REACTATHON

ES6

ES6 (ECMASCRIPT 2015)

- 6th edition to the ECMAScript standard released in 2015
- First update since ES5 released in 2009
- Introduced some major syntax and features such as classes, modules, arrow functions, promises…
- ES7 — Finalized in 2016 (Array.prototype.includes(), ** exponent operator)
- ES8 — Finalized June 2017 (async/await)
- ES.Next

CONST / LET / VAR

- **var** — function scoped variable that can be reassigned (pre ES6)
- **let** — like var but block scoped (scoped to the nearest {}) rather than function scoped

```
for(var i = 0; i<10; i++) {
    console.log(i)
}
console.log(i)
```

10

```
for(let i = 0; i<10; i++) {
    console.log(i)
}
console.log(i)
```

I is not defined!

CONST / LET / VAR

- **const** — blocked scoped (like **let**) variable that cannot be reassigned
- However you can reassign properties

```
// Foo cannot be reassigned
const foo = 213

const bar = {
    name: 'Bar',
    color: 'Green'
}

// Bar.name can be reassigned
bar.name = 'Blue'
```

- Use **const** when you can, but if you must reassign use **let**

DECONSTRUCTION

- Unpack values from arrays or properties from objects into variables

- Object Deconstruction

```
const person = {
    name: 'Bob',
    age: 32,
    occupation: 'Dancer'
}

const {name, age, occupation} = person
```

```
const person = {
    name: 'Bob',
    age: 32,
    occupation: 'Dancer'
}

const {name: firstName, age, occupation: jobTitle} = person
```

Renaming the deconstructed args

- Array Deconstruction

```
const iterable = ['a', 'b'];
const [x, y] = iterable;
```

x = ‘a’ and y = ‘b’

ARROW FUNCTIONS

ES6

- Less verbose syntax for function definitions

```
const multiply = function (x,y)
{
    return x * y
}
```

As Arrow Function

```
const multiply = (x, y) => { return x * y }
```

Parameter Syntax

```
    () => { /*...*/ }  // no parameter
     x => { /*...*/  } // one parameter, an identifier
(x, y) => { /*...*/  } // several parameters
```

Body Syntax

```
x => { return x * x }  // block
x => x * x             // expression
```

No brackets will return result automatically

- No rebinding of this to reduce usage of *bind*

CLASSES

- More syntactic sugar over Prototypical Inheritance
- Allows inheritance with the **extends** keyword
- Some Features:
  - Class Methods
  - Static Methods
  - Constructor
  - Gettings/Setters

```
class Rectangle {
    constructor(height, width) {
        this.height = height;
        this.width = width;
    }

    // Method
    calcArea() {
        return this.height * this.width;
    }
}

const square = new Rectangle(10, 10);
console.log(square.calcArea())      // 100
```

PROMISES

ES6

- A **Promise** is an object representing *the eventual completion or failure of an asynchronous operation*
- Promise Construction — constructor takes 2 call backs
  - ***resolve*** — get called upon successful execution completion
  - ***reject*** — gets called upon error during execution

```
function asyncFunc() {
    return new Promise(
        function (resolve, reject) {
            try {
                const result = logicToGetResult()
                resolve(result);
            } catch (error) {
                reject(error);
            }
        });
}
```

resolve called with result on success

reject called on error

PROMISES

ES6

- Using Promise
  - ***then*** — get executed if the Promises invoked the resolve callback with any returned value
  - ***catch*** — gets executed if the Promises invoked the reject

then called with result on success

catch called on error

```
asyncFunc()
    .then(result => {
        console.log(result)
    })
    .catch(error => {
        // Handle errors
    });
```

PROMISES

ES6

- Chaining Multiple Promises:

```
asyncFunctionOne(a, b)
    .then(result1 => {
        console.log(result1);
        return asyncFunctionTwo(result1);
    })
    .then(result2 => {
        console.log(result2);
    }).catch(error => {
    // Handle errors of asyncFuncOne() and asyncFuncTwo()
})
```

Second **.then** called when **asyncFunctionTwo** resolves

Catches errors from either first or second promise

PROMISES - ASYNC/AWAIT

ES6

- Build upon **Promises** to help further synchronize asynchronous code.

Promise

```
const makeRequest = () =>
    getJSON()
        .then(data => {
            console.log(data)
            return "done"
        })
```

With async/await

Async/Await

await must be within an *async* function

```
const makeRequest = async () => {
    console.log(await getJSON())
    return "done"
}
```

await pauses function until promise is resolved

async functions actually return another promise

PROMISES - ASYNC/AWAIT

Promises

```
const makeRequestComplex = () => {
    return getJSON()
        .then(data => {
            if (data.needsAnotherRequest) {
                return makeAnotherRequest(data)
                    .then(moreData => {
                        console.log(moreData)
                        return moreData
                    })
            } else {
                console.log(data)
                return data
            }
        })
}
```

Async/Await

```
const makeRequestComplex = async () => {
    const data = await getJSON()
    if (data.needsAnotherRequest) {
        const moreData = await makeAnotherRequest(data);
        console.log(moreData)
        return moreData
    } else {
        console.log(data)
        return data
    }
}
```

MODULES

- Separating code into their own files (known as **modules**) which do not expose their variables and functions outside the file unless explicitly exported

- **CommonJS** — Standard that inspired Node exports
  - Server Side Focus, Compact Syntax, Synchronous Loading

- **AMD** (Asynchronous Module Definition) - *Require.js*
  - Browser Focus, Asynchronous Loading, More Complex Syntax

- **ES6 Modules**
  - Tries to be best of both: Compact Syntax with Asynchronous Loading

MODULES

- **Named Export**
  - Modules can have as many named exports as you want
  - Can export functions, classes, objects.....

```
export const square = x => x*x
export const squareRoot = x => Math.sqrt(x)

export function diag(x, y) {
    return sqrt(square(x) + square(y));
}
```

Import uses a relative path

```
import {square, squareRoot, diag} from './module_one'
```

Named imports go in curly braces{}

MODULES

ES6

- Default Export
  - Modules can only have **ONE** default export

```
export default function(){}
```

```
import foo from './module_one'
```

Import of default export can be renamed ANYTHING

```
import foo, {square, squareRoot, diag} from './module_one'
```

Mixed import of default and named exports

- Node Modules
  - Node modules are referenced by the module name (like **'react'**)

```
import React, { Component } from 'react'
import {connect} from 'redux'
import axios from 'axios'
```

BABEL

- JavaScript Compiler — *Use next generation JavaScript, today*
- Allows you ***transpile*** different source codes into JavaScript
  - ES6/ES.Next —> ES5
  - JSX —> ES5
  - Flow —> ES5
  - https://babeljs.io/repl/

NPM/YARN

- **JavaScript Package Managers** — register of node_modules
  - **NPM** (Node Package Manager)
  - **Yarn** — build by Facebook, Google, etc… to solve commonly faced problem with NPM
    - Introduced the '*lock*' file
    - Same packages as NPM
- **package.json** — contains all of a project dependencies

