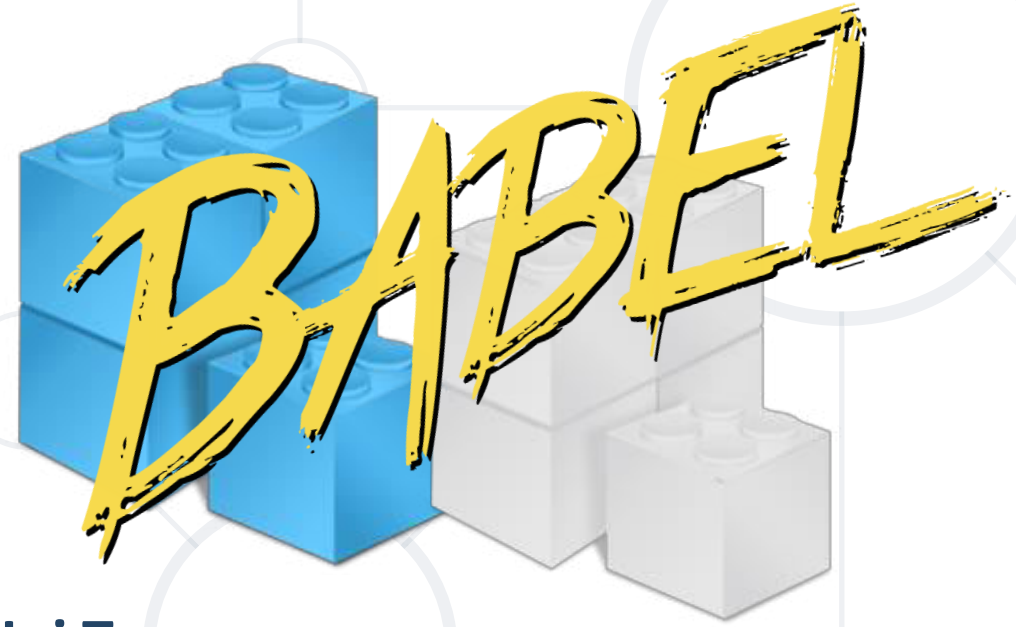
# Modules in JS

## Modules, Babel, RequireJS, Other JavaScript Module Systems

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# Table of Contents



# Have a Question?

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sli.do

#JSCORE

# Modular Code

## Concepts

# What is a Module?

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persons.js

```
class Person {
  constructor(name) {
    this.name = name;
  }
  toString() {
    return `I'm ${this.name}`;
  }
}
module.exports = Person;
```

app.js

```
let Person = require('./person');

let p = new Person('Pesho');
console.log(p.toString());
```

# Submitting Modules in the Judge

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- SoftUni Judge (https://judge.softuni.bg) submissions should consis t of a zip file, containing all required files
- Attach members as requested by the problem description as prope rties of the **result** object:

```
let Person = require('./person');
result.Person = Person;
```

- The entry point of your solution is always **app.js**

Check your solution here: https://judge.softuni.bg/Contests/342

# Modular Code

- Reduced global scope pollution
- Improved performance - only load the code that is needed
- Easier to maintain
- Interchangeable code - use parts of one application in another

# IIFE

- An Immediately-Invoked Function Expression
  - Maintains hidden state
  - Limits the exposure of variables

```
let count = (function() {
  let counter = 0;
  return function() { counter++; }
})();
```

# Revealing Module Pattern

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- Expands the IIFE concept
- Return objects with internal state and complex functionality

```
let revModule = (function() {
  let counter = 0; // private
  function increase(num) { counter += num; }
  function decrease(num) { counter -= num; }
  function value() { return count; }
  return { increase, decrease, value }; // public
})();
```


