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JavaScript Development Environments

JavaScript

JavaScript and React (CRA)

Run all tests with Filewatch

If you create you react app using `npx create-react-app my-react-app` then this all tests with filewatch is the default for the npm `test` script. From the terminal just enter the following command

```
npm test
```

Debug All Tests

Add the following code to your `launch.config`

```
{
  "name": "Debug CRA Tests",
  "type": "node",
  "request": "launch",
  "runtimeExecutable": "${workspaceRoot}/node_modules/.bin/react-scripts",
  "args": ["test", "--runInBand", "--no-cache", "--watchAll=false"],
  "cwd": "${workspaceRoot}",
  "protocol": "inspector",
  "console": "integratedTerminal",
  "internalConsoleOptions": "neverOpen",
  "env": { "CI": "true" },
  "disableOptimisticBPs": true
}
```

Debug Single Test File

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Typescript

Setup

JavaScript/Typescript Project Structure

Command	Details
`package.json`	Describes a project's top-level dependencies. These are packages that have been added to a project using `npm install`
`package-lock.json`	All package dependencies for the project
`tsconfig.json`	TypeScript compiler configuration

Node Packages

Package	Description
`typescript`	The typescript compiler
`jest`	JavaScript testing framework
`tsc-watch`	Run a script specified in `package.json`
`ts-jest`	Enable us to use Jest with TypeScript

TypeScript Compiler Options (tsconfig.json)

Package	Description
`target`	The version of JavaScript to transpile to
`module`	The JavaScript module format. Some environments such as node do not support ES2015 modules so specifying `commonjs` tells the compiler to generate older module code
`lib`	Tell TypeScript that certain APIs will be available in the environment in which the code will run. Examples such as DOM's `document.querySelector`
`outDir`	The directory into which we will put the transpiled JavaScript.
`include`	The folders to look in for TypeScript files

The following listing shows an example tsconfig.json file.

Listing 1 tsconfig.json

```
{
    "compilerOptions": {
        "target": "ES2018",
        "outDir": "./dist",
        "noEmitOnError": true,
        "sourceMap": true,
        "module": "commonjs"
    }

}
```

Development Template

This section shows how to setup a TypeScript development environment with the following benefits.

- Automatically transpile TypeScript files as they change.
- Unit testing with Jest.
- Debugging individual unit tests with Jest Visual Studio Code Plugin.

PACKAGE.JSON

```
{
  "name": "tools",
  "version": "1.0.0",
  "description": "",
  "main": "index.js",
  "scripts": {
    "test": "npx jest --watchAll",
    "start": "tsc-watch --onsuccess \" node dist/index.js\""
  },
  "keywords": [],
  "author": "",
  "license": "ISC",
  "devDependencies": {
    "tsc-watch": "^4.2.3",
    "typescript": "^3.8.3"
  }
}
```

The bold lines specify scripts that can be run by npm. We have added a script called start that monitors files for change and executes the index.js when changed files have been compiled

Typescript – Review to delete

Debugging

If we want to debug in VSCode we need to add a folder called `.vscode` into which we add a file called `launch.json`

```
{
    // Use IntelliSense to learn about possible attributes.
    // Hover to view descriptions of existing attributes.
```

```
    // For more information, visit: https://go.microsoft.com/fwlink/?link
id=830387
    "version": "0.2.0",
    "configurations": [
        {
            "type": "node",
            "request": "launch",
            "name": "Launch Program",
            "program": "${workspaceFolder}\\dist\\index.js",
        }
    ]
}
```

We can then run our debugger using F5 in visual studio code

Unit Testing

Unit testing with Jest consists of two parts. The first part is to setup a configuration file called `jest.config.js` at the root level of our project. The following is a good example.

```
module.exports = {
    "roots": ["src"],
    "transform":{"^.+\\.tsx?$": "ts-jest"}
}
```

Then we simply add tests in our source code folder. If we have a module called `adder.ts` as follows

