Front-end build tools "All you need to know" workshop

Webpack, Gulp, Babel, TypeScript, Sass,
Hot Module Replacement

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Why to use build tools

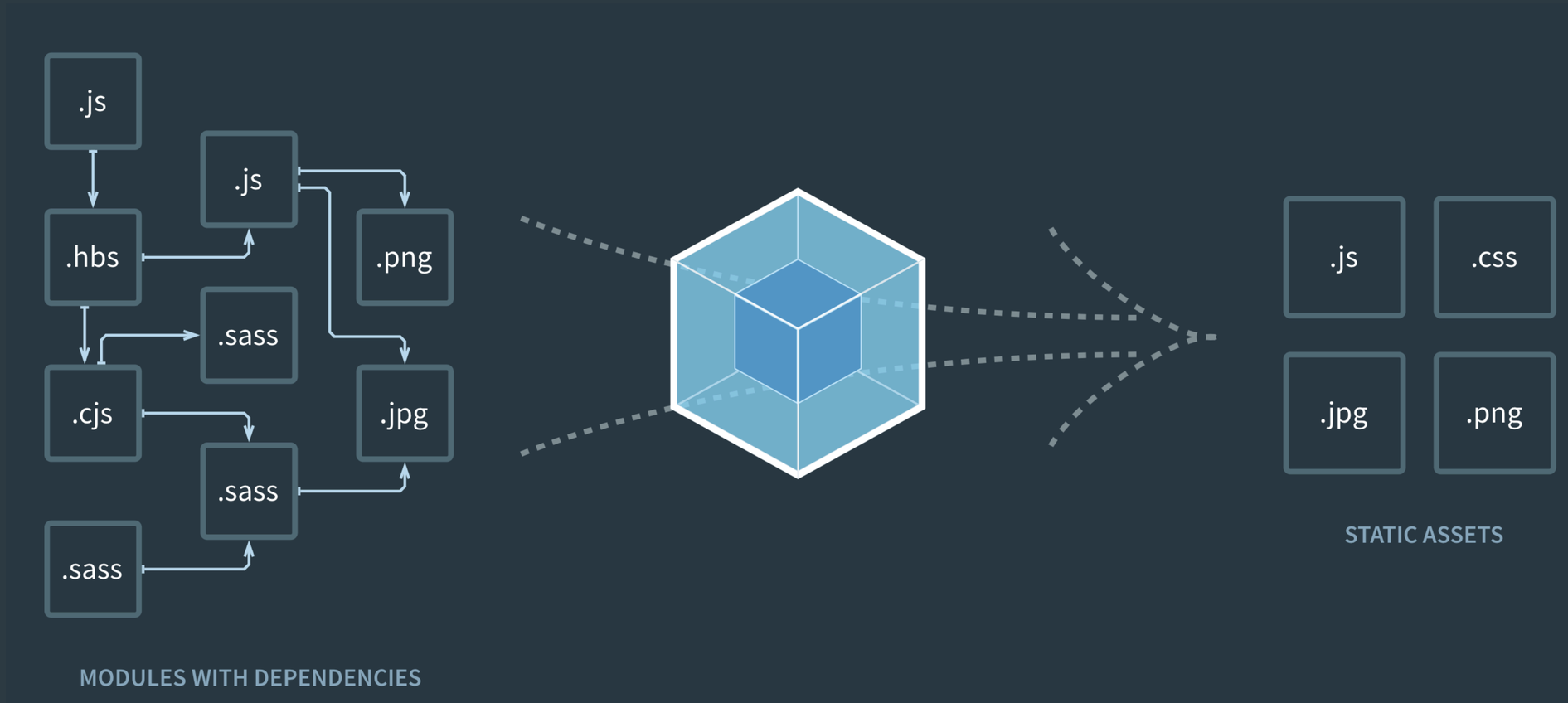
If you're building a complex Front End application with many non-code static assets such as CSS, images, fonts, etc, then yes, Webpack will give you great benefits.

