How writing just one import the wrong way slows down your website

François Martin

VOXXED DAYS TICINO

KARAKUN

François Martin

Senior Full Stack Software Engineer

francois.martin@karakun.com

martinfrancois

/in/françoismartin

@fmartin_

Let‘s start with the basics…

Terminology: Bundler, Bundle (simplified)

package.json:

```
{
  "name": "hello-react",
  "dependencies": {
    "react": "17.0.1",
    "react-dom": "17.0.1",
    "lodash": "4.17.20"
  },
  "devDependencies": {
    "webpack": "5.4.0"
  }
}
```

Bundler

index.html

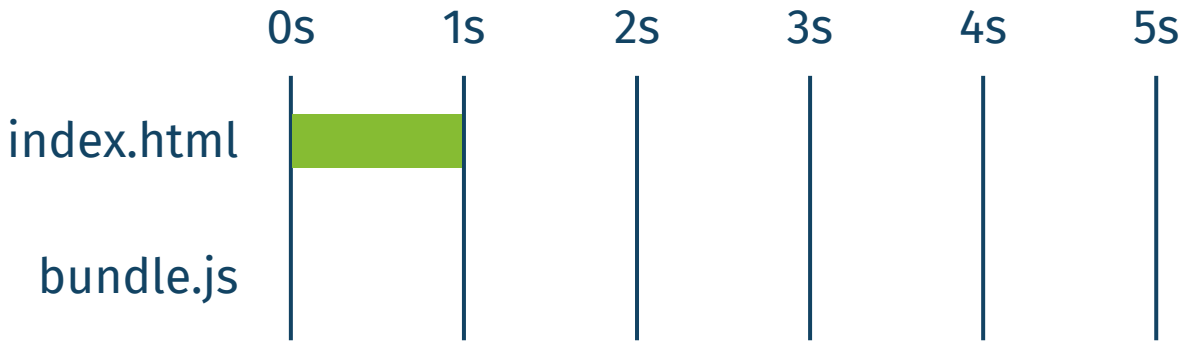

```
<!doctype html>
<html lang="en">
  <body>
    <script src="bundle.js"></script>
  </body>
</html>
```

bundle.js

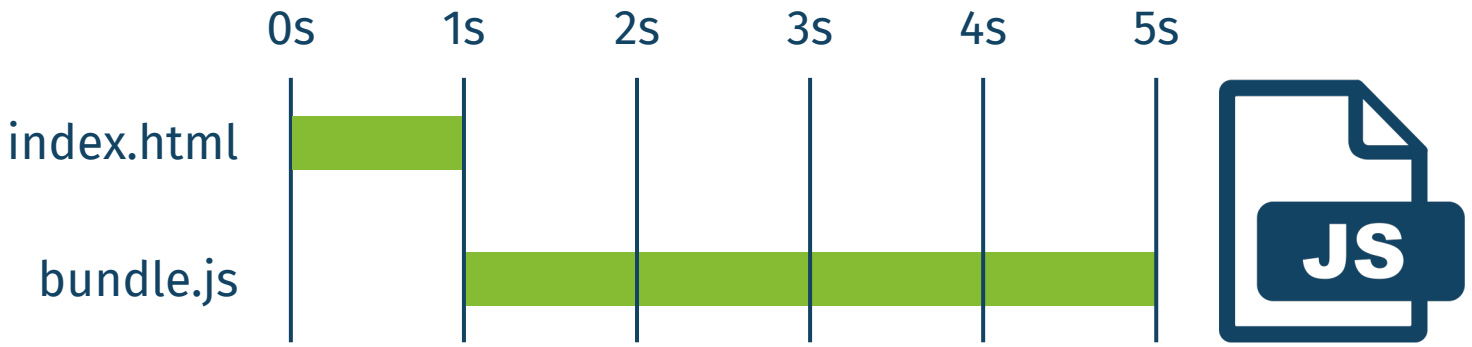
Source Code + Dependencies

Bundle Size

```
"dependencies": {
  "react": "17.0.1",
  "react-dom": "17.0.1",
}
```



