* Declarative configuration
* File-based processing
* Relies on plugins

# Gulp

* Configuration = Code
* In-memory, stream-based processing
* Still relies on plugins

# DIY (NPM) SCRIPTS

* Just your code
* Or a single command line
* Executed by NPM

# Compilers/Transpilers:

## Millions of them

(but mainly Babel)

# Babel

Cutting edge JS

\/

Ordinary ECMAscript

# TypeScript

Cutting edge JS (with types)

\/

Ordinary ECMAscript

# The rest

* 'alternative' JS syntax languages (ex. – CoffeeScript)
* Full blown runtime environments (Scala.js, Elm)

# Bundlers:

## The 'pack it for the browser' gizmo

# Before

* <script>, <link>, <style> managed by hand
* Should A.js be before, or after B.js?
* Global variables

# After (Webpack)

* Look Ma, a single JS file!
* And a cryptic Declarative + Code based configuration

# Hands-on

## Basic webpack configuration

source available: 00-base

# Tests:

## need a guide to choose a tool to **just run them**

# Testing

* test runners (mocha, jasmine, jest, karma)
* The 'actual' tests (mocha, jasmine, jest)
* assertions (chai, jasmine, jest)
* snapshot testing (jest, ava)

# Testing

* Mocks, spies (sinon, jasmine, jest)
* code coverage (istanbul)
* Browser automation & headless browser environments (PhantomJS, Protractor, testcafe)

# Linting & formatting:

## Optional, but handy

# JavaScript ecosystem tools 22

Linting: ESLint

Formatting: Prettier

# Introduction to react.js 1

React.js is **NOT** a framework. It is **ONLY** a view library.

# Introduction to react.js 2

* No controllers
* No digest loops
* No directives
* No view models

## Just Components.

In react.js world every rendered block is a component.

## Separation of ~~concerns~~ components

(only) if they are designed and built as self-contained entities.

* Composability and flexibility
* Reusability
* Maintainability
* Ability to be tested independently

# Introduction to react.js 4

## JSX

XML-LIKE SYNTAX EXTENSION FOR ECMASCRIPT

```
return (
  <div className="wrapper s12">
    <p>How the hell is it possible?!</p>
  </div>
)
```

HTML!?

# Introduction to react.js 5

## Functional components

Define simple and stateless components.

```
const SimpleComponent = (props) => {
  return (
    <div className="wrapper">
      <p>Simple, huh?</p>
    </div>
  )
}
```

## Class-based components

Used for more advanced entities maintaining their own state.

```
const ClassComponent = React.createClass({
  // ...
  render: () => {
    return (
      <div className="wrapper">
        <p>I can have my own state!</p>
      </div>
    )
  },
})
```

# Data flow

## No library

### All-to-all

Any component can communicate directly with any other component.

## Angular 2+

### Two-way data binding

Compares values representing application state (in all components) before and after browser events.

## React.js

### One-Way data binding

Model is the *single source of truth*. More deterministic than two-way binding – side effects are not possible.

# Introduction to react.js 7

```
const Parent = (props) => {
  return (
    <div><Child name="firstComponent" /></div>
  )
}

const Child = (props) => {
  processName = () => {
    doProcessing(props.name)
  }
  // ...
}
```

## Data in child component is accessed via "**PROPS**" object.

**PROPS** within children are **IMMUTABLE** (cannot be overwritten).

# Introduction to react.js 8

```
const Child = React.createClass({
  // ...
  disableButton: () => {
    this.setState({ disabled: true })
  },

  render: () => {
    return <button type="submit"
      disabled={this.state.disabled} />
  },
})
```

## Each component can have its own isolated **state**.

The state can be accessed by its owner only. It **can be mutated**.

By default react.js rerenders components whenever their **props** or **state** change.

# Data flows down

```
const Grandparent = React.createClass({
  // ...
  render: () => {
    return (
      <Parent
        onEnabledClick={this.handleItemClick}
        item={this.currentItem}
      />
    )
  },
})
```

```
const Parent = (props) => {
  return (
    <Child
      onEnabledClick={props.onEnabledClick}
      item={props.item}
    />
  )
}
```

```
const Child = (props) => {
  return (
    <div className="itemContainer">
      <label>{props.item.name}</label>
      <input type="check" onClick={props.onEnabledClick} />
    </div>
  )
}
```

