# Tooling for building React applications

## What are we going to cover

Create-React-App

Babel

NPM

Webpack

TypeScript

ESLint

## Create-React-App

Create React apps with **no build configuration**

The **react-scripts** package does most of the work

- Uses Babel, Webpack and ESLint under the hood.

## Getting started

```
// Install create-react-app
npm install -g create-react-app

// To create a new application
create-react-app my-new-app
cd my-new-app
npm start
Open browser at http://localhost:3000
```

## NPM

## NPM

The **Node Package Manager**

- Originally intended for Node.js development
- The default package manager for most JavaScript these days

**React is distributed** using NPM

- As is Babel and all other packages in this module

NPM is normally installed with **Node.js**

- But developed and versioned separately

The ***NPM*** command is used for all actions

- Some editors have tooling that hide the NPM command

## NPM Basics

Each module or application has a **package.json**

- Create a new one using ***NPM INIT***

Each module can list other modules it **depends on**

- NPM INSTALL <package>
- These modules are installed from the NPM repository

There is a difference between **runtime** and **development dependencies**

- development dependencies are only needed during development
  - Packages like Webpack, Babel, ESLint etc
- Use –SAVE-DEV

Use **NPM INSTALL** to install all packages listed in the package.json

## NPM Commands

The **package.json** file defines what a number of NPM commands do

- Useful to help developers new to a module

***NPM TEST*** is the standard command to run the modules unit tests

- CI servers like Travis will download the code, run ***npm install*** and ***npm test*** to test your code

***NPM START*** is the standard command to start the application

- Can start any executable

## NPM and React

NPM is the normal way to include **React**

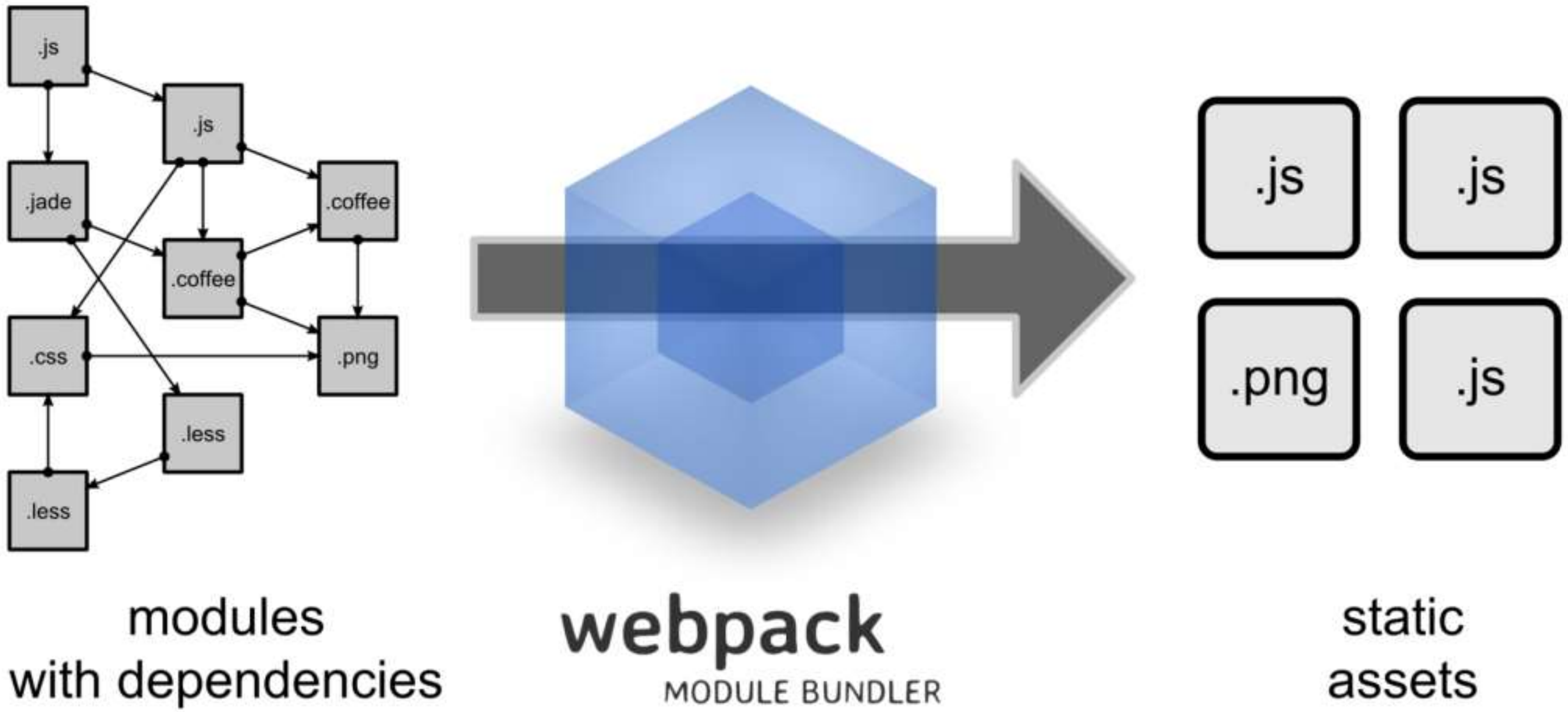
- Then use tools like Babel and Webpack to bundle everything together

