# Full Stack JS Tools

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## Outline

- **ES2015+** review
- **Node.js** overview
- **npm** overview
- JavaScript tools: **ESLint**, **Prettier**, **Babel**

## JavaScript

- Can be used on client-side and server-side (with Node.js)
- Large pool of experienced developers
- Language has improved dramatically
  since ES6 was standardized
  and it continues to evolve
- If types are desired, use TypeScript or Flow

# ES2015+ Review ...

**ES6**

**ECMAScript 2015**

- Justing hitting the high points
- **Block Scope** - `const` and `let`
  - variables scoped to block where declared
  - value of `const` variables cannot be changed; preferred over `let`
  - stop using `var`

```
const SIZE = 13;
let score = 0;
```

- **Destructuring**
  - extracts values from arrays and object

```
const [first, , third] = myArr;
const {name, age} = person;
function validatePerson({name, age}) {
  ...
}
```

- **Arrow Functions**
  - more compact syntax, especially for short functions
  - value of `this` is same as surrounding context

```
function add(n1, n2) {
  return n1 + n2;
}

const add = (n1, n2) => n1 + n2;
```

- **Template Literals**
  - alternative to concatenation for embedding expression values in strings

```
const msg = `Email ${email} or text ${cellNumber}`;
```

# … ES2015+ Review …

- **Spread Operator**
  - spreads array elements inside another array
  - spreads object key/value pairs inside another object

```
const newArr = [7, ...oldArr, 13];
const newPerson = {
  ...oldPerson,
  age: 21,
  firstName: 'Danielle'
};
```

last in wins

- **Enhanced Object Literals**
  - shorthand for specifying key/value pairs when a variable with same name as key exists
  - expressions can be used to specify keys

```
const name = 'Mark';
const key = 'height';
const person = {
  name,
  [key]: 74
};
```

- **Classes**
  - better syntax than defining classes in ES5
  - just syntactic sugar; still uses prototypal inheritance

```
class Employee extends Person {
  constructor() { ... }
  getYears() { ... }
}
```

perhaps calculated from hire date

## ... ES2015+ Review

- **Modules**
  - export variables, functions, and classes
  - import these in another source file
- **async/await**
  - make it easier to work with promises

```
export const name = expression;
export function name(params) { ... };
export class name { ... };
export name; // for something previously defined
// Can add "default" after "export" in any of above.

import {name1, name2, ...} from 'path';
import name from 'path'; // imports default
import name, {name1, name2, ...} from 'path';
```

```
async function getPerson(url) {
  const res = await fetch(url);
  const obj = await res.json();
  obj.name = `${obj.firstName} ${obj.lastName}`;
  return obj;
}
async function processPerson() {
  try {
    const person = await getPerson(someUrl);
    // Do something with person.
  } catch (e) {
    console.error(e.message);
  }
}
processPerson();
```

`await` can only be used in `async` functions

if a promise rejects, `catch` is entered

## Node.js

https://nodejs.org

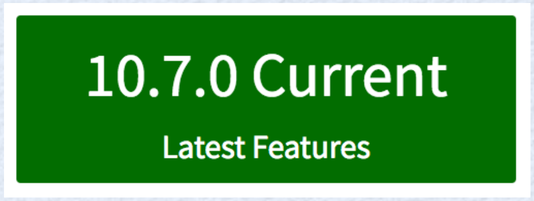
- **JavaScript runtime** built on Chrome V8 JavaScript engine
- Uses event-driven, non-blocking I/O model
  that makes it **lightweight and efficient**
- "Designed to build scalable network applications" from https://nodejs.org/#about
  - like HTTP servers
- Implemented in **C++ and JavaScript**
- Supported on **Linux, macOS, and Windows**

## Why Consider Node.js?

- Front-end developers are likely already experienced in JavaScript
- Using Node allows them to
  more easily participate in full-stack development
  since no mental shift in programming language is needed
- **Express** package make it easy to implement REST services
  - very little code is needed and learning it is easy
- Fast enough for nearly all applications
  - amazing how only using multithreading for I/O is enough
- Server startup time is very fast
  - ideal for iterative development
- Node.js is widely used, well-tested, and well-supported