# Introduction to react.js 10

## EVENTS FLOW UP

```
const Grandparent = React.createClass({
  // ...
  render: () => {
    return (
      <Parent
        onEnabledClick={this.handleItemClick}
        item={this.currentItem}
      />
    )
  },
})
```

```
const Parent = (props) => {
  return (
    <Child
      onEnabledClick={props.onEnabledClick}
      item={props.item}
    />
  )
}
```

```
const Child = (props) => {
  return (
    <div className="itemContainer">
      <label>{props.item.name}</label>
      <input type="check" onClick={props.onEnabledClick} />
    </div>
  )
}
```

# Introduction to react.js 10

## Data flows down*

## Events flow up*

```
const Grandparent = React.createClass({
  // ...
  render: () => {
    return (
      <Parent
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        item={this.currentItem}
      />
    )
  },
})
```

```
const Parent = (props) => {
  return (
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    />
  )
}
```

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  return (
    <div className="itemContainer">
      <label>{props.item.name}</label>
      <input type="check" onClick={props.onEnabledClick} />
    </div>
  )
}
```

Data flows down

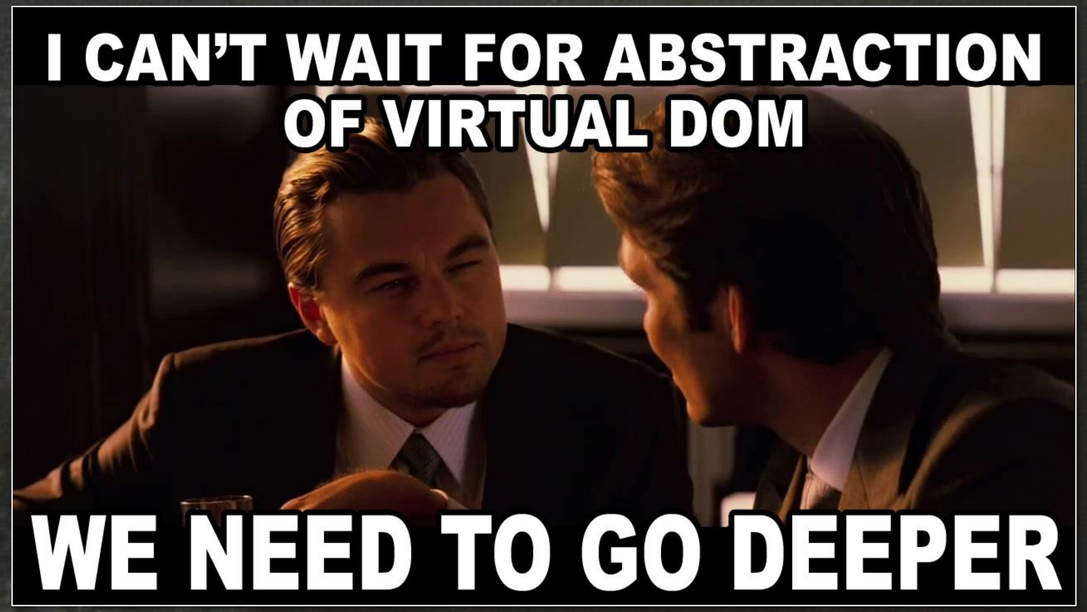
events flow up

Just like in DOM.

# Virtual DOM

* Pure JavaScript, in-memory **abstraction of real DOM**
* Whenever render() fires (which means that state or props have been updated), react.js updates the in-memory DOM representation
* If anything has changed, react.js modifies the real DOM to match

# Because **performance** matters.



# Hands-on

## First react component

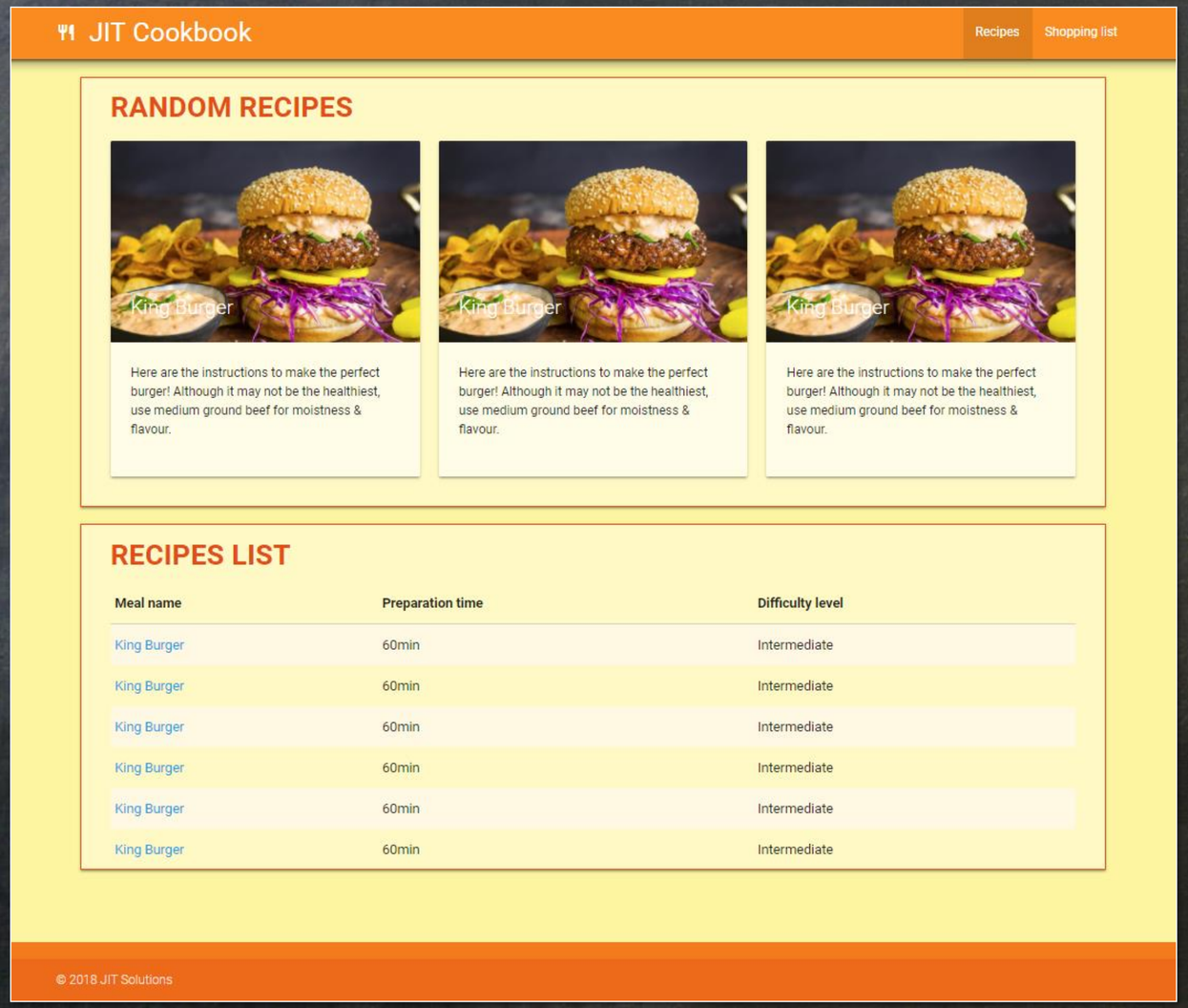
source available: 01-react-base

