1

Introduction to Typescript

Objectives

After completing this lesson, you should be able to do the following:

- What is TypeScript?
- TypeScript Philosophy
- Why Use TypeScript?
- Using TypeScript

Introduction to Typescript

Introduction

- TypeScript is Typed JavaScript. TypeScript adds types to JavaScript to help you speed up the development by catching errors before you even run the JavaScript code.

- TypeScript is an open-source programming language that builds on top of JavaScript. It works on any browser, any OS, any environment that JavaScript runs.

History

- TypeScript is an **open-source**, object-oriented programing language, which is developed and maintained by **Microsoft** under the ***Apache 2*** license.

- It was introduced by **Anders Hejlsberg**, a core member of the development team of C# language.

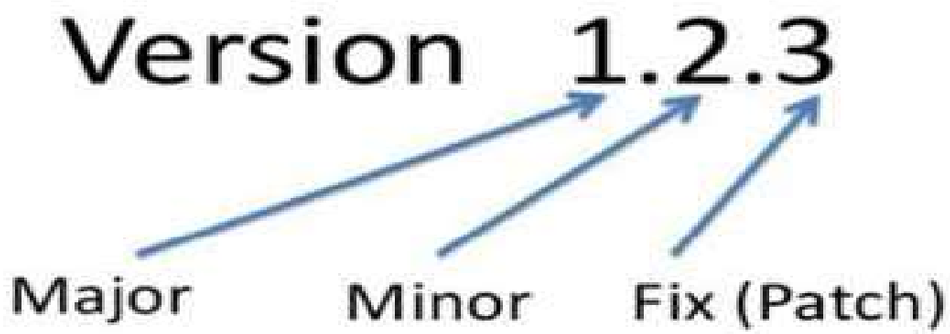
- TypeScript can be used to write everything that can be written in JavaScript. With support of types, it looks very close to any other typed OOPs language like C# and Java.

- The types are optional, so it is not mandatory to strongly type everything.

Typescript Version Releases

- 2012 – Typescript Initial Release
- 2014 – Typescript Version 1.1.0
- 2016 – Typescript Version 2.0.0
- …
- 2022 – Typescript Version 4.8.0 (Currently Used)