## Installing and Running Node

- To install
  - browse https://nodejs.org/
  - click large, green box for “Current” to download installer
  - double-click downloaded installer and follow instructions



- To verify
  - open terminal window (or Command Prompt in Windows)
  - enter “**`node -v`**” to see version installed
- To run REPL, enter **`node`**
  - enter JavaScript statements
  - to exit, enter **`.exit`** or press ctrl-d
- To execute source code in a file, enter **`node`** ***`file-path`***

demo.js

```
console.log('in demo.js');
```

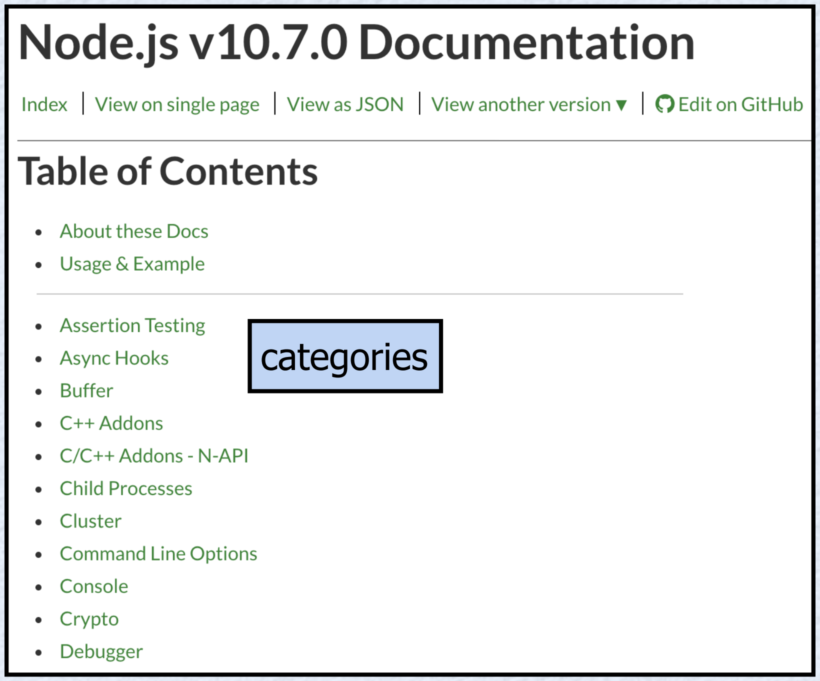
# Node API

- Node ships with many builtin modules
- For documentation
  - click "DOCS" at top of https://nodejs.org/
  - click a version link such as "v10.7.0 API"
  - click a category in left nav
- "File System" Example

```
const fs = require('fs');

const obj = {
  color: 'yellow',
  number: 19,
  favorite: true
};

fs.writeFile(
  'data.json',
  JSON.stringify(obj),
  err => {
    if (err) {
      console.error(err);
    } else {
      console.log('done');
    }
  }
);
```



Node.js v10.7.0 Documentation

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# npm Overview

https://www.npmjs.com/

- Purpose
  - installs Node packages
  - manages dependencies in **`package.json`** file
    - three kinds
    - **`dependencies`** are needed at runtime
    - **`devDependencies`** are used by developers
    - **`peerDependencies`** are expected to be installed upstream
  - scripts common tasks
  - also learn about **`package-lock.json`** files
    for repeatable builds
- Automatically installed when Node.js is installed
  - can also install separately
- Initially an acronym for Node Package Manager

