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How to Create and Publish a React Component Library

#webdev #react #javascript #tutorial

All code from this tutorial as a complete package is available in [this repository](#).

If you are interested in a video version of this tutorial, check out the link below! You can follow along with the code in this blog.

(The video is entirely optional, every step and instruction is covered in the blog post)

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Introduction

This tutorial will take you through the process of creating and publishing your own custom React component library and hosting it on Github.

At the end of this tutorial you will have the ability to the following in all of your future React projects:

```
npm install @my-github-account/my-cool-component-library
```

```
import MyCustomComponent from '@my-github-account/my-cool-component-library';

const MyApp = () => {
  return (
    <div>
      <MyCustomComponent />
    </div>
  )
}
```

Prerequisites and Setup

This project assumes you are familiar with and have installed:

- Code editor / IDE (this tutorial uses VS Code but any IDE will work)
- NPM (NPM is installed when you install Node.js on your machine)
- Installing packages (presume you know how to add packages to a Javascript project with `npm install`)
- Bash terminal (or another terminal you are comfortable with for running commands)
- Git (we will be creating a git repository on our machine and publishing it to Github, though all instructions will be provided on how to follow along)
- React (how to create simple components using JSX)
- Typescript (how to create an object interface with simple properties)

First we will initialize our project.

```
npm init
```

You can take the defaults for all the values, we'll edit them later in the tutorial.

Next we will add the tools necessary to create our components.

```
npm install react typescript @types/react --save-dev
```

Creating Components

Now we can create our first component. Because we are creating a library, we are going to create *index* files for each tier, and export our components from each one to make it as easy as possible for the people using our library to import them.

Within the root of your project, create the following file structure:

```
.
├── src
│   ├── components
│   │   ├── Button
│   │   │   ├── Button.tsx
│   │   │   └── index.ts
│   │   └── index.ts
│   └── index.ts
├── package.json
└── package-lock.json
```

Make sure to double check your structure. You should have three `index.ts` files, and a `Button.tsx` file inside of a `Button` directory. If you have a preferred way of structuring

React components within a project you are of course welcome to do it however you like, but this is the structure we will follow for this tutorial.

Begin by creating `Button.tsx`:

```
src/components/Button/Button.tsx
```

```
import React from "react";

export interface ButtonProps {
  label: string;
}

const Button = (props: ButtonProps) => {
  return <button>{props.label}</button>;
};

export default Button;
```

To keep things simple we will just export a button that takes a single prop called `label`. We can add more complexity and styles to our components once we have confirmed that our basic template is setup correctly.

After our button, we update the index file inside our Button directory:

```
src/components/Button/index.ts
```

```
export { default } from "./Button";
```

Then we export that button from the components directory:

```
src/components/index.ts
```

```
export { default as Button } from "./Button";
```

And finally, we will export all of our components from the base `src` directory:

```
src/index.ts
```

```
export * from './components';
```

Adding Typescript

Up until now, we haven't yet initialized Typescript in our project. Although you technically don't need a configuration file to use Typescript, for the complexity of building a library we are definitely going to need one.

You can initialize a default configuration by running the following command:

```
npx tsc --init
```

That will create a `tsconfig.json` file for us in the root of our project that contains all the default configuration options for Typescript.

If you would like to learn more about the many options in a `tsconfig.json` file, modern versions of TS will automatically create descriptive comments for each value. In addition you can find full documentation on the configuration [here](#).

You may notice depending on your IDE that immediately after initializing you begin to get errors in your project. There are two reasons for that: the first is that Typescript isn't configured to understand React by default, and the second is that we haven't defined our method for handling modules yet: so it may not understand how to manage all of our exports.

To fix this we are going to add the following values to `tsconfig.json`:

```
{
  "compilerOptions": {
    // Default
    "target": "es5",
    "esModuleInterop": true,
    "forceConsistentCasingInFileNames": true,
    "strict": true,
    "skipLibCheck": true,

    // Added
    "jsx": "react",
    "module": "ESNext",
    "declaration": true,
    "declarationDir": "types",
    "sourceMap": true,
    "outDir": "dist",
    "moduleResolution": "node",
    "allowSyntheticDefaultImports": true,
    "emitDeclarationOnly": true,
  }
}
```

I have separated these values into a couple different sections based on the default `tsconfig.json` created using the most recent version of Typescript as of this writing (4.4). The values commented *default* should already be set for you by default (you will want to double check and make sure however).

The values marked *added* are new values that we need for our project. We'll briefly outline why we need them:

- `"jsx": "react"` -- Transform JSX into React code
- `"module": "ESNext"` -- Generate modern JS modules for our library
- `"declaration": true` -- Output a `.d.ts` file for our library types
- `"declarationDir": "types"` -- Where to place the `.d.ts` files
- `"sourceMap": true` -- Mapping JS code back to its TS file origins for debugging
- `"outDir": "dist"` -- Directory where the project will be generated
- `"moduleResolution": "node"` -- Follow node.js rules for finding modules
- `"allowSyntheticDefaultImports": true` -- Assumes default exports if none are created manually
- `"emitDeclarationOnly": true` -- Don't generate JS (rollup will do that) only export type declarations

Once you add those values to your TS configuration file you should see the errors in `Button.tsx` and other files immediately disappear.

Adding Rollup

Next we will add [rollup](#) to our project. If you've never used rollup before, it's very similar to [webpack](#) in that it is a tool for bundling individual Javascript modules into a single source that a browser is better able to understand.

Though both tools can accomplish the same goal depending on configuration, typically webpack is used for bundling applications while rollup is particularly suited for bundling libraries (like ours). That's why we've chosen rollup.

Also similar to webpack, rollup uses a *plugin ecosystem*. By design rollup does not know how to do everything, it relies on plugins installed individually to add the functionality that you need.

We are going to rely on four plugins for the initial configuration of our library (more will be added later):

- [@rollup/plugin-node-resolve](#) - Uses the [node resolution algorithm](#) for modules

- [@rollup/plugin-typescript](#) - Teaches rollup how to process Typescript files
- [@rollup/plugin-commonjs](#) - Converts commonjs modules to ES6 modules
- [rollup-plugin-dts](#) - rollup your `.d.ts` files

So with that said, let's go ahead and install rollup and our plugins:

```
npm install rollup @rollup/plugin-node-resolve @rollup/plugin-typescript @rollu
```

To configure how rollup is going to bundle our library we need to create a configuration file in the root of our project:

rollup.config.js

```
import resolve from "@rollup/plugin-node-resolve";
import commonjs from "@rollup/plugin-commonjs";
import typescript from "@rollup/plugin-typescript";
import dts from "rollup-plugin-dts";

const packageJson = require("../package.json");

export default [
  {
    input: "src/index.ts",
    output: [
      {
        file: packageJson.main,
        format: "cjs",
        sourcemap: true,
      },
      {
        file: packageJson.module,
        format: "esm",
        sourcemap: true,
      },
    ],
    plugins: [
      resolve(),
      commonjs(),
      typescript({ tsconfig: "../tsconfig.json" }),
    ],
  },
  {
    input: "dist/esm/types/index.d.ts",
    output: [{ file: "dist/index.d.ts", format: "esm" }],
    plugins: [dts()],
  },
];
```

```
    },  
  ];
```

In this file we import our four plugins that we installed. We also import our `package.json` file as a commonJS module into a variable called `packageJson`. We use this variable to refer to the *main* and *module* values that we will define in the next section.

