

# Fullstack Development

# Module

- Mechanisms for splitting JavaScript programs up into separate "pieces".
- When JavaScript modules first came into use, different developers created their own solutions.
  - Asynchronous Module Definition (AMD)
  - Universal Module Definition (UMD)
  - **CommonJS**
  - **ES Modules**

# CommonJS vs ES Modules

# CommonJS

- **Older** type of writing modules
- Popularized by `NodeJS`
  - `CommonJS` modules was the only supported style of modules in `NodeJS` up until version 12.

# Using CommonJS

- You can mark your file as a `CommonJS` module by either
  - Naming it with the `.cjs` extension
  - Using `type: "commonjs"` in `package.json` (default)

# CommonJS syntax

onefile.cjs

```
module.exports.add = function (a, b) {  
  return a + b;  
};
```

anotherfile.cjs

```
const { add } = require("./util");  
  
console.log(add(5, 5)); // 10
```

# EcmaScript (ES) Modules

- EcmaScript's standard way of writing modules.
  - Newer system
- Natively supported module style in browsers and all modern runtimes

# Using ESM

- You can mark your file as a `ES` module by either
  - Naming it with the `.mjs` extension
  - Using `type: "module"` in `package.json`



# ESM syntax

util.mjs

```
export function add(a, b) {  
  return a + b;  
}
```



app.mjs

```
import { add } from "./util.mjs"; // Note the extension is required.  
  
console.log(add(5, 5)); // 10
```

# Comparison

- Synchronous vs. asynchronous loading
  - CommonJS modules ➡ synchronous loading ➡ blocks execution
  - ESM modules ➡ asynchronous loading ➡ does not block execution.
- Static vs. dynamic imports
  - CommonJS ➡ dynamic imports ➡ less optimization
  - ESM ➡ static imports ➡ more optimization

# Comparison

- Compatibility
  - CommonJS  server-side
  - ESM  server-side + web browsers
- More [details](#)

# What about TypeScript?

- From [TypeScript Handbook](#)

In TypeScript, just as in ECMAScript 2015, any file containing a top-level import or export is considered a module.

- [Additional info](#)
- *This means we are actually using ESM.*

# TypeScript Output

- Let's take a look at <https://github.com/fullstack-67/pf-backend>
  - If you `npm run build` this project and inspect JavaScript files, you will see `CommonJS` module.
- The reason is in the `tsconfig.json`

```
{  
  "compilerOptions": {  
    "module": "commonjs"  
  }  
}
```

# Problem

Start encountering packages that start to drop CommonJS support.

- `nanoid`
  - <https://github.com/ai/nanoid/blob/main/CHANGELOG.md#40>
- `@auth/express`
  - <https://authjs.dev/reference/express#notes-on-esm>

**Let's do it the right (modern) way.**

# Steps

- `npm init -y`
- `pnpm install -D typescript @types/node nodemon`
- `pnpm install -D @tsconfig/node-lts` (Option)
- `pnpm install tsx`
  - Much better than `ts-node`, trust me.



# Steps

- `package.json`

```
{  
  "type": "module" <---- Note this change  
}
```

- `tsconfig.json`

- `nodemon.json`

- Notice that I used `tsx`, not `ts-node`

- Files in `src` folder

# Notes

- Inspect linked `@tsconfig/node-lts/tsconfig.json`:

```
{  
  "module": "node16"  
}
```

- I have to import with `js` extension. (*What!*)

```
import { msg } from "@src/lib.js";
```

- Run `npm run build` and inspect the output to see ESM module.

# Further

- **CommonJS** version
  - `git clone -b cjs https://github.com/fullstack-67/typescript-esm.git cjs`
- **nanoid** with ES module (*working*)
  - `git clone -b test-nanoid https://github.com/fullstack-67/typescript-esm.git test-nanoid`
- **nanoid** with CommonJS module (*not working*)
  - `git clone -b test-nanoid-cjs https://github.com/fullstack-67/typescript-esm.git test-nanoid-cjs`