# Module Systems for JS

## Formats and Loaders

# Formats and Loaders

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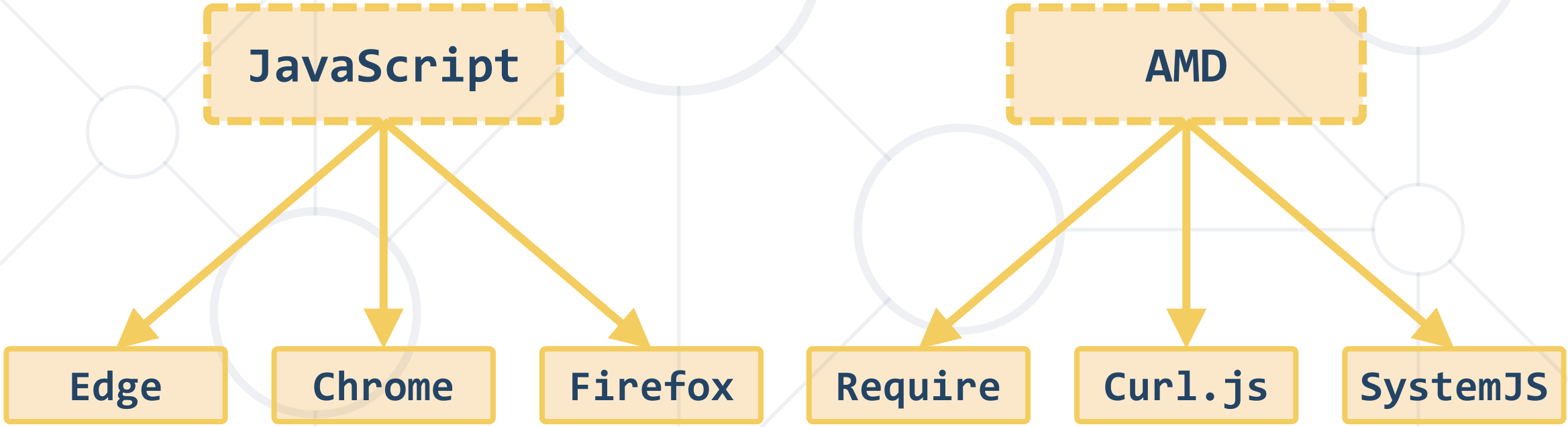
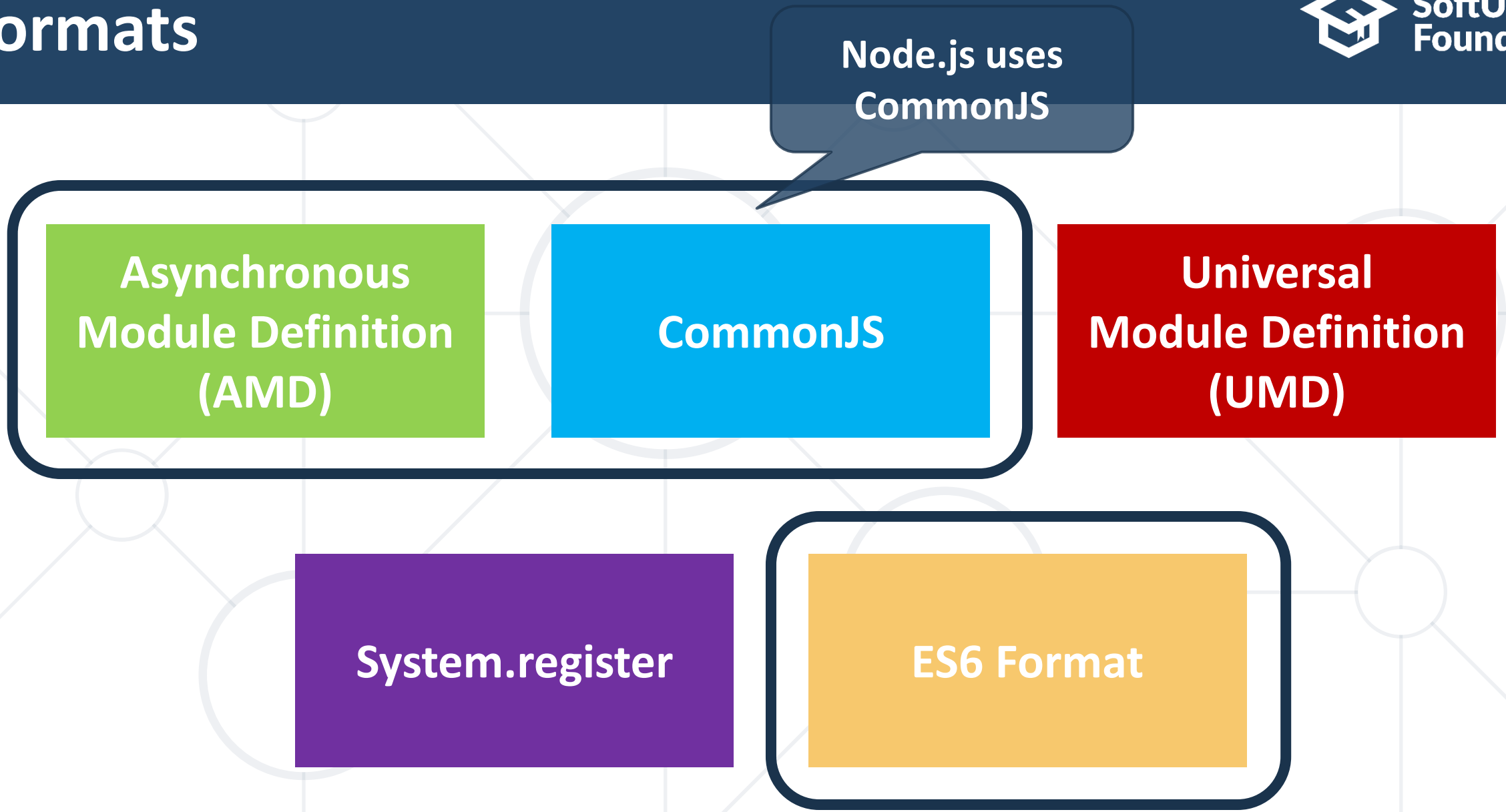
- Module Format → Syntax
- Module Loader → Execution



