The future of modules

The future of javascript modules & node

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CTO, @ceejbot

you use a lot of modular javascript
billions & billions of packages

if you use code from npm
the future of modules
matters to you

what's a module anyway?

a module is a scope plus an API that lets you reuse it

files are modules

groups of files can be

give that group of files a package.json and it's a package

module syntax:
this is what I'm sharing
this is what I'm re-using

CommonJS is one module syntax
ECMAScript Modules is another

you've seen the syntax a million times

but here's a fast refresher

```
const chalk = require('chalk'); // cjs
import chalk from 'chalk'; // esm

console.log(chalk.bold('hello world!'));
```

```
const { yellow, bold } = require('chalk'); // cjs
import { yellow, bold } from 'chalk'; // esm

console.log(`${bold('hello')} ${yellow('world!')}`);
```

```
function red(word) = { ... }; // etc

module.exports = { red, green, blue, bold, ...}; // cjs
export { red, green, blue, bold, ...}; // esm
```

why is this worth a talk?
it isn't because of syntax

it's because the transition has not been smooth


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node needs both

and it still doesn't do ESM natively

ESM is the future of modular JavaScript

in order to understand the future
we must first understand the past

in 2009 JS had no module spec
but CommonJS had one

there was a lot of server-side js going on and people needed a way to share code

node adopted the CommonJS syntax

and wrote a loader

node's resolution algorithm
turns a human-friendly module name
into a path to code that can be loaded

```
const chalk = require('chalk');
// loads './node_modules/chalk/index.js'
const other = require('./chalk');
// loads './chalk.js' if it finds it
```

node's take on modules is useful
you're using the heck out of it today

browser-side js was still concatenating files

TC39 started working on the problem in 2009

`import` & `export` arrived in ES2015

esm design choices differ from cjs!
its intended uses are different!

inherently asynchronous not synchronous

(mostly) not dynamic:

can't import from a variable source

designed to support static analysis

the `import()` variation is, however, dynamic

see Lin Clark's cartoon deep-dive for an exploration of the details

static analysis is important when your target is the browser

node's nested deps are a great solution server-side, where disk space is cheap

static analysis & tree shaking help minimize download burden in FE


SPEEEED!!

so front-end focused developers want ESM

in between 2009 and now
something very interesting happened

node's user base changed

throwbacks like me still write server-side js

most of you use node for frontend tooling

you didn't want to wait for new js features

you wanted them now

transpilation took off

babel was the new hotness

babel transpiled the ESM syntax into CJS and the future looked like it was here

but babel was CJS behind the scenes

which meant node's loader was doing the work

problem: there is no esm loader

no loader? no loader.
well, html's loader.

```
<script type="module" src="entry.js"></script>
```

```
import {chalk} from 'https://example.com/js/chalk/index.js';
import {foo} from '../js/foo.js';
```

file paths are super-predictable
and super-annoying to write by hand

node's loader is part of its magic

there's no magic in spec-compliant ESM loading

babel set some expectations for that magical resolution algorithm

meanwhile, back in Gotham City...

node's been using CJS for 9 years

npm has 725K public packages

you will recall, front-end dev is now what people are using node to do

node should use JS standards when those standards exist

therefore node should use ESM.
but what does this mean?

the devil is in the details

ESM in node looked like it was not going good places

very depressing talk by Myles Borins about how hard the integration was

the systems have to co-exist
but they have little in common

how do CJS & ESM interoperate?

can you require() an esm file?

can you import a cjs file?

how do you know which is which without parsing everything?

node has no `type="module"` marker

for its entry points

so it proposed `.mjs` as a file suffix for javascript using the esm api

`.mjs` means no parsing:

every module must advertise api in name


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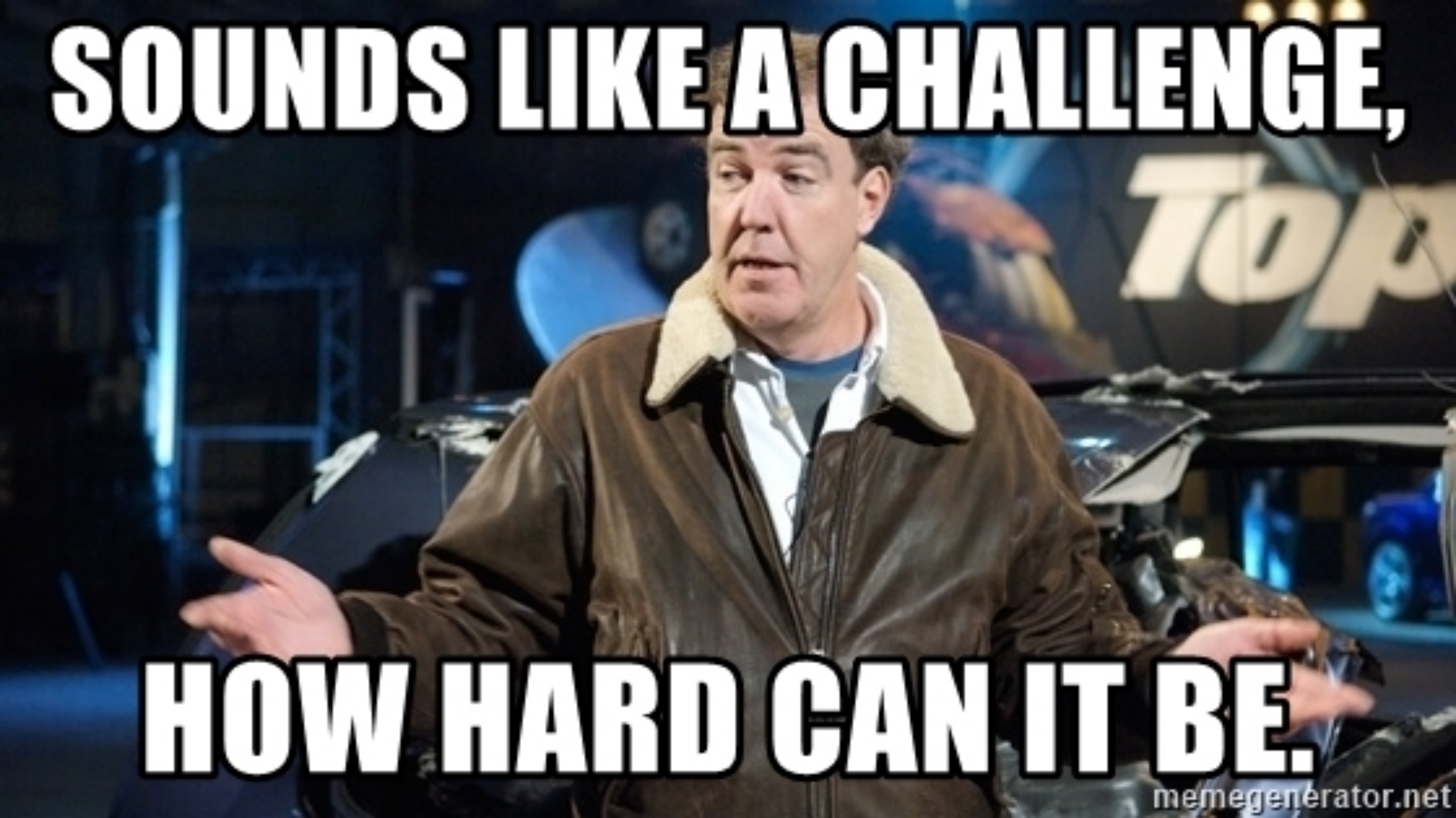
I'm the Stig table-flipping.

"Well," I said. "What happens if we choose different constraints?"


SOUNDS LIKE A CHALLENGE,
HOW HARD CAN IT BE.
memegenerator.net

well, not very hard.

Chris Dickinson & I implemented a usable take on ESM + CJS in node.

no mjs, parse entry points;

require module consumer know its api in advance

our aim was to prove with a bit of parsing

you could get a lot of usability

reception was mixed

BrendanEich

@BrendanEich

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This is good:

npm's proposal for supporting ES modules in node

npm's proposal for supporting ES modules in node

gist.github.com

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HONEYCAM

technical problems are easy

people problems are hard

what is node for?
how do we use node?
where is node going?

fundamental differences in answers
lead to fundamental differences in designs

talking

thinking

typing

the node modules problem needed more talking

I didn't want our solution adopted.
I wanted the talking phase restarted.


great news!

node has an unchartered modules team
doing the hard work of talking

it started with use cases

and it's continuing with some deep questions

see `github.com/nodejs/modules`

to understand how complicated the tradeoffs are

this brings us to the present state

ESM is not quite there yet, but soon!

if you are using babel in your build
you have no reason not to use ESM now

those of us not using Babel had
few options until recently

github.com/standard-things/esm

```
npm init esm -y
```

record scratch noise

```
npm install -g npm@latest
```

npm@6 has some goodies

like templated init

even better than `npm init -y`

`npm audit` & `npm audit fix`

report and automatically fix

known vulnerabilities in your dep tree

npm, Inc, is a company that sells goods and services

you can pay us to run a very nice
single-tenant registry for you

now back to modules...