# Component split

Has to be done based on the application UI design

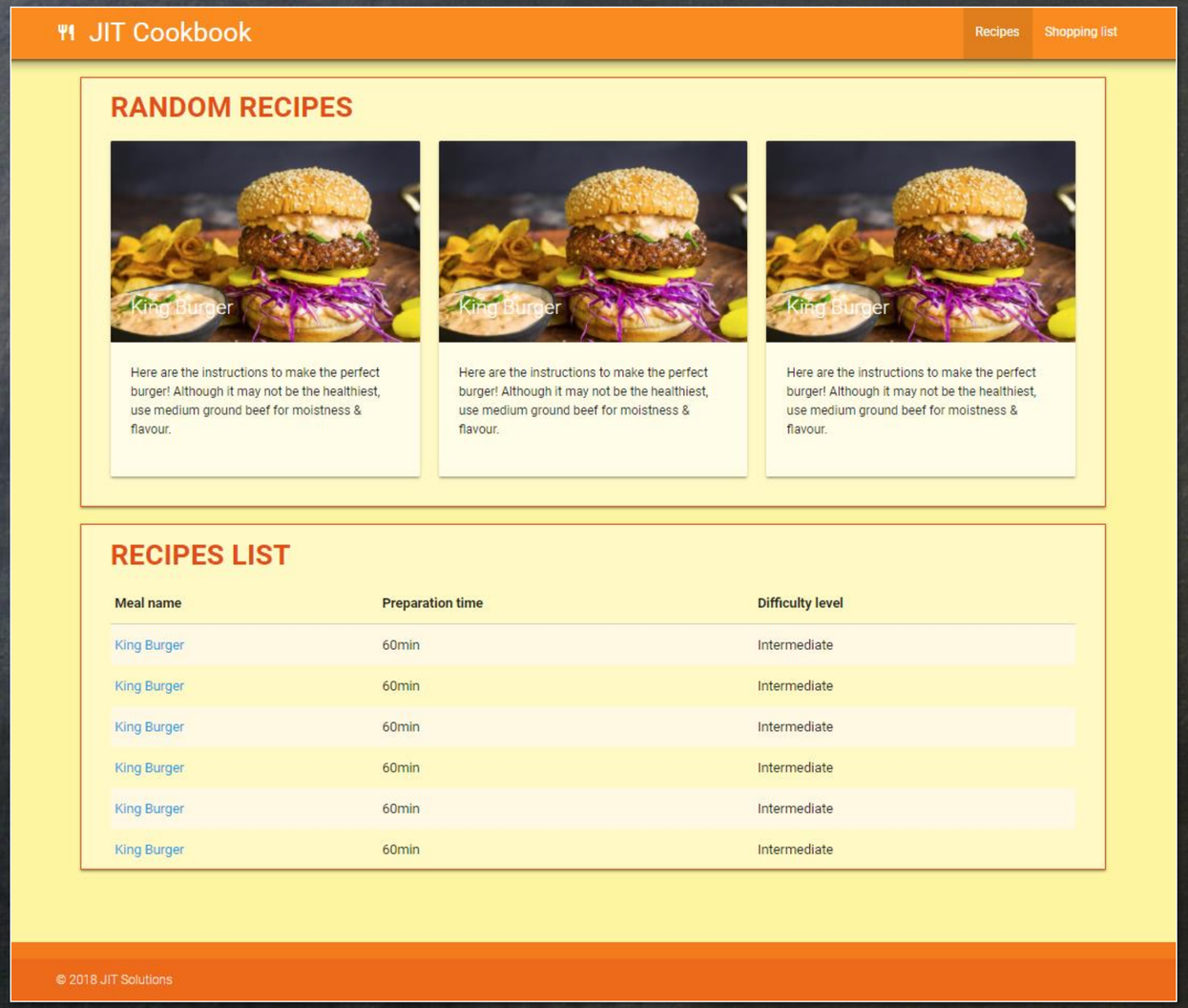
&

business requirements analysis



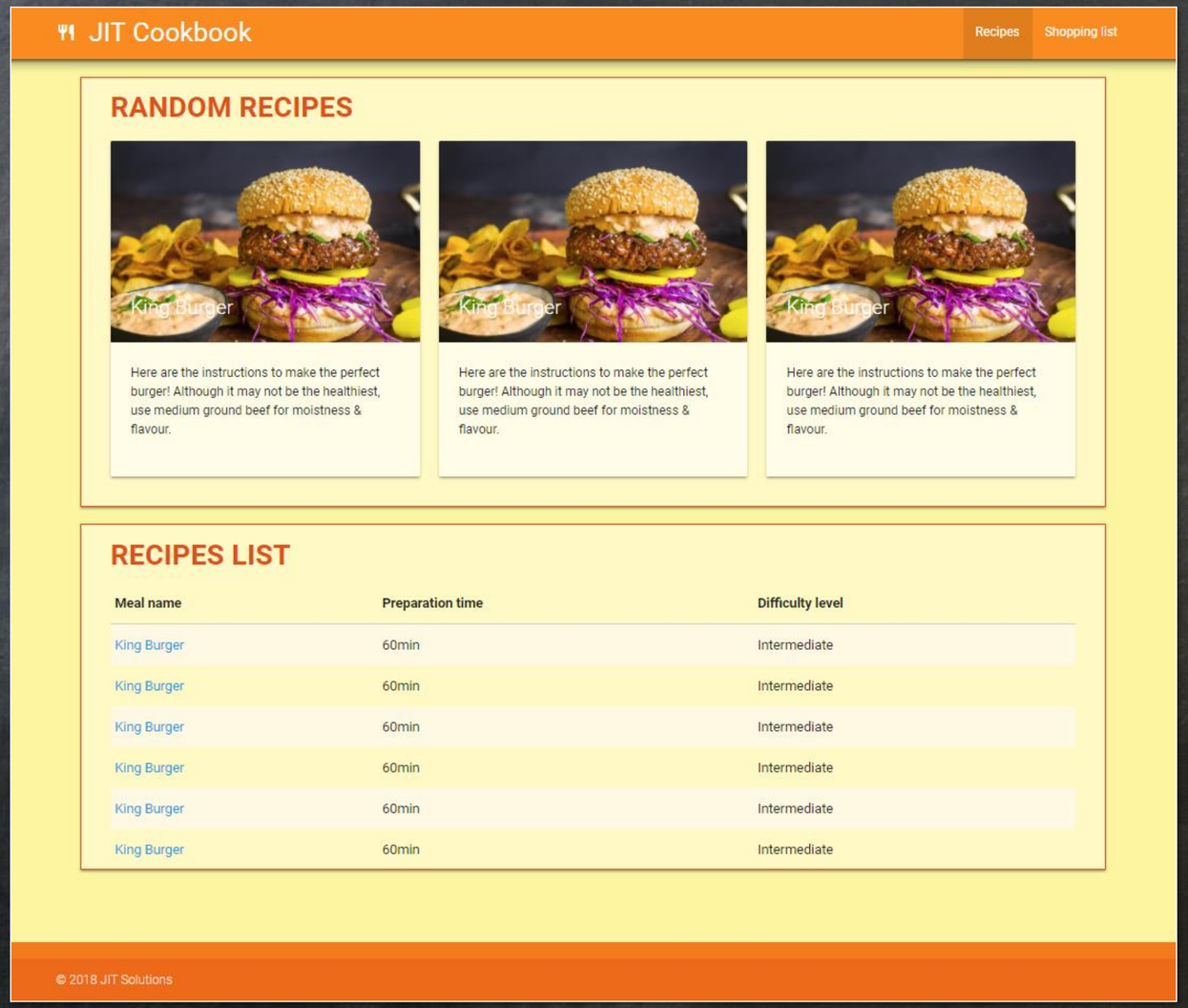

## JIT Cookbook

* Navigation bar at the top should show the application name with icon (left side) and navigation panel between dashboards (right side)
* Currently active dashboard tab is indicated with darker color
* User should be able to switch between the dashboards by clicking on particular tabs
* By default Recipes dashboard should be shown
* Footer contains only the copyrights section with company name




## JIT Cookbook – recipes dashboard

* Recipes dashboard's main screen is responsible for displaying three random recipes in the top panel and full list of recipes in the bottom panel
* After clicking on any name from the recipes list, the user should see a single recipe view (the whole page should be replaced with page representing single recipe)