You can skip NPM if you really want to

- Download the React starter kit and reference the prebuilt copies of React and React DOM
- Not the recommended approach!

***npm install react react-dom***

## Webpack


.js
.js
.jade
.coffee
.coffee
.css
.png
.less
.less
modules
with dependencies
webpack
MODULE BUNDLER
.js
.js
.png
.js
static
assets

## Webpack

Webpack is an extremely flexible **module bundler**

- Great for building applications

Some of the **advantages** of Webpack

- Fast incremental builds
- Hot reloading of changes
- Use different module styles as needed

Can **bundle different artifacts** together

- JavaScript
- CSS
- Images

Webpack is very popular in the React community

## Webpack

**Loaders** let you preprocess files

- Babel-loader will transpile code using Babel
- TS-loader will compile code using TypeScript
- LESS-loader or SASS-loader and CSS-loader preprocess and bundle CSS

**Plugins** can be used to control Webpack

- Bundle output into multiple bundles
- Hot module replacement
- Run Uglify over the code
- Add a banner to each module included
- etc

## Webpack configuration

```
module.exports = {
  mode: 'development',
  entry: './src/start.js',
  output: {
    filename: './bundle.js'
  },
  module: {
    rules: [{
        test: /\.jsx?$/,
        exclude: /node_modules/,
        loader: 'babel-loader'
    }]
  }
};
```