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

We can create a test called `adder.test.ts` as follows

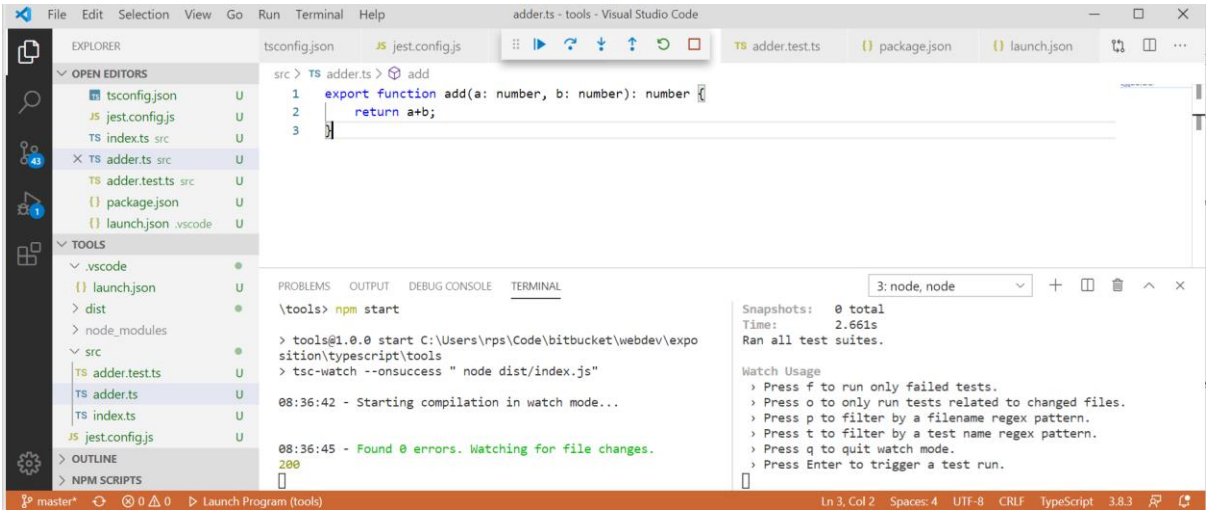
```
import {add} from "./adder";

test("do a test", () => {
    let result = add(10,5);
    expect(result).toBe(15);
})
```

Putting it together

Often it is useful to have two terminal windows: one with a file watcher compiling and running our application and one running the tests.

```
npm start
npm test
```


File Edit Selection View Go Run Terminal Help
adder.ts - tools - Visual Studio Code
EXPLORER
OPEN EDITORS
tsconfig.json
jest.config.js
index.ts src
adder.ts src
adder.test.ts src
package.json
launch.json .vscode
TOOLS
.vscode
launch.json
dist
node_modules
src
adder.test.ts
adder.ts
index.ts
jest.config.js
OUTLINE
NPM SCRIPTS
src > adder.ts > add
1 export function add(a: number, b: number): number {
2 return a+b;
3 }
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
3: node, node
\tools> npm start
> tools@1.0.0 start C:\Users\rps\Code\bitbucket\webdev\exposition\typescript\tools
> tsc-watch --onsuccess " node dist/index.js"
08:36:42 - Starting compilation in watch mode...
08:36:45 - Found 0 errors. Watching for file changes.
200
Snapshots: 0 total
Time: 2.661s
Ran all test suites.
Watch Usage
› Press f to run only failed tests.
› Press o to only run tests related to changed files.
› Press p to filter by a filename regex pattern.
› Press t to filter by a test name regex pattern.
› Press q to quit watch mode.
› Press Enter to trigger a test run.
master* 0 0 Launch Program (tools)
Ln 3, Col 2 Spaces: 4 UTF-8 CRLF TypeScript 3.8.3

Specified Single File

We need to make sure we have the typescript compiler installed.

```
npm init -yes
npm install --save-dev typescript
```

We need to create a typescript compiler configuration file

Listing 2 tsconfig.json

```
{
    "compilerOptions": {
        "target": "ES2018", ❷
        "outDir": "./dist",
        "rootDir": "./src",
        "noEmitOnError": true,
        "sourceMap": true,
        "module": "commonjs" ❶
    }
}
```

❶ **module format**	Some environments such as node do not support ES2015 modules so specifying `commonjs` tells the compiler to generate older module code
❷ **target**	The version of JavaScript to target

Compile

When we run tsc from the command line with no arguments it will compile TypeScript source files in the `rootDir` to JavaScript files in the `outDir`

```
npx tsc
```

Run specified single File

We run JavaScript and not TypeScript, so the command is then

```
node dist/hello.js
```

RUN SPECIFIED SINGLE FILE WITH WATCH

To run typescript in watch mode we need an extra package called `tsc-watch`

```
npm install –save-dev tsc-watch
```

We then need to add a line to the scripts section in our `package.json`

```
"scripts": {
    "test": "npx jest --watchAll",
    "start": "tsc-watch --onsuccess \" node dist/hello.js\""
  },
```

Selected File

RUN/DEBUG SPECIFIED FILE NO WATCH

Setup the **`lauch.json`** with a configuration as follows.

```
{
    "version": "0.2.0",
    "configurations": [
        {
            "type": "node",
            "request": "launch",
            "name": "Run/Debug Open File",
            "skipFiles": [
                "<node_internals>/**"
            ],
            "program": "${file}",
            "preLaunchTask": "tsc: build - tsconfig.json",
            "outFiles": [
                "${workspaceFolder}/**/*.js"
            ]
        }
    ]
}
```

