React With Grails 3

St. Louis Groovy and Grails Meetup - Feb 1, 2017

Zak Klein
OCI Grails Team
@ zacharyaklein

Visit us at ocitraining.com

Using React with Grails 3

Zachary Klein
Software Engineer, OCI

OCI | HOME TO GRAILS

Slides/Sample Code: http://bit.ly/2fD91Qf

About Me

Grails & web developer for 5 years

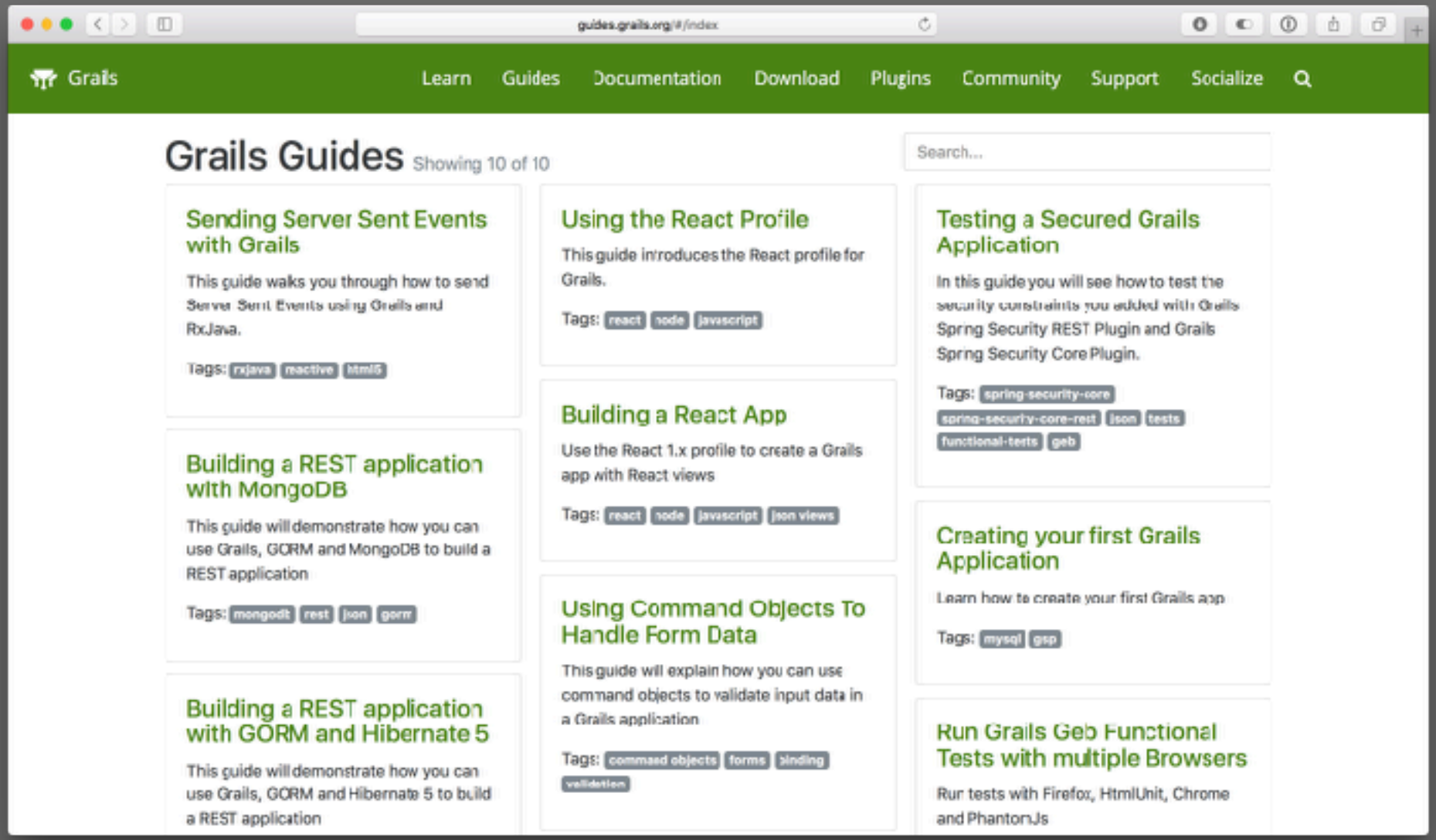
Joined OCI Grails team in 2015

Using React since 2015

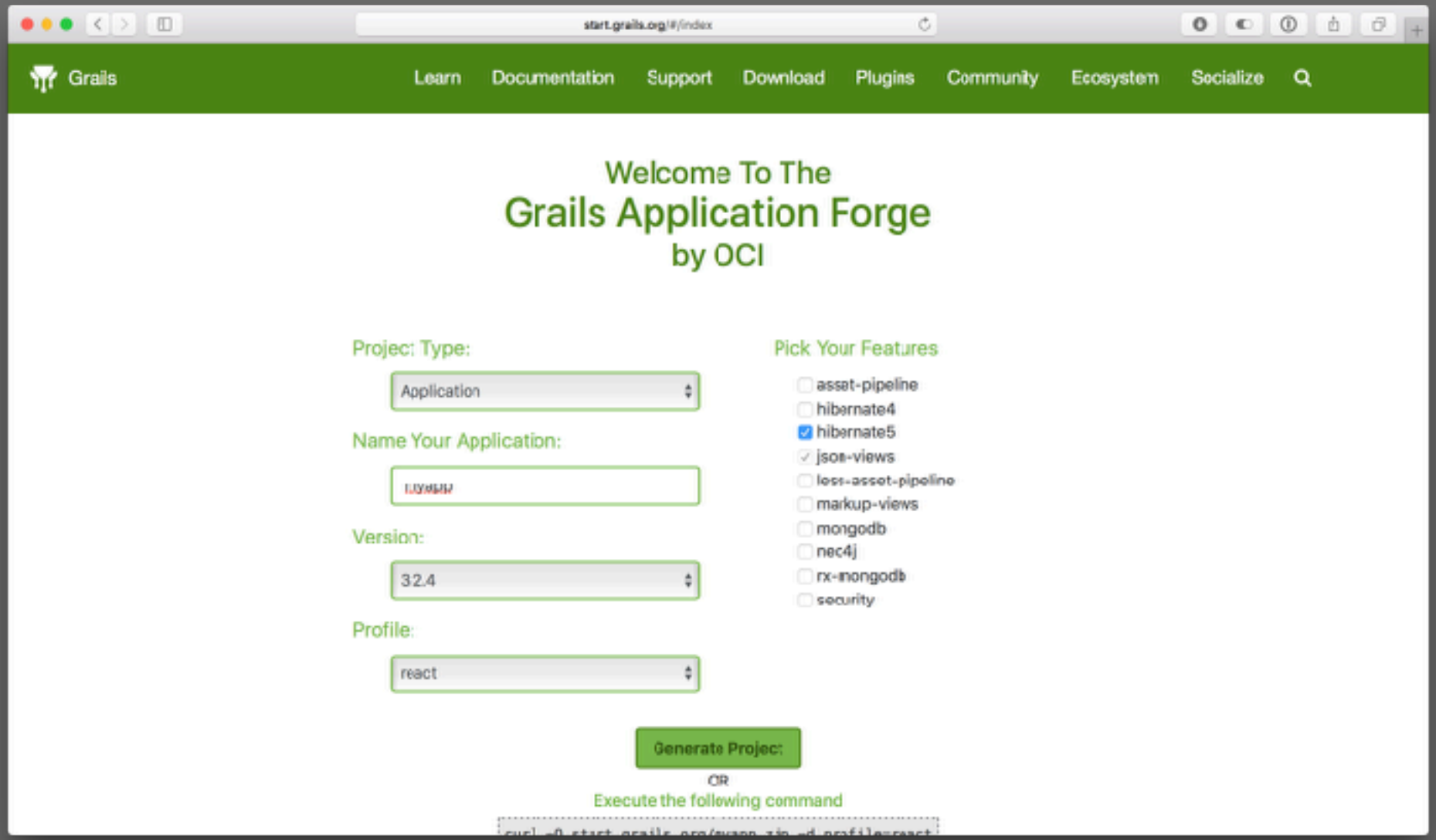
Author of the React profile/s for Grails 3

@zacharyaklein

On the Grails Team at @ObjectComputing. Christ-follower, husband (of Elizabeth), dad (of John & Timmy) programmer, guitarist. Needing to be more like Jesus.



http://guides.grails.org



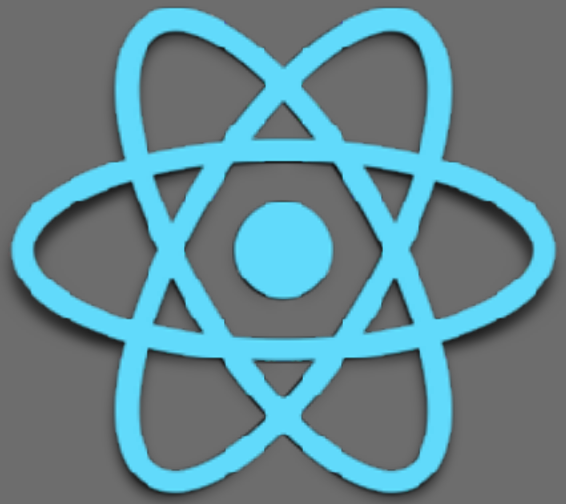
http://start.grails.org

Where we're going today

- What is React?
  - Brief overview of React and friends (npm, webpack, babel)
  - Only a primer - there's lots more!
- How do I use React with Grails?
  - Asset Pipeline plugin/s
  - React profile - monolith
  - React profile 2.x - separate client & server
  - Isomorphic React - server-side rendering w/Nashorn
- Resources & Q/A

What is React?

A Javascript library for building user interfaces

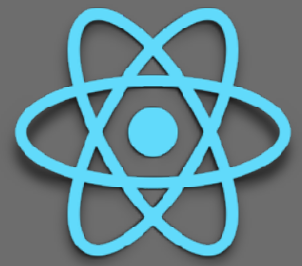


Key Features:

- Virtual DOM
- JSX
- Components
- Single Page Apps
- Functional emphasis
- Beyond the browser

"**React is a JavaScript library,** and so it assumes you have a basic understanding of the JavaScript language."