# Formats


Node.js uses CommonJS
Asynchronous Module Definition (AMD)
CommonJS
Universal Module Definition (UMD)
System.register
ES6 Format

# Loaders

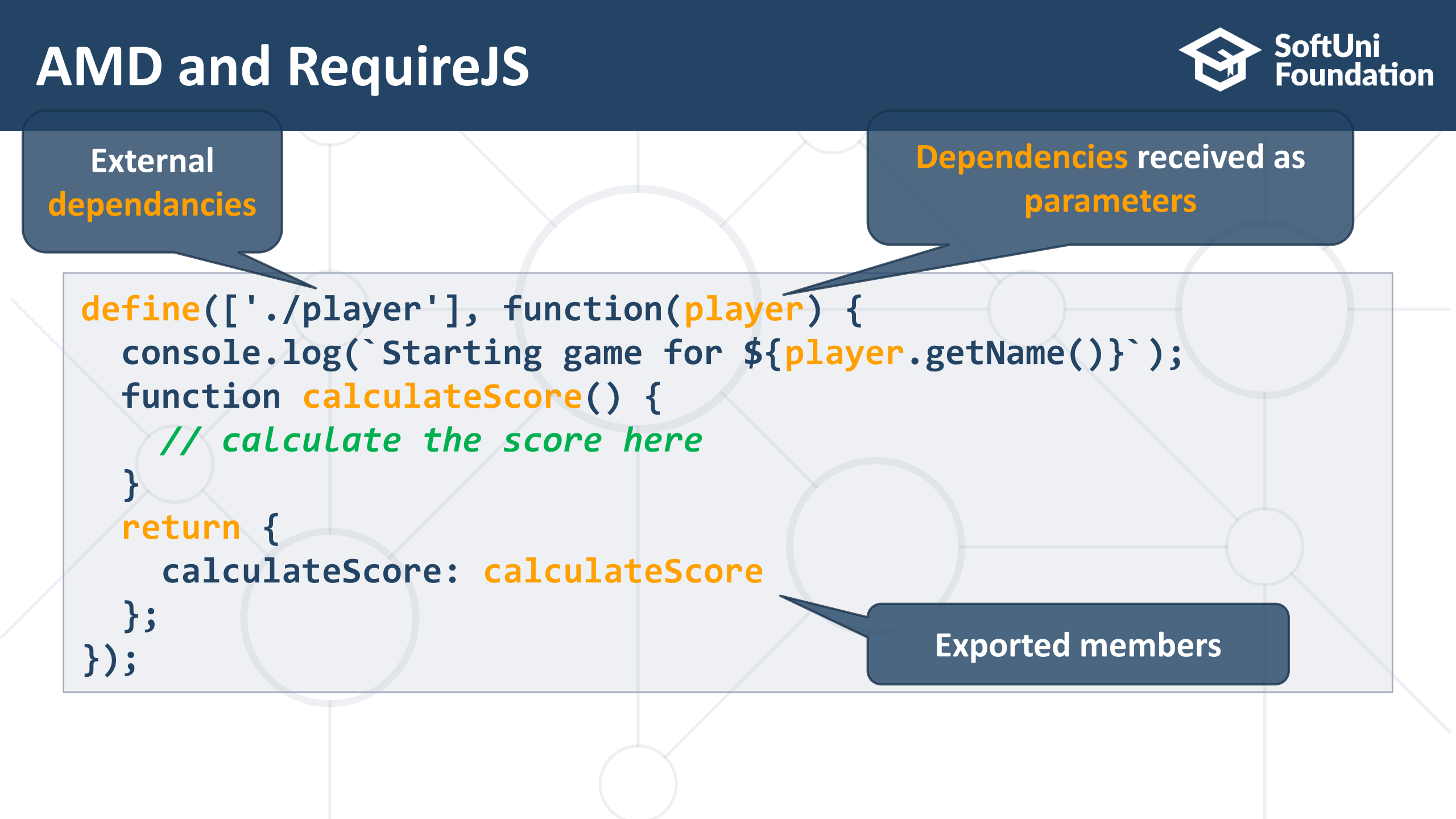
- RequireJS
  - Most popular for browsers
  - Works with AMD format