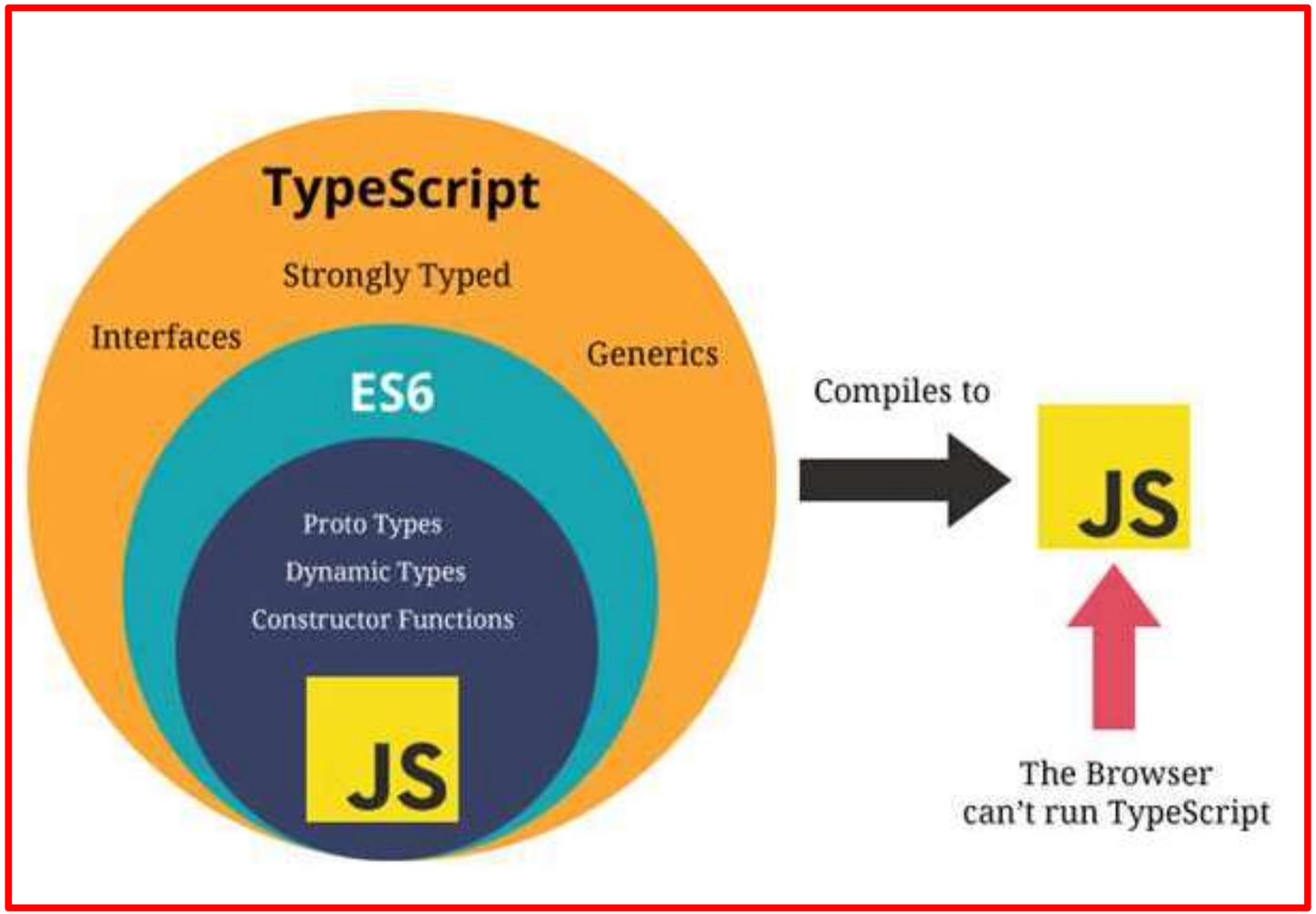
Semantic Versioning



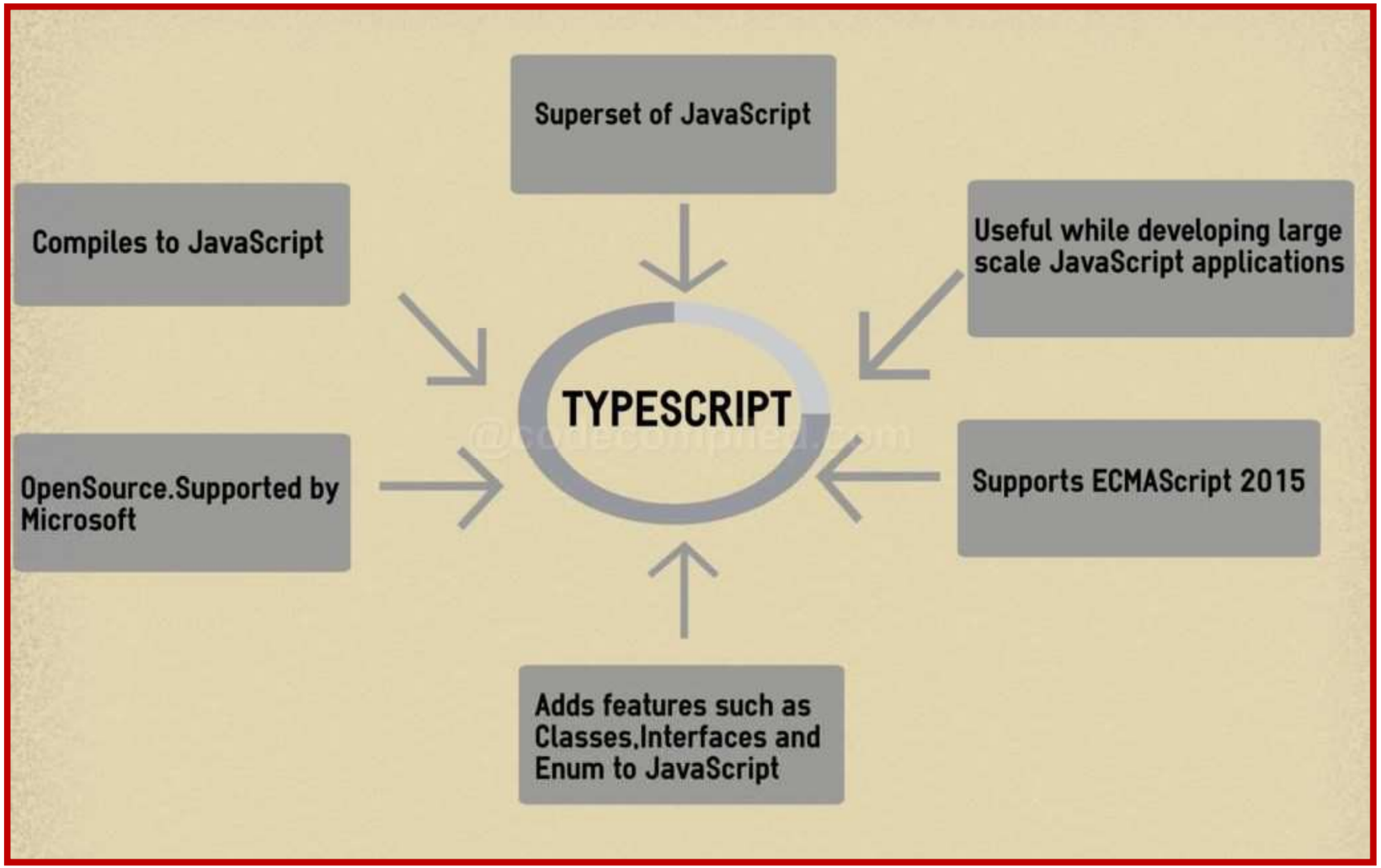
What is Typescript ?

- TypeScript is a super set of JavaScript.
- TypeScript builds on top of JavaScript. First, you write the TypeScript code. Then, you compile the TypeScript code into plain JavaScript code using a TypeScript compiler.
- Once you have the plain JavaScript code, you can deploy it to any environments that JavaScript runs.
- TypeScript files use the .ts extension rather than the .js extension of JavaScript files.

Cont …


TypeScript
Strongly Typed
Interfaces
Generics
ES6
Proto Types
Dynamic Types
Constructor Functions
JS
Compiles to
JS
The Browser
can't run TypeScript

Visual Representation of TypeScript



Why TypeScript?

- JavaScript is a dynamic programming language with no type system. JavaScript provides primitive types like string, number, object, etc., but it doesn't check assigned values. JavaScript variables are declared using the var keyword, and it can point to any value.
- JavaScript doesn't support classes and other object-oriented features (ECMA2015 supports it). So, without the type system, it is not easy to use JavaScript to build complex applications with large teams working on the same code.
- The type system increases the code quality, readability and makes it easy to maintain and refactor codebase. More importantly, errors can be caught at compile time rather than at runtime.

Cont …

- Hence, the reason to use TypeScript is that it catches errors at compile-time, so that you can fix it before you run code.

- It supports object-oriented programming features like data types, classes, enums, etc., allowing JavaScript to be used at scale.

- Some of the most popular JavaScript frameworks like OJET, Angular and WinJS are written in TypeScript.

How to Use Typescript ?