# Common npm Commands

- **`npm init`** - asks questions and creates **`package.json`** (detail on next slide)
- **`npm install`** ***`name`*** - installs specified package as <u>runtime</u> dependency
  - updates **`dependencies`** in **`package.json`**

    installs in local **`node_modules`** directory
- **`npm install -D`** ***`name`*** - installs specified package as <u>development</u> dependency
  - updates **`devDependencies`** in **`package.json`**

    installs in local **`node_modules`** directory
- **`npm install -g`** ***`name`*** - installs specified package globally
  - to find out where, **`npm root -g`**
- **`npm install`** - installs all dependencies listed in **`package.json`**
  - and creates **`package-lock.json`** file

    installs in local **`node_modules`** directory
- **`npm run`** ***`script-name`*** - runs an npm script
- Other notable commands
  - **`help`**, **`update`**, **`publish`**, **`uninstall`**

can omit **`run`** for special script names including **`install`**, **`prepare`**, **`publish`**, **`start`**, **`restart`**, **`stop`**, **`test`**, **`uninstall`**, **`version`**, plus **`pre`** and **`post`** versions of most of these

Also learn about the **`npx`** command!

# `package.json` Properties

- **`name`**
- **`version`** - uses semver conventions (***`major.minor.patch`***)
- **`description`**
- **`repository`** - typically a GitHub URL
- **`main`** - primary entry point; often **`index.js`**
- **`dependencies`** - packages needed at runtime
- **`devDependencies`** - packages needed by developers, but not at runtime
- **`peerDependencies`** - packages expected to be installed upstream
- **`scripts`** - to automate common tasks
- Less important properties: **`author`**, **`homePage`**, **`keywords`**, **`engines`**
- For more detail, see https://docs.npmjs.com/files/package.json

**`1.2.3`** means exactly this version
**`~1.2.3`** means **`1.2.x`**
where **`x`** >= 3
**`^1.2.3`** means **`1.x.y`**
where **`x`** = 2 and **`y`** >= 3
or **`x`** > 2 and **`y`** is anything

# npm Scripts

- Defined in **`package.json`**
- Can write in a way that works on Windows and *nix platforms
  - **shx** - "Portable Shell Commands for Node"
    - https://github.com/shelljs/shx

    also see **shelljs** at https://shelljs.org
  - **cross-env** - "Run scripts that set and use environment variables across platforms"
    - https://github.com/kentcdodds/cross-env

    also see **cross-run** at https://github.com/sheerun/cross-run
- Examples

```
"build": "npm-run-all verify bundle",
"bundle": "webpack",
"clean": "rm -rf build coverage",
"cover": "jest --coverage",
"cover-open": "open coverage/lcov-report/index.html",
"flow": "flow",
"format": "prettier --write 'src/**/*.js'",
"lint": "eslint --quiet src --ext .js",
"prepush": "npm run verify",
"sync": "browser-sync start --server --files 'index.html' 'build/bundle.js'",
"test": "jest --watch src",
"verify": "npm-run-all lint flow cover"
```

`npm install -D npm-run-all`

!Windows; can use shx

!Windows, consider https://www.npmjs.com/package/opener

git hook processed by Husky

See ModernJSTools.key.pdf at https://github.com/mvolkmann/talks for more detail on tools used here.

# ESLint Overview

http://eslint.org/

- “The pluggable linting utility for JavaScript and JSX”
- Can report many syntax errors and potential run-time errors
- Can report deviations from specified coding guidelines
- For TypeScript, consider TSLint

# ESLint Details

- Error messages identify violated rules,
  making it easy to adjust them if you disagree
- Has `--fix` mode that can fix violations of many rules
  - modifies source files
- To install, `npm install -D eslint babel-eslint`

"You only need to use **babel-eslint** if you are using **types** (Flow) or **experimental features** not supported in ESLint itself yet."

- To use from an npm script, add following to `package.json`

```
"lint": "eslint --quiet src --ext .js",
```

`--quiet` only reports errors

- Editor/IDE integrations available
  - Atom, Eclipse, emacs, Intellij IDEA, Sublime, VS Code, Vim, WebStorm

may also want `eslint-plugin-flowtype`, `eslint-plugin-html`, and `eslint-plugin-react`

# ESLint Rules

- No rules are enforced by default
- Desired rules must be configured
  - can download configuration files shared by others
- See list of current rules at http://eslint.org/docs/rules/
- Configuration file formats supported
  - JSON - `.eslintrc.json`; can include JavaScript comments; most popular
  - JavaScript - `.eslintrc.js`
  - YAML - `.eslintrc.yaml`
  - inside `package.json` using `eslintConfig` property
  - use of `.eslintrc` containing JSON or YAML is **deprecated**

see mine at https://github.com/mvolkmann/MyUnixEnv/blob/master/**.eslintrc.json**