# Webpack Analyse Tool

A useful tool to check the Webpack results

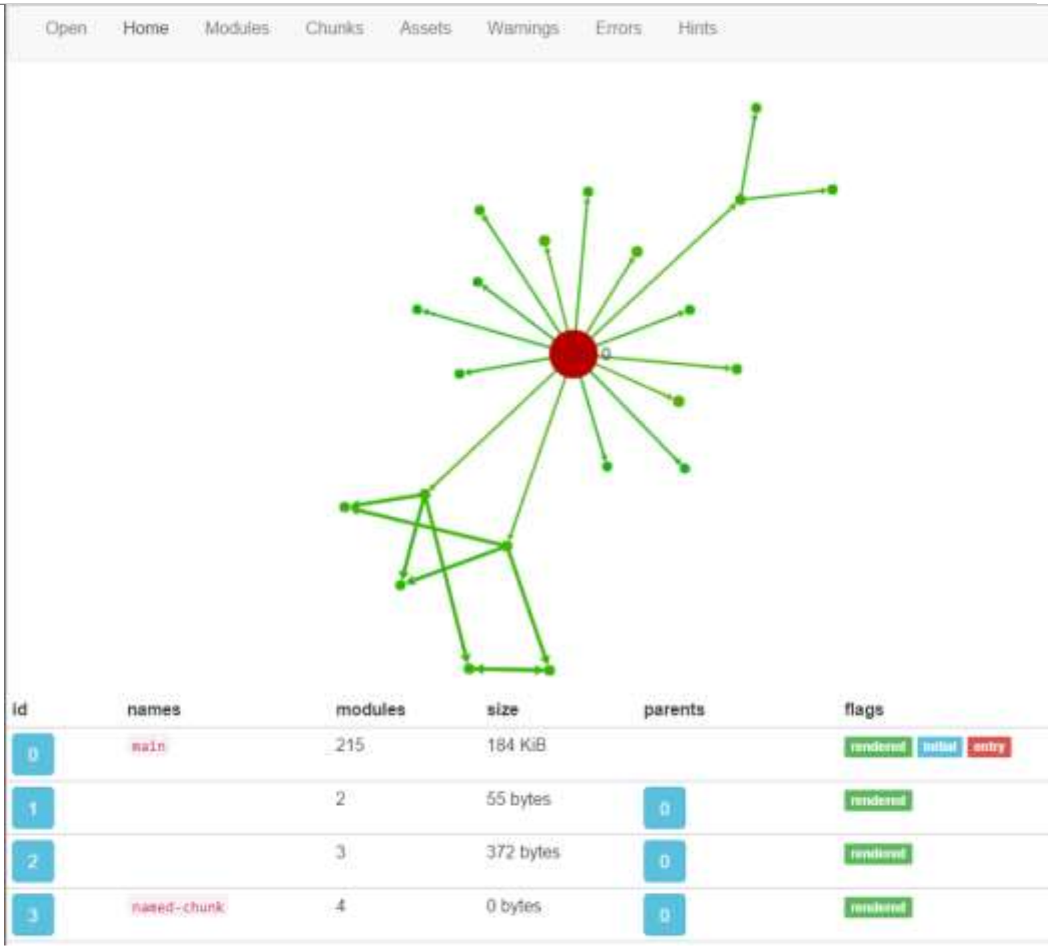
- https://webpack.github.io/analyse
- Run Webpack with --profile --json as input

Shows everything Webpack bundled

- Chunks are about grouping modules
- Modules being included

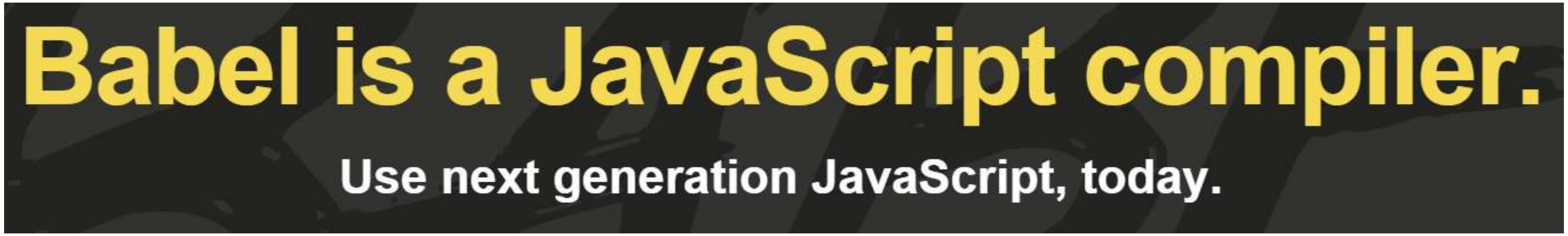
Diagnostics information

- Warnings and errors to fix
- Hint that can make Webpack better



| id | names | modules | size | parents | flags |
|---|---|---|---|---|---|
| 0 | main | 215 | 184 KiB | | rendered initial entry |
| 1 | | 2 | 55 bytes | 0 | rendered |
| 2 | | 3 | 372 bytes | 0 | rendered |
| 3 | named-chunk | 4 | 0 bytes | 0 | rendered |

## Babel



Babel is a JavaScript compiler.

Use next generation JavaScript, today.