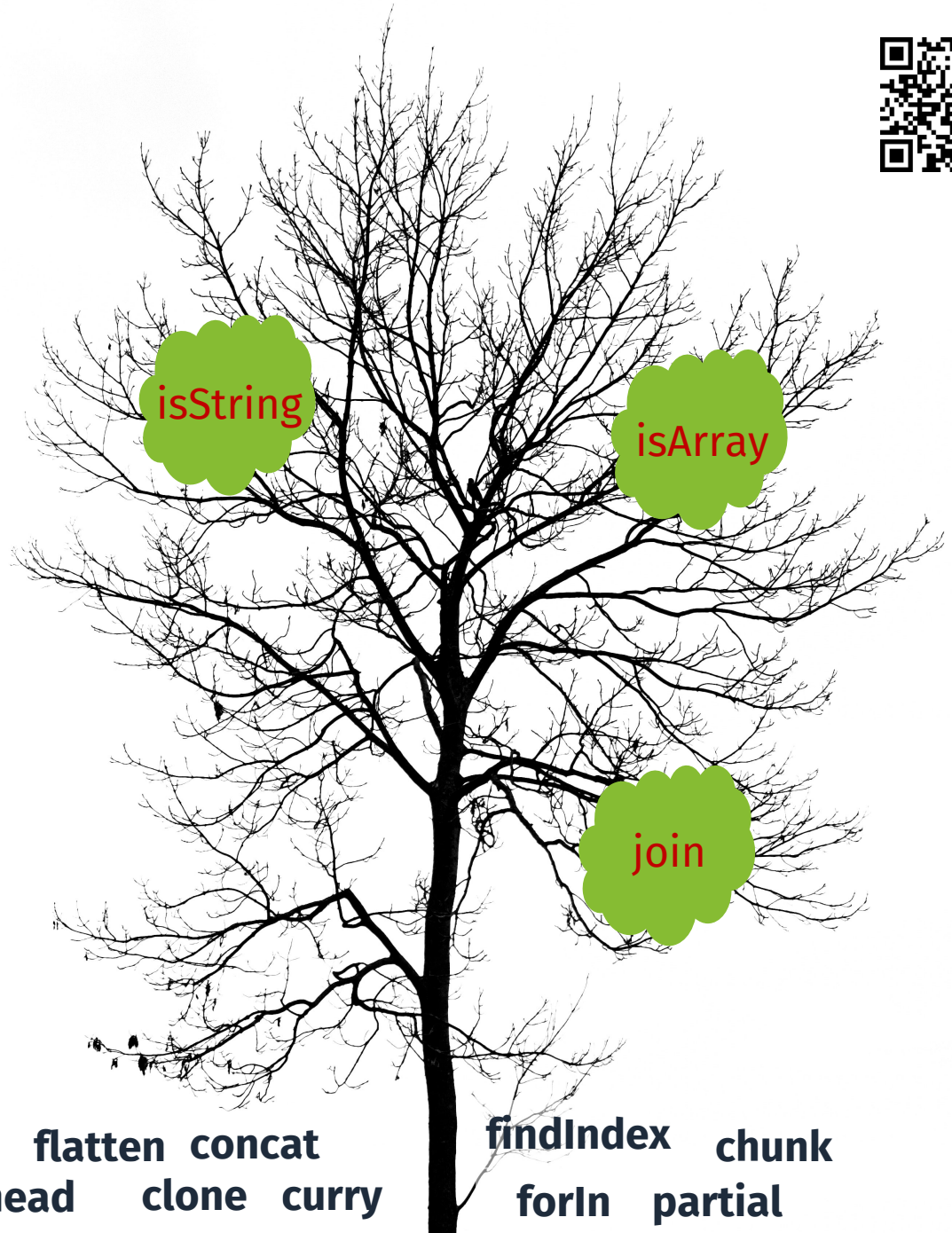

```
"dependencies": {
  "react": "17.0.1",
  "react-dom": "17.0.1",
  "lodash": "4.17.20",
  "@material-ui/core": "4.11.0",
  "@material-ui/icons": "4.9.1",
  "@material-ui/styles": "4.10.0",
  "chartjs": "2.9.4",
  "moment": "2.29.1",
  "reactstrap": "8.7.1",
  "the-whole-internet": "1.0.0"
}
```



Example

```
import isString from "lodash/isString";
import isArray from "lodash/isArray";
import join from "lodash/join";

function shakeIt(input) {
  if (isString(input)) {
    return input;
  } else if (isArray(input)) {
    return join(input, "-");
  } else {
    return input.toString();
  }
}
```



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Definition

- **Dead-code elimination**
- Relies on static structure of ES2015 module syntax (**import**, **export**)
- Name and concept popularized by bundler **rollup**.