PACKAGE.JSON

Build/Test/Run/Lint Scripts

Production Dependencies

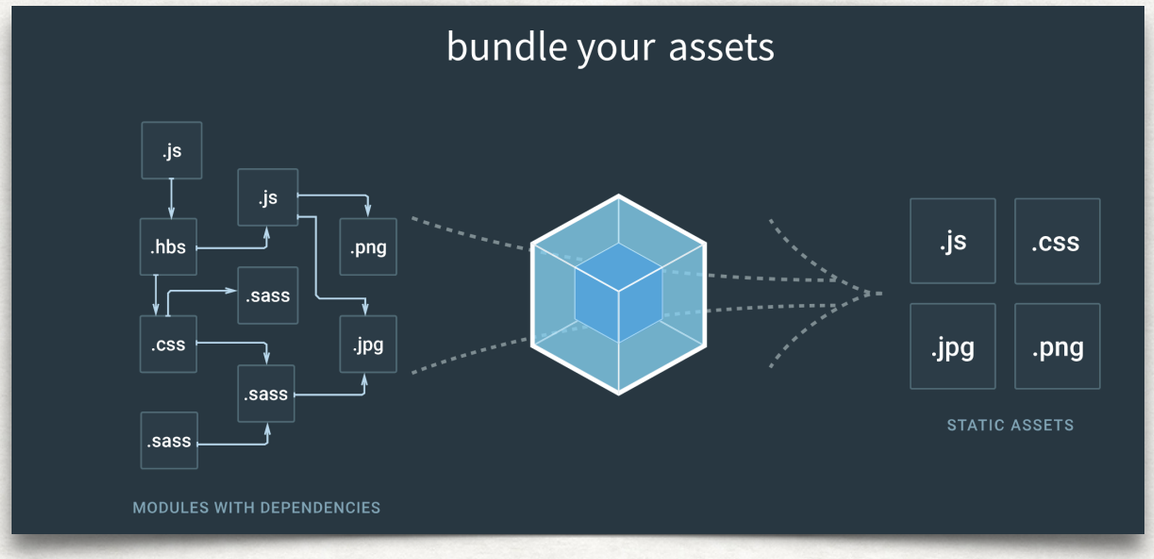
Project metadata

Development Dependencies (testing and building)

```
{
  "name": "react-example",
  "version": "1.0.0",
  "description": "Simple React example app",
  "main": "index.js",
  "scripts": {
    "dev": "webpack-dev-server --inline --content-base ./ --env.dev",
    "build": "webpack --env.prod",
    "lint": "eslint app test",
    "test": "cross-env NODE_ENV=test nyc mocha",
    "watch:test": "mocha --watch --compilers js:babel-register",
    "start": "http-server",
    "setup": "npm install && npm run validate",
    "validate": "npm-run-all lint test build"
  },
  "repository": {
    "type": "git",
    "url": "https://github.com/mzabriskie/react-example"
  },
  "author": "Matt Zabriskie",
  "license": "MIT",
  "bugs": {
    "url": "https://github.com/mzabriskie/react-example/issues"
  },
  "homepage": "https://github.com/mzabriskie/react-example",
  "dependencies": {
    "axios": "0.13.1",
    "bootstrap": "^3.3.5",
    "history": "^3.0.0",
    "moment": "^2.10.6",
    "react": "15.3.0",
    "react-dom": "15.3.0",
    "react-router": "2.6.1",
  },
  "devDependencies": {
    "babel-core": "6.13.2",
    "babel-loader": "6.2.4",
    "babel-plugin-istanbul": "1.0.3",
    "babel-preset-es2015": "6.13.2",
    "babel-preset-react": "6.11.1",
    "babel-preset-stage-2": "6.13.0",
    "babel-register": "6.11.6",
    "chai": "3.5.0",
    "chai-enzyme": "0.5.0",
    "css-loader": "0.23.1",
    "enzyme": "2.4.1",
    "eslint": "3.2.2",
    "eslint-config-kentcdodds": "^9.0.2",
    "file-loader": "0.9.0",
    "http-server": "0.9.0",
    "jsdom": "9.4.1",
    "lodash": "4.14.2",
    "mocha": "3.0.2",
    "moxios": "0.3.0",
    "npm-run-all": "2.3.0",
    "nyc": "7.1.0",
    "react-addons-test-utils": "15.3.0",
    "sinon": "1.17.5",
    "webpack": "2.1.0-beta.20",
    "webpack-config-utils": "2.0.0",
    "webpack-dev-server": "2.1.0-beta.0",
    "webpack-validator": "2.2.7"
  }
}
```

WEBPACK

- **Modular Bundler** for JavaScript
  - Bundles all your files (javascript, images, styles, …) and their dependencies into a few static files using a series of **Plugins** and **Loaders**



- **Loaders**: Preprocess files before bundling (example babel-loader for JavaScript transpiling, SASS/Less loader for CSS compiling,
- Optimizations:
  - Minimize/Uglify
  - Tree Shaking (dead-code elimination)
  - Code Splitting

WEBPACK CONFIG

Starting Entry Point

Final output directory and filename

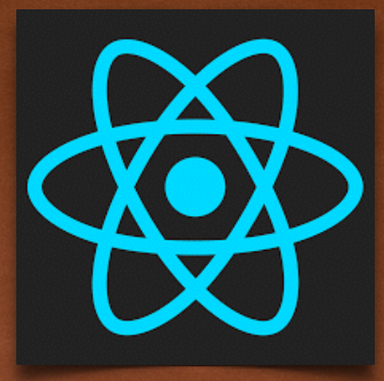
PLUGINS

babel loader on js files

LOADERS

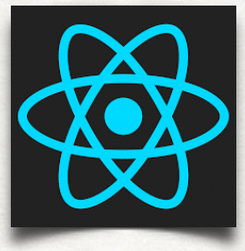
style/sass loaders

```
import path from 'path';
import HtmlWebpackPlugin from 'html-webpack-plugin';

export default () => ({
    entry: [
        path.join(__dirname, 'src/index.js'),
    ],
    output: {
        path: path.join(__dirname, 'dist'),
        filename: 'bundle.js',
    },
    plugins: [
        new HtmlWebpackPlugin({
            filename: 'index.html',
            template: './src/index.html'
        }),
    ]
    module: {
        rules: [
            {
                test: /.js?$/,
                exclude: /node_modules/,
                include: path.join(__dirname, 'src'),
                use: [
                    {
                        loader: 'babel',
                        options: {
                            babelrc: false,
                            presets: [
                                ['es2015', {modules: false}],
                                'react',
                            ],
                        }
                    }
                ]
            },
            {
                test: /\.(css|scss|sass)$/,
                loader: 'style!css!sass',
            },
        ]
    },
});
```