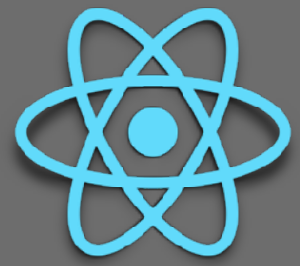
What is React?



```
import React from ‘react’
import ReactDOM from ‘react-dom’


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

What is React?



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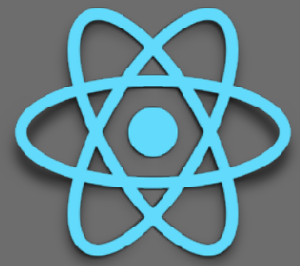

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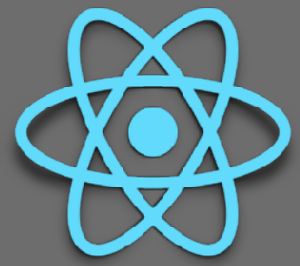
class Greeting extends React.Component {
  render() {
    return <h1>Hello, {this.props.name}!</h1>;
  }
}

ReactDOM.render(
  <Greeting name=‘G3 Summit’ />,
  document.getElementById('root')
);
```

What is React?

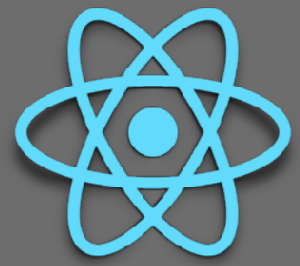


```
var React = require('react');
var ReactDOM = require('react-dom');

var Greeting = React.createClass({
  render: function() {
    return <h1>Hello, {this.props.name}</h1>;
  }
});

ReactDOM.render(
  <Greeting name='G3 Summit' />,
  document.getElementById('root')
);
```

What is React?



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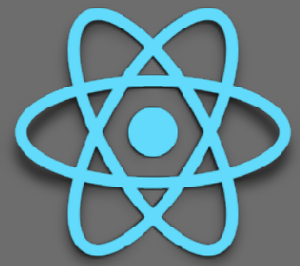
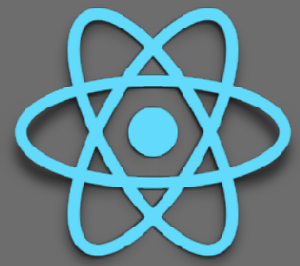


```
var React = require('react');
var ReactDOM = require('react-dom');

var Greeting = React.createClass({
  render: function() {
    return React.createElement(
      'h1', null, `Hello, ${this.props.name}!`
    );
  }
});

ReactDOM.render(
  React.createElement(Greeting, {name: 'G3 Summit'}, null),
  document.getElementById('root')
);
```

What is React?



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    );
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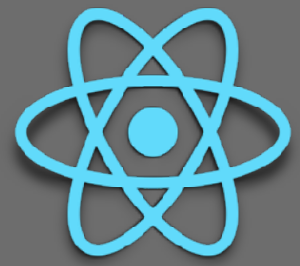
);
```

name props body

name props body

What is React?



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  render() {
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  }
}

ReactDOM.render(
  <Greeting name=‘G3 Summit’ />,
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);
```

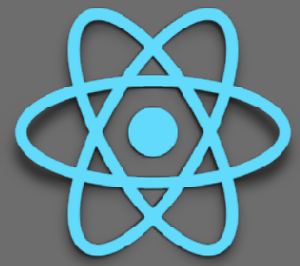
name

body

name

props

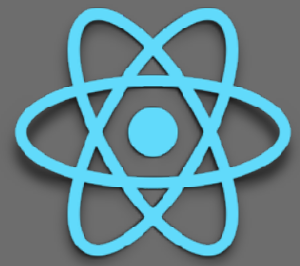
What is React?



```
class Greeting extends React.Component {
  render() {
    return(
      React.createElement('div', {},
        React.createElement('h1', {}, “Greetings, ${this.props.name}"),
        React.createElement('ul', {},
          React.createElement('li', {},
            React.createElement('a', {href: ‘edit'},
              ‘Edit this greeting’)
            ),
          React.createElement('li', {},
            React.createElement('a', {href: 'reset'},
              ‘Reset this greeting')
        )
      )
    );
  }
}

ReactDOM.render(
  React.createElement(Greeting, {name: ‘G3 Summit'}, null),
  document.getElementById('root')
);
```

What is React?



```
class Greeting extends React.Component {
  render() {
    return (<div>
      <h1>Hello, {this.props.name}!</h1>
      <ul>
        <li><a href='edit'>Edit this greeting</a></li>
        <li><a href='reset'>Reset this greeting</a></li>
      </ul>
    </div>);
  }
}

ReactDOM.render(
  <Greeting name='G3 Summit' />,
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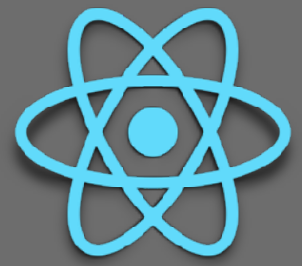
);
```

What is React?

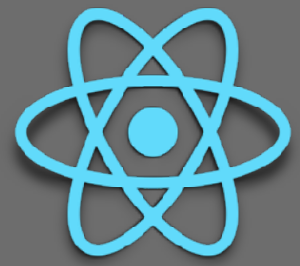


“React is only the view layer.

We're only in one concern. React only knows how to render markup. It doesn't know where your data came from, how it's stored, or how to manipulate it. What concerns are being violated?”

Andrew Ray, via ***http://blog.andrewray.me/youre-missing-the-point-of-jsx/***

Component State



```
class Greeting extends React.Component {
  constructor() {
     super();

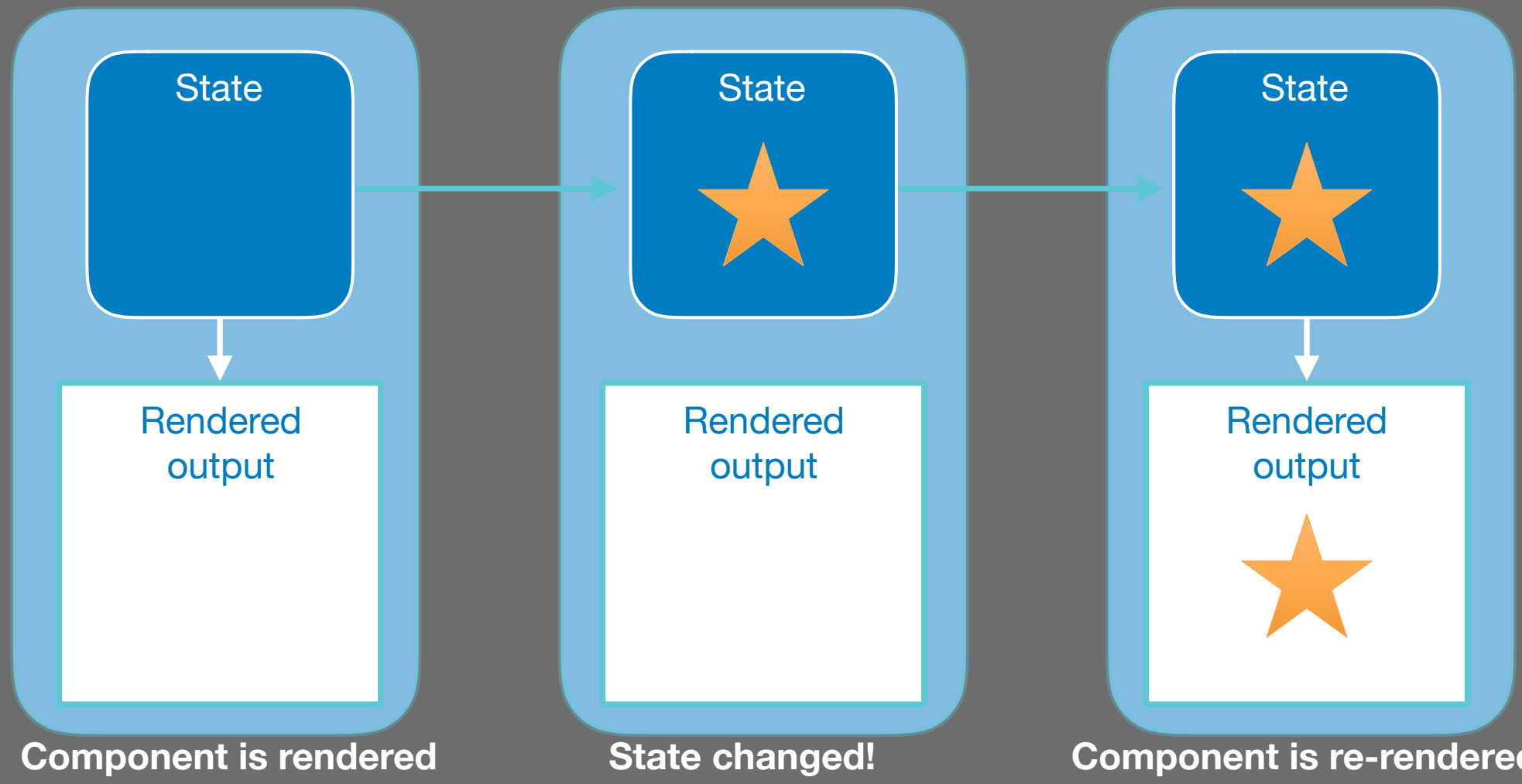
     this.state = {
       greetings: ['Hello', 'Salutations', 'Ho there']
     }
  }

  render() {
    const greetings = this.state.greetings;
    const randomGreeting = greetings[Math.floor(Math.random() * greetings.length];

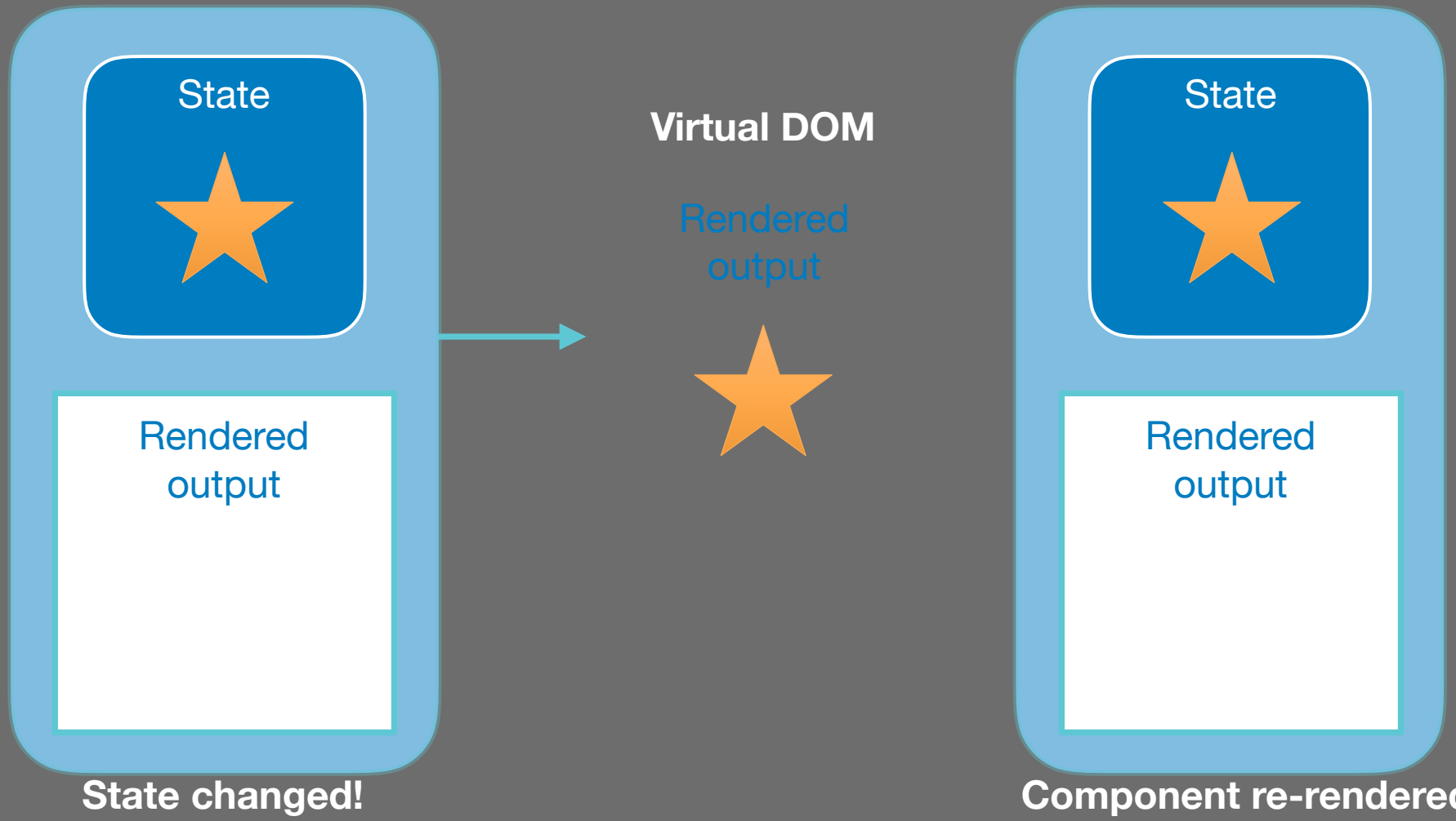
    return(
      <h1>{randomGreeting}, {this.props.name}</h1>
    );
  }
}

ReactDOM.render(
  React.createElement(<Greeting name='G3 Summit' />, document.getElementById('root')
);
```