If your application is fairly small, and you don't have many static assets and you only need to build one Javascript file to serve to the client, then Webpack might be more overhead than you need.

- To use ES6 modules
- To use latest Javascript features
- To use TypeScript
- To use Sass
- To use polyfills for specific target browsers
- To simplify, unify and automate build processes

- To take advantage of production build optimizations
- To speed up local development without the need to refresh the page and lose state
- Dead asset elimination
    - You only build the images and CSS into your dist folder that your application actually needs
- Stable production deploys
    - You can't accidentally deploy code with images missing, or outdated styles

Webpack



Static module builder

Webpack is a build tool that puts all of your assets, including Javascript, images, fonts, and CSS, in a dependency graph.

When webpack processes your application, it starts from a list of modules defined on the command line or in its config file.

Starting from these entry points, webpack recursively builds a dependency graph that includes every module your application needs, then bundles all of those modules into a small number of bundles - often, just one - to be loaded by the browser.

Features

- Ability to bundle all sort of different files
- Fairly easy to set up
- Production-ready with a lot of optimizations already built-in
- Hot Module Replacement for fast development
- Lots of advanced customization features
- Mature, widely used and constantly developed

Comparsion

Feature	webpack/webpack	jrburke/requirejs	substack/node-browserify	jspm/jspm-cli	rollup/rollup	brunch/brunch
Additional chunks are loaded on demand	**yes**	**yes**	no	System.import	no	no
AMD `define`	**yes**	**yes**	deamdify	yes	rollup-plugin-amd	yes
AMD `require`	**yes**	**yes**	no	yes	no	yes
AMD `require` loads on demand	**yes**	with manual configuration	no	yes	no	no
CommonJS `exports`	**yes**	only wrapping in `define`	**yes**	yes	commonjs-plugin	yes
CommonJS `require`	**yes**	only wrapping in `define`	**yes**	yes	commonjs-plugin	yes
CommonJS `require.resolve`	**yes**	no	no	no	no	
Concat in require `require("./fi" + "le")`	**yes**	no♦	no	no	no	
Debugging support	**SourceUrl, SourceMaps**	not required	SourceMaps	**SourceUrl, SourceMaps**	**SourceUrl, SourceMaps**	SourceMaps

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Debugging support	**SourceUrl, SourceMaps**	not required	SourceMaps	**SourceUrl, SourceMaps**	**SourceUrl, SourceMaps**	SourceMaps
Dependencies	19MB / 127 packages	11MB / 118 packages	**1.2MB / 1 package**	26MB / 131 packages	?MB / 3 packages	
ES2015 `import` / `export`	**yes** (webpack 2)	no	no	**yes**	**yes**	yes, via es6 module transpiler
Expressions in require (guided) `require("./templates/" + template)`	**yes (all files matching included)**	no♦	no	no	no	no
Expressions in require (free) `require(moduleName)`	with manual configuration	no♦	no	no	no	
Generate a single bundle	**yes**	yes♦	yes	yes	yes	yes
Runtime overhead	**243B + 20B per module + 4B per dependency**	14.7kB + 0B per module + (3B + X) per dependency	415B + 25B per module + (6B + 2X) per dependency	5.5kB for self-executing bundles, 38kB for full loader and polyfill, 0 plain modules, 293B CJS, 139B ES2015 System.register before gzip	**none for ES2015 modules** (other formats may have)	
Watch mode	yes	not required	watchify	not needed in dev	rollup-watch	yes

Babel

Javascript compiler / transpiler

Features

- Developers can use latest JavaScript features
- Polyfills features that are missing in target environments
- Transforms syntax
- Supports plugins for specific environments e.g React JSX
- Highly customizable target browsers