* A single recipe view should contain detailed description of the meal and list of ingredients needed in order to prepare it

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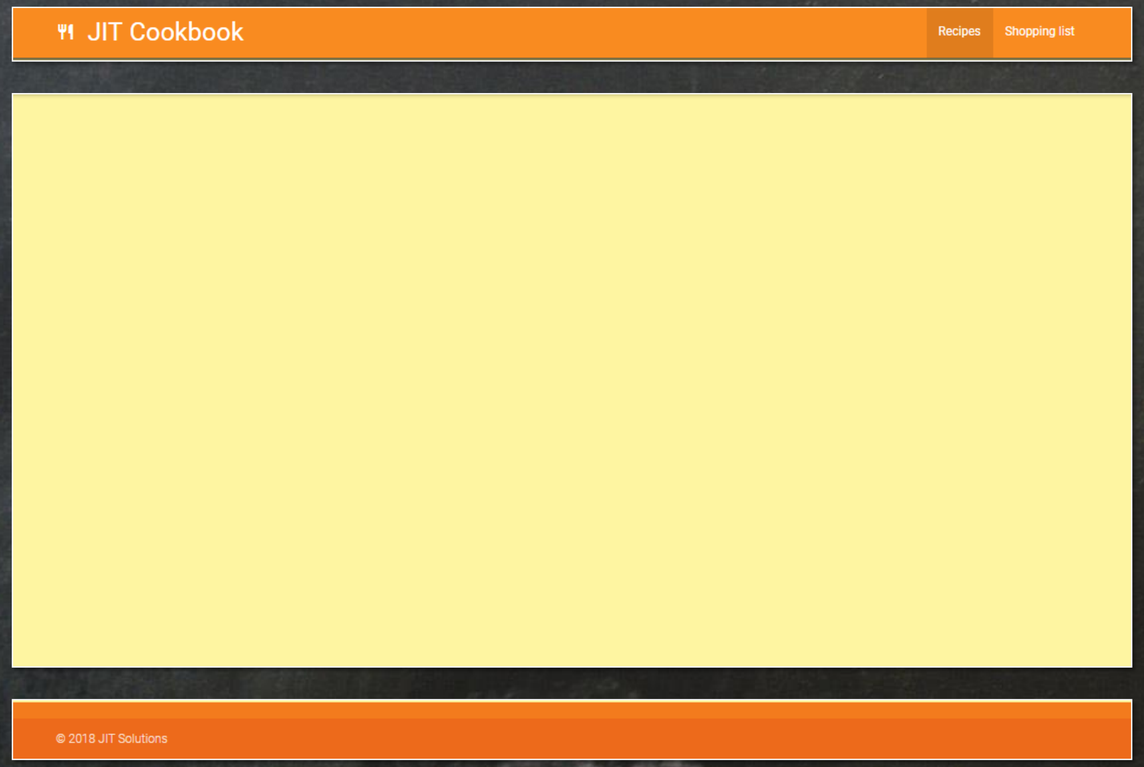
# Introduction to react.js 16

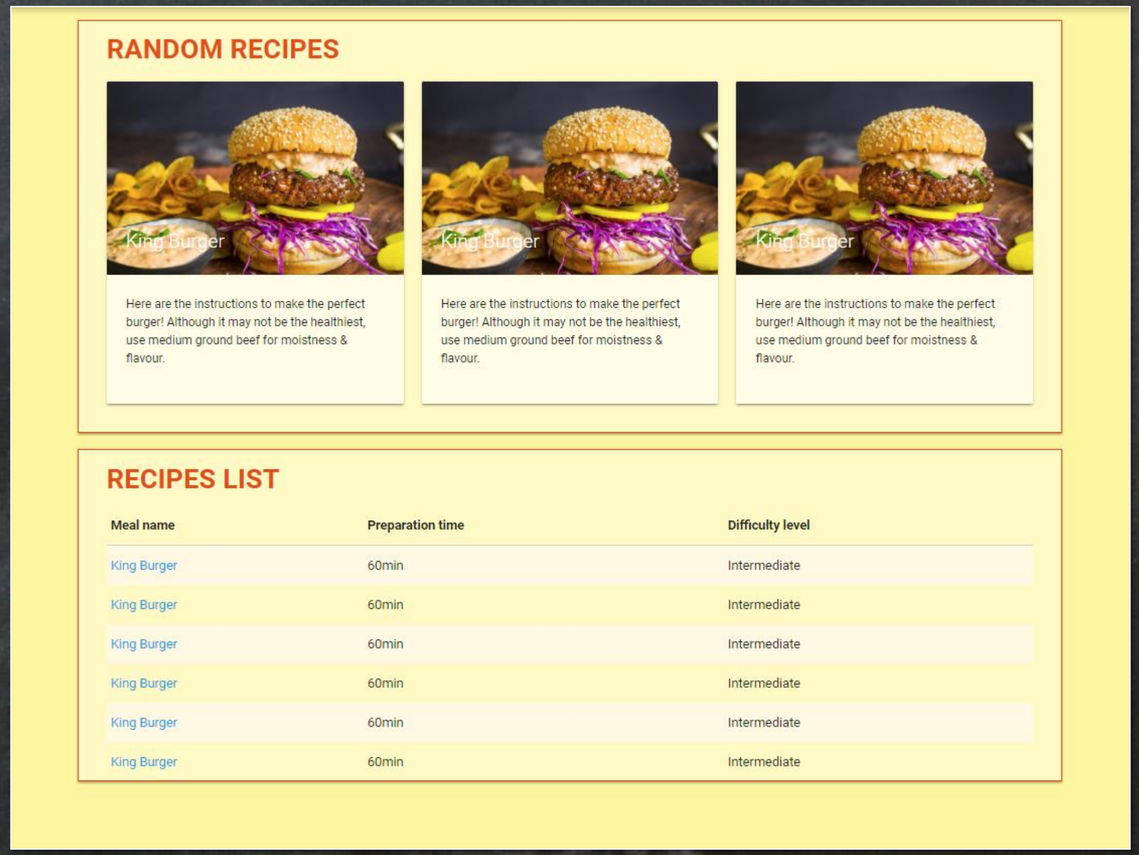



Navbar

Content

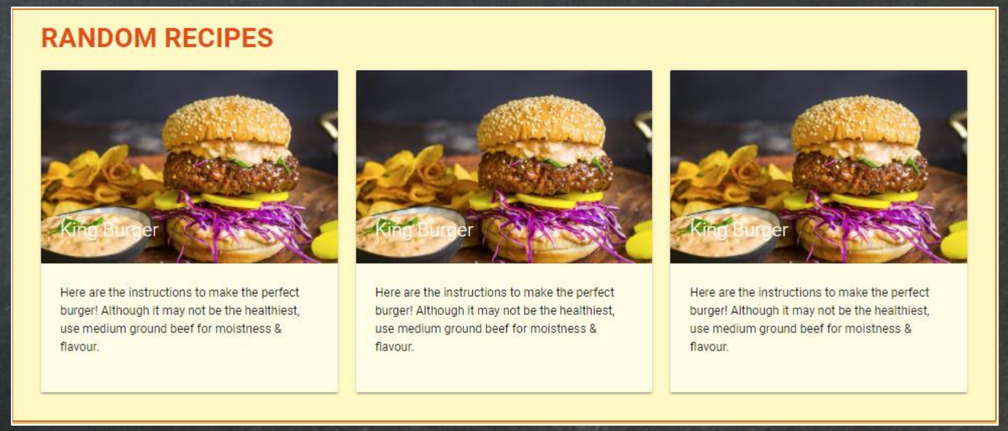
Footer

# Introduction to react.js 16

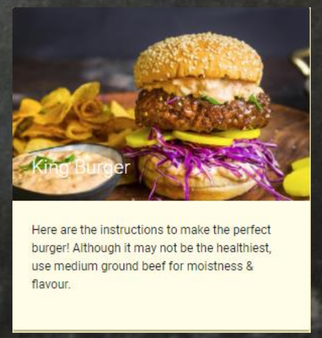



## RecipesContainer

# Introduction to react.js 16




RandomRecipesList




RecipeCard

# Introduction to react.js 16

**RECIPES LIST**

| Meal name | Preparation time | Difficulty level |
|---|---|---|
| King Burger | 60min | Intermediate |
| King Burger | 60min | Intermediate |
| King Burger | 60min | Intermediate |
| King Burger | 60min | Intermediate |