## Babel

Babel is an **ECMAScript compiler**

It takes flavors of JavaScript and transpiles it down to **standard ECMAScript 5**

- Supported by all modern browsers

The React team depends on Babel to **transpile JSX** code to JavaScript

- Sebastian McKenzie the author is now employed by Facebook

Babel has many **presets** for common uses cases

- New in Babel 6

Transpiling React code requires the **react preset**

- The @babel/env presets is frequently added

## Cofiguring Babel

Use a .babelrc file to configure babel

```
{
  "presets": [
    [
      "@babel/env",
      {
        "targets": {
          "ie": 9
        }
      }
    ],
    "@babel/preset-react"
  ]
}
```

## Babel converts JSX to JavaScript

Input

```
import React, { Component} from 'react';

export class Greeter extends Component {
  render() {
    return (
      <div>Hello {this.props.name}</div>
    );
  }
}
```

# Babel converts JSX to JavaScript

Output

```
var Greeter = exports.Greeter = function (_Component) {
  _inherits(Greeter, _Component);
  function Greeter() {
    _classCallCheck(this, Greeter);
    return _possibleConstructorReturn(this,
        (Greeter.__proto__ || Object.getPrototypeOf(Greeter)).apply(this, arguments));
  }
  _createClass(Greeter, [{
    key: 'render',
    value: function render() {
      return _react2.default.createElement(
        'div’, null, 'Hello ‘, this.props.name);
    }
  }]);

  return Greeter;
}(_react.Component);
```

## TypeScript

## TypeScript

React is often written using JSX and JavaScript
- Frequently combined with ECMAScript 2015 features

JSX and JavaScript are **not compiled**
- This can lead to errors you don’t notice until later

The code is not checked until you run it
- Either in the browser or using unit tests

TypeScript will let you check your code with a **compiler**
- Prevents mistakes due to typing errors or incorrect type

## TypeScript

Requires **TypeScript 1.6** or later

- Use TSX as the file extension

Get type **definition files** from DefinitelyTyped

- Start with react.d.ts and react-dom.d.ts

No additional libraries needed at runtime

- It is still all just standard JavaScript

# TypeScript example

```
interface GreeterProps {
  name: string;
}
interface GreeterState {
  clickCount: number;
}
class Greeter extends Component<GreeterProps, GreeterState> {
  constructor(props: GreeterProps) {
    super(props);
    this.state = { clickCount: 0 };
  }
  private clicked() {
    this.setState({clickCount: this.state.clickCount + 1});
  }
  render() {
    return (<div>
        <h1>Hello {this.props.name}</h1>
        <button onClick={this.clicked}>Click me</button>
      </div>);
  }
}
```

## ESLint

ESLint

The pluggable linting utility for JavaScript and JSX

# ESLint

It is easy to make mistakes in JavaScript

- Most errors don't show up until you execute the code
  - And some are even then really subtle
- There is no compiler to catch common error

**Static analysis** of the code can find quite a few issues

- But not all of them

**ESLint** is a popular way of checking JavaScript code

- More configurable than JSLint or JSHint

There are many popular rule **configurations** available

- The AirBNB configuration is a popular starting point

# Configuring ESLint

Create a **.eslintrc** file to configure ESLint

- ESLint can also be configured using command line parameters
- Or with a parameter object when using Gulp

## Configuring ESLint

```
{
  "extends": "airbnb",
  "env": {
    "browser": true,
    "es6": true
  },
  "parserOptions": {
    "ecmaVersion": 6
  },
  "rules": {
    "no-console": "off",
    "strict": ["error", "global"],
    "curly": "warn"
  }
}
```

# ESLint

ESLint can be used with Gulp

- Use **gulp-eslint**

ESLint can also be use from Webpack

- Use eslint-loader as a module preLoaders

ESLint can be run as an NPM command

- Or using a global NPM install
- Useful for running ESLint with --fix

ESLint can also be extended with custom **rules**

- Add specific rules for React using eslint-plugin-react
- Contains many useful rules that can be configured

Consider using TSLint to check your TypeScript

- Even with a compiler using a linter is still useful

## Custom rule configuration

```
{
  parser: "babel-eslint",
  extends: "airbnb",
  plugins: ["react"],
  rules: {
    // warn if indentation is not 4 spaces
    indent: [1, 4],
    // error if missing props validation
    "react/prop-types": 2
  }
}
```

## Conclusion

Babel is the standard way to transpile React JSX into JavaScript

- TypeScript is a great alternative if you like type safety and compile time checking

NPM is used to install a JavaScript modules needed during development

- React and ReactDOM are distributed using NPM

Webpack is the most common way to bundle your code with all NPM modules

ESLint is a great way of statically checking JavaScript and JSX for common mistakes.

- TSLint is a great alternative if you are using TypeScript instead of JavaScript