ESM in node without a build step:

```
npm init esm -y
```

transpilation on the fly by monkey-patching the `module` object

```
require = require('esm')(module);
const Widget = require('./main.js').default;

// over in main.js
import fs from 'fs';
import cjs from './cjs.js';
const esm = require('./esm.js');
export default class Widget { ... }
```

Q: Was that transparent interop?

A: I believe it was, Bob.

std/esm sets the tradeoff dial to max parsing for a lot of features

is std/esm the future? not exactly.

unclear where the tradeoff dial will point.

so what is the future of modules?

the future of node is front-end

the future of node is using common standards

learn the syntax now if you haven't yet

future-you will assume ESM not CJS

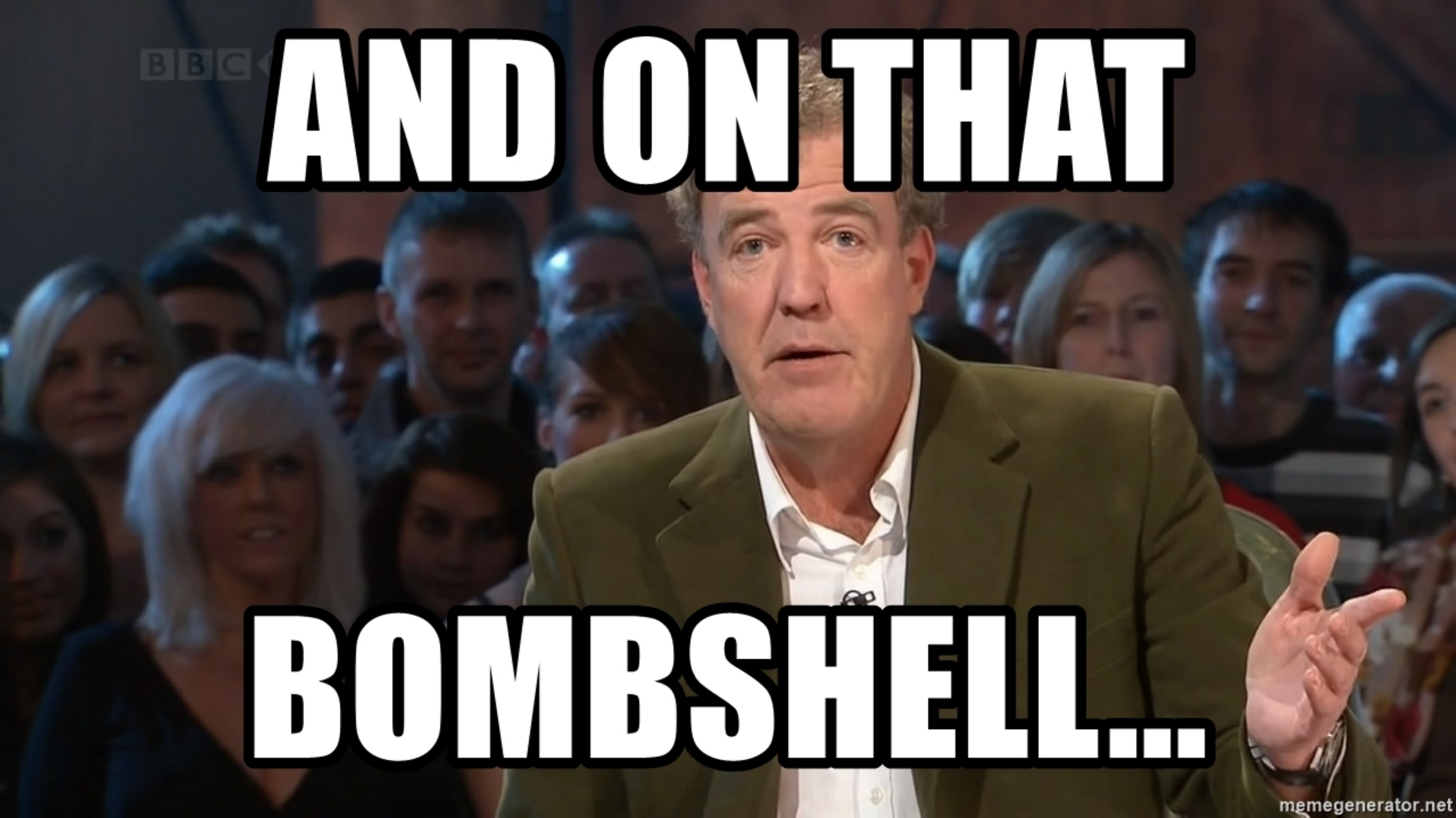
CommonJS modules won't go away
you'll just use fewer of them

migrate when you have a reason

don't migrate now if you don't need to

the future of js modules is ESM

and it will be just fine


AND ON THAT
BOMBSHELL...
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you

github/ceejbot/future-of-modules