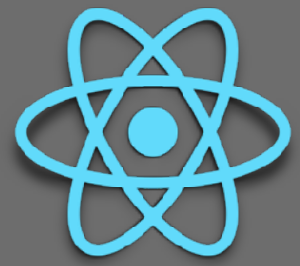
Component State



Virtual DOM


State
Rendered output
State changed!
Virtual DOM
Rendered output
State
Rendered output
Component re-rendered

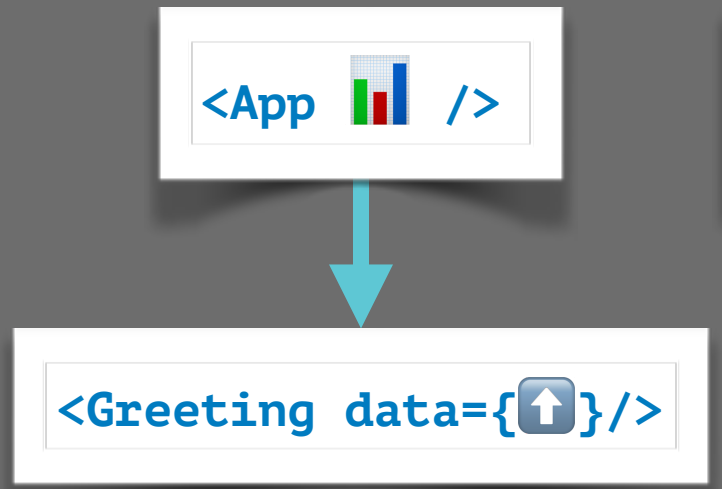
Component State



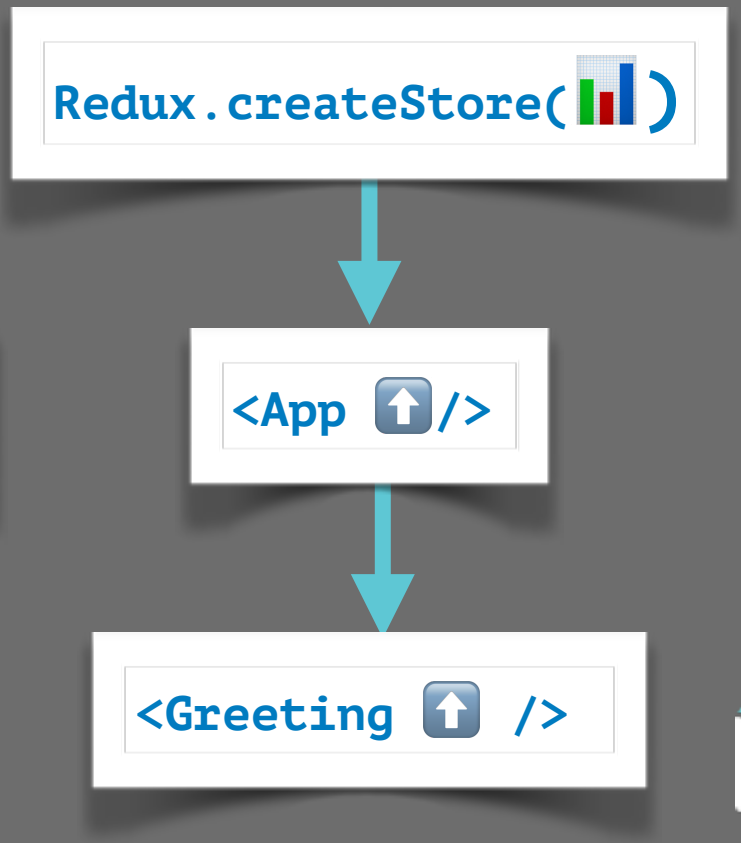
Where should `state` go? 📊

Each component?

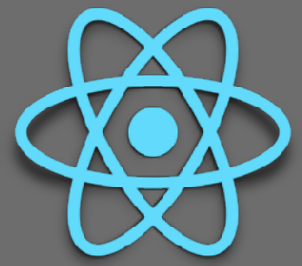
Top-level component?



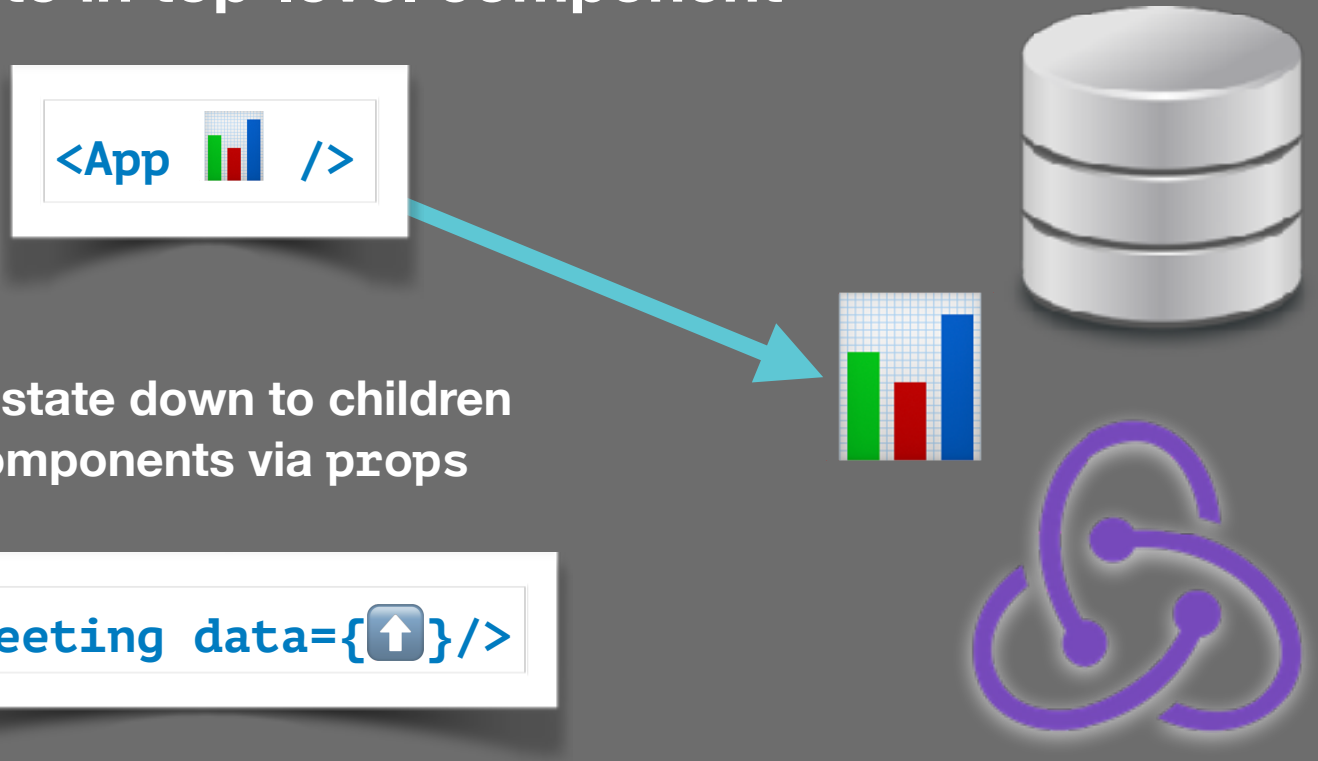
External store?