- TypeScript code is written in a file with .ts extension and then compiled into JavaScript using the TypeScript compiler.
- A TypeScript file can be written in any code editor.
- A TypeScript compiler needs to be installed on your platform.
- Once installed, the command tsc <filename>.ts compiles the TypeScript code into a plain JavaScript file.
- JavaScript files can then be included in the HTML and run on any browser.

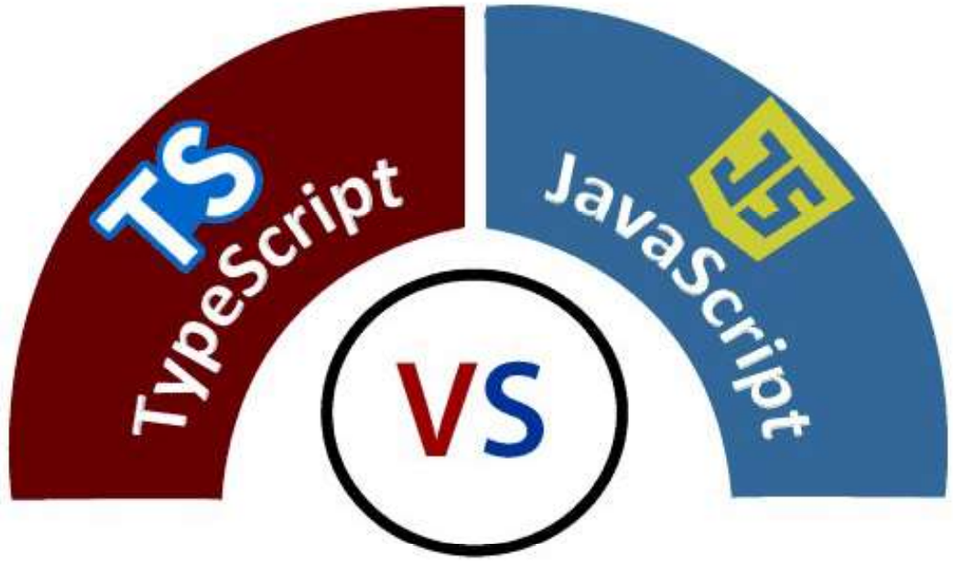
Advantage of TypeScript over JavaScript

1. TypeScript always highlights errors at compilation time during the time of development, whereas JavaScript points out errors at the runtime.
2. TypeScript supports strongly typed or static typing, whereas this is not in JavaScript.
3. TypeScript runs on any browser or JavaScript engine.
4. Great tooling supports with IntelliSense which provides active hints as the code is added.
5. It has a namespace concept by defining a module.

Disadvantage of TypeScript over JavaScript

1. TypeScript takes a long time to compile the code.
2. TypeScript does not support abstract classes.
3. If we run the TypeScript application in the browser, a compilation step is required to transform TypeScript into JavaScript.