The entrypoint for our library (input) is the `index.ts` file in the `src` directory which exports all of our components. We will be distributing both ES6 and commonJS modules so the consumers of our library can choose which type works best for them. We also invoke three of our four plugins on the first of two configuration objects on the exported array. This first configuration defines how the actual Javascript code of our library is generated.

The second configuration object defines how our libraries types are distributed and uses the `dts` plugin to do so.

The final step before we can run our first rollup is to define the values of "main" and "module" in our `package.json` file:

`package.json`

```
{  
  "name": "template-react-component-library",  
  "version": "0.0.1",  
  "description": "A simple template for a custom React component library",  
  "scripts": {  
    "rollup": "rollup -c"  
  },  
  "author": "Alex Eagleson",  
  "license": "ISC",  
  "devDependencies": {  
    "@rollup/plugin-commonjs": "^21.0.1",  
    "@rollup/plugin-node-resolve": "^13.0.6",  
    "@rollup/plugin-typescript": "^8.3.0",  
    "@types/react": "^17.0.34",  
    "react": "^17.0.2",  
    "rollup": "^2.60.0",  
    "rollup-plugin-dts": "^4.0.1",  
    "typescript": "^4.4.4"  
  },  
  "main": "dist/cjs/index.js",  
  "module": "dist/esm/index.js",
```



```

    "files": [
      "dist"
    ],
    "types": "dist/index.d.ts"
  }

```

Here is the sample of the `package.json` file we are using for this tutorial. Obviously your author name can be different, and the specific version of each of your libraries might be different as well.

The most important changes are as follows:

- "main" -- We have defined the output path for commonjs modules
- "module" -- We have defined the output path for es6 modules
- "files" -- We have defined the output directory for our entire library
- "types" -- We have defined the location for our library's types
- "scripts" -- We have defined a new script called **rollup**. This will run the rollup package with the `-c` flag which means "use the rollup configuration file". If you're not familiar with *script* in a `package.json` file, these are simply shorthand commands you can run by name with `npm run {SCRIPTNAME}`. So to run this one will be `npm run rollup`.

Building your library

With these configurations in place you are now ready to run rollup for the first time and make sure your basic configuration is correct. Your project structure should look like this before you run:

```

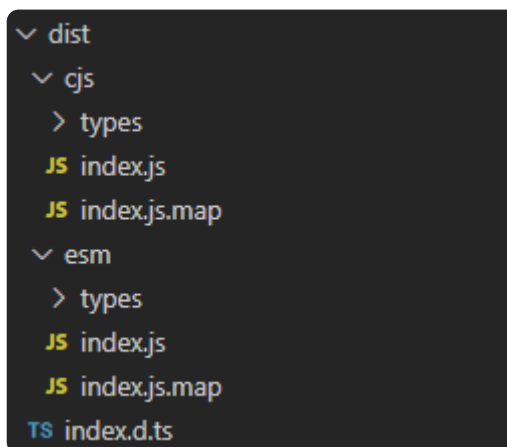
.
├── src
│   ├── components
│   │   ├── Button
│   │   │   ├── Button.tsx
│   │   │   └── index.ts
│   │   └── index.ts
│   └── index.ts
├── package.json
├── package-lock.json
├── tsconfig.json
└── rollup.config.js

```

The contents of each file should be as described above. Once you have confirmed this, run the following command:

```
npm run rollup
```

If everything has been configured correctly rollup will run without error and you will see a `dist` directory created in the root of your project with a structure that looks like:



(If you received an error make sure to read it closely to try and identify the issue. Double check that each of your files follows exactly the structure of the examples. Depending on the amount of time passed since the publishing of this tutorial, new major versions of libraries could potentially be published with breaking changes. All versions of libraries numbers are visible above in the `package.json` example in the event you need to specify a specific version)

Publishing your library

Now that we've created our component library, we need a way to allow ourselves (or others) to download and install it. We will be publishing our library via NPM through hosting on Github. First before anything else we need to create a repository for our library.

Create a new repository on Github. I have titled mine `template-react-component-library`. Then follow the steps to initialize your project as a git project, and push to your new repository.

Log into Github and create a new repository called whatever you like. For this example I've titled it `template-react-component-library` and it will be available for everyone to clone and use publicly. You can choose to make your library private if you like, methods described in this tutorial will work for private packages as well (in case you are making a library for your company for example).

Once the repository is created we need to initialize git within our project locally. Run the following command:

```
git init
```

Next create a `.gitignore` file in the root of the directory (make particular note of the leading period, that signifies this is a hidden file):

```
.gitignore
```

```
dist
node_modules
```

In our `.gitignore` file we are adding the `dist` and `node_modules` directories. The reason being that both of these are auto-generated directories that we create using commands, so there is no need to include them in our repository.

Now follow the instructions on Github shown in your new repository for committing your code.

This repository that you have created is the one you will clone & edit when you want to make changes and updates to your component library. This is not the package itself that your (as a user) would install and use. To configure within our project where our package needs to be published to, next we need to update `package.json` with that information:

```
package.json
```

```
{
  "name": "@YOUR_GITHUB_USERNAME/YOUR_REPOSITORY_NAME",
  "publishConfig": {
    "registry": "https://npm.pkg.github.com/YOUR_GITHUB_USERNAME"
  },
  ...
}
```

You will be updating the field "name" value and adding a new field called "publishConfig". Note the values above in caps are meant to be replaced with your own values. For example my "name" field value would be `@alexeagleson/template-react-component-library`. Notice the "publishConfig" also has your Github account name in it as well, but that value does not lead with the `@` symbol.

Now that we have configured our project, we need to configure our local install of *NPM* itself to be authorized to publish to your Github account. To do this we use a `.npmrc` file.

This file is **NOT PART OF OUR PROJECT**. This is a global file in a central location. For Mac/Linux users it goes in your home directory `~/.npmrc`.

For Windows users it goes in your home directory as well, though the syntax will be different. Something along the lines of `C:\Users\{YOUR_WINDOWS_USERNAME}`

For more information about this configuration file [read this](#).

Once you have created the file, edit it to include the following information:

```
~/.npmrc
```

```
registry=https://registry.npmjs.org/  
@YOUR_GITHUB_USERNAME:registry=https://npm.pkg.github.com/  
//npm.pkg.github.com/:_authToken=YOUR_AUTH_TOKEN
```

There are two values in caps to replace in the example above. The first is `YOUR_GITHUB_USERNAME`. Make sure to include the leading `@` symbol.

The second is `YOUR_AUTH_TOKEN` which we haven't created yet. Back to Github!

Go to your Github profile: Settings -> Developer Settings -> Personal access tokens. Or just click [this link](#)

Click **Generate new token**. Give it a name that suits the project you are building. Give it an expiry date (Github recommends you don't create tokens with an infinite lifespan for security reasons, but that's up to you).

The most important thing is to click the `write:packages` access value. This will give your token permission to read & write packages to your Github account, which is what we need.

New personal access token

Personal access tokens function like ordinary OAuth access tokens. They can be used instead of a password for Git over HTTPS, or can be used to [authenticate to the API over Basic Authentication](#).

Note

Template React Component Library

What's this token for?

Expiration *

7 days

The token will expire on Thu, Nov 18 2021

Select scopes

Scopes define the access for personal tokens. [Read more about OAuth scopes](#).