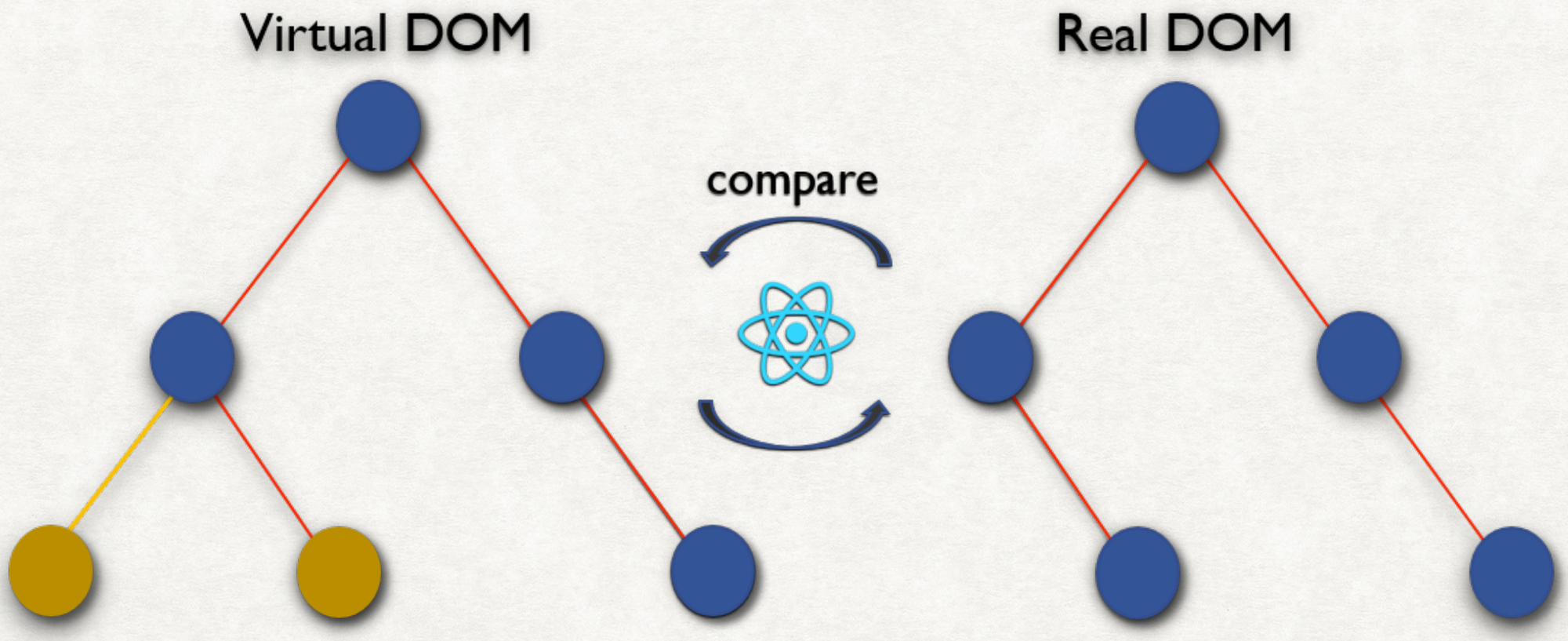
REACT

REACT

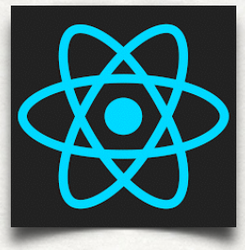


- Declarative component based UI library developed by Facebook
- Been developed at Facebook since ~2011 and was open sourced in 2013
- Latest stable release React 16 (code name *React Fiber*) was released in September 2017 and included a new reimplementation of React's core algorithm (without changing any of the API)

VIRTUAL DOM



INTRODUCTION



- Two main modules **React** and **React-DOM**
- **React DOM** is responsible for *DOM interactions* - most importantly rendering the initial React application in the DOM:

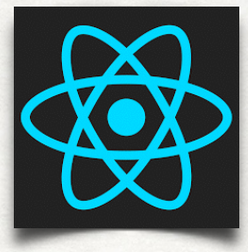
```
import ReactDOM from 'react-dom';

ReactDOM.render(
    <h1>Hello, world!</h1>,
    document.getElementById('root')
)
```

Inserting an <h1> element into element with id root

```
import ReactDOM from 'react-dom';

ReactDOM.render(<App />, document.getElementById('root'));
```

Insert the **<App>** component

JSX



- **JavaScript XML** — syntactic extension of JavaScript that allows you describe what your UI should look like
- Syntax may look like HTML or a templating language but it is fully functional JavaScript

```
const element = <h1>Hello, world!</h1>
```

```
<h1>
    {2+2}
</h1>
```

Expressions can be evaluated within curly brackets ({})

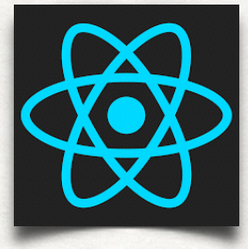
style takes an object

```
const MyComponent = <span>Hello world</span>

const element = <div tabIndex=0 style={{color: 'green', background:'blue'}} className="my-class">< MyComponent/></div>
```

DOM Attributes become camel case

class —> ***className*** because *class* is a keyword

COMPONENTS



- **Class Component**

```
import React, {Component} from 'rea

class Welcome extends Component {
    render() {
        return <div>Welcome!</div>
    }
}

export default Welcome
```

Class that extends **React.Component**

- Component **State**
- Component **Lifecycle methods**
- More *verbose*
- ***Render** method returns JSX*

- **Functional Component**

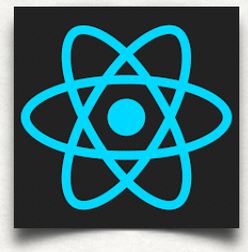
```
import React from 'react'

const Welcome = () => {
    return <div>Welcome!</div>
}

export default Welcome
```

- No **State** or **Lifecycle methods**
- More *concise*
- *Returns JSX to be rendered*

```
import Welcome from './Welcome'

const App = () => {
    return <div><Welcome/></div>
}
```

<Welcome> can be imported and used in another component's JSX

PROPS



- **Props** — a means of passing information from a parent **Component** to a child component
- *Read Only* within a component

props passed to children as tag attributes

```
<App>
    <Welcome firstName='Jane' lastName='Smith'/>
</App>
```

Class Component

props accessed via **this.props**

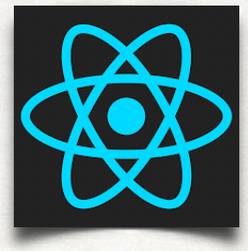
```
class Welcome extends Component {
    render() {
        return <div>Welcome {this.props.firstName} {this.props.lastName}!</div>
    }
}
```

Functional Component

props passed as the **parameter** to the function

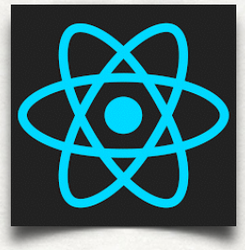
```
const Welcome = (props) => {
    return <div>Welcome {props.firstName} {props.lastName}!</div>
}
```

STATE



- While **props** are a way to pass data from parent to child **State** is a components internal data store
- Class component only
- **Plain JavaScript Object**
  - Accessed with with *this.state*
  - Manipulated *this.setState*
- Isolated to the component — cannot be accessed by component's children or parents

STATE



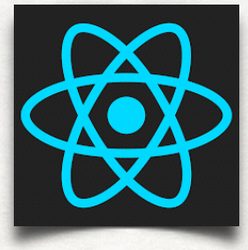
- Initialized in the component's *constructor*
- Access with *this.state*

constructor initialization

```
class Counter extends Component {
    constructor(props) {
        super(props)
        this.state = {
            count: props.initialCount
        }
    }

    render() {
        return <div>Count: {this.state.count}</div>
    }
}
```

Accessing state via ***this.state***

STATE



- Setting state with *this.setState:*

```
this.setState({count: 2})
```

Merges new **count** will all other state properties

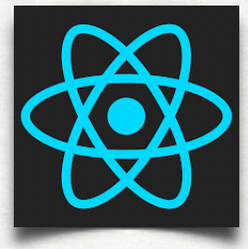
```
Object.assign(
    previousState,
    {count: state.count + 1},
    {count: state.count + 1},
    ...
)
```

this.setState is **asynchronous**

```
this.setState ((prevState, props) => {
    return {count: prevState.count + 1}
})
```