Rich Harris Follow
Dec 22, 2015 · 3 min read

I've been working (albeit sporadically of late, admittedly) on a tool called Rollup, which bundles together JavaScript modules. One of its features is *tree-shaking*, by which I mean that it only includes the bits of code your bundle actually needs to run.

- Supported by rollup since 2015
- Supported by webpack since version 2 (2016)

Adding lodash, good idea?

BUNDLEPHOBIA

lodash@4.17.21

BUNDLE SIZE

69.8 kB MINIFIED

24.4 kB MINIFIED + GZIPPED

DOWNLOAD TIME

488 ms SLOW 3G

28 ms EMERGING 4G

Over half the size of vue!

Yes, if done correctly, will be tree-shaken!

BUNDLEPHOBIA

vue@3.4.27

tree-shakeable

BUNDLE SIZE

112.7 kB MINIFIED

40.7 kB MINIFIED + GZIPPED

DOWNLOAD TIME

0.81 s SLOW 3G

47 ms EMERGING 4G

How to use Tree Shaking?

Most of the advice on tree shaking online: **Use ES2015 style imports / exports**

Exports:

❌
```
function foo() {...};
module.exports = foo;
```

✅
```
export function foo() {...};
```

Imports:

❌
```
const foo = require('./foo');
```

❌
```
import foo from './foo';
```

✅
```
import { foo } from './foo';
```

NEVER do this!

❌
```
import lodash from 'lodash';
```

Will include EVERYTHING from lodash in your bundle!

Impact on Bundle Size

How much does `isString` from lodash increase the bundle size?

```
import { isString } from 'lodash';
```

Bundle size before: 196.924 KB

Bundle size after: 220.844 KB **(+23.92 KB)**

Wait a second...

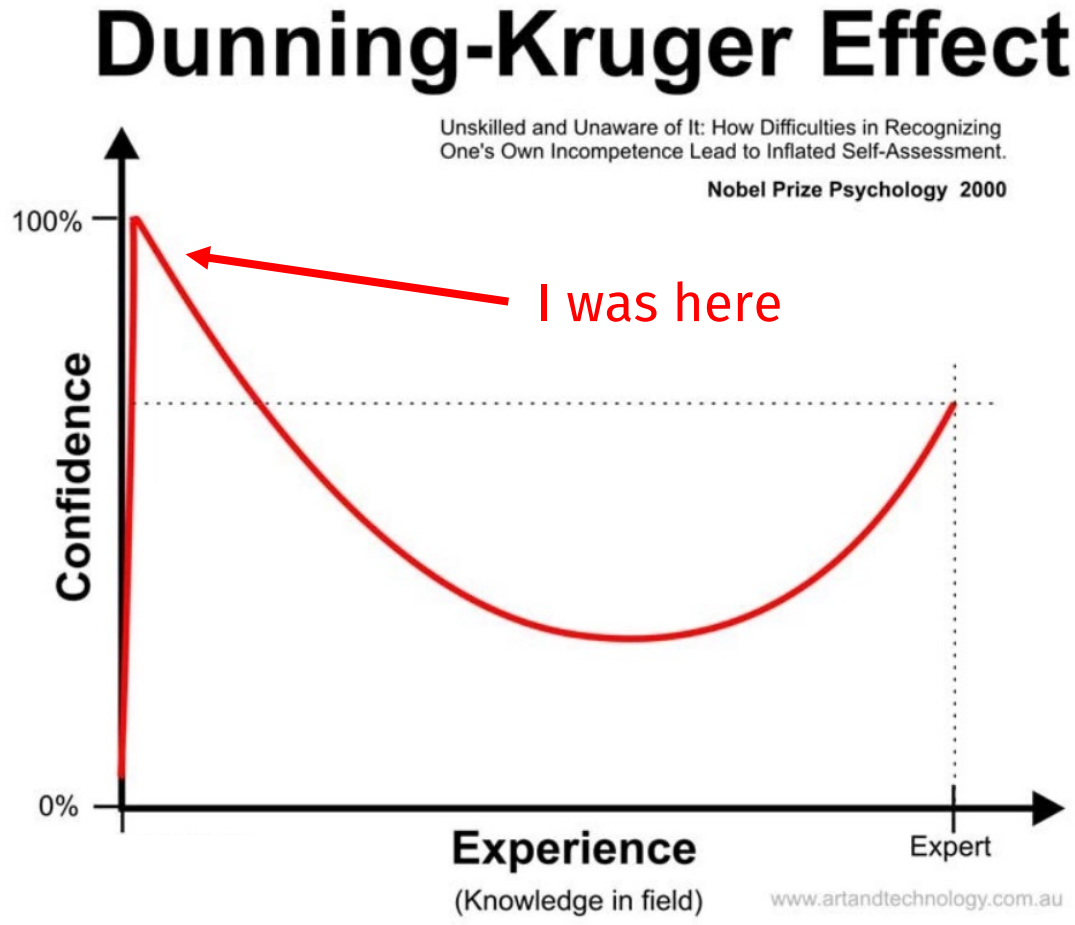
What??? It just added the entire lodash to the bundle?