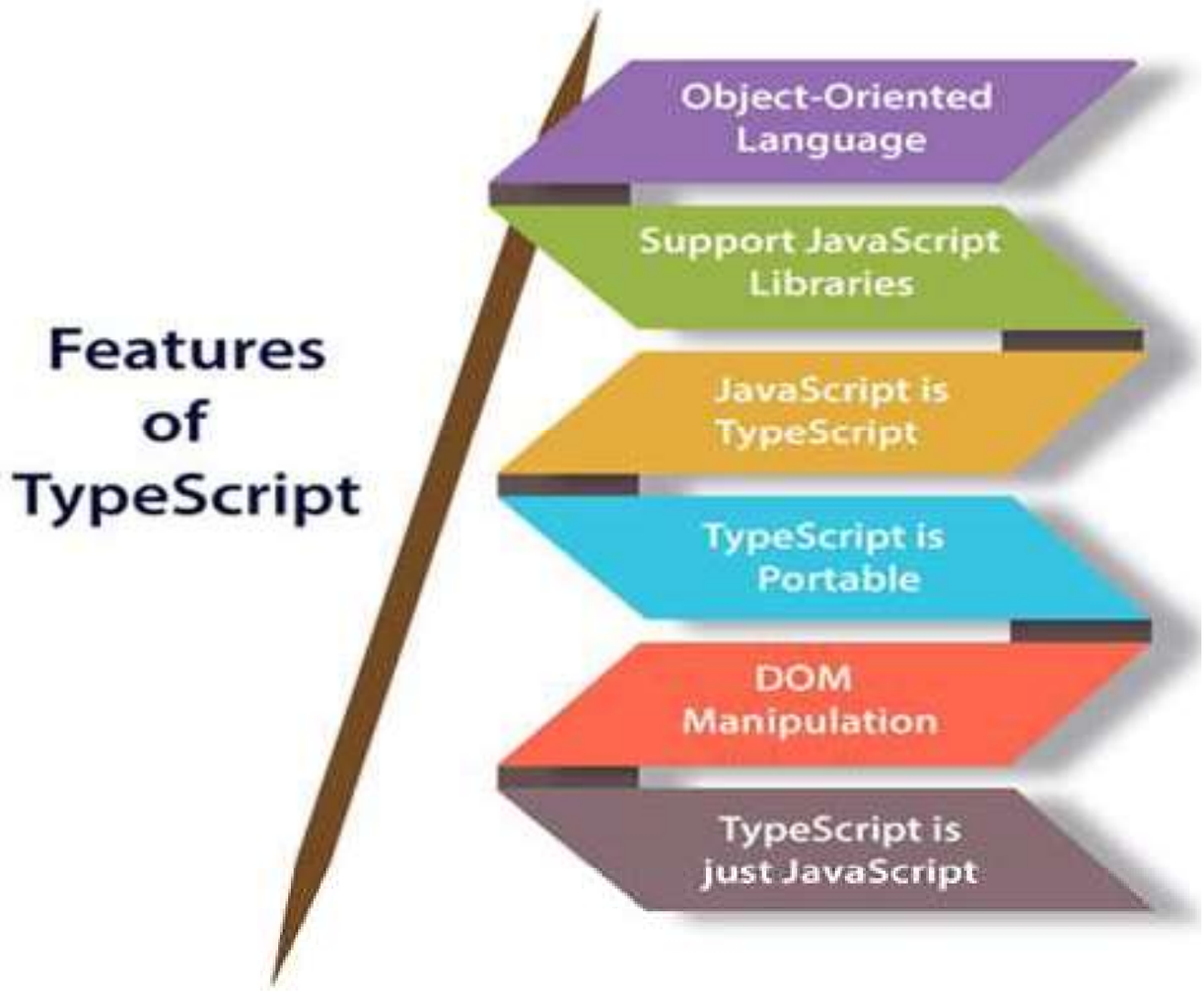
TS vs JS



JS vs TS

	JavaScript	TypeScript
1.	It doesn't support strongly typed or static typing.	It supports strongly typed or static typing feature.
2.	Netscape developed it in 1995.	Anders Hejlsberg developed it in 2012.
3.	JavaScript source file is in ".js" extension.	TypeScript source file is in ".ts" extension.
4.	It is directly run on the browser.	It is not directly run on the browser.
5.	It is just a scripting language.	It supports object-oriented programming concept like classes, interfaces, inheritance, generics, etc.
6.	It doesn't support optional parameters.	It supports optional parameters.
7.	It is interpreted language that's why it highlighted the errors at runtime.	It compiles the code and highlighted errors during the development time.
8.	JavaScript doesn't support modules.	TypeScript gives support for modules.