Instead of an object pass an updater function

LIFE CYCLE METHODS



- **Class components** have hooks into several of React's **Lifecycle methods**
- 4 Categories:
  - Mounting
  - Updating
  - Unmounting
  - Error Handling (new to React 16)

LIFE CYCLE METHODS

Mounting — Called once when the component is first being inserted into the DOM:

1. constructor(props)

```
constructor(props) {
        super(props)
        this.state = {
            count: props.initialCount
        }
    }
```

2. ~~componentWillMount(props)~~

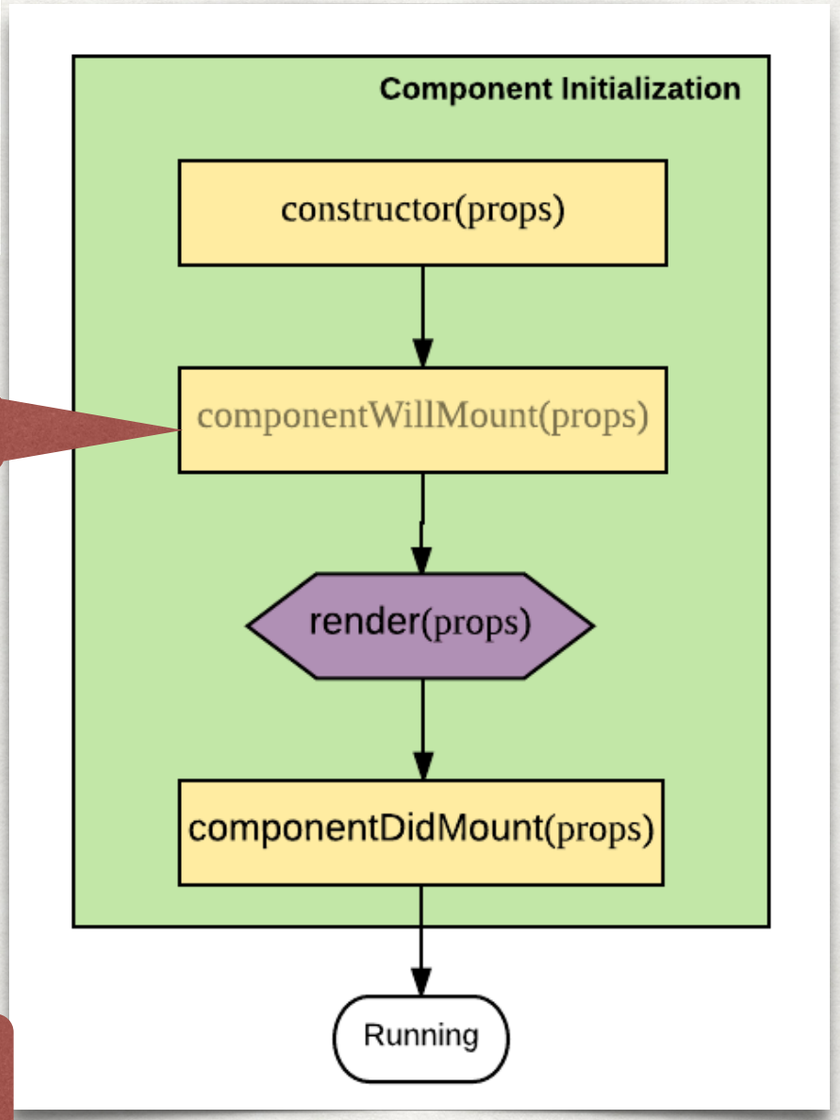
Avoid componentWillMount

3. render()

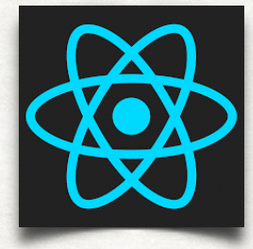
4. componentDidMount(props)

```
componetDidMount() {
    fetch('https://gitconnected.com')
        .then((res) => {
            this.setState({
                user: res.user
            });
        });
}
```

Dom manipulation and data loading in **componentDidMount**



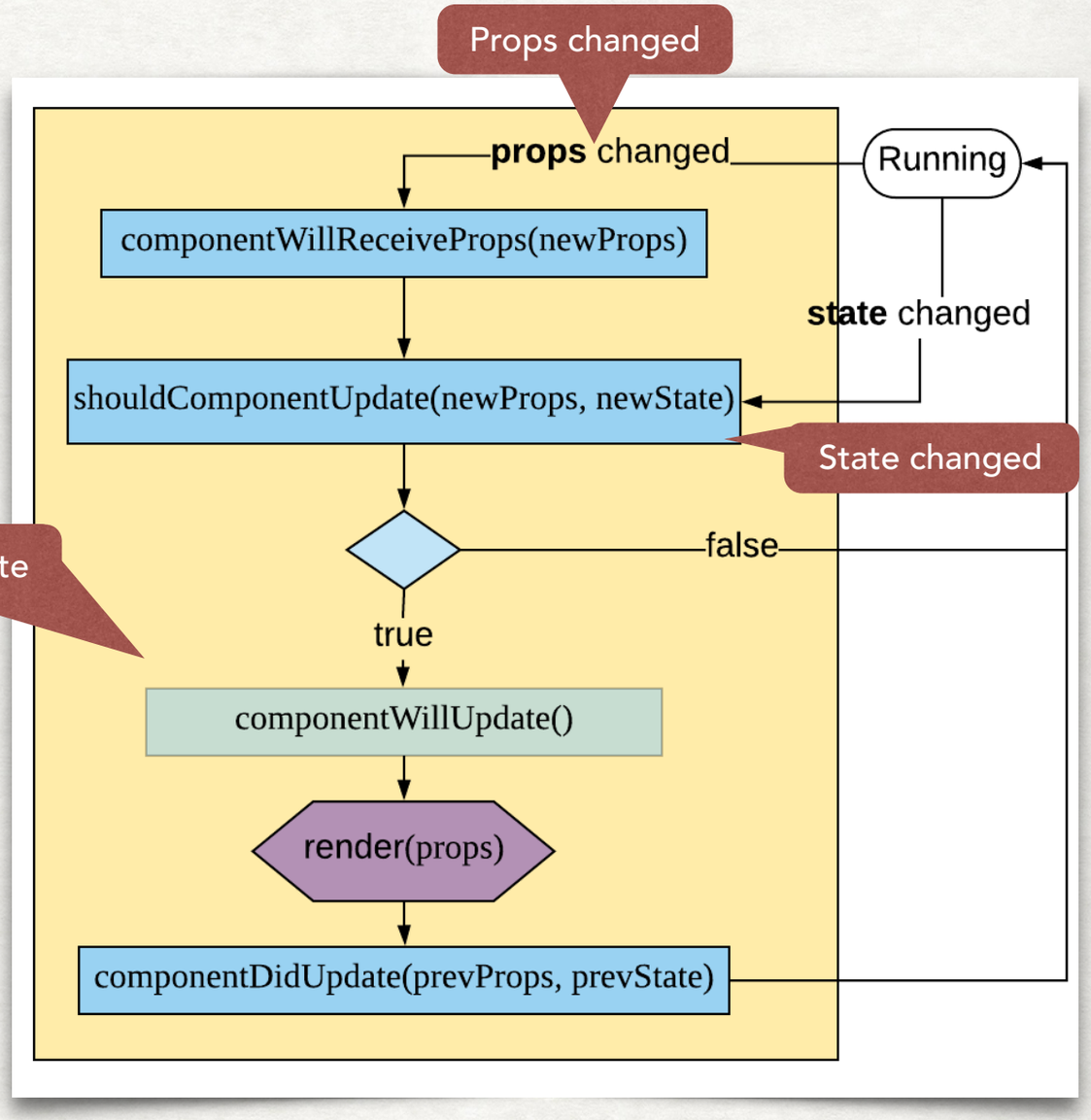
LIFE CYCLE METHODS



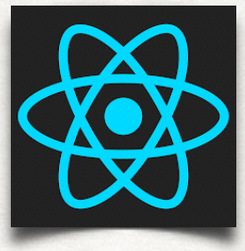
Updating — Called many times in a component's life cycle in response to changes in *this.props* or *this.state*