<input checked="" type="checkbox"/> repo	Full control of private repositories
<input checked="" type="checkbox"/> repo:status	Access commit status
<input checked="" type="checkbox"/> repo_deployment	Access deployment status
<input checked="" type="checkbox"/> public_repo	Access public repositories
<input checked="" type="checkbox"/> repo:invite	Access repository invitations
<input checked="" type="checkbox"/> security_events	Read and write security events
<input type="checkbox"/> workflow	Update GitHub Action workflows
<input checked="" type="checkbox"/> write:packages	Upload packages to GitHub Package Registry
<input checked="" type="checkbox"/> read:packages	Download packages from GitHub Package Registry
<input type="checkbox"/> delete:packages	Delete packages from GitHub Package Registry
<input type="checkbox"/> admin:org	Full control of orgs and teams, read and write org projects
<input type="checkbox"/> write:org	Read and write org and team membership, read and write org projects
<input type="checkbox"/> read:org	Read org and team membership, read org projects

Once you are done you can click to create the token. Github will **ONLY SHOW YOU THE TOKEN ONCE**. When you close/refresh the page it will be gone, so make sure to copy it to a secure location (perhaps a password manager if you use one).

The main location you need to place this token is in the `~/.npmrc` file that you created replacing the `YOUR_AUTH_TOKEN` value from the example above.

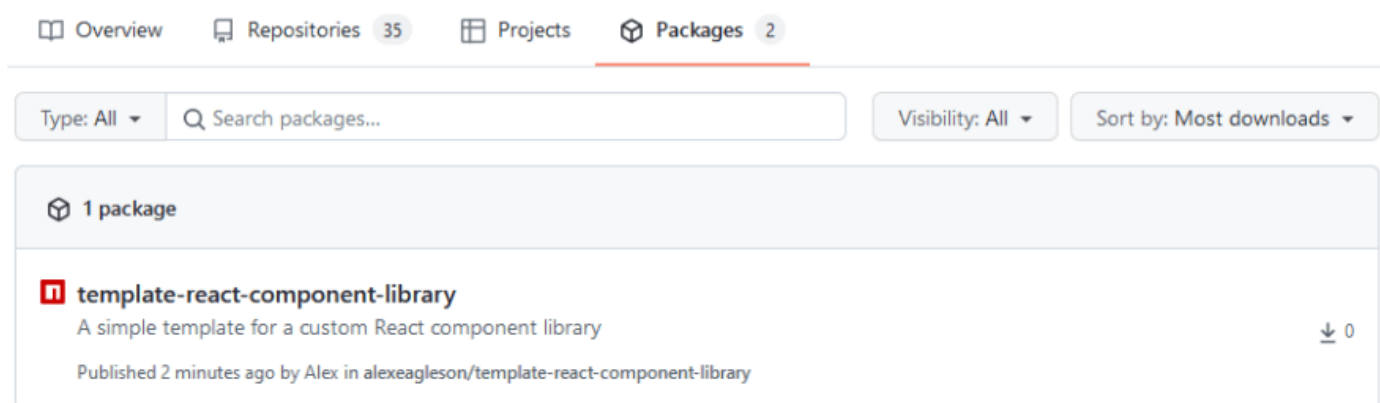
Before you continue, do one more sanity check to be sure you didn't create the `.npmrc` file in the root directory of your actual library project. This is technically an option, however the reason you need to be careful is that you could accidentally commit it to your Github repository with the rest of your library code and expose your token to the public. If your `.npmrc` file is in your home directory the risk of this is minimized.

At this point, once you `~/ .npmrc` file has both your Github username and access token added, go back to your project directory and run the following command:

```
npm publish
```

(If you get prompted for login credentials, the username is your Github username and your password is the access token you generated)

Congratulations! You have now published version 0.0.1 of your React component library! You can view it on your Github account by going to your main account dashboard and clicking "packages" along the top to the right of "repositories":



Using Your Library

Now that your library is live, you'll want to use it!

Note that the instructions for using your library are slightly different if you published to a *private* repository. Everyone (aside from your own machine) who tries to import it is going to get a *404 Not Found* error if they are not authorized.

Those users also need to add a `~/ .npmrc` file with the same information. To be more secure however you can provide those users with an access token that has only **read privileges**, not write.

(From this point onward we will presume you have completed that step, or are working with a public repository.)

Since we have created a component library using React and Typescript, we are presuming that the consumers of our library will be using those tools as well.

Technically all of our type files (`.d.ts`) are supplemental: meaning they are simply ignored if working with standard Javascript, so it's not necessary to use Typescript to use our library. The types are simply there if desired.

For our example we will use it however so that we can confirm that they are working properly. We will initialize a React app using one of the most popular and simple methods: [Create React App](#).

Run the following command in a **new directory**:

(Remember we are simulating other users downloading and installing our library, so this project should be completely separate from the library itself)

```
npx create-react-app my-app --template typescript
```

Open the new `my-app` directory that is created and run:

```
npm run start
```

Confirm that you are able to open and load the default application screen on `localhost:3000` (or whatever port it opens on).

Now comes the test for our library. From the root directory of your new `my-app` project, run the following command:

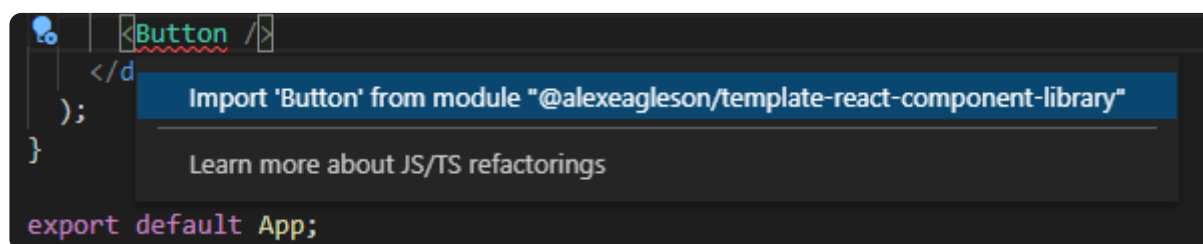
```
npm install @YOUR_GITHUB_USERNAME/YOUR_REPOSITORY_NAME
```

So for my project for example its: `npm install @alexeagleson/template-react-component-library`

Presuming your tokens and configuration are set up properly, everything will install correctly *(if there are any issues, revisit the example for the `~/.npmrc` config.)*

Now open the `my-app` project in your IDE of choice (VS Code for example) and navigate to the `src/App.tsx` file.

When you go to add a `<Button />` component, if your editor supports import auto complete (`ctrl/cmd + .` for VS Code) then you will see it automatically recognize thanks to Typescript that our library exports that button.



Lets add it! The simplest example to update `src/App.tsx` is:

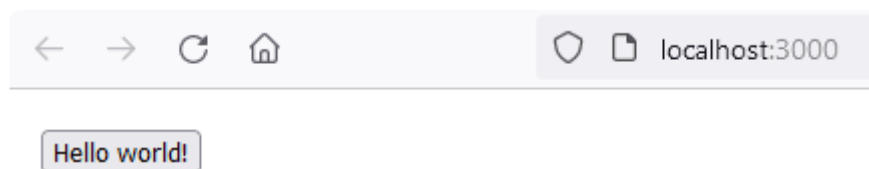
`src/App.tsx`

```
import React from "react";
import { Button } from "@alexeagleson/template-react-component-library";

function App() {
  return <Button label="Hello world!"/>;
}

export default App;
```

And when we run `npm run start` again, there tucked up in the corner is our *Hello world!* button.