You can then run/debug the current file using `Ctrl-F5` or `F5`

Jest

RUN ALL TESTS NO WATCH

To use jest with typescript we need the following

```
npm install --save-dev jest
npm install --save-dev @types/jest
npm install --save-dev @babel/preset-typescript
```

We also need a file called `babel.config.js`

```
module.exports = {
    presets: [
      ['@babel/preset-env', {targets: {node: 'current'}}],
  +    '@babel/preset-typescript',
    ],
  };
```

Finally, we run the tests as follows in the terminal

```
npx jest
```

RUN ALL TESTS WITH WATCH

```
npx jest --watchAll
```

RUN SINGLE FILE TEST NO WATCH

Run the test in `hello2.test.ts` Note we miss off the .ts from the filename

```
npx jest hello2.test
```

RUN SINGLE FILE TEST WATCH

```
npx jest hello2.test--watch
```

DEBUG/RUN SINGLE TEST FILE NO WATCH

Add the following configuration to `launch.json`

```
        {
            "name": "Run/Debug Open Test",
            "type": "node",
            "request": "launch",
            "runtimeExecutable": "${workspaceRoot}/node_modules/.bin/jest
.cmd",
            "args": [
                "--runInBand",
                "--watchAll=false",
                "${fileBasenameNoExtension}"
            ],
            "cwd" : "${workspaceFolder}",
            "protocol": "inspector",
            "console": "integratedTerminal",
            "internalConsoleOptions": "neverOpen"
        }
```

DEBUG/RUN SINGLE TEST FILE WITH WATCH

Add the following configuration to `launch.json`

```
        {
            "name": "Run/Debug Open Test",
            "type": "node",
            "request": "launch",
            "runtimeExecutable": "${workspaceRoot}/node_modules/.bin/jest
.cmd",
            "args": [
                "--runInBand",
                "--watchAll=true",
                "${fileBasenameNoExtension}"
            ],
            "cwd" : "${workspaceFolder}",
            "protocol": "inspector",
            "console": "integratedTerminal",
            "internalConsoleOptions": "neverOpen"
        }
```

CODECOVERAGE

```
npx jest --coverage
```

React

The following sections assume the project was setup using

```
npx create-react-app my-app --template typescript
```

RUN ALL TESTS NO WATCH

To use jest with typescript we need the following

```
npm install --save-dev jest
npm install --save-dev @types/jest
npm install --save-dev @babel/preset-typescript
```

We also need a file called `babel.config.js`

```
module.exports = {
    presets: [
      ['@babel/preset-env', {targets: {node: 'current'}}],
  +    '@babel/preset-typescript',
    ],
  };
```

Finally, we run the tests as follows in the terminal

```
npx jest
```

RUN ALL TESTS WITH WATCH

```
npx jest --watchAll
```

RUN SINGLE FILE TEST NO WATCH

Run the test in `hello2.test.ts` Note we miss off the .ts from the filename

```
npx jest hello2.test
```

RUN SINGLE FILE TEST WATCH

```
npx jest hello2.test--watch
```

Debug/Run Single Test File No Watch

Add the following configuration to `launch.json`

```
        {
            "name": "Run/Debug Open Test",
            "type": "node",
            "request": "launch",
            "runtimeExecutable": "${workspaceRoot}/node_modules/.bin/jest
.cmd",
            "args": [
                "--runInBand",
                "--watchAll=false",
                "${fileBasenameNoExtension}"
            ],
            "cwd" : "${workspaceFolder}",
            "protocol": "inspector",
            "console": "integratedTerminal",
            "internalConsoleOptions": "neverOpen"
        }
```

Debug/Run Single Test File With Watch

Add the following configuration to `launch.json`

```
        {
            "name": "Run/Debug Open Test",
            "type": "node",
            "request": "launch",
            "runtimeExecutable": "${workspaceRoot}/node_modules/.bin/jest
.cmd",
            "args": [
                "--runInBand",
                "--watchAll=true",
                "${fileBasenameNoExtension}"
            ],
            "cwd" : "${workspaceFolder}",
            "protocol": "inspector",
            "console": "integratedTerminal",
            "internalConsoleOptions": "neverOpen"
        }
```

Code Coverage

```
npx jest --coverage
```

React

This section assumes react with typescript was installed with

```
npx create-react-app my-app --template typescript
```

RUN ALL TESTS WITH WATCH

Simply run the following from the VSCode terminal

```
npm run tests
```

RUN SINGLE TEST WITH WATCH

If the test file is called maths.test.js we enter the command on the terminal

```
npm run test maths.test
```

DEBUG SINGLE TEST