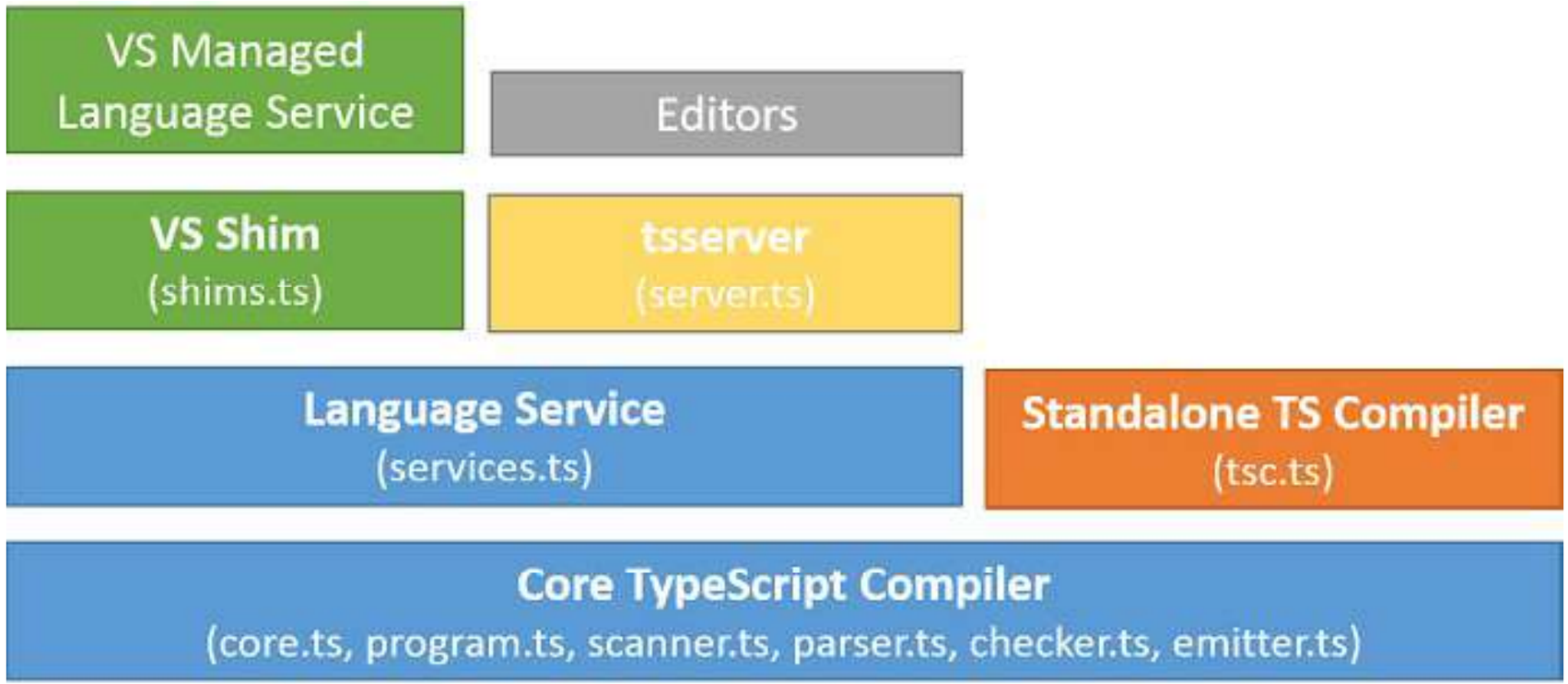
Benefits and Features


Features of TypeScript
Object-Oriented Language
Support JavaScript Libraries
JavaScript is TypeScript
TypeScript is Portable
DOM Manipulation
TypeScript is just JavaScript