BUNDLEPHOBIA

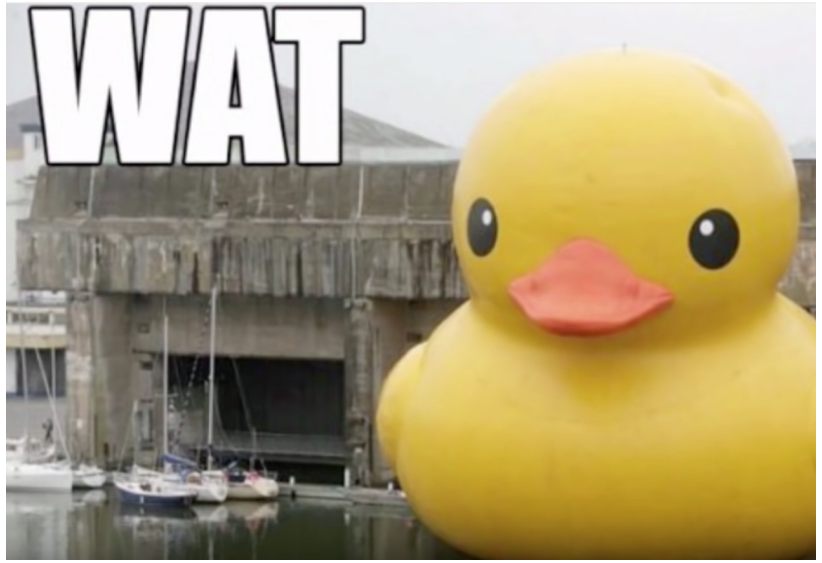
BUNDLE SIZE

24.4 kB

MINIFIED + GZIPPED



What the internet doesn‘t tell you



… about Tree Shaking

- Looking at the implementation of lodash‘s `isString`:

```
function isString(value) {
  return typeof value == 'string' || ...;
}
module.exports = isString;
```

- Turns out, when using ES2015 imports together with CommonJS exports, it results in **importing the whole module instead**
  - No warnings by the IDE!
  - No warnings by the linter!
  - No warnings by the bundler!

How to use Tree Shaking here?

❌ Copy the implementation of `isString` from lodash into your codebase.

- lodash is structured in a way that uses one js file per method (*cherry-picking syntax*):
  ```
  import isString from 'lodash/isString';      (+0.21 KB)
  ```

- lodash offers package with ES2015 style imports called lodash-es:
  ```
  import { isString } from 'lodash-es';        (+0.22 KB)
  ```

But there must be an easier way!