1. componentWillReceiveProps(newProps)
2. shouldComponentUpdate(newProps, newState)
3. ~~componentWillUpdate()~~
4. render()
5. componentDidUpdate(prevProps, prevState)

Avoid componentWillUpdate



LIFE CYCLE METHODS



1. **componentWillReceiveProps(newProps)**
   - Called when new props are passed in from the parent

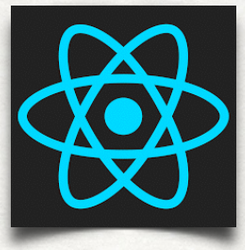
```
componentWillReceiveProps(nextProps) {
    if (this.props.id !== nextProps.id) {
        this.setState({
            feedContent: []
        });
    }
}
```

2. **shouldComponentUpdate(newProps, newState)**
   - Determines if a component should should re-render based on the new props and state

```
shouldComponentUpdate(nextProps, nextState) {
    return this.props.color !== nextProps.color
}
```

Override for required **optimizations only**

LIFE CYCLE METHODS



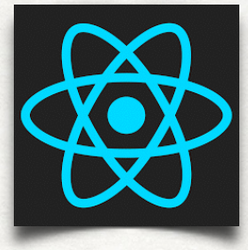
5. componentDidUpdate(prevProps, prevState)

- Called after a component has re-rendered after a change

```
componentDidUpdate(prevProps, prevState) {
    // only update chart if the data has changed
    if (prevProps.data !== this.props.data) {
        this.chart = c3.load({
            data: this.props.data
        });
    }
}
```

Place for code requiring **DOM interactions**

LIFE CYCLE METHODS



Unmounting — begins *just before* a component is about to be removed from the DOM (unmounted)

- Simple lifecycle method *componentWillUnmount*

Place for any clean up like removing event listeners or timers

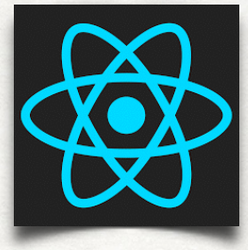
```
componentWillUnmount() {
    window.removeEventListener('resize', this.resizeEventHandler);
}
```

Error Handling

- Introduced in React 16 - *componentDidCatch* allows you to create **Error Boundaries**

```
class ErrorBoundary extends React.Component {
    constructor(props) {
        super(props);
        this.state = { hasError: false };
    }

    componentDidCatch(error, info) {
        // Display fallback UI
        this.setState({ hasError: true });
        logErrorToMyService(error, info);
    }

    render() {
        if (this.state.hasError) {
            // You can render any custom fallback UI
            return <h1>Something went wrong.</h1>;
        }
        return this.props.children;
    }
}
```

HIGHER ORDER COMPONENTS



- **Pattern** developed to facilitate avoiding code duplication and replace depreciated mixins
- Function that takes in a component to be wrapped and returns a new component with additional functionality

```
function logProps(WrappedComponent) {
    return class extends Component {
        componentWillReceiveProps(nextProps) {
            console.log('Current props: ', this.props);
            console.log('Next props: ', nextProps);
        }
        render() {
            return <WrappedComponent {...this.props} />
        }
    }
}
```

Creates a new component with a custom componentWillReceiveProps

Returns the original component passing in all the props with the spread operator

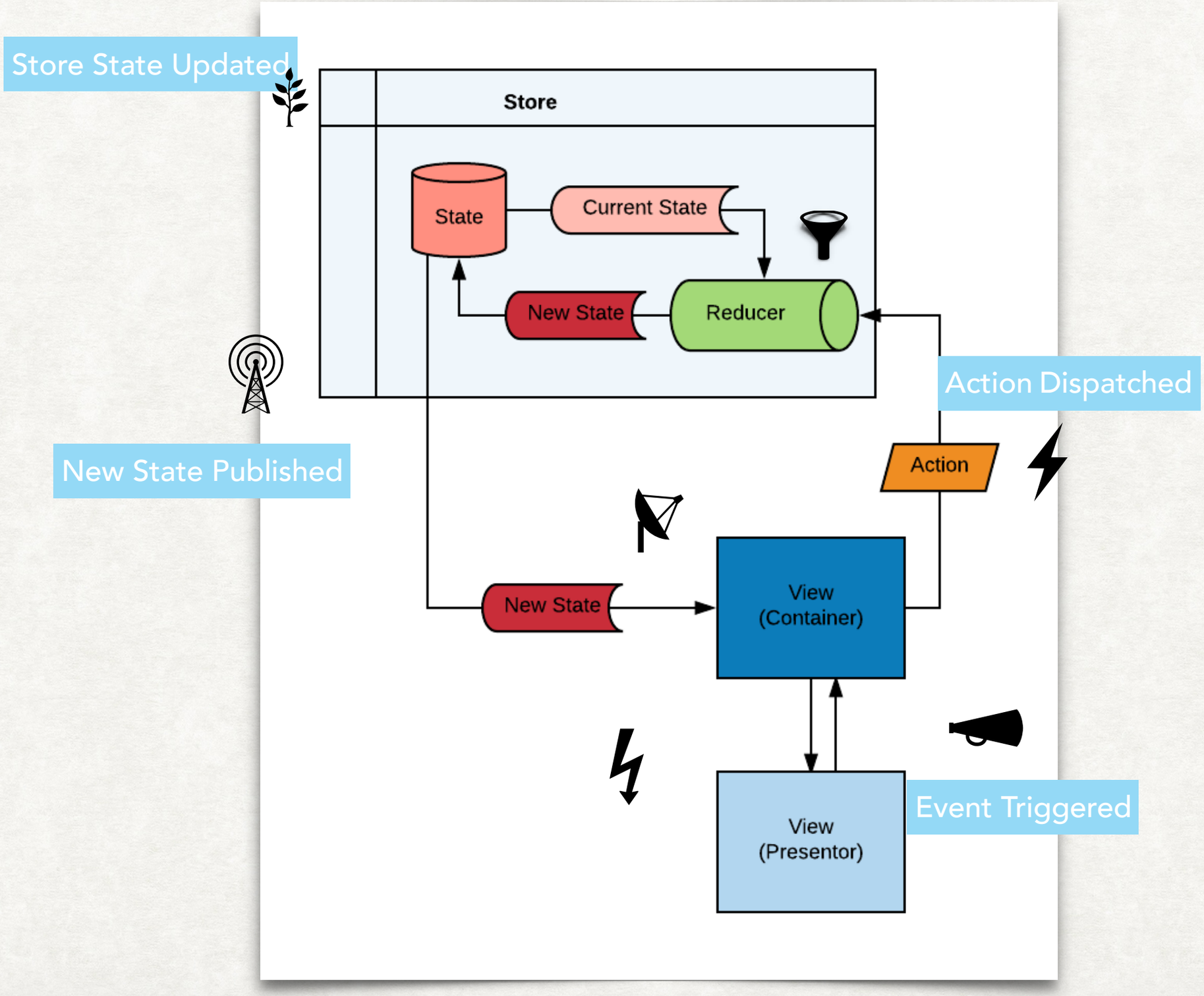
```
const MyComponent extends Component {
    render() {
        return <div>Component to be Wrapped</div>
    }
}

export default logProps(MyComponent)
```