- SystemJS
  - Prefered on server-side implementations
  - Supports AMD, CommonJS, UMD, System.register
  - CommonJS is used by Node.js


# AMD and RequireJS

## Syntax and Configuration

# AMD and RequireJS




External dependancies

Dependencies received as parameters

```
define(['./player'], function(player) {
  console.log(`Starting game for ${player.getName()}`);
  function calculateScore() {
    // calculate the score here
  }
  return {
    calculateScore: calculateScore
  };
});
```

Exported members

# Installing RequireJS

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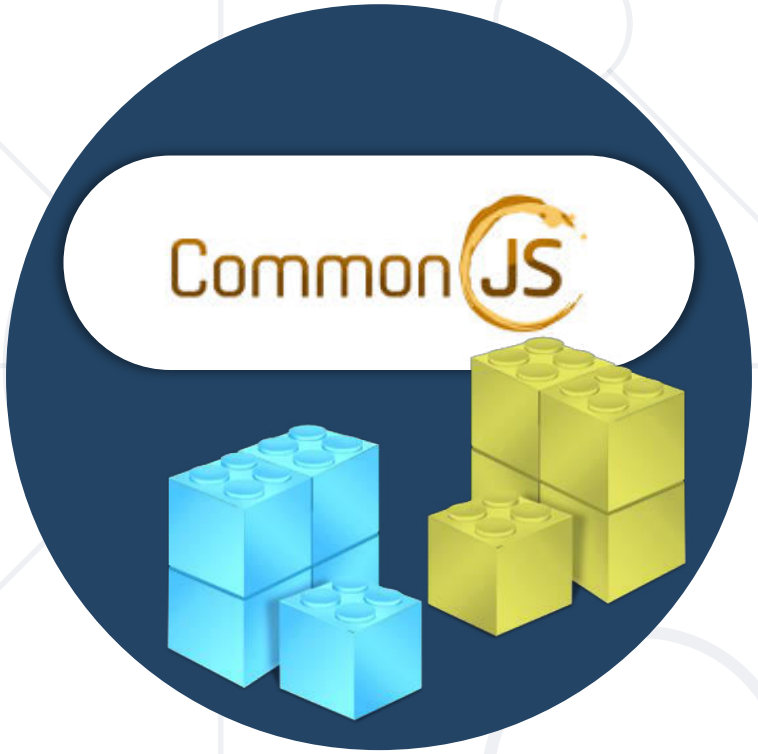
- Download RequireJS using WebStorm's terminal

```
npm install --save requirejs
```

- Or download from requirejs.org
- Use a script tag with **data-main** set to your app's path

```
<script data-main="./app.js"
src="node_modules/requirejs/require.js">
</script>
```

Note: It's best if your project has a **package.json** file.