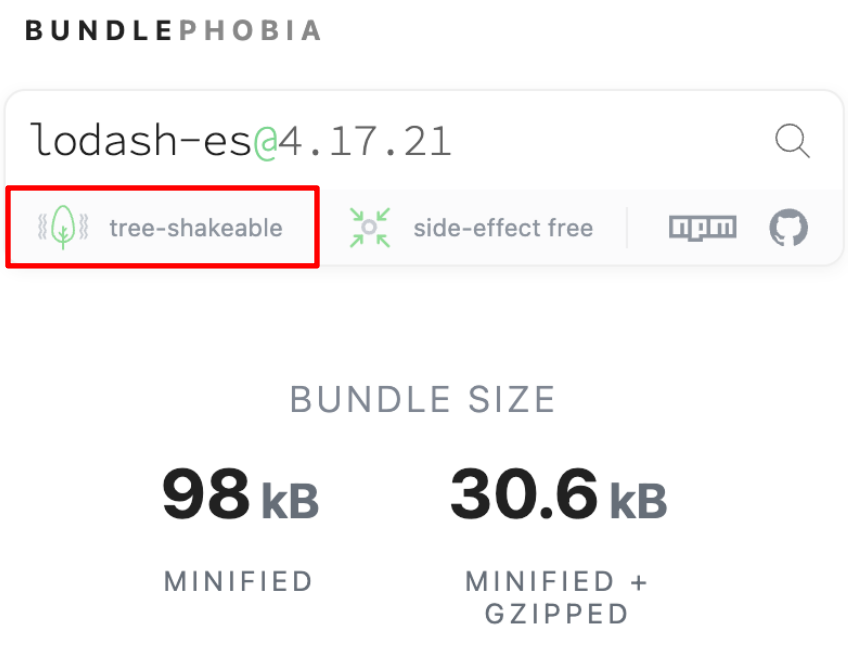
There is (at least kind of…)

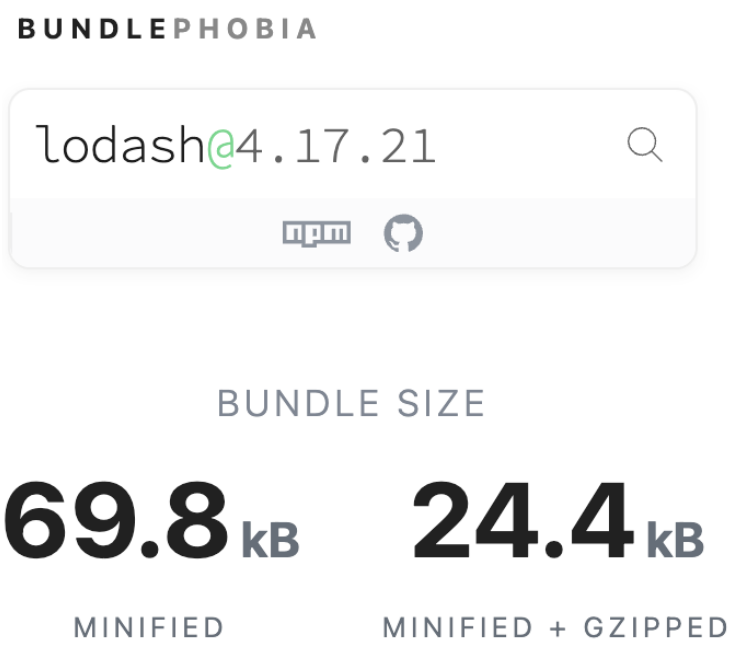
Import Cost plugin for IntelliJ and VSCode estimates bundle size impact for imports:

But there must be an easier way!

There is (at least kind of...)

Bundlephobia will tell you which packages are tree-shakeable:





Pull Request Time!

- „sure, you want to introduce lodash just because of isString? Thats a big fish!“

- **Difficult to predict by eye how (and if) bundlers will tree-shake**
- Using Import cost plugin and Bundlephobia can help make decisions quicker
- As with performance optimization in general:
  - **The only way to know for sure is by measuring!**

- Don‘t be afraid to use dependencies
  - But make sure they are tree-shaked!
  - Consider submitting a PR to the dependency if open source

Tree Shaking!

Slides:

https://fm.ht/vdt25