REDUX

REDUX

- **Redux** is library build to simplify and centralize application state which predicable changes.
- Enforces **unidirectional** data flow based on Flux Architecture
- 3 Core Concepts
    1. Single Source of Truth
    2. Store is **Read Only**
    3. Changes are made with **Pure** Functions

REDUX


Store State Updated
Store
State
Current State
New State
Reducer
Action Dispatched
Action
New State Published
New State
View
(Container)
View
(Presentor)
Event Triggered

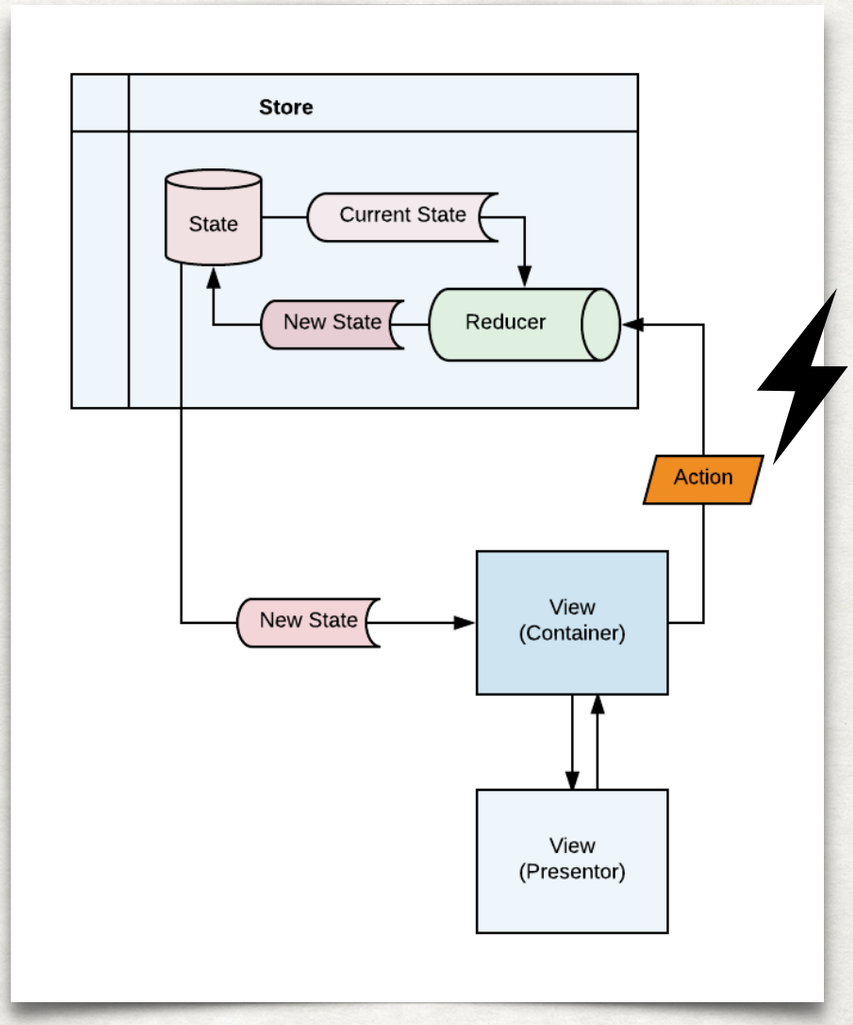
REDUX - ACTIONS

- **Actions**
  - **Plain JavaScript Object** that describes a change potential changes to the store
  - Must contain a **type**

```
const ADD_TODO = 'ADD_TODO'

const addAction = {
    type: ADD_TODO,
    text: 'Buy milk from the store'
}
```

- **Action Creators**
  - Common pattern — functions that are responsible for creating actions

```
const addTodo = text =>{
    return {
        type: ADD_TODO,
        text: 'Buy milk from the store'
    }
}
```



REDUX - REDUCERS

- **Functions** responsible for generating new state based on the **Action** and **Previous State**

```
(previousState, action) => newState
```

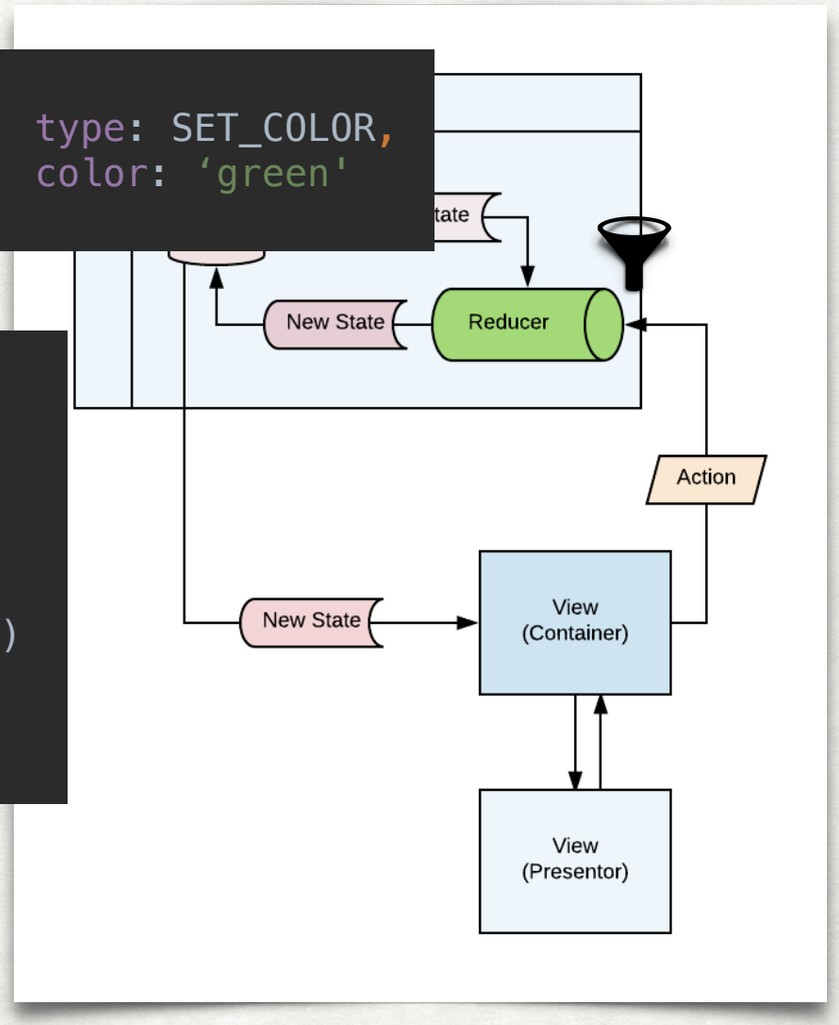
- Must be **PURE** — cannot mutate the previous state