And that's it! Congratulations! You now have all the tools you need to create and distribute a React component library using Typescript! At this point you end the tutorial and continue on your own if you wish.

If you choose to continue, we will look at how to expand our component library to include a number of extremely useful features such as:

- **CSS:** For exporting components *with style*
- **Storybook:** For testing our components within the library itself as we design them
- **React Testing Library & Jest:** For testing our components

Adding CSS

Before we do any additional configuration, we'll begin by creating a CSS file that will apply some styles to our Button. Inside of the `Button` directory where our component lives, we'll create a file called: `Button.css`:

`src/components/Button/Button.css`

```
button {
  font-size: 60px;
```



```
}
```

This will turn our regular *Hello world!* button into a REALLY BIG button.

Next we will indicate that these styles are meant to be applied on our button component. We'll be using special syntax that isn't native to Javascript, but thanks to rollup and the appropriate plugins, we are able to use it. Update our `Button.tsx` file with the following:

`src/components/Button/Button.tsx`

```
import React from "react";
import "../Button.css";

export interface ButtonProps {
  label: string;
}

const Button = (props: ButtonProps) => {
  return <button>{props.label}</button>;
};

export default Button;
```

Notice the `import '../Button.css'` that has been added.

Now we need to tell rollup how to process that syntax. To do that we use a plugin called `rollup-plugin-postcss`. Run the following command:

```
npm install rollup-plugin-postcss --save-dev
```

Next we need to update our rollup config:

`rollup.config.js`

```
import resolve from "@rollup/plugin-node-resolve";
import commonjs from "@rollup/plugin-commonjs";
import typescript from "@rollup/plugin-typescript";
import dts from "rollup-plugin-dts";

// NEW
import postcss from "rollup-plugin-postcss";

const packageJson = require("../package.json");
```

```

export default [
  {
    input: "src/index.ts",
    output: [
      {
        file: packageJson.main,
        format: "cjs",
        sourcemap: true,
      },
      {
        file: packageJson.module,
        format: "esm",
        sourcemap: true,
      },
    ],
    plugins: [
      resolve(),
      commonjs(),
      typescript({ tsconfig: "./tsconfig.json" }),

      // NEW
      postcss(),
    ],
  },
  {
    input: "dist/esm/types/index.d.ts",
    output: [{ file: "dist/index.d.ts", format: "esm" }],
    plugins: [dts()],

    // NEW
    external: [/\.css$/],
  },
];

```

Note the three new lines indicated with the `NEW` comments. In the `dts` config we need to specify that `.css` modules are external and should not be processed as part of our type definitions (otherwise we will get an error).

Finally we need to update the *version number* in our `package.json` file. Remember we are publishing a package so when we make changes, we need to ensure we don't impact users of previous versions of our library. Every time we publish we should increment the version number:

`package.json`

```
{  
  "version": "0.0.2",  
  ...  
}
```

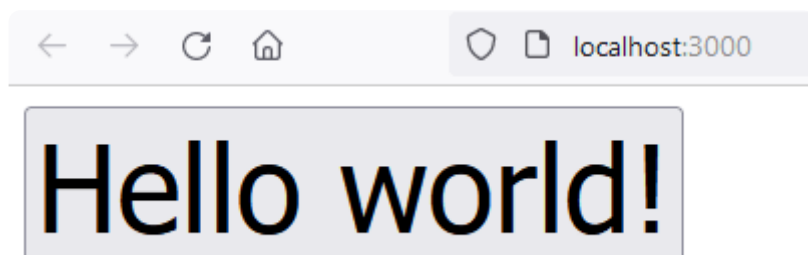
Now run these commands:

```
npm run rollup  
npm publish
```

On the library consuming side (my-app React app from our tutorial) we also need to update to get the latest version of the package. The easiest way is to increment the version number in the `package.json` file of my-app. It should show `^0.0.1`. Increment that to `^0.0.2` and then you can update with the `npm install` command:

```
npm install  
npm run start
```

And you'll be treated to a giant button component from our library that now supports bundling CSS!



Optimizing

There are a couple of easy optimizations we can make with this setup. The first is to add a plugin called [terser](#) that will minify our bundle and reduce the overall file size.

The other is to update some of our dependencies to `peerDependencies`. With rollup's [peer dependencies](#) plugin we can tell the projects that are using our libraries which dependencies are required (like React) but won't actually bundle a copy of React with the library itself. If the consumer already has React in their project it will use that, otherwise it will get installed when they run `npm install`.

First we will install these two plugins:

```
npm install rollup-plugin-peer-deps-external rollup-plugin-terser --save-dev
```

Then we will update our rollup config:

rollup.config.js

```
import resolve from "@rollup/plugin-node-resolve";
import commonjs from "@rollup/plugin-commonjs";
import typescript from "@rollup/plugin-typescript";
import postcss from "rollup-plugin-postcss";
import dts from "rollup-plugin-dts";

//NEW
import { terser } from "rollup-plugin-terser";
import peerDepsExternal from 'rollup-plugin-peer-deps-external';

const packageJson = require("./package.json");

export default [
  {
    input: "src/index.ts",
    output: [
      {
        file: packageJson.main,
        format: "cjs",
        sourcemap: true,
      },
      {
        file: packageJson.module,
        format: "esm",
        sourcemap: true,
      },
    ],
    plugins: [
      // NEW
      peerDepsExternal(),

      resolve(),
      commonjs(),
      typescript({ tsconfig: "./tsconfig.json" }),
      postcss(),

      // NEW
      terser(),
    ],
  },
  {
    input: "dist/esm/types/index.d.ts",
    output: [{ file: "dist/index.d.ts", format: "esm" }],
```

```

    plugins: [dts()],
    external: [/\.css$/],
  },
];

```

Then we move React from `devDependencies` to `peerDependencies` in our `package.json` file:

`package.json`

```

{
  "devDependencies": {
    "@rollup/plugin-commonjs": "^21.0.1",
    "@rollup/plugin-node-resolve": "^13.0.6",
    "@rollup/plugin-typescript": "^8.3.0",
    "@types/react": "^17.0.34",
    "rollup": "^2.60.0",
    "rollup-plugin-dts": "^4.0.1",
    "rollup-plugin-peer-deps-external": "^2.2.4",
    "rollup-plugin-postcss": "^4.0.1",
    "rollup-plugin-terser": "^7.0.2",
    "typescript": "^4.4.4"
  },
  "peerDependencies": {
    "react": "^17.0.2"
  },
  ...
}

```

Adding Tests

To add tests for our components we are going to install [React Testing Library](#), and to run those tests we will install [Jest](#).

```
npm install @testing-library/react jest @types/jest --save-dev
```

Inside of our Button directory, create a new file called `Button.test.tsx`

`src/components/Button/Button.test.tsx`

```

import React from "react";
import { render } from "@testing-library/react";

import Button from "../Button";

describe("Button", () => {

```

```
test("renders the Button component", () => {  
  render(<Button label="Hello world!" />);  
});  
});
```

What this will do is render our button on a non-browser DOM implementation and make sure that it mounts properly. This is a very simple test, but it serves as a good example of the syntax you can use to get started. To go deeper in depth read further in the React Testing Library [documentation](#).