Component State



Recommendation:
Store all state in top-level component

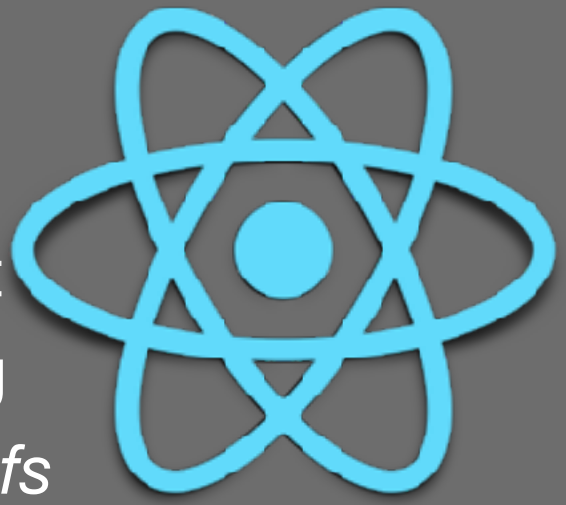


Pass state down to children components via props

What is React?

Other features:

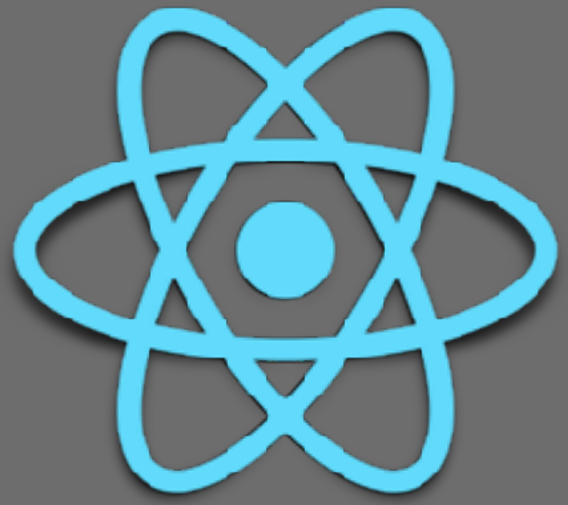
- Lifecycle methods
- Event-handling
- State management
- PropType checking
- DOM access via *refs*
- SPA or partials



"**React is, in our opinion,** the premier way to build big, fast Web apps with JavaScript. It has scaled very well for us at Facebook and Instagram."

What is React?

React is a small, focused library by design, but there's plenty of options for augmentation.



Redux

React Bootstrap

IMMUTABLE

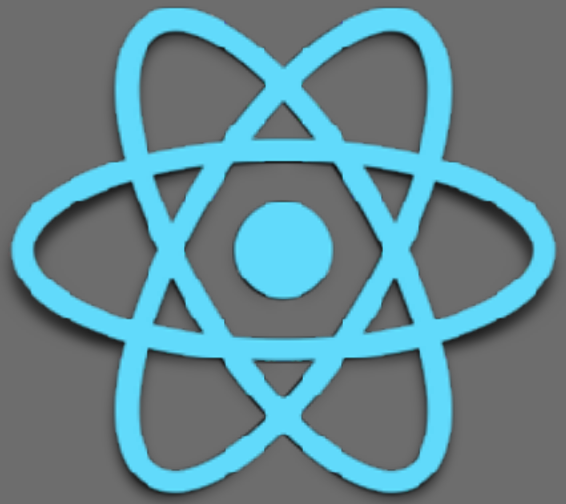
fetch

axios

https://www.toptal.com/react/navigating-the-react-ecosystem

What is React?

React can be used standalone, but is more frequently used with **node**, **npm** & friends.



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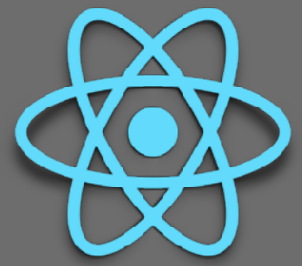
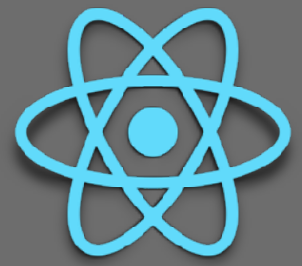


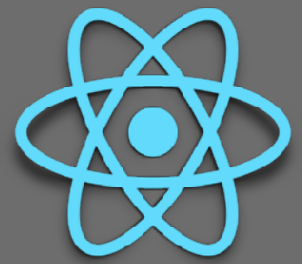
“Node.js is an open-source, cross-platform JavaScipt runtime environment.” *(Wikipedia)*

What is React?



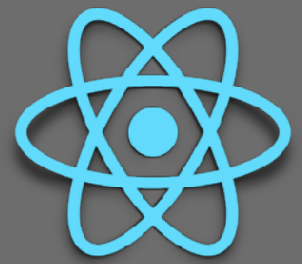
"npm is the default package manager for… Node.js." *(Wikipedia)*

What is React?



The 6th edition of ECMAScript, officially titled ECMAScript 2015.

What is React?



Babel - a Javascript “transpiler”

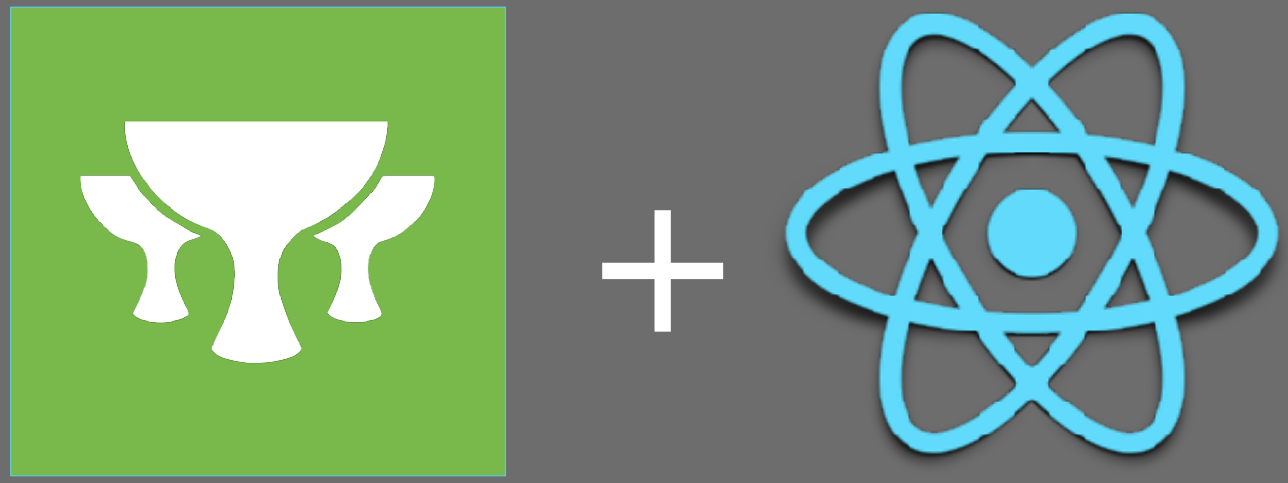
What is React?

Webpack is an open-source Javascript module bundler. *(official website)*

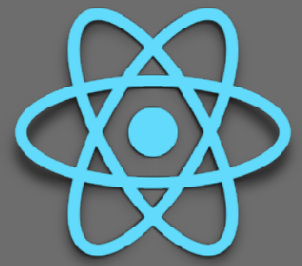
Why use React with Grails?

Why use React with Grails?

- GORM
- Convention/Config
- Spring Boot
- Profiles
- URL mappings
- JSON views
- Spring Websockets
- Gradle