# Prettier Overview

https://github.com/prettier/prettier

- "An opinionated JavaScript formatter ...
  with advanced support for language features
  from ES2017, JSX, Flow, TypeScript, CSS, LESS, and SCSS"
- "Parses your JavaScript into an AST and pretty-prints the AST, completely ignoring any of the original formatting"
  - "Well actually, **some original styling is preserved** when practical - see empty lines and multi-line objects."
- Can also format JSON, Markdown, and more

# Prettier Details

- To install, **`npm install -D prettier`**
- To use from an npm script, add following to **`package.json`**

```
"format": "prettier --no-bracket-spacing --single-quote --write 'src/**/*.{css,js}'",
```

Must have quotes around glob path!
(see https://prettier.io/docs/en/cli.html)

  - to format all matching files under **`src`** directory, enter **`npm run format`**
  - **`--write`** option overwrites existing files with formatted versions
- Can also configure in **`.prettierrc`** file

```
{
  "bracketSpacing": false,
  "singleQuote": true
}
```

- Doesn't run on files under **`node_modules`** by default
- Editor/IDE integrations available
  - Atom, Emacs, JetBrains, Sublime, Vim, VS Code

# Prettier Options

- **`--jsx-bracket-same-line`**
  - puts closing > of JSX start tags on last line instead of on new line

```
<something
  prop1="value1"
  prop2="value1"
  prop3="value1"
  prop4="value1"
>
  content
</something>
```

vs.

```
<something
  prop1="value1"
  prop2="value1"
  prop3="value1"
  prop4="value1">
  content
</something>
```

- ☆ **`--no-bracket-spacing`**
  - omits spaces between brackets in object literals

```
{ foo='1' bar=true }
```

vs.

```
{foo='1' bar=true}
```

- **`--no-semi`** - omits semicolons
- **`--print-width n`** - defaults to 80
- ☆ **`--single-quote`**
  - uses single quotes instead of double quotes for string delimiters
- **`--tab-width n`** - defaults to 2
- **`--trailing-comma`**
  - adds trailing commas wherever possible; defaults to none
- **`--use-tabs`** - uses tabs instead of spaces for indentation
- and more lesser used options

# Babel Overview

https://babeljs.io/

- Transpiles JavaScript code to different JavaScript code
- Can use newer JS features in environments that don't support them yet
  - reads modern JS code and generates JS code that runs in older environments
  - ex. **ES modules**
- Can use JS features not yet finalized by ECMAScript (via plugins)
  - ex. `String` `trimStart` and `trimEnd` methods stage 3 proposal
- Can use features that may never be part of ECMAScript
  - ex. **Flow** for type checking

- **TypeScript** also provides transpiling

# Babel Details

- To install, **`npm install -D babel-cli babel-preset-env`** described on next slide
- To use from an npm script, add following to **`package.json`**

```
"babel": "babel src -d build"
```

  - not needed if using **`webpack`** and **`babel-loader`**

# Babel Plugins

- Recommended plugins
  - **babel-preset-env**
    - "automatically determines the Babel plugins you need based on your supported environments"
    - can target specific browser and Node.js versions
    - https://babeljs.io/docs/plugins/preset-env/
  - **babel-plugin-transform-flow-strip-types**
    - removes Flow type declarations from **`.js`** files
    - https://babeljs.io/docs/plugins/transform-flow-strip-types/
- To use a plugin
  - install with npm as a dev dependency
  - configure in **`.babelrc`** (see next slide)

environments are specified in **`.babelrc`**

# Babel Configuration

- In `.babelrc` file
- Example

```
{
  "presets": [
    ["env", {
      "targets": {
        "browsers": ["last 2 versions"],
        "node": "8.9"
      }
    }]
  ],
  "plugins": [“transform-flow-strip-types"]
}
```

only need when transpiling code to run in a browser

only need when transpiling code to run in Node.js

only need when using Flow types