DEVELOPMENT

Setting up Webpack build and Babel configuration

TypeScript

JavaScript with types

Features

- Adds support for type annotations
- Adds object oriented features to JavaScript
- Compile-time checking
- Interfaces, enums, generics, tuples etc…
- Decreases potential of bugs
- Increases confidence in code refactor

TypeScript vs Flow.js

Flow vs. TypeScript

Flow

- **Checker**
- Non-nullable by default
- Focused on **Soundness**
- Written in OCAML
- **Works without any annotations**
- Works out of the box with React

TypeScript

- **Compiler**
- Nullable by default
- Focused on **Tooling & Scalability**
- Written in TypeScript
- Great IDE/Editor integration
- Used as default by more and more libraries

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Setting up TypeScript compilation

Sass

CSS with superpowers

Features

- Enables writing CSS as modules in separate files
- Paired with BEM methodology increases clarity greatly
- Adds scripting support to CSS
- Variables, nesting, mixins, partials, SassScript etc…

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Setting up Sass compilation

Webpack Dev Server (WDS)
+ Hot Module Replacement (HMR)

Hot Module Replacement exchanges, adds, or removes modules while an application is running, without a full reload.

How HMR works

The following steps allow modules to be swapped in and out of an application:

1. The application asks the HMR runtime to check for updates.
2. The runtime asynchronously downloads the updates and notifies the application.
3. The application then asks the runtime to apply the updates.
4. The runtime synchronously applies the updates.

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Setting up WDS and HMR

Gulp.js

Task runner

Gulp task

gulp.task(name[, deps], fn)

```
gulp.task('js', function() {
    gulp.src('app/js/main.js')
      .pipe(uglify())
      .pipe(concat())
      .pipe(gulp.dest('build'))
});
```

Features

- More efficient than npm scripts for IO operations
- Possible to define custom tasks that cannot be performed otherwise

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Setting up Gulp

Linting

ESLint

TSLint

SassLint

A linter refers to tools that analyze source code to flag programming errors, bugs, stylistic errors, and suspicious constructs.

Features

- Agreed upon code syntax and methodologies per team/service
- Reduction in potential bugs
- Tons of rules that can be configured easily
- More readable code

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Setting up Linting

Useful resources

https://blog.andrewray.me/webpack-when-to-use-and-why/
https://github.com/webpack-contrib/sass-loader
https://webpack.js.org/configuration/
https://webpack.js.org/concepts/modules/
https://webpack.js.org/configuration/devtool/
https://webpack.js.org/configuration/module/
https://babeljs.io/
https://github.com/TypeStrong/ts-loader
http://chir.ag/projects/name-that-color/
https://github.com/webpack-contrib/css-loader
https://github.com/webpack-contrib/css-loader
https://webpack.js.org/concepts/hot-module-replacement/
https://github.com/webpack-contrib/file-loader
https://github.com/jantimon/html-webpack-plugin
https://github.com/johnagan/clean-webpack-plugin
https://www.npmjs.com/package/url-loader
https://learn.co/lessons/javascript-lodash-templates
https://eslint.org/

Useful resources

https://eslint.org/docs/user-guide/configuring
https://www.npmjs.com/package/eslint-plugin-react
https://www.npmjs.com/package/eslint-plugin-import
https://github.com/babel/eslint-plugin-babel
https://palantir.github.io/tslint/
https://www.npmjs.com/package/sass-lint
https://webpack.js.org/comparison/
https://engineering.velocityapp.com/webpack-vs-browsersify-vs-systemjs-for-spas-95b349a41fa0
https://en.wikipedia.org/wiki/TypeScript
https://en.wikipedia.org/wiki/Webpack
https://en.wikipedia.org/wiki/Babel_(compiler)
https://github.com/niieani/typescript-vs-flowtype
https://sass-lang.com/
https://en.wikipedia.org/wiki/Sass_(stylesheet_language)
http://getbem.com/
https://en.wikipedia.org/wiki/Gulp.js
https://en.wikipedia.org/wiki/Lint_(software)

Thank you!

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2018