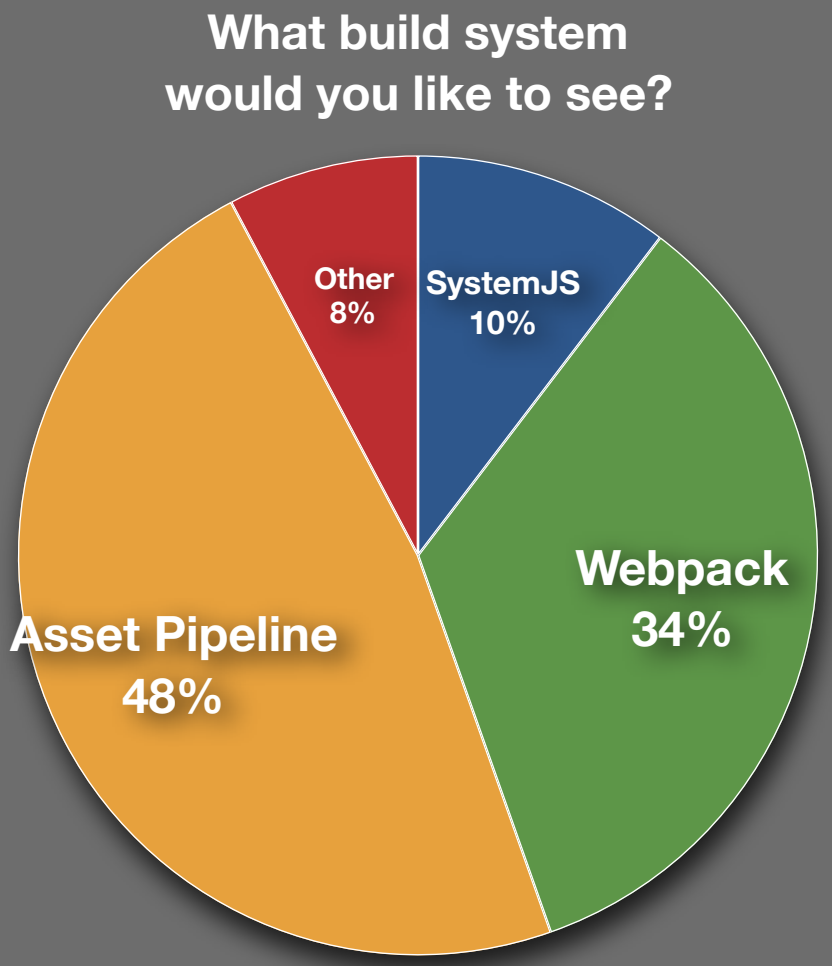


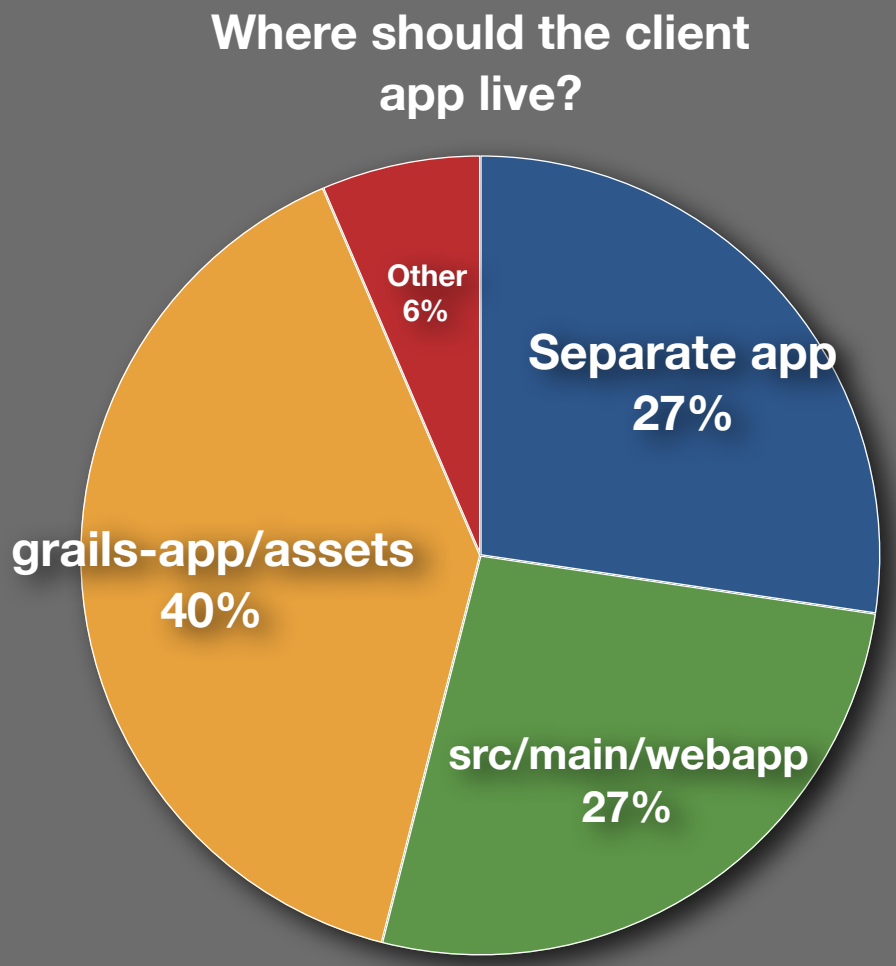
How do I use React with Grails?



- Most React community resources & documentation assume a node/Javascript-based environment.
- Typical project structure is not immediately transferable to a Grails project.
- Use of **npm** is ubiquitous (but not required) and brings both advantages & challenges.
- Potential tension between front-end and back-end developer workflows
- Wild west - the trail is still being blazed!

How do I use React with Grails?





React & the Asset Pipeline

React & the Asset Pipeline

- Front-end asset management/processing in Grails is typically handled via the **Asset Pipeline**.
- Recently-released plugins now support React with AP.
- React/JSX files in *grails-app/assets/javascripts*.
- Take advantage of other front-end Grails/Gradle plugins, such as the excellent **client-dependencies** plugin (**https://github.com/craigburke/client-dependencies-gradle**)
- Performant, extensible, familiar to Grails developers.

React & the Asset Pipeline

- **Babel Asset-Pipeline Plugin**
  - Makes use of the Babel transpiler to transform ES6 code to ES5
  - Supports Webpack bundler, hot-reloading
  - Promising, but tricky to configure

```
compile(‘:babel-asset-pipeline:2.1.0')
```

React & the Asset Pipeline

- **JSX Asset-Pipeline Plugin**
  - Natively parses React/JSX code w/o Babel
  - Follows Asset Pipeline conventions
  - Works well with **client-dependencies** plugin
  - Documentation is lacking
  - Excellent option for teams experienced/invested in AP

```
assets "com.bertramlabs.plugins:jsx-asset-pipeline:2.12.0"
```

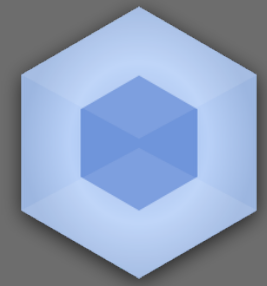
React & the Asset Pipeline

DEMO

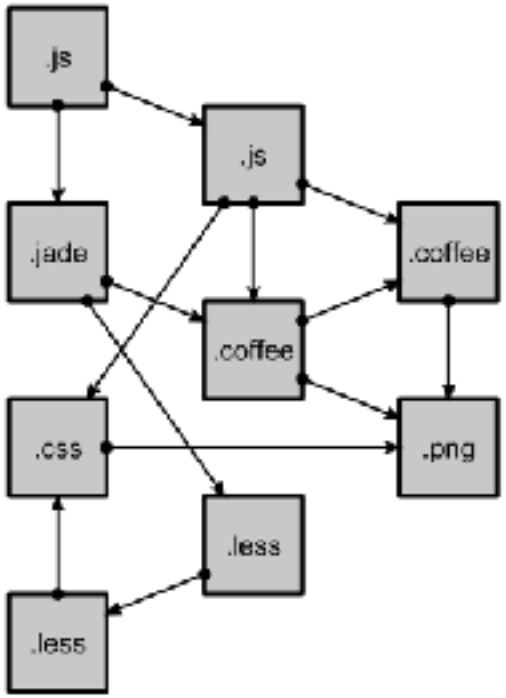
React & the Asset Pipeline

- “Asset pipeline” seems to be out of favor among front-end developers (perhaps unfairly).
- May be difficult to follow along with **community documentation/resources**.
- AP support for new asset processing tools tends to lag behind Node-based tooling.
- Not compatible with popular front-end toolchains.
- **Grails-centric** - may be confusing/unfamiliar to a dedicated front-end team.

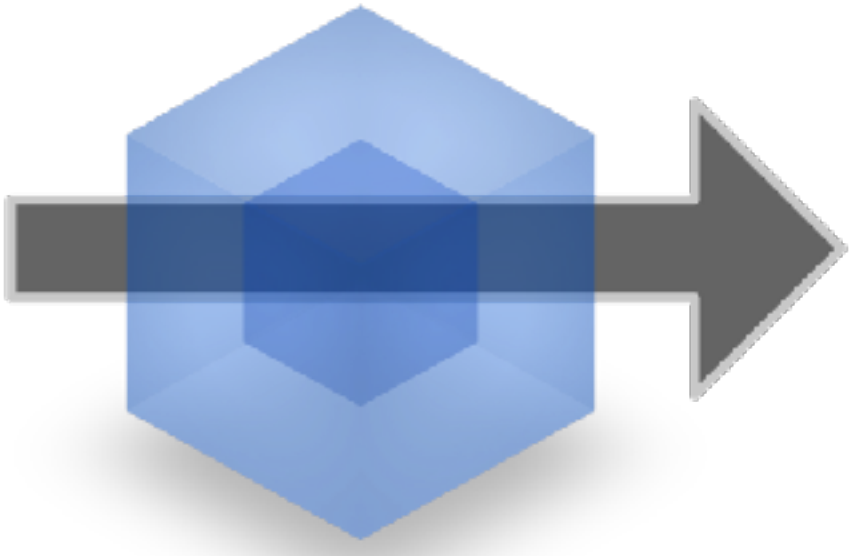
Webpack



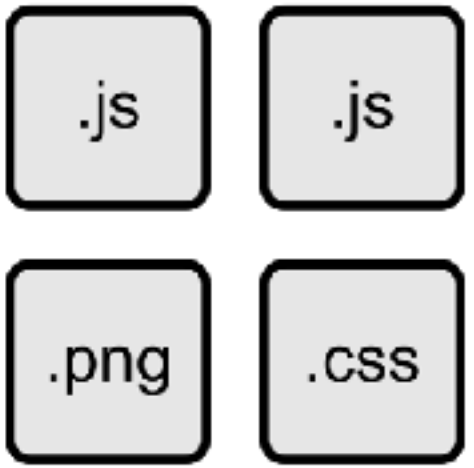
- Webpack is a Module bundler.
- Typically installed via **npm**, run via scripts in *package.json*
- Designed for Single Page Apps
- Supports a huge variety of asset types via configurable "loaders" (processors)
- Supports code-splitting/chunking
- Supports hashed/version assets for cache control
- Outputs a single bundle (by default), containing all required Javascript/CSS to render the target (i.e, your React app)



modules
with dependencies



webpack
MODULE BUNDLER



static
assets

hello.js

```
import ‘text-label’
```

text-label.js

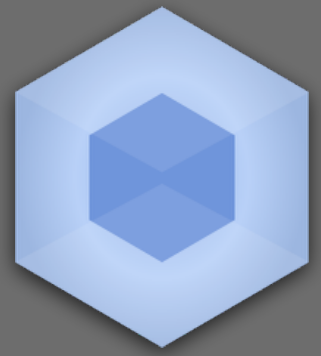
```
import ‘lodash’
```

app.js

```
import ‘hello’
```

loadash.js

```
//from node_modules
```



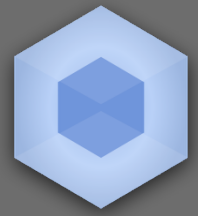
bundle.js

```
_react2.default.createElement(
    _reactBootstrap.Modal.Footer,
    null,
    _react2.default.createElement(
        'span',
        { className: 'copyright' },
        'Built with React 15.3.2, webpack
1.13.1, Grails 3'
    ),
    _react2.default.createElement(
        _reactBootstrap.Button,
        { onClick: this.toggleModal },
        'Close'
    )
```