Before we can run the tests we need to configure jest, and create a test runner script in our `package.json`. We'll start with the configuration, create a `jest.config.js` file in the root of the project:

`jest.config.js`

```
module.exports = {  
  testEnvironment: "jsdom",  
};
```

This tells Jest to use [jsdom](#) as our DOM implementation.

Next update your `package.json` file:

`package.json`

```
{  
  "scripts": {  
    "rollup": "rollup -c",  
    "test": "jest"  
  },  
  ...  
}
```

Now we can run our tests with:

```
npm run test
```

Unfortunately we are going to get an error! The error is when our JSX code is encountered. If you recall we used Typescript to handle JSX with our rollup config, and a Typescript plugin for rollup to teach it how to do that. We have no such setup in place for Jest unfortunately.

We are going to need to install [Babel](#) to handle our JSX transformations. We will also need to install a Jest plugin called `babel-jest` that tells Jest to use Babel! Let's install them now, along with Babel plugins to handle our Typescript and React code. The total collection of all of them looks like:

```
npm install @babel/core @babel/preset-env @babel/preset-react @babel/preset-typescript
```

Now we create our Babel configuration file in the root of our project, which tells Babel to use all these plugins we've just installed:

`babel.config.js`

```
module.exports = {
  presets: [
    "@babel/preset-env",
    "@babel/preset-react",
    "@babel/preset-typescript",
  ],
};
```

Now we should be able to run our tests with `npm run test...` but... there is one more problem!

You'll get an error saying the `import` of the `.css` file isn't understood. That makes sense because, again, we configured a `postcss` plugin for rollup to handle that, but we did no such thing for Jest.

The final step will be to install a package called [identity-obj-proxy](#). What this does is allow you to configure Jest to treat any type of imports as just generic objects. So we'll do that with CSS files so we don't get an error.

```
npm install identity-obj-proxy --save-dev
```

We need to update our Jest config to include the `moduleNameMapper` property. We've also added `less` and `scss` in there for good measure in case you want to expand your project later to use those:

`jest.config.js`

```
module.exports = {
  testEnvironment: "jsdom",
  moduleNameMapper: {
```

```
    ".(css|less|scss)$": "identity-obj-proxy",  
  },  
};
```

Now finally if you've followed up step up to this point, you can run:

```
npm run test
```

And you will be treated to a successful test!

```
> jest  
  
PASS src/components/Button/Button.test.tsx  
  Button  
    ✓ renders the Button component (11 ms)  
  
Test Suites: 1 passed, 1 total  
Tests:       1 passed, 1 total  
Snapshots:   0 total  
Time:        0.601 s  
Ran all test suites.
```

Adding Storybook

Storybook is a a tool for visualizing UI components outside of your site / application. It's fantastic for prototyping and testing different visual states of components to ensure they work the way they are designed to, without the extra overhead of having other unrelated components on the screen.

It also gives you an easy way to see and use your components while working on them in your library project, without having to build an unnecessary testing page just to display them.

Initializing Storybook is very easy. To set it up and configure it automatically we just run the following command:

```
npx sb init --builder webpack5
```

(Note as of this writing Storybook still defaults to using webpack 4 which is why we have added the extra builder flag. Presumably 5 will be the default soon so it may be unnecessary in the future)

Unlike some of the other tools we have added so far, Storybook much more of a "batteries included" kind of package that handles most of the initial setup for you. It will even add the `scripts` to run it into your `package.json` file automatically.

You will also notice that it creates a `stories` directory in your `src` directory. This directory is full of pre-built templates for you to use as an example of how to create your own stories. I recommend you don't delete these until you become familiar with Storybook and how to write your own stories, having them close by will be very handy.

Now let's create a simple story for our button. Create a new file in the `Button` directory called `Button.stories.tsx`:

```
src/components/Button/Button.stories.tsx
```

```
import React from "react";
import { ComponentStory, ComponentMeta } from "@storybook/react";
import Button from "../Button";

// More on default export: https://storybook.js.org/docs/react/writing-stories/
export default {
  title: "ReactComponentLibrary/Button",
  component: Button,
} as ComponentMeta<typeof Button>;

// More on component templates: https://storybook.js.org/docs/react/writing-stories/
const Template: ComponentStory<typeof Button> = (args) => <Button {...args} />;

export const HelloWorld = Template.bind({});
// More on args: https://storybook.js.org/docs/react/writing-stories/args
HelloWorld.args = {
  label: "Hello world!",
};

export const ClickMe = Template.bind({});
ClickMe.args = {
  label: "Click me!",
};
```

This might be a little overwhelming at first, but when you go through it piece by piece you should see it's fairly straightforward.

- The *default export* defines where the button will appear in the Storybook. I've chosen **ReactComponentLibrary** as a simple name to group our custom components together separately from the examples.
- The *Template* determines which component is actually being rendered, and which default args/props to apply to it.

- The *Template.bind* objects are instances or example states of the component. So in a real project you might have something like "LargeButton" and "SmallButton". Since our button is always big I've just used an example of testing the button with two different labels.

If you look at your `package.json` file you'll see that Storybook has already added a `storybook` and `storybook-build` script. The first will host the Storybook application locally for quick and easy testing. The second one will build a static HTML/JS bundle that can easily be hosted on a remote server, so all members of your team can try your components.