# CommonJS and System.js

## Syntax and Configuration

# CommonJS and SystemJS

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External dependancies

```
let player = require('./player.js');

console.log(`Starting game for ${player.getName()}`);
function calculateScore() {
  // calculate the score here
}

exports.calculateScore = calculateScore;
```

Exported members

```
// module.exports === exports
```

# Installing SystemJS

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- Download SystemJS using WebStorm's terminal

```
npm install --save systemjs
```

- You can find documentation at SystemJS' github

- Node.js supports CommonJS format natively – you don't need to d ownload anything if you're writing a node module

Note: It's best if your project has a **package.json** file

# Configuring SystemJS

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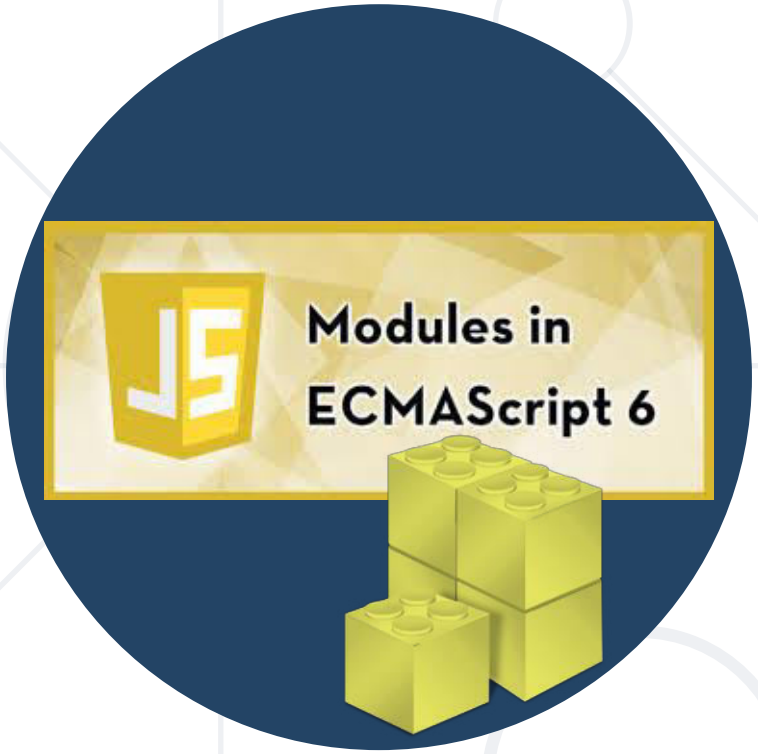
- Load the library in your host HTML

```
<script src="node_modules/systemjs/dist/system.js">
</script>
```

- Configure and load your app's path

```
<script>
  System.config({ meta: { format: 'cjs' } });
  System.import('./app.js');
</script>
```




# ES6 (Harmony) Modules

## Syntax and Configuration

# ES6 Native Modules

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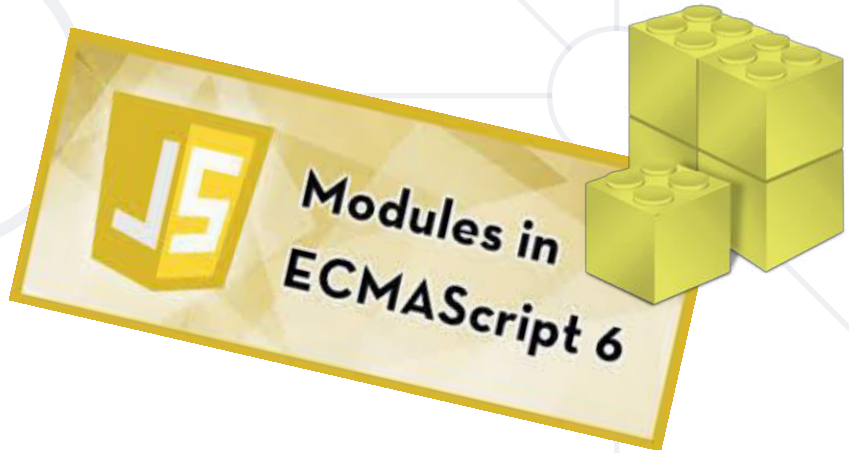
- Functions similar to module formats
  - Dependency management
  - Hide from scope and expose explicitly
  - Used from Angular, React, Ember
- Some major differences
  - Cleaner syntax
  - Slightly better performance