Assigns default **initial** state

```
const reduce = (state = {}, action) => {

    switch (action.type) {
        case SET_COLOR:
            return Object.assign({}, state, {color: action.color})
        case SET_QUANTITY:
            return Object.assign({}, state, {quantity: action.quanity})
        default:
            return state
    }
```

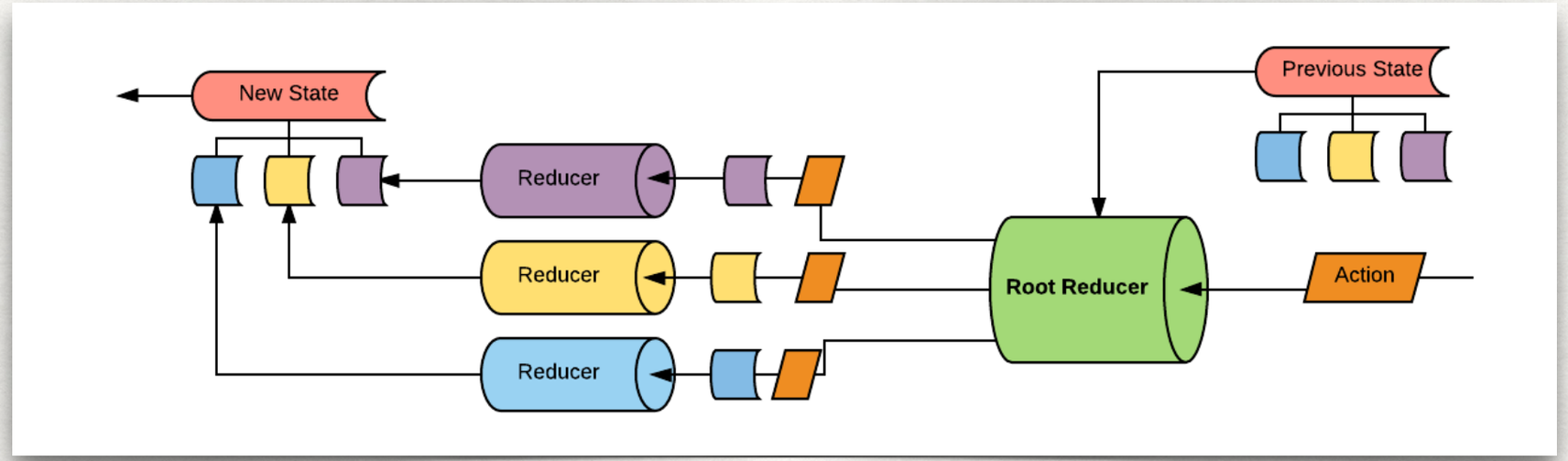
Returns previousState if no changes performed

```
{
    type: SET_COLOR,
    color: 'green'
}
```



REDUX - REDUCERS

- Multiple reducers can be combined to form a tree of reducers — the top level state will also be




```
import combineReducers from 'redux'
import potatoReducer from './potato'
import tomatoReducer from './tomato'

rootReducer = combineReducers({
    potato: potatoReducer,
    tomato: tomatoReducer
})
```

Resulting nested **state**

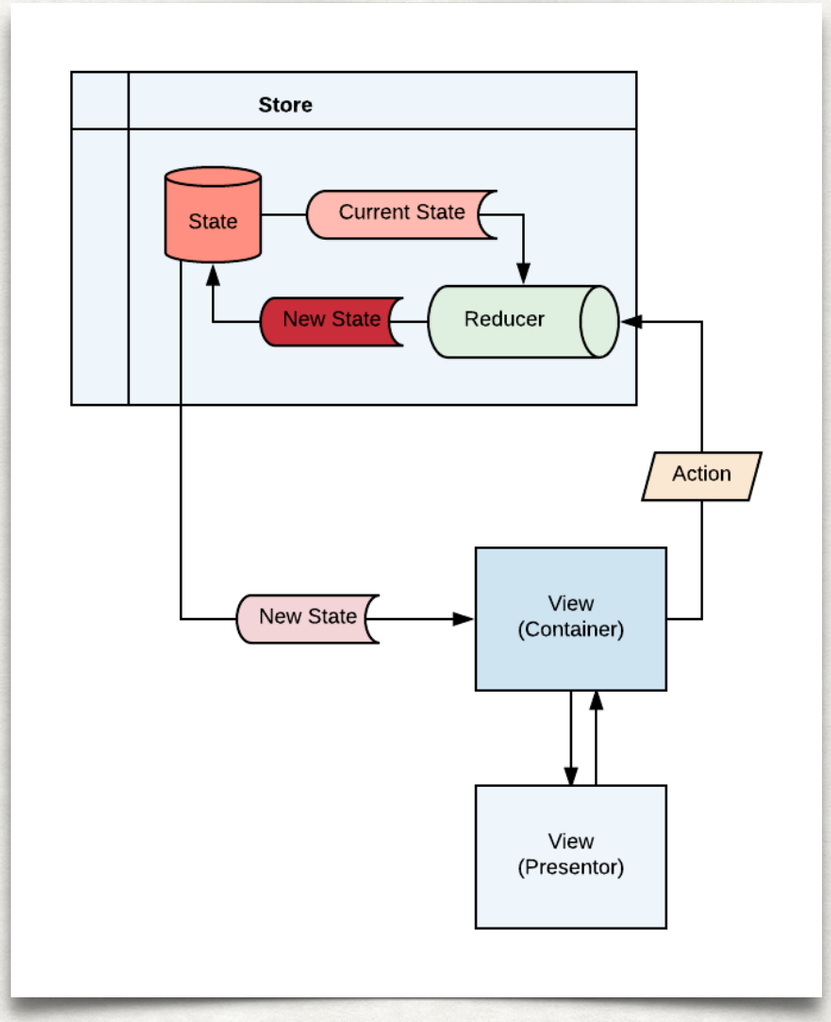
```
{
    potato: {
        // ... potatoes, and other state managed by the potatoReducer
    }
    tomato: {
        // ... tomatoes, and other state managed by the tomatoReducer
    }
}
```

REDUX - STATE/STORE

- **State**
  - **Single** plain JavaScript object containing nested structure for the entire application
  - Lives within the Store
- **Store**
  - Holds the state
  - Allows actions to be dispatched to update state
  - Notifies subscribed listeners on state changes

```
import { createStore } from 'redux'
import app from './reducers'
const store = createStore(app)
```

Initialized with root reducer



REACT REDUX BINDINGS

- Library that contains a series of bindings that greatly help integrate Redux into a react app
- **Provider** wraps entire app

```
import {Provider} from `react-redux`

ReactDOM.render(
    <Provider store={store}>
        <MyRootComponent />
    </Provider>,
    rootEl
)
```

Provider takes in the created store as a prop

- Provider gives all of the children component's access to the store via the second binding **connect**

REACT REDUX BINDINGS

- **Connect** is a Higher Order component that takes 2 main functions as parameters:
  - mapStateToProps(state, [ownProps]): stateProps

```
const mapStateToProps = state => {
    return {
        todos: state.todos
    }
}
```