| King Burger | 60min | Intermediate |
| King Burger | 60min | Intermediate |

RecipesTable

| | | |
|---|---|---|
| King Burger | 60min | Intermediate |

RecipesTableEntry

# Hands-on

## Base component split

source available: 02-react-base-layout

# PropTypes

* When the application grows it's quite important to ensure that all objects passed to component as **props** match the desired types
* **PropTypes** is a react.js built-in mechanism to run typechecking
* All you have to do is to assign a specific property to a component

# Hands-on

## Props typechecking

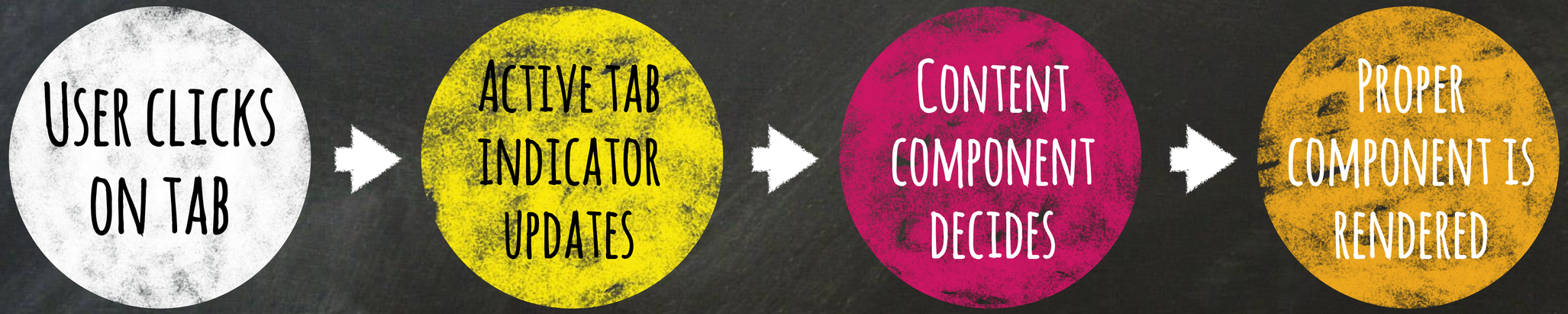
## (let's convert some of the components to classes as well)

source available: 03-class-based-components

# Action binding

Making application interactive!

# Introduction to react.js 21



# Conditional rendering

Decide what to render based on current conditions