For now let's just run:

```
npm run storybook
```

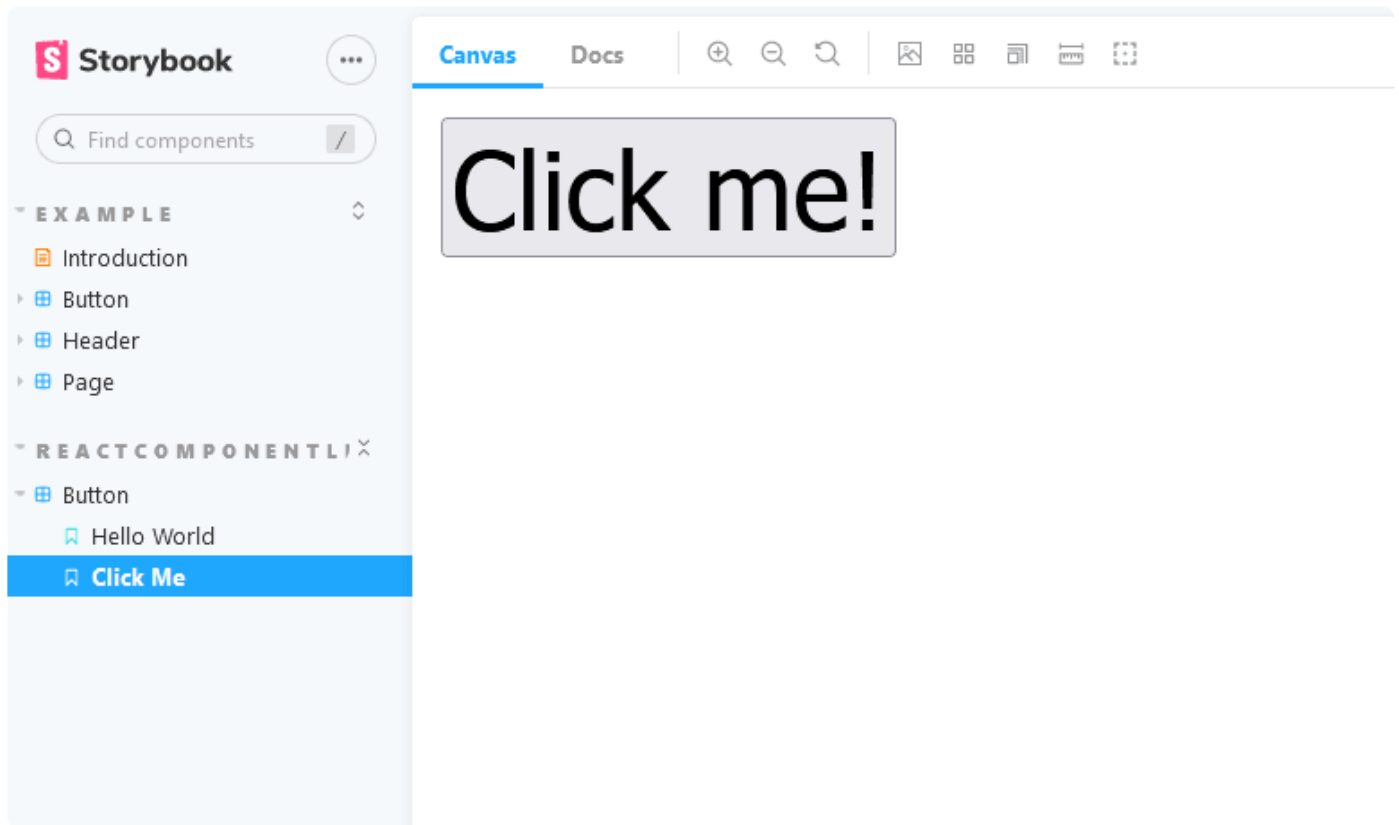
Edit: It's possible you may encounter errors due to missing dependencies. If this occurs there are a few solutions.

The first is to install those dependencies manually. For example `react-dom`. This is not ideal as your project itself should not depend on these libraries, so it should not be necessary to include them as they are included with Storybook's peer dependencies, [as example here](#).

If you simply run a fresh `npm install` command it will install all the `peerDependencies` of the libraries you are using. Before running this you may need to delete your `package-lock.json` and `node_modules` directory. They will be regenerated automatically after your fresh install.

It can be tricky to troubleshoot issues related to both overlapping and missing dependencies between libraries. Stay patient and make sure to read your error messages!)

If all goes well you will be greeted with a friendly interface that lets you navigate through the example components as well as your own custom button in real time. Click between them to check out the different states that you have created.



There is plenty more to learn about Storybook, make sure to read through the [documentation](#).

Adding SCSS

Thanks to `rollup-plugin-postcss` you should already be able to simply rename your `.css` file to `.scss` and then `import 'Button.scss'` and be on your way. Running `npm run rollup` will compile it all just fine with the current configuration.

To get it running with Storybook is a different matter however. Note that this is the main reason we used the `--builder webpack5` flag when installing in the previous section, you will likely encounter a lot of errors trying to configure Storybook to support SCSS with webpack 4. With version 5 it's fairly simple using the SCSS preset.

(If you followed an earlier version of this tutorial you may have initialized Storybook with the default webpack 4. You can remove anything related to Storybook from your `package.json` file. Next delete your `package-lock.json` and `/node_modules/` directory and initialize Storybook again with the `--builder webpack5` flag).

```
npm install @storybook/preset-scss css-loader sass sass-loader style-loader --
```

To read more on different kinds of CSS support and Storybook click [here](#).

(If you'd like to understand more about the difference between what these different loaders do, here is a great answer on [Stack Overflow](#))

Then all you need to do is add `@storybook/preset-scss` to your main Storybook config:

`.storybook/main.js`

```
module.exports = {
  "stories": [
    "../src/**/*.stories.mdx",
    "../src/**/*.stories.@(js|jsx|ts|tsx)"
  ],
  "addons": [
    "@storybook/addon-links",
    "@storybook/addon-essentials",
    "@storybook/preset-scss"
  ],
  "core": {
    "builder": "webpack5"
  }
}
```

Now you will be able to run `npm run storybook` and see all your SCSS styles.

(One last reminder that it's common to encounter dependency errors with Storybook. Before you begin installing the missing dependencies it asks for, always try deleting `package-lock.json` and `node_modules` first and then running `npm install` again. This will often fix your issue without requiring you to add unnecessary dependencies to your own project.)

Wrapping Up

You should now have a good understanding about how to create your own React component library. Doing so can not only teach you a lot about how the Javascript package management ecosystem works, but it can be a great way to make code that you use across multiple projects easily available with a simple command.

Please check some of my other learning tutorials. Feel free to leave a comment or question and share with others if you find any of them helpful:

- [Learnings from React Conf 2021](#)
- [How to Create a Dark Mode Component in React](#)
- [How to Analyze and Improve your 'Create React App' Production Build](#)
- [How to Create and Publish a React Component Library](#)

- [How to use IndexedDB to Store Local Data for your Web App](#)
- [Running a Local Web Server](#)
- [ESLint](#)
- [Prettier](#)
- [Babel](#)
- [React & JSX](#)
- [Webpack: The Basics](#)
- [Webpack: Loaders, Optimizations & Bundle Analysis](#)

For more tutorials like this, follow me [@eagleson_alex](#) on Twitter

Discussion (58)



Gonzalo Geraldo • Feb 23



Excellent! followed the whole thing and in a couple of hours already have a package on github that I started using in another project (just for testing). Also added jest for unit testing and storybook. All working as expected, thanks!



Ben • Nov 18 '21



I really appreciate that you've summarised this process.

I wonder what would you recommend as a workflow to actually author those components?

What I mean is that I'd never develop a design system in isolation. I usually need my whole app/website to see the context and make adjustments if necessary, but - obviously - I don't want to include any of that into the final commit of the design system.

So what do you recommend to seamlessly bring together the development of a main application and the belonging design system locally?



Alex Eagleson 🌟 • Nov 19 '21 • Edited on Nov 19



That's a great question, I want to make sure I'm understanding it properly.

I can only speak personally, since we work with a designer, all of our design work is done in advance in [Figma](#) so the overall picture & theming of everything can be

designed together, then I turn those designs into components and use Storybook to validate that the components match the intention of the designs.

If I were working alone or without a designer I would probably create a few helper components that are meant to group components together (but not actually exported as part of the library). Something that would allow me to wrap unrelated components and compare them in proximity with one another with some padding between. Something along the lines of the [Stack](#) from Material-UI (which is basically just a convenient wrapper around a flex element). Then I could drop all my components inside of it and use Storybook to make a story where I can see them.

That said, since I am not skilled at design (and don't pretend to be) I would definitely encourage anyone else who has an opinion on this to respond as well!

Cheers.



Ben • Dec 3 '21



Thanks Alex sharing your take on this.

I also encourage everyone to read this article from the authors of [Tailwind CSS / UI](#).

They've explained their process of designing components and then turning them into code.

Their high level overview with your practical article I think is a good starting point.



Kristin Bradley • Jan 31 • Edited on Jan 31



Great article! Very clear and easy to follow.

When importing the library I created into my test application, it worked great except I got this error: TS7016: Could not find a declaration file for module ... implicitly has an 'any' type.