Extract redux **state** and injects them into the component as *props*

  - mapDispatchToProps(dispatch, [ownProps]): dispatchProps

```
const mapDispatchToProps = dispatch => {
    return {
        onTodoClick: id => {
            dispatch(toggleTodo(id))
        }
    }
}
```

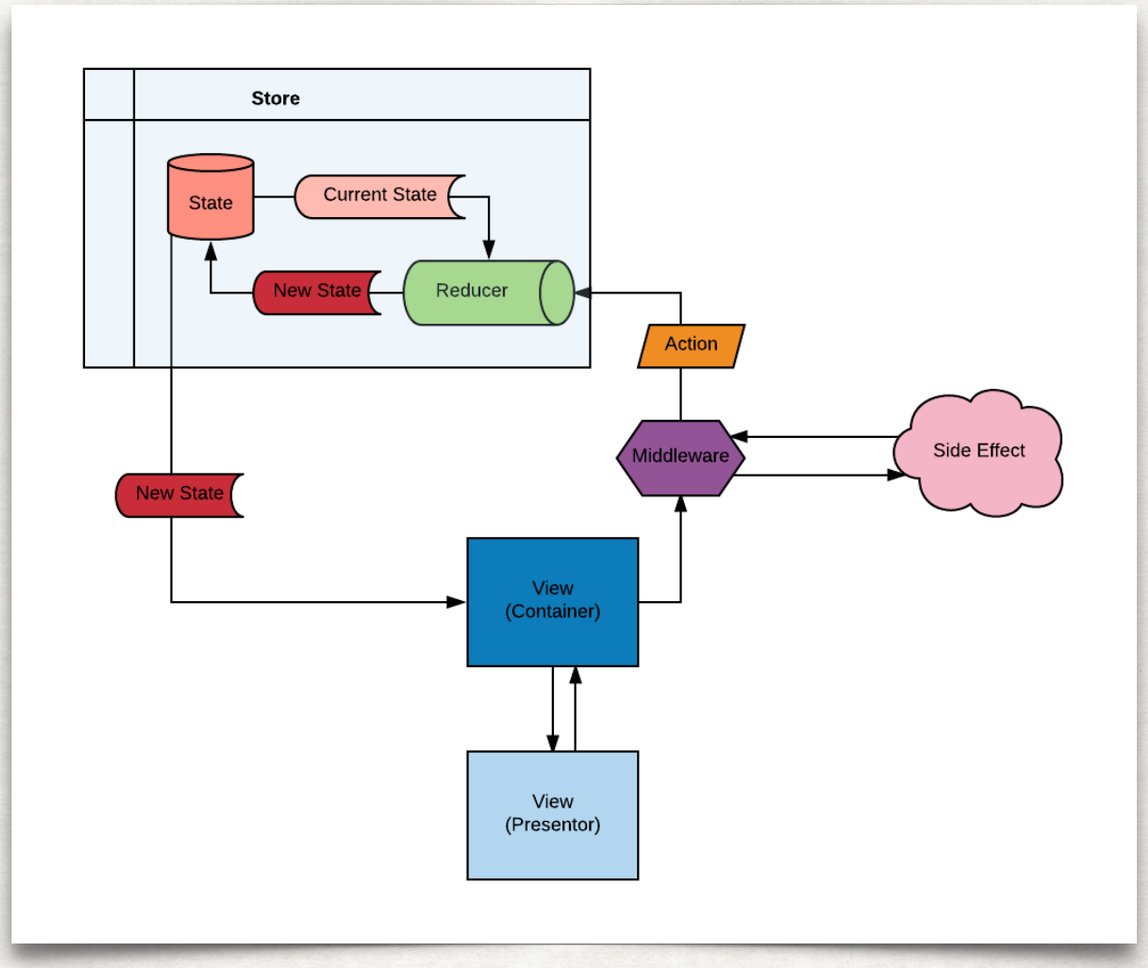
Create functions that allow the component to **dispatch** actions to the redux **store** and injects them as *props*

REACT REDUX BINDINGS

```
import React, { Component } from 'react'
import { connect } from 'react-redux'

import UserProfile from './UserProfile'
import { updateProfile } from './profileActions'

class Profile extends Component {
    render() {
        const { profile, updateProfile } = this.props
        return <UserProfile firstName={profile.firstName} lastName={profile.lastName} email={profile.email}
                            updateProfile={updateProfile}/>
    }
}

const mapStateToProps = state => {
    return {
        profile: state.profile
    }
}

const mapDispatchToProps = dispatch => {
    return {
        updateProfile: (profile) => dispatch(updateProfile(profile))
    }
}

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

REACT SIDE EFFECTS - MIDDLEWARE

- **Redux Middleware** — Provides 3rd party extension points between dispatching an action and it reaching the reducer.
  - Api Calls, Logging, etc…
- Many middleware for asynchronous logic:
  1. Redux-Thunks
  2. Redux-Saga
  3. Redux-Promise



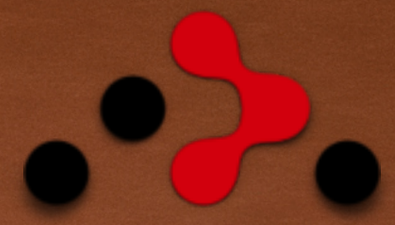
REACT SIDE EFFECTS - THUNKS

- Thunks allow you to dispatch a function to your store instead of just an action object
  - This function allows the **delay** of dispatching the action until after the asynchronous call has completed

```
function setCats(cats) {
    return {
        type: 'SET_CATS',
        cats
    }
}

function loadCats(catType) {
    return async function (dispatch) {
        const cats = await loadCatsofType(type)
        return dispatch(setCats(cats))
    }
}
```

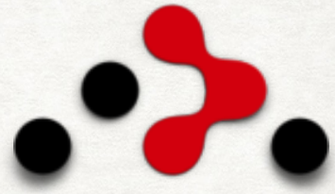
Thunk returns a function with **dispatch** as it's parameter

```
store.dispatch(loadCats('Siamese'))
```



REACT ROUTER

REACT ROUTER



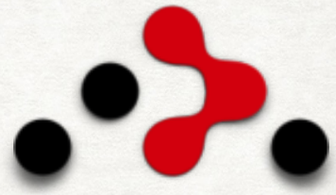
- The most populate routing library for React apps
- The entire app should be wrapped in a **<Router>** components
- Individual **<Route>** components map urls to specific components
- <Link> components allow for navigation within the application

```
import {BrowserRouter as Router} from 'react-router-dom'


<Router>
    <div>
        <ul>
            <li><Link to="/">Home</Link></li>
            <li><Link to="/about">About</Link></li>
          <li><Link to=“/topics”>Topics</Link></li>
          <li><Link to=“/profiles/123”>Profile</Link></li>
        </ul>

        <hr/>

        <Route exact path="/" component={Home}/>
        <Route path="/about" component={About}/>
        <Route path="/topics/" component={Topics}/>
      <Route path=“/profiles/:id” component={Profile}/>
    </div>
</Router>
```

<Link> provide navigation links

<Routes> map urls to components

REACT ROUTER



- Component's passed to Router get passed 3 props from the Router:

  1. **match** — information about the matched url to extract params

  2. **location** — information where the app is and query params

  3. **history** — allows for programatic navigation

```
const Child = ({ match, location, history }) => (
    <div>
        <h3>ID: {match.params.id}</h3>
    </div>
)
```