# ES6 Export Syntax

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- **export** → expose public API

```
export function updateScoreboard(newResult) { … }
export let homeTeam = 'Tigers';
```

- You can export multiple members

```
export { addResult, homeTeam as host };
```

- Default exports can be imported without a name

```
export default function addResult(newResult) { … }
```

# ES6 Import Syntax

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- **import** → load dependency

```
import * as scoreboard from './scoreboard.js';
scoreboard.updateScore(); // call from module
```

- Import specific members

```
import {addResult, homeTeam} from './scoreboard.js';
addResult(); // call directly by name
```

- Import default member by specifying alias

```
import addResult from './scoreboard.js';
addResult(); // call directly by name
```


# Transpilers

## Using Babel to Transpile ES6 Modules

# Workflow with Transpilers

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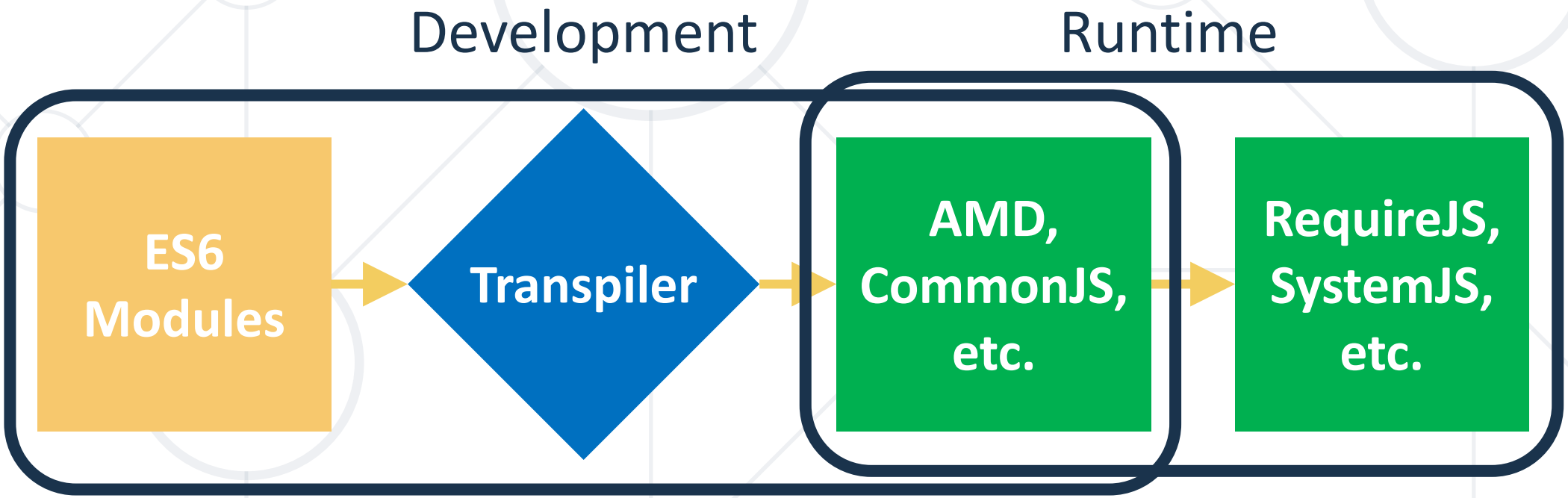
- Transpilers convert source code from one language to another
  - Or from one version to another of the same language



# Transpiling with Babel

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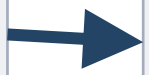
- Babel allows us to use the latest JS features in today's browsers
  - Creates clean and readable code
  - Integrates seamlessly into WebStorm

```
export function getScore() {
  // get score
}
```



```
Object.defineProperty(
  exports, "__esModule",
  { value: true });
exports.getScore = getScore;
function getScore() {
  // get score
}
```