```
render = () => {
  const userLoggedIn = !isGuest()

  return userLoggedIn
    ? <button name="logOut " type="submit" />
    : <p>Please log in first</p>
}
```

```
render = () => {
  return (
    <div className="profileCard">
      {
        shouldShowAvatar && (
          <img src={this.props.user.imgUrl}
            alt={this.props.user.name} />
        )
      }
      <p>{this.props.user.name}</p>
    </div>
  )
}
```

# Hands-on

## Bringing some life to the application

source available: 04-state-action-binding

# react.js more advanced concepts 1

## Lists rendering

```
render = () => {
  return (
    <div className="usersList">
      <ul>
        {this.props.users.map((user) => {
          return <li key={user.id}>{user.id}. {user.name}</li>
        })}
      </ul>
    </div>
  )
}
```

"KEY" PROPERTY IS CRUCIAL.

# Component lifecycle

* React.js allows us to intercept each phase of components lifecycle
* Useful when we want to update component configuration based on the calculation on new props or the difference between new and old ones
* Hooks may be necessary when you're dealing with 3rd party libraries

# Hands-on

Enhance lists renderings and inspect lifecycle hooks

source available: 05-list-renderings-and-hooks

# PureComponent

Special type of react.js component. Reduces number of wasted renderings.

# Hands-on

Optimize number of renderings by inheriting from React.PureComponent

source available: 06-pure-components

# App state management with redux 1

Redux is a library that brings **state management** to another level.

It was strongly inspired by **flux** architecture.

# App state management with redux 2

The only source of state updates; contains a type and often additional context

Routes particular actions to registered stores (via reducers)

Stores the state tree of the whole application

Rendered based on the store (state) updates; can trigger actions too

# App state management with redux 3

## Why redux produces so deterministic state?

* The store is a single source of truth; the whole application state comes from the store only.
* State of the application is read-only. All modifications should be triggered consciously by direct action calls. They are centralized and synchronized by a dispatcher.
* Changes are applied with pure ~~functions~~ reducers. Reducers are functions which combine a previous state and incoming action into the new state.

# App state management with redux 4

## Action creator

A state update intention