It looks like I need to declare the module for my components but I'm unsure where to do this? I want to add this in the component library itself so users importing it won't see this error.



Alex Eagleson 🌟 • Feb 1 • Edited on Feb 1



The output of the declaration files is covered in the "Adding Rollup" section. From this part of the rollup config in particular:

```
{
  input: "dist/esm/types/index.d.ts",
  output: [{ file: "dist/index.d.ts", format: "esm" }],
  plugins: [dts()],
},
```



Kristin Bradley • Feb 2

...



Ok thanks. I double checked and I have that in my rollup.config.js file.



abhinav anshul • Jan 9

...



Amazing article, however I'm stuck into an issue here when I try to install the package, it says not found (it is a public repo), neither its available on the npmjs website.

I've written down about my problem here too : stackoverflow.com/questions/706391...



Alex Eagleson 🌟 • Jan 9

...



This tutorial is specifically for publishing a package on Github, I would imagine you could probably publish a public package to npmjs.com as well but I've never personally done that before so I'm not sure the exact steps to follow.

If you figure it out and share I'd be happy to update the tutorial

Cheers



Vikrant Bhat • Feb 4

...



I am facing the same issue, did you stumble upon a way to publish to NPM as well?



Gavin Sykes • Mar 10

...



It looks like you can only really do one or the other at a time, I'm yet to give this a go but this article seems to cover it - sevic.dev/npm-publish-github-actions/



Wesley Janse • Dec 29 '21

...



Great post,

Got a small issue, running the tests though, You mentioned something about not adding `React-Dom` to the library since that would deny the purpose of building a 'standalone' component library, if I remember correctly.

Now when I try to run 'yarn test' I'm getting the following error.

```
Cannot find module 'react-dom' from 'node_modules/@testing-library/react/dist/pure.js'
```

This is fixed when I add React-Dom to the project.

Do you see any way around this?



Alex Eagleson • Dec 29 '21



In the "Adding Tests" section there is an instruction for editing your jest config to use `jsdom` instead of `React DOM` which is aimed to eliminate the need for that dependency, did you include that in your config?



Wesley Janse • Dec 29 '21



Yes I have that included, I have just added `React-Dom` as a peer dep, as a workaround. It is accessing the config file correctly though, just always wants to go back to `ReactDOM`, but the workaround works, and since we need it anyway for `storybook` it's fine.

Thanks again for the blog!



Jay • Nov 18 '21



Thanks for this article. I just recently created a pirate library for my job. This article looks spot on.

The one thing that helped me, I didn't want to post all my project, and when you do an `npm publish` from the root, it posts your whole project. So what I do is copy my `package.json`, and `node modules` into the `dist` folder, `cd` into it, and do my `npm publish` from there. It makes a much cleaner finished product.



Mike Barkmin • Nov 18 '21



You can add a `files` property to your `package.json`. It is an array containing all paths which should be uploaded to `npm`.

For example

```
"files": ["dist", "README.MD"]
```



Vytenis • Nov 18 '21



Readme, license and package.json will be included by default. To check what will be available as you publish your package you can run `npm pack`



Alex Eagleson • Nov 18 '21



Great tips, thank you!



度 • Nov 30 '21



Thank you for your great tutorial, It was very enlightening to me, But I have a little of different view, I think deleting `package-lock.json` will cause the package version to get out of control, It is a bad practice, Perhaps we can use `npm i PACKAGE_NAME@x.x.x` to solve the release problem



Alex Eagleson • Nov 30 '21



That's definitely a great option if it works. Deleting `package-lock.json` in a mature application absolutely creates a risk of introducing bugs with package interactions, even between minor and patch versions.

That said, although removing the file may be bad practice, I would be interested to see if your solution works for initializing Storybook in an existing project and creating a stable alignment between all the `peerDependencies`. That's the issue that gets fixed with a fresh `npm install` and I'm not sure if harcoding the versions of each package fixes that issue (I'd be happy to be wrong though).



Gerald Jeff Torres • Dec 8 '21



Hi Alex,

This is an amazing tutorial but I ran into a problem after installing storybook. I was not able to run `'npm run rollup'` because of the new storybook files and folders'.

Am I missing anything in the `rollup.config.js` file that will ignore these files from being bundled?



Alex Eagleson • Dec 8 '21



Hey there, I don't believe that anything in the rollup config was impacted by the installation of storybook. What was the error specifically? You can try cloning the repo linked at the top of the tutorial which has a working version all combined together, and then begin to compare that with your implementation piece by piece to see where the difference might lie.



Michael Drayer • Jan 7



Hey Alex,

I was running into the same issue, even using your repository. On `npm run rollup`, I was getting the following warnings:

```
src/index.ts → dist/cjs/index.js, dist/esm/index.js...
(!) Plugin typescript: @rollup/plugin-typescript TS4082: Default export of t1
src/stories/Button.stories.tsx: (7:1)
```

```
7 export default {
  ~~~~~
8   title: 'Example/Button',
  ~~~~~
...
13 },
  ~~~~
14 } as ComponentMeta<typeof Button>;
  ~~~~~
```



While the package built out fine, it also included components and type files for the various Storybook and test files within the `src` directory, for example

`dist/esm/types/stories/Button.d.ts`,

`dist/esm/types/components/Button/Button.stories.d.ts` and

`dist/esm/types/components/Button/Button.test.d.ts` were all created. My solution was to add `test` and `stories` files to the `exclude` arg in the `typescript()` plugin:

```
typescript({
  exclude: [
    // Exclude test files
    /\.test\.((js|jsx|ts|tsx))$/,
    // Exclude story files
    /\.stories\.((js|jsx|ts|tsx|mdx))$/,
  ],
  tsconfig: "./tsconfig.json",
}),
```

There are probably other ways to exclude these files from the rollup bundler, but this worked for me. Thanks for the tutorial by the way! I've been in webpack land for a while, so it's interesting to see how other bundlers are being used.



Charles • Dec 7 '21



Hi ! Thank you a lot for this article and video, it helps me a lot !

I may have found something useful if you want to use external librairies (like material UI, HighchartJS, etc) and do some custom components in your npm package (storybook).

The error

Unhandled Runtime Error Error: Invalid hook call. Hooks can only be called inside of the body of a function component. This could happen for one of the following reasons:

1. You might have mismatching versions of React and the renderer (such as React DOM)
2. You might be breaking the Rules of Hooks
3. You might have more than one copy of React in the same app

The why

The React of the parent project is being used, instead of using the second, that is a **duplicate React**.

The solution

I found a solution ([here](#) and [here](#)) where you just have to add this line inside the **rollup.config.js** file :

```
external: ["react", "react-dom"],
```



Alex Eagleson 🌟 • Dec 7 '21



Good stuff, thanks for the resource!



Gavin Sykes • Mar 10 • Edited on Mar 10



Thanks for this Alex, it's been incredibly helpful and encouraged me to finally take the plunge and stop using webpack to (badly) bundle my components and libraries together!

One issue I am facing though, which I'm hoping someone has encountered and fixed before, is that when I try and import the main component from my package into another project, TypeScript then shouts at me "JSX element type 'YourComponent' does not have any construct or call signatures. ts(2604)". Like, what?