hello.js

ES6

```
function hello() {
  return <div>Hello world!</div>;
}
```



BABEL - loader

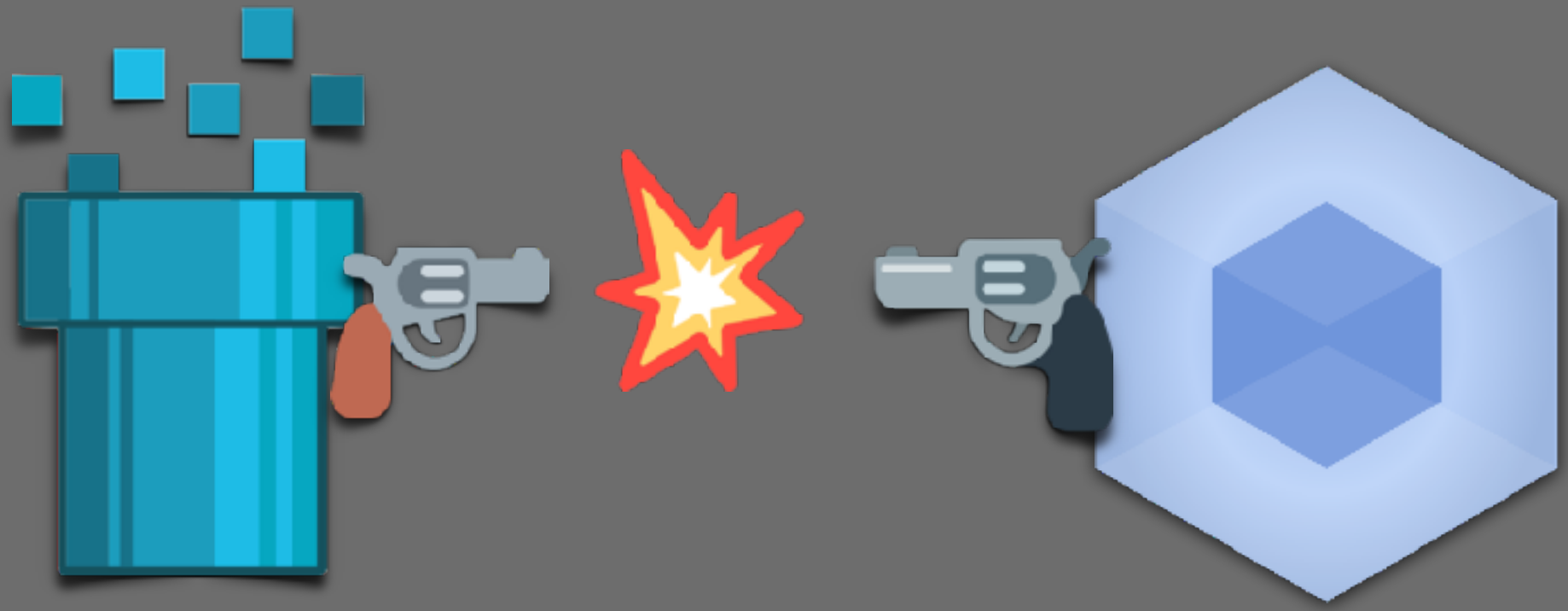
bundle.js

ES5

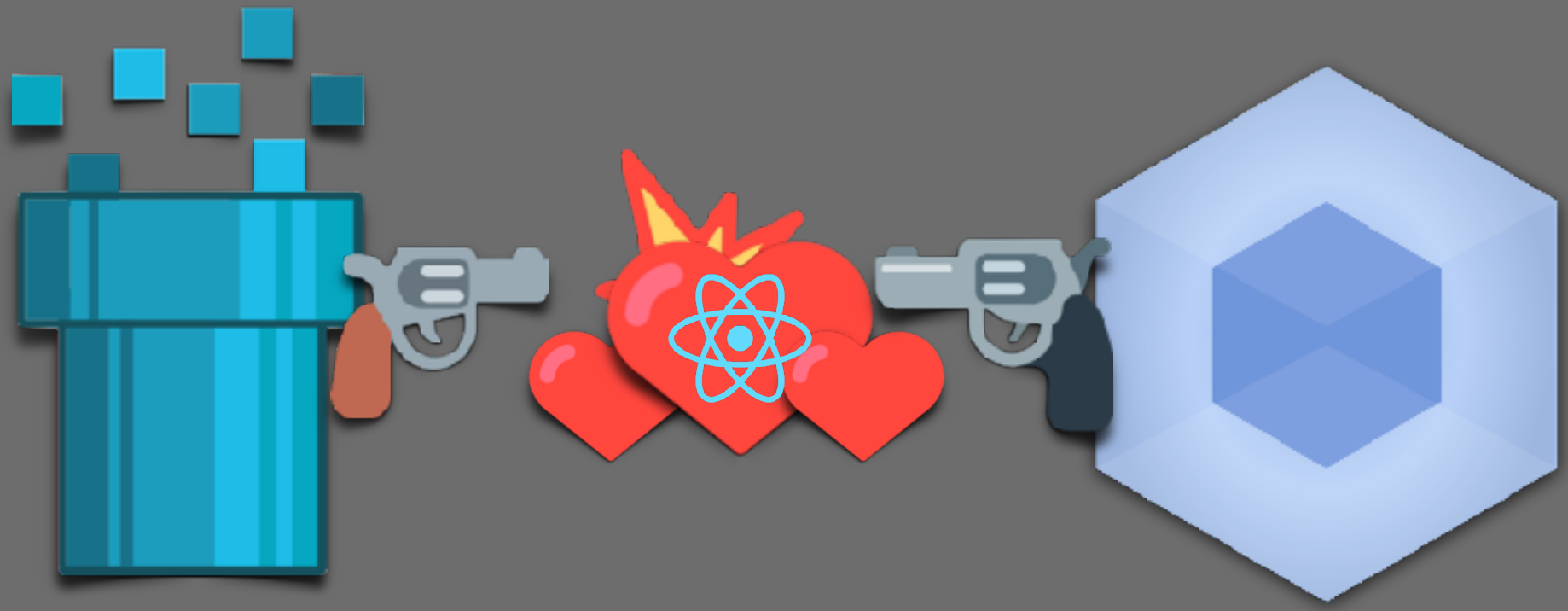
```
"use strict";

function hello() {
  return React.createElement(
    "div",
    null,
    "Hello world!"
  );
}
```

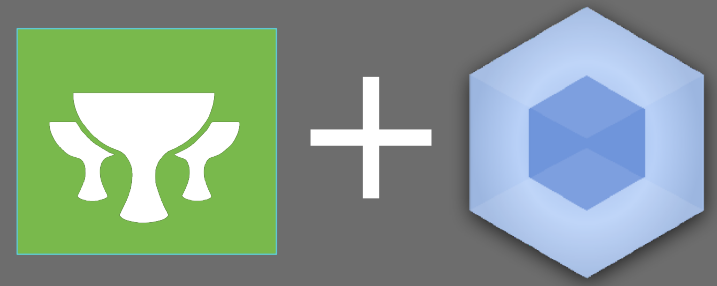
Asset Pipeline vs Webpack

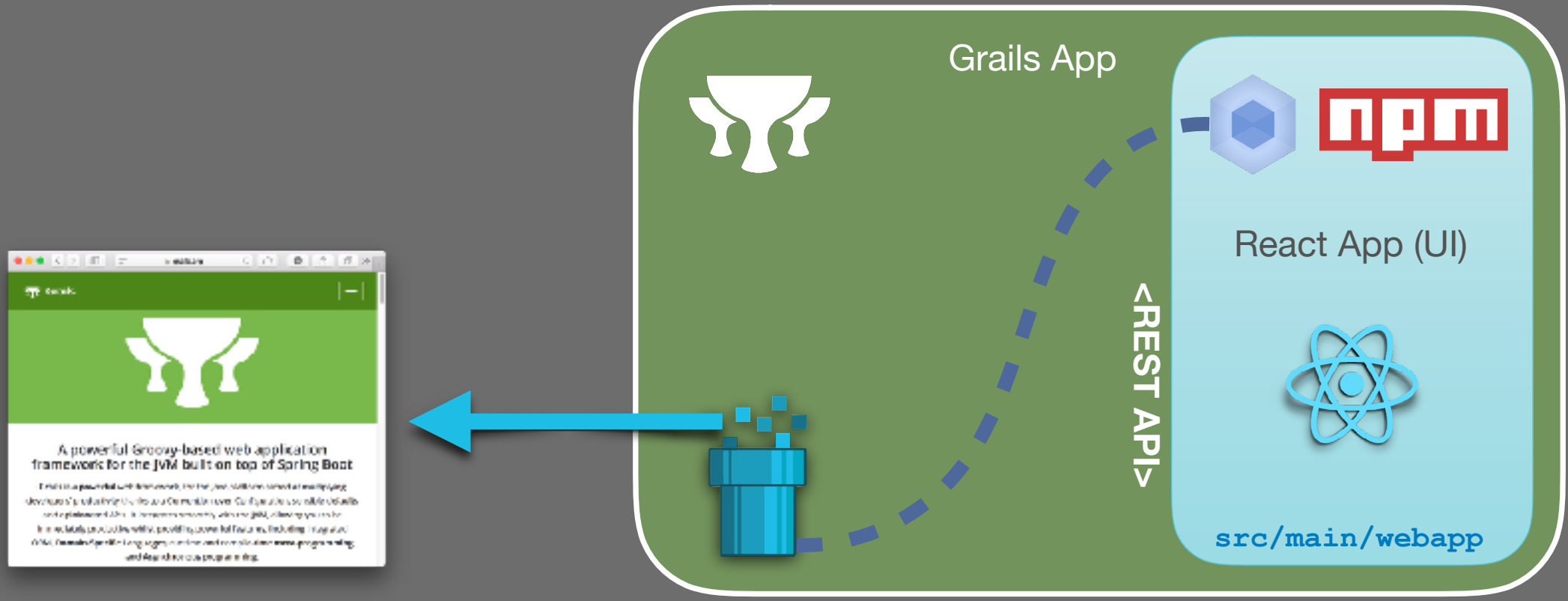


Asset Pipeline vs Webpack

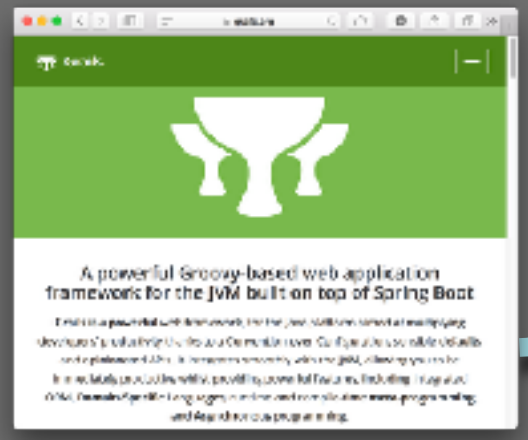


Webpack & Grails





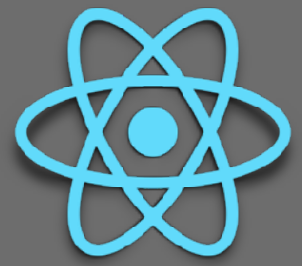
Webpack & Grails



Webpack & Grails

- Compromise:
  - Configure Webpack to output bundle/s into *grails-app/assets/javascripts*
  - Keep React source code in a separate directory tree (e.g, *src/main/webapp)*
  - Rely on Webpack for processing our React/ES6 code
  - Continue to use AP for non-React assets (jQuery, bootstrap, scaffolded pages, etc), as well as to serve the webpack bundle to the browser.
  - Use Gradle to automate running webpack via **npm** scripts
- All this can be tricky to configure - if only there was an easier way…