```
export const addToFavorites = (videoId) => {
  return {
    type: "VIDEO_ADD_TO_FAVORITES",
    videoId,
  }
}
```

# App state management with redux 5

```
const initialState = {
  favorites: [],
}

export default reducer = (state = initialState, action) => {
  switch (action.type) {
    case "VIDEO_ADD_TO_FAVORITES":
      return {
        favorites: [ ...state.favorites, action.videoId ]
      }
  }

  return state
}
```

## Reducer

Converts previous state and executed action into new state

# App state management with redux 6

## Store

Always keeps the most recent state

```
import { combineReducers, createStore } from "redux"

import videoReducer from "services/video/reducer"

const reducers = combineReducers({
  videosState: videoReducer,
})

const store = createStore(reducers)
export default store
```

# App state management with redux 7

## React and Redux

```
const globalState={
  username: "HotBlonde69",
  credentials: [ "viewer" ],
  isAdmin: false,
}

render(
  <Provider state={globalState}>
    <App />
  </Provider>,
  document.getElementById("app")
)
```

"globalState" will be available on each level of component tree without passing it explicitly.

# App state management with redux 8

## Components

Responsible for displaying the data only

## Containers

Fetches the data from the store and stores it in the local state; acts as a proxy between store and components

# App state management with redux 9

```
const mapStateToProps = (store) => {
  return {
    favorites: store.videosState.favorites,
  }
}

const mapDispatchToProps = (dispatch) => {
  return bindActionCreators({
    addToFavorites: VideoActions.addToFavorites,
  }, dispatch)
}

export default connect(
  mapStateToProps,
  mapDispatchToProps
)(VideosContainer)
```

Three steps needed to combine react component with redux

# Hands-on

## Managing application state with redux

sources available: 07-redux-store, 08-redux-recipes-store, 09-selected-recipe-screen

# Redux thunk

* Allows to return functions from action creators
* Used for dispatching actions only when certain conditions are met (mostly when the data fetch from external resource completes)

# App state management with redux 12

## Store with thunks support

That's what middleware is for

```
import { combineReducers, createStore } from "redux"
import thunk from "redux-thunk"

import videoReducer from "services/video/reducer"

const reducers = combineReducers({
  videosState: videoReducer,
})

const store = createStore(reducers, applyMiddleware(thunk))
export default store
```

# App state management with redux 13

```
const fetchNewVideosError = (error) => {
  return {
    type: "VIDEOS_FETCH_NEW_ERROR",
    error,
  }

const fetchNewVideosAsync = () => {
  return (dispatch) => {
    dispatch(fetchNewVideos())

    return videosApi.fetchNew().then(
      (data) => dispatch(fetchNewVideosSuccess(data)),
      (error) => dispatch(fetchNewVideosError(error)),
    )
  }
}
```

## Thunk creation

Nesting action dispatching

# Hands-on

## Fetching data using external API

source available: 10-redux-thunk

# Redux form

* HTML Input elements are not easy to maintain in react
* That library automatically links input of various types with the auto-generated store of a very specific structure
* It also provides a wrappers for raw HTML form fields with intuitive API

# App state management with redux 16

## Exposing form component

Allows to use redux form API with

```
export default reduxForm({
  form: "userRegistrationForm",
})(UserRegistrationForm)
```

# App state management with redux 17

```
render() {
  return (
    <div className="formWrapper">
      <UserRegistrationForm initialValues={{
        yearOfBirth: 2000,
        group: "Unassigned",
      }}
      onSubmit={(data) => this.submitData(data)}/>
    </div>
  )
}
```

## Injected API

No need to reinvent the wheel

# Hands-on

## Utilizing forms to update the data on server

source available: 11-redux-forms