# Installing Babel

- Download Babel-CLI globally using WebStorm's terminal

```
npm install --save-dev babel-cli -g
```

- Configure WebStorm with the correct path to **babel.cmd**
- You can find documentation at **babeljs.io**
- Babel requires plug-ins to work

Note: It's best if your project has a **package.json** file

# Babel Configuration Cheat Sheet (2)



- Quick settings:
  - Program: (path to) node_modules\.bin\babel.cmd
  - Arguments: $FilePathRelativeToProjectRoot$ --source-maps --out-dir build
  - Working dir: $ProjectFileDir$
  - Output paths: build

# Configuring for AMD and RequireJS



- Download the plugin from WebStorm's terminal

```
npm install --save-dev babel-plugin-transform-es2015-modules-amd
```

- Create a **.babelrc** configuration file in the project's root

```
echo { "plugins": ["transform-es2015-modules-amd"] } > .babelrc
```

- To load the resulting files, you also need RequireJS installed

Note: It's best if your project has a **package.json** file

# Configuring for CommonJS and SystemJS


- Download the plugin from WebStorm's terminal

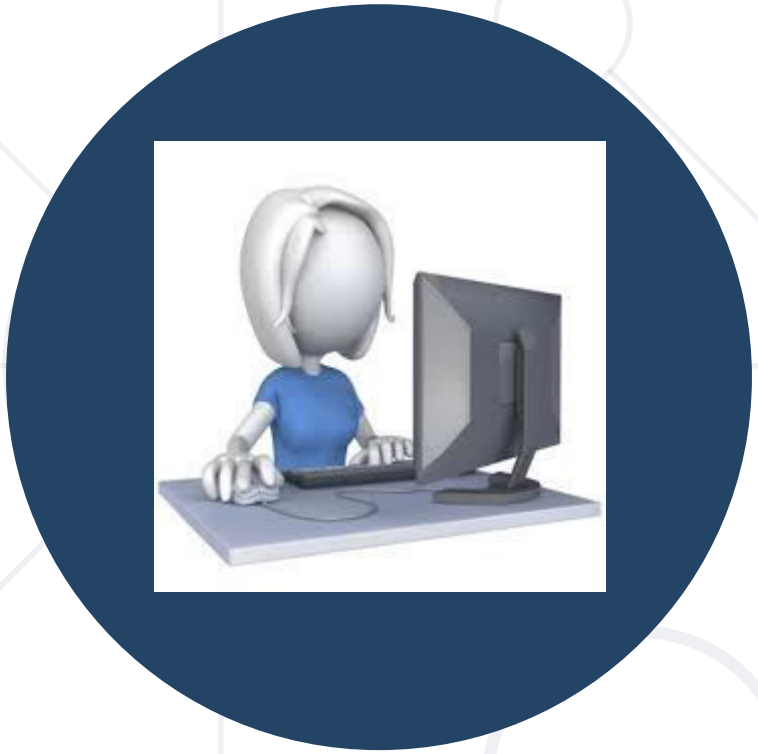
```
npm install --save-dev babel-plugin-transform-es2015-modules-commonjs
```

- Create a **.babelrc** configuration file in the project's root

```
echo { "plugins": ["transform-es2015-modules-commonjs"] } > .babelrc
```

- To load the resulting files, you also need SystemJS installed

Note: It's best if your project has a **package.json** file



# Live Exercises in Class (Lab)

## Practice: Writing Modular Code

# Summary



- Modular code improves workflow
- JS files can be loaded with external libraries
- ES6 gives us built-in module support

```
import addResult from './scoreboard';
export { homeTown as host };
```

- Use the latest features today with Transpilers

# Questions?

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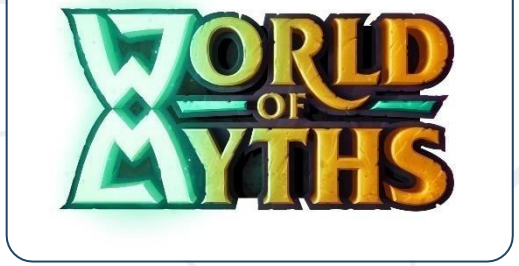



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