JavaScript Development Environments

JavaScript

Specified Single File

Run

Open a terminal and enter the command.

```
node hello.js
```

Run and Watch

Setup package.json if you have not already

```
npm init --yes
```

Install the `nodemon` node package as a development dependency.

```
npm install --save-dev nodemon
```

If we want to run the dev dependency from the terminal we use the `npx` command

```
npx nodemon hello.js
```

Run as Script

As we install it as a dev dependency, we can only run it from the scripts section of package.json

```
{
  "name": "JS",
  "version": "1.0.0",
  "description": "",
  "main": "test.js",
  "scripts": {
    "test": "echo \"Error: no test specified\" && exit 1",
    "watch" : "nodemon hello.js"
  },
  "keywords": [],
  "author": "",
  "license": "ISC",
  "devDependencies": {
    "install": "^0.13.0",
    "nodemon": "^2.0.4",
    "npm": "^6.14.8"
  }
}
```

Run the script `npm run watch`

Debug

```
{
      "version": "0.2.0",
      "configurations": [
          {
              "type": "node",
              "request": "launch",
              "name": "Launch Program",
              "skipFiles": [
                  "<node_internals>/**"
              ],
              "program": "${workspaceFolder}\\hello.js"         }
      ]
  }
```

You can now run or debug the file which has focus by using the command `Ctrl-F5` or `F5` respectively on windows.

Debug with Watch

Setup a launch.json target as follows. Make sure nodemon is installed globally

```
          {
              "name": "Launch server.js via nodemon",
              "type": "node",
              "request": "launch",
              "runtimeExecutable": "nodemon",
              "program": "${workspaceFolder}/hello.js",
              "restart": true,
              "console": "integratedTerminal",
              "internalConsoleOptions": "neverOpen"
            }
```

Now run or debug it using Ctrl-F5 or F5 respectively

For more details see

https://code.visualstudio.com/docs/nodejs/nodejs-debugging

Currently Selected File

Debug

Add the following to your launch.json

```
{
      "version": "0.2.0",
      "configurations": [
          {
              "type": "node",
              "request": "launch",
              "name": "Launch Program",
              "skipFiles": [
                  "<node_internals>/**"
              ],
              "program": "${file}"        }
      ]
  }
```

Now use Ctrl-F5 or F5 to run or debug the currently selected file

Unit Test All Files

Tests

Run All Tests

First, we install jest

```
  npm install --save-dev jest
```

Now we can run all the tests as

```
npx jest
```

Run single test file

```
npx jest myModule.test
```

Run Specified Test

```
npx jest myModule.test -t=<TestName>
```

Run all tests in Debug Mode

Add the following to vs code on Mac and run debug from the VS Code console. You will need something else on windows.

```
{
    "name": "Debug tests single run",
    "type": "node",
    "request": "launch",
    "env": { "CI": "true" },
    "runtimeExecutable": "${workspaceRoot}/node_modules/.bin/jest",
    "args": ["test", "--runInBand", "--no-cache"],
    "cwd": "${workspaceRoot}",
    "protocol": "inspector",
    "console": "integratedTerminal",
    "internalConsoleOptions": "neverOpen"
}
```

Run Single Test File in Debug Mode

```
{
    "name": "Debug single tests single run",
    "type": "node",
    "request": "launch",
    "env": { "CI": "true" },
    "runtimeExecutable": "${workspaceRoot}/node_modules/.bin/jest",
    "args": ["--runInBand", "--no-cache"],
    "cwd": "${workspaceRoot}",
    "program": "${fileBasenameNoExtension}",
    "protocol": "inspector",
    "console": "integratedTerminal",
    "internalConsoleOptions": "neverOpen"
}
```

Run Single Test File in Debug Mode With Watch

```
{
    "name": "Debug single tests single run",
    "type": "node",
    "request": "launch",
    "env": { "CI": "true" },
    "runtimeExecutable": "${workspaceRoot}/node_modules/.bin/jest",
    "args": ["--runInBand", "--no-cache", "--watchAll"],
    "cwd": "${workspaceRoot}",
    "program": "${fileBasenameNoExtension}",
    "protocol": "inspector",
    "console": "integratedTerminal",
    "internalConsoleOptions": "neverOpen"
}
```

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

Typescript

Setup

Node Commands

File/Folder/Command	Details
`npm install`	Install all packages specified in `package.json`
`npm list`	Show all local packages and their dependencies
`npm run`	Run a script specified in `package.json`

JavaScript/TypeScript Project Structure

File/Folder/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

```
npm init -yes
npm install --save-dev typescript ❶
npm install -save-dev tsc-watch ❷
npm install --save-dev jest ❸
npm install --save-dev @types/jest ❹
npm install --save-dev ts-jest   ❺
```

❶ **typescript**	The typescript compiler
❷ **tsc-watch**	Watches typescript files for changes. When it sees a change, it compiles. It can be configured to run a resulting JavaScript file after compilation
❸ **jest**	JavaScript testing framework
❹ **@types/jest**	Typescript types for the jest framework
❺ **ts-test**	Test utilities for TypeScript

TypeScript Compiler Options

Listing 1 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

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

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

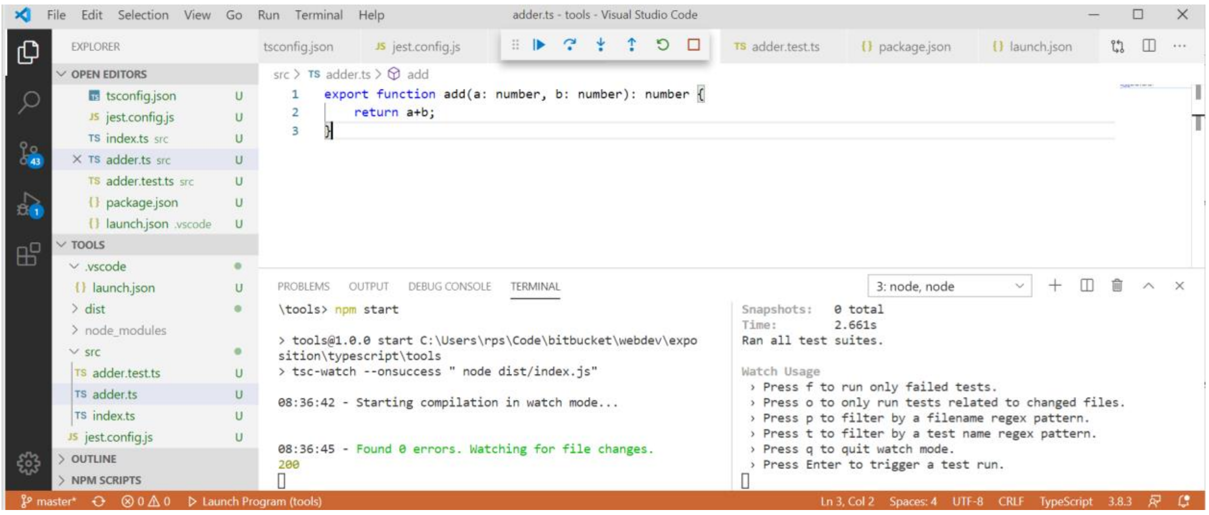
```
import {add} from "./adder";

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
```



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

```
\tools> npm start

> tools@1.0.0 start C:\Users\rps\Code\bitbucket\webdev\expo
sition\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.
```

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"
          }
```

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