React Profile for Grails 3

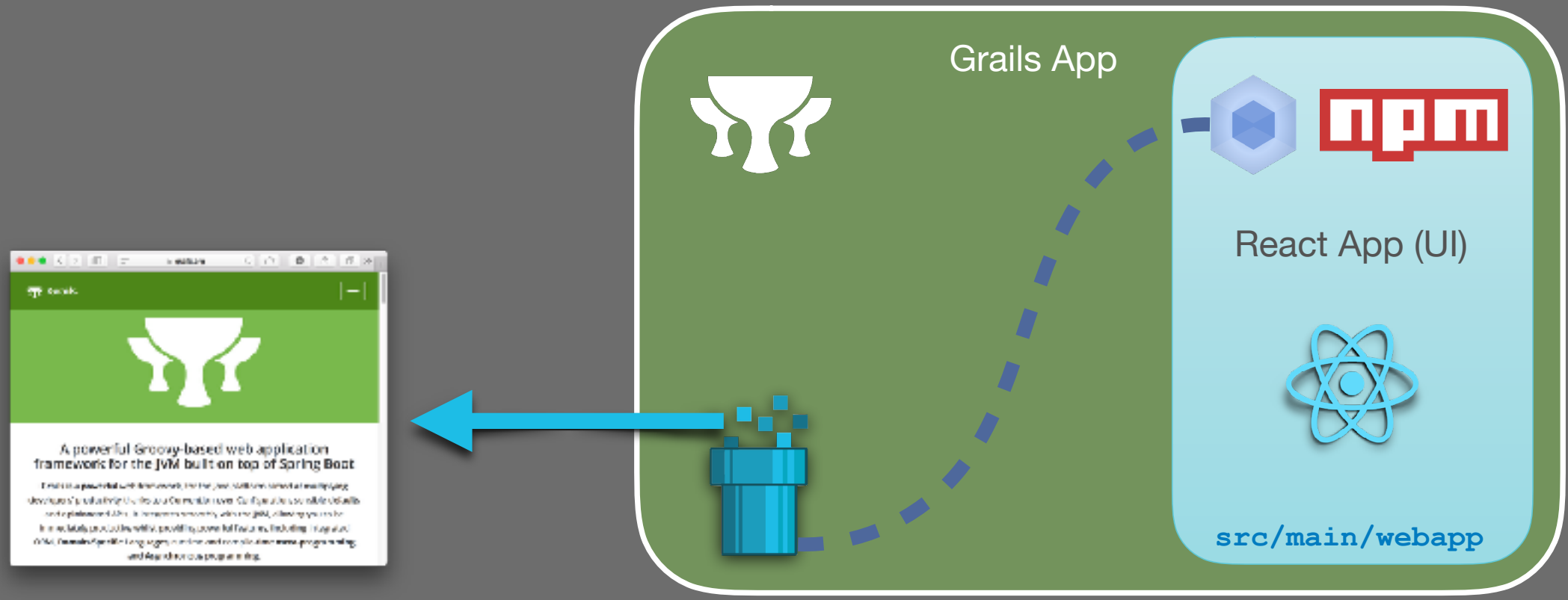


React 1.x Profile generates a Grails project with the following:

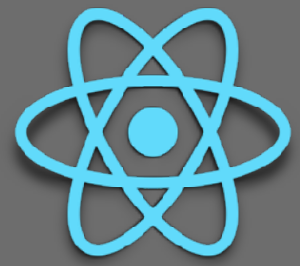
- React, ReactDOM etc., installed via **npm**
- Webpack configured to process React code and output to *grails-app/assets/javascripts*
- **gradle-node** plugin installed, custom tasks to run webpack on app startup/packaging
- Sample React code & unit tests

```
grails create-app myReactApp –profile org.grails.profiles:react:1.0.2
```

React Profile for Grails 3



React Profile for Grails 3



webpack bundle

npm project file

```
$ ls -l

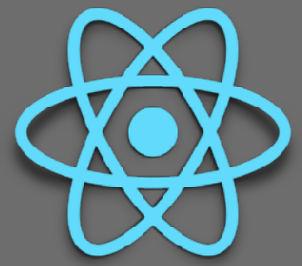
grails-app/
-  assets/
-  - javascripts/
-  - - bundle.js
node_modules/
package.json
src/
-   main/
-  - webapp/
-  - - app/
-  - - - about.js
-  - test/
-  - - js/
-  - - - about.spec.js
webpack.config.js
```

React source code

Unit test

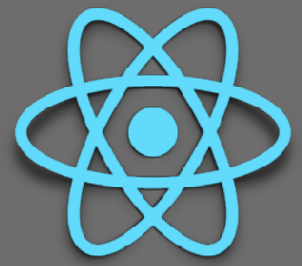
webpack configuration file

React Profile for Grails 3



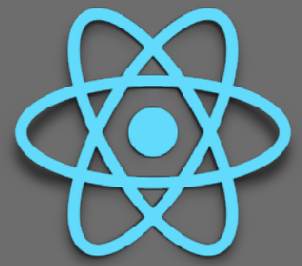
DEMO

React Profile for Grails 3



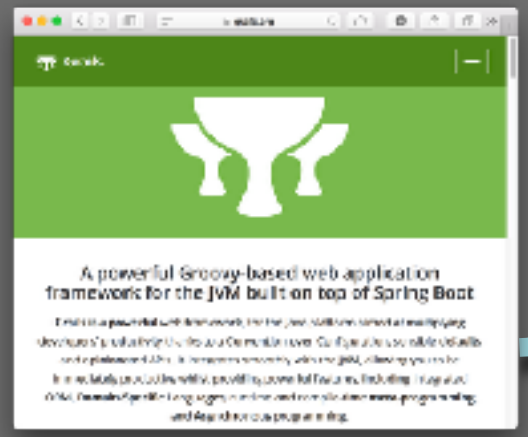
- The React 1.x profile simplifies the setup process for using React & Webpack with Grails
- Designed for monolithic applications
- Gradle-node plugin ties the two “worlds” together
- Single development/test/deployment path
- Gradle wrapper allows front-end devs to run the Grails app w/o installing Grails `./gradlew bootRun`
- Gradle-node tasks allow Grails devs to run webpack w/o installing npm `./gradlew webpack`

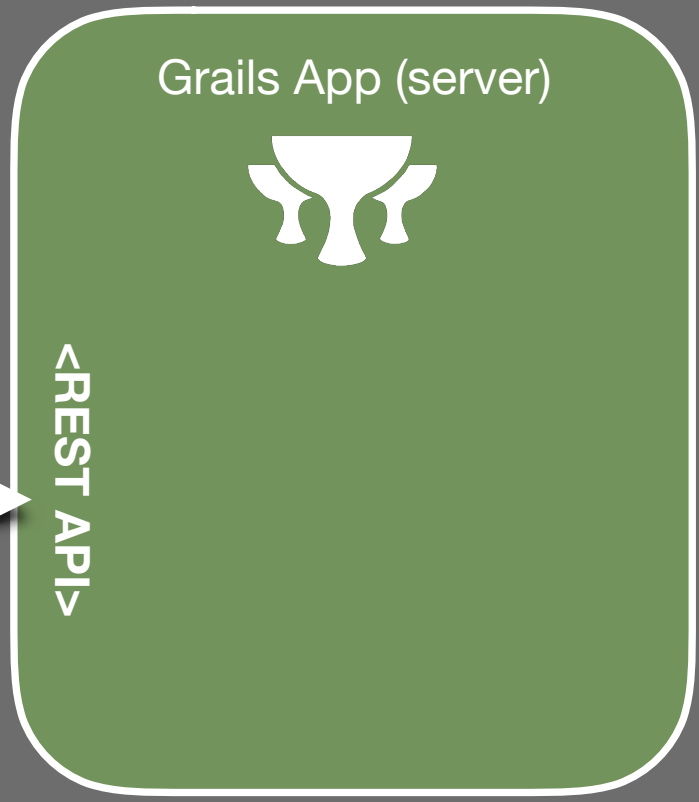
Separate Client & Server



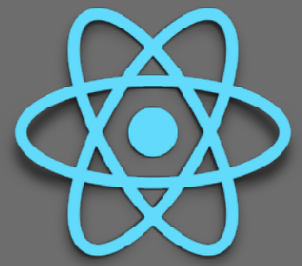
- Microservice-friendly
- Deploy/update front-end and back-end separately
- Take advantage of Grails' RESTful features
  - Domain resources
  - JSON Views
- Gradle multi-project build for client & server apps
- Requires fully standalone React app, including:
  - webpack, babel & dev-server
  - CORS configuration

Separate Client & Server





create-react-app

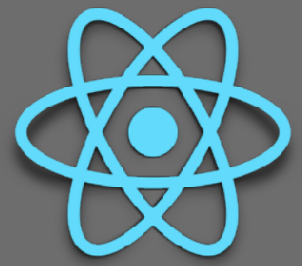


"**Create React App** is a new officially supported way to create single-page React applications. It offers a modern build setup with no configuration."

https://facebook.github.io/react/blog/2016/07/22/create-apps-with-no-configuration.html

- Generates fully standalone React app
- Provides working webpack & Babel config
- Provides scripts for starting app, building public bundle, running tests
- Simplified development & an easy "exit strategy"