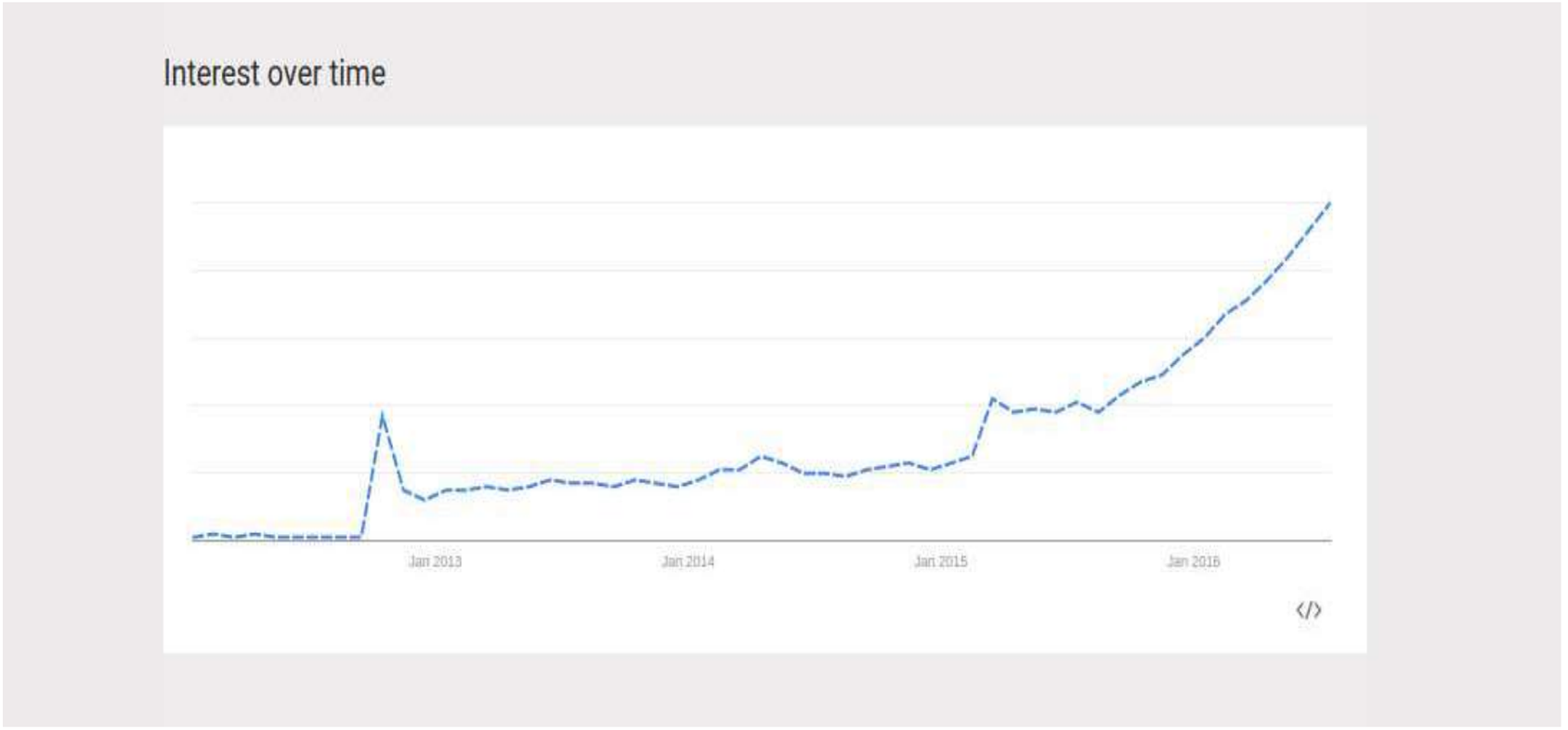
Benefits of TypeScript

1. Optional Type System
2. Intellisense & Syntax Checking
3. Maintainable Code
4. Language Enhancement
5. We are still using JavaScript
6. Cross Platform [The TypeScript compiler can be installed on any Operating System such as Windows, macOS, and Linux.]