I've tried changing the return type from `ReactElement` to `JSX.Element` to `ReactNode` to `ReactChild` to `FunctionComponent` to even removing it altogether, and it just flat out refuses to get rid of that error message.



Gavin Sykes • Mar 10



False alarm!

My component wasn't set as a default import (so I'm going to look at doing that) so changing `import MyComponent from '@gavinsykes/my-component'` to `import { MyComponent } from '@gavinsykes/my-component'` fixed it! 😊



Grant Ralls • Dec 11 '21



I've been looking for a way to create a component library. I've configured my own webpack projects before but I constantly ran into errors with both `bit.dev` and `create-react-library`. Thank you for putting this together!



Oscar Cornejo Aguila • Nov 24 '21



Hi Alex, very good publication, but I was left with a question, how can I work or include sass in my component library?

I would appreciate the help!



Alex Eagleson 🌟 • Nov 25 '21 • Edited on Nov 25



Great question, and it took a bit of time to figure out.

Getting SCSS to work with the rollup bundle is extremely easy. All you need to do from the current state of the tutorial is update `rollup.config.js` in the `mts()` plugin config section. Change the `external` value from just CSS to:

```
external: [/\/.(css|less|scss)$/],
```

With that alone you can now change `Button.css` to `Button.scss` and import `Button.scss` in your Button component. That's it! The Postcss plugin for Rollup that is

already installed will take care of it for you.

Getting it to work with Storybook however is another beast altogether and involves re-installing Storybook using the Webpack 5 option instead of the default webpack 4. More than I can fit in a comment here, but I may update the blog post itself.

I have however updated the repository with those changes, so it should work out of the box with Storybook if you clone it now.

Cheers.



Oscar Cornejo Aguila • Nov 25 '21



Thanks Alex, I was really lost on how to add sass to my component library, and although I followed the steps that storybook recommends, I had not realized that the errors that kept happening were due to the webpack version, thank you very much for this update.
Greetings from Chile!



Alex Eagleson • Nov 25 '21



New SCSS section has been added to the post.



FarihaAftab0 • Dec 27 '21 • Edited on Dec 27



Will you please tell how to make it work with css modules.. how to resolve module.scss extension?



Alex Eagleson • Dec 27 '21



Simply add `modules: true` on your Rollup postcss plugin. There's a section for modules on the plugin NPM docs:

[npmjs.com/package/rollup-plugin-po...](https://npmjs.com/package/rollup-plugin-postcss#modules)



Luiz Azevedo • Feb 21



Hi Alex!

Congratulations for the tutorial and the beautiful explanation.
After a long time of your tutorial, it is still possible to apply it in a simple way.

I'm currently getting a Warning when I run npm start of a project created with create-react-app referring to the package created from your tutorial.

I've been looking for a solution but haven't found it yet.

When running npm start from the application that is using my package I get this warning:

warning in ./node_modules/my_package/dist/esm/index.js

Module Warning (from ./node_modules/source-maploader/dist/cjs.js)

Failed to parse source map from '.../components/my_component.tsx' file: Error ENOENT: no such file or directory, open '.../components/my_component.tsx' @ ./src/index.tsx

I know it's just a warning, but I wanted to resolve it.

Thanks.



xingming2020 • Mar 4



I have the same warning. Did you fix it?



Annmarie Switzer • Mar 3



Alex - this is an awesome tutorial. Thank you so much! I was wondering if you could tell me how to export a CSS file to be used by a consuming application. For example, I want to define a color palette in the library and allow my consumers to use those pre-defined CSS vars. How could I do that?

my-react-library/src/palette.css

```
:root {  
  --grey0: #eaeaea;  
}
```

Consuming application's index.css

```
@import 'my-react-library/src/palette.css'  
  
:root {  
  --custom-white: var(--grey0);  
}
```



Annmarie Switzer • Mar 3





I may have been overthinking this. What I have done is simply copied `palette.css` directly into `/dist` - no need for rollup to be involved. Now, my consuming application can import that file like so:

```
@import '~my-react-library/dist/palette.css'

:root {
  --custom-white: var(--grey0);
}
```

and this works perfectly.



Roomak • Feb 20 • Edited on Feb 20



Hey alex! Thank you so much for such a clear summary of the component library creation process. I followed your advice but can't seem to test this with a local project.

My component library is housed in the local directory "component-library". I used `npm link ../component-library` in my project. When I try to import Button from my component library, I get:

```
Error: Can't resolve './Button' in 'component-library/dist/esm/types/components'
```

Any advice on this? I've double checked my file structure versus yours at least 20 times.



GenghisKhan123 • Dec 27 '21



Thank you for this great tutorial. You publish some really wonderful stuff on React here. I'm very happy I found your work on this blog: dailybinaryhub.com. Your resources have really helped me in my journey as a beginner.



Tyler Beggs • Nov 17 '21



Thanks for this.



Seanmclem • Jan 20



How different would this be for react native components?



Alex Eagleson 🌟 • Jan 20 • Edited on Jan 20



Good question! Considering React Native supports the same NPM package installation process, my assumption would be that it's no different at all, you would simply need to identify in your package description that React Native is the target.

I haven't built RN packages before though so I could be wrong, I'm be curious if anyone else had input.



Preciouzword • Nov 22 '21



Nice post. I enjoyed the read. I will like to work on something like this >>
momsall.com/app-controlled-christm...



Sérgio Viúla • Nov 20 '21



Did a similar thing, but git submodule instead.
Its nice see such a detailed article, this was spot on 👍



Saša Šijak • Nov 20 '21



very good post, thank you



Alex Eagleson 🌟 • Nov 22 '21



you are welcome



Harrison Henri dos Santos Nascimento • Feb 6



Hey Guys, first thanks for this wonderful article [@alexeagleson](#)! Is there anyone having problems when testing the main project using the library as a dependency? Have anyone had to mock the library in the tests of the main project?



Matt • Feb 16 • Edited on Feb 16



May I ask what verison of node you are using to have this run? When running rollup I get the error "Cannot use import statement outside a module".

I cloned this repository and also get the same error out the box, which makes me think it's a Node version issue or something like that. I've tried on v14.18.3 and v16.14.0



Arash • Mar 29



That was AWESOME! Thank you. Is it the same process if I wanna publish my library on Bitbucket?

Wondering what needs to be put for below (instead of github):

```
{
  "name": "@YOUR_GITHUB_USERNAME/YOUR_REPOSITORY_NAME",
  "publishConfig": {
    "registry": "npm.pkg.github.com/YOUR\_GITHUB\_USE..."
  },
  ...
}
```



abhinav anshul • Jan 9



Hi, just a question - if i'm publishing this to github package, why this would be available at npmjs at all?

Alex Eagleson  • Jan 9

npm (the tool) is still used to install it even though it is hosted privately on Github. It will not be visible on [npmjs.com/](\"https://npmjs.com/\") (the public package repository).



Negreanu Calin • Nov 18 '21



Thanks for your time writing and making the video, love it!!!

Alex Eagleson  • Nov 18 '21

Glad it was helpful!



Cagri UYSAL • Mar 10



Thank you so much, you saved my life <3



Shayan • Nov 19 '21



Alex, this has been a great! Thank you very much.

Would you be interested in joining a dev community on discord? discord.gg/zvE8QjdWaf



Marco Aurélio Silva Lima • Mar 18



✕ That's so nice man! I wold like to ask... how can I export a custom hook using rollup?

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