React Profile for Grails 3

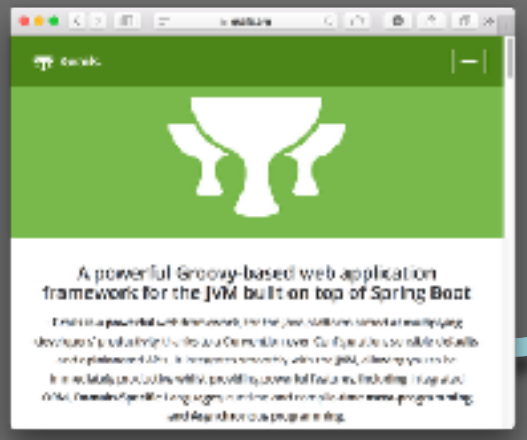


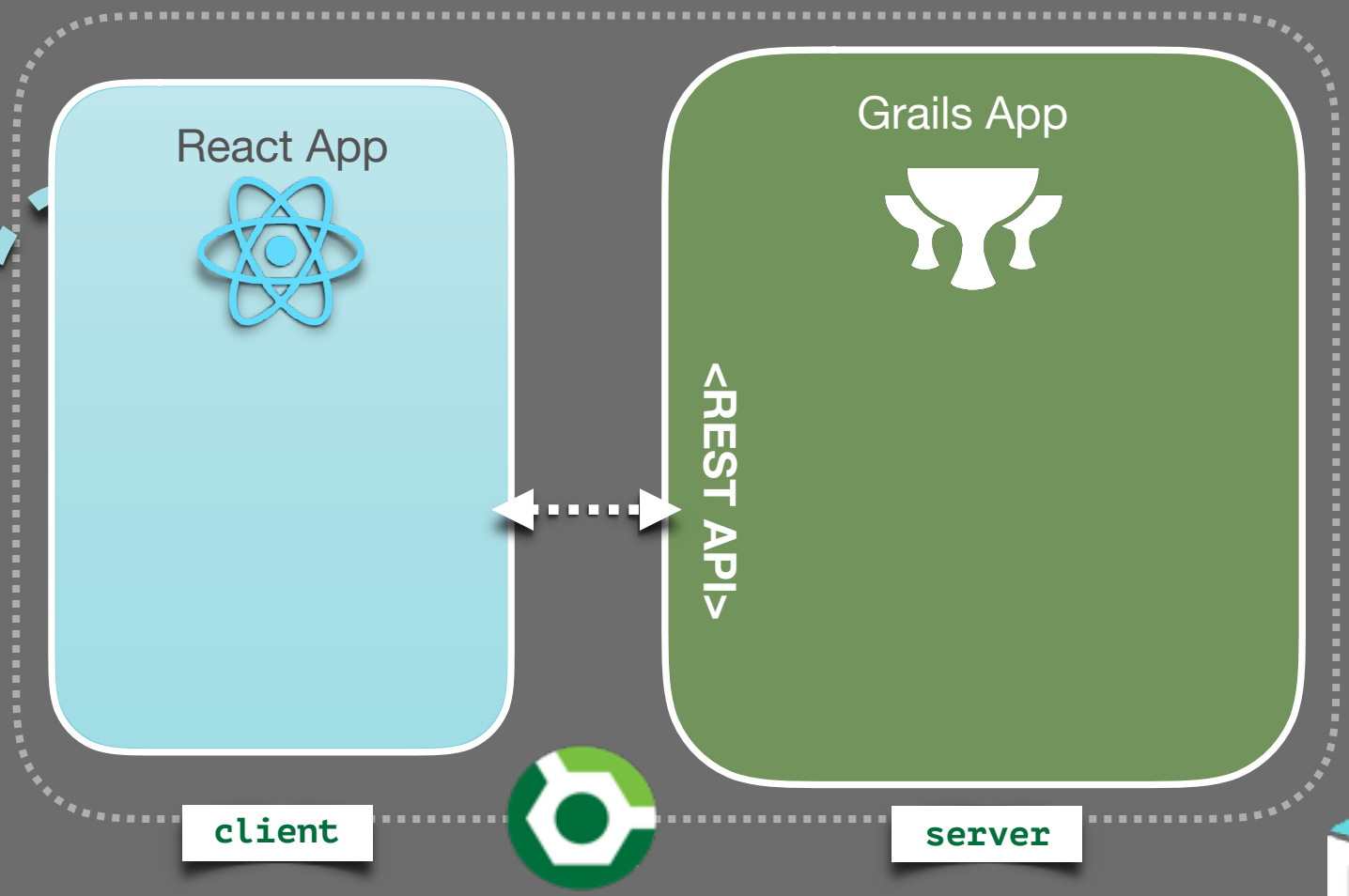
React 2.x Profile generates a multi-project Gradle build:

- React app (generated via **create-react-app**) as *client* project
- Grails 3 app (**rest-api** profile) as *server* project
- Gradle-node tasks defined within *client* project to run npm scripts (*start*, *build*, *test*, & *eject*)
- Grails index page built with *react-bootstrap*, with app data populated via REST call

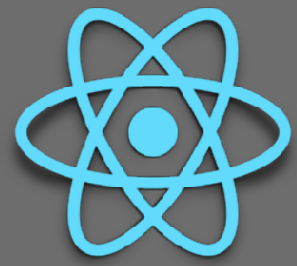
```
grails create-app myReactApp –profile react
```

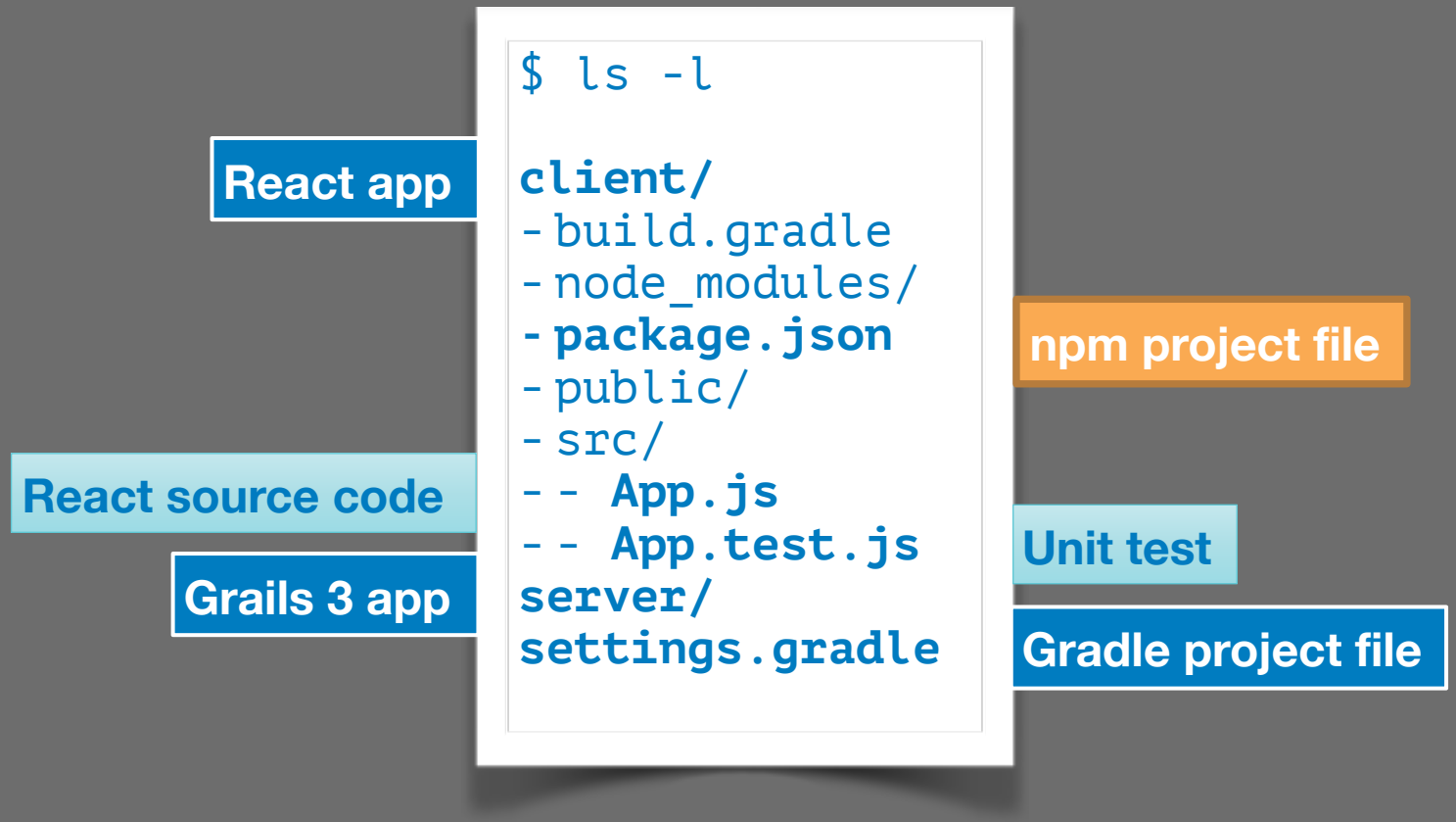
React Profile for Grails 3



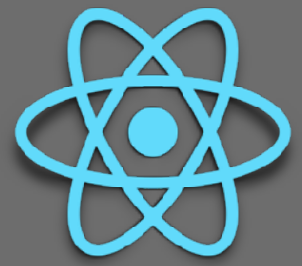


React Profile for Grails 3





React Profile for Grails 3

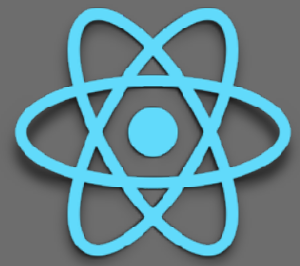


DEMO

Isomorphic React

- Isomorphic - same code on client & server (aka “universal”)
- React can be rendered server-side
- Can improve initial page load time
- Can improve SEO performance
- Java 8 introduced a new JavaScript engine, **Nashorn**

Isomorphic React



```
function myFunction(data) {
  render(“Here’s some data we got from the server: “ + data.arg);
}
```

ES6

```
NashornScriptEngine nashornScriptEngine =
                    new ScriptEngineManager().getEngineByName("nashorn")

nashornScriptEngine.eval(readResource(“myscript.js”))

nashornScriptEngine.invokeFunction('myFunction',
                    “${new JsonBuilder([arg:‘some arg’])}”)
```

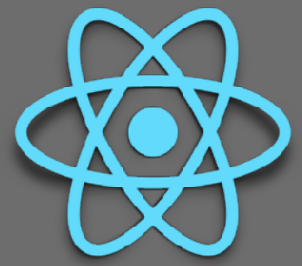
Isomorphic React

DEMO

Isomorphic React

- Tightly couples React source code with Grails app
- Adds additional complexity
- Requires polyfill to work with React
- Nashorn's CSS/LESS support is very poor
- Perhaps useful for React scaffolding?
- Performance?

Resources



React Ecosystem

- https://www.toptal.com/react/navigating-the-react-ecosystem

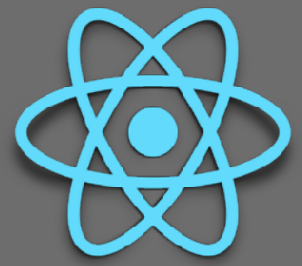
JSX

- http://jamesknelson.com/learned-stop-worrying-love-jsx/
- http://blog.andrewray.me/youre-missing-the-point-of-jsx/

React Architecture

- https://facebook.github.io/react/docs/thinking-in-react.html
- https://discuss.reactjs.org/t/best-practices-for-extending-subclassing-components/1820

Resources



Grails Plugins & Profiles

- https://grails.org/plugin/babel-asset-pipeline
- https://github.com/bertramdev/asset-pipeline/tree/master/jsx-asset-pipeline
- https://github.com/ZacharyKlein/grails-isomorphic
- https://github.com/grails-profiles/webpack
- https://github.com/grails-profiles/react

Using React & Grails

- http://grailsblog.objectcomputing.com/posts/2016/05/28/using-react-with-grails.html
- http://grailsblog.objectcomputing.com/posts/2016/11/14/introducing-the-react-profile-for-grails.html
- http://guides.grails.org/using-the-react-profile/guide/index.html

Thank you!

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mailto: kleinz@ociweb.com

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