Typescript Components



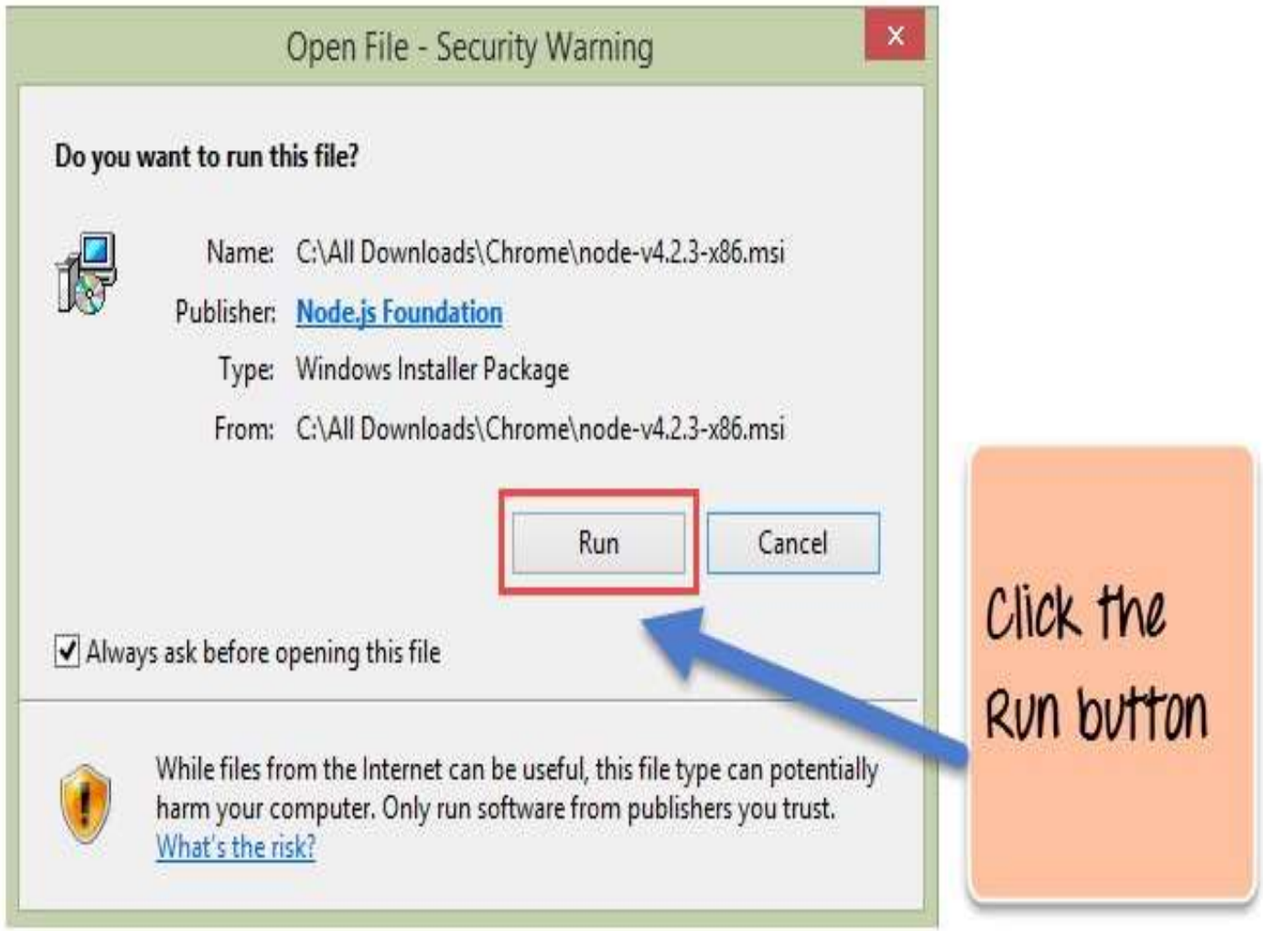
Trend of TypeScript



Installation

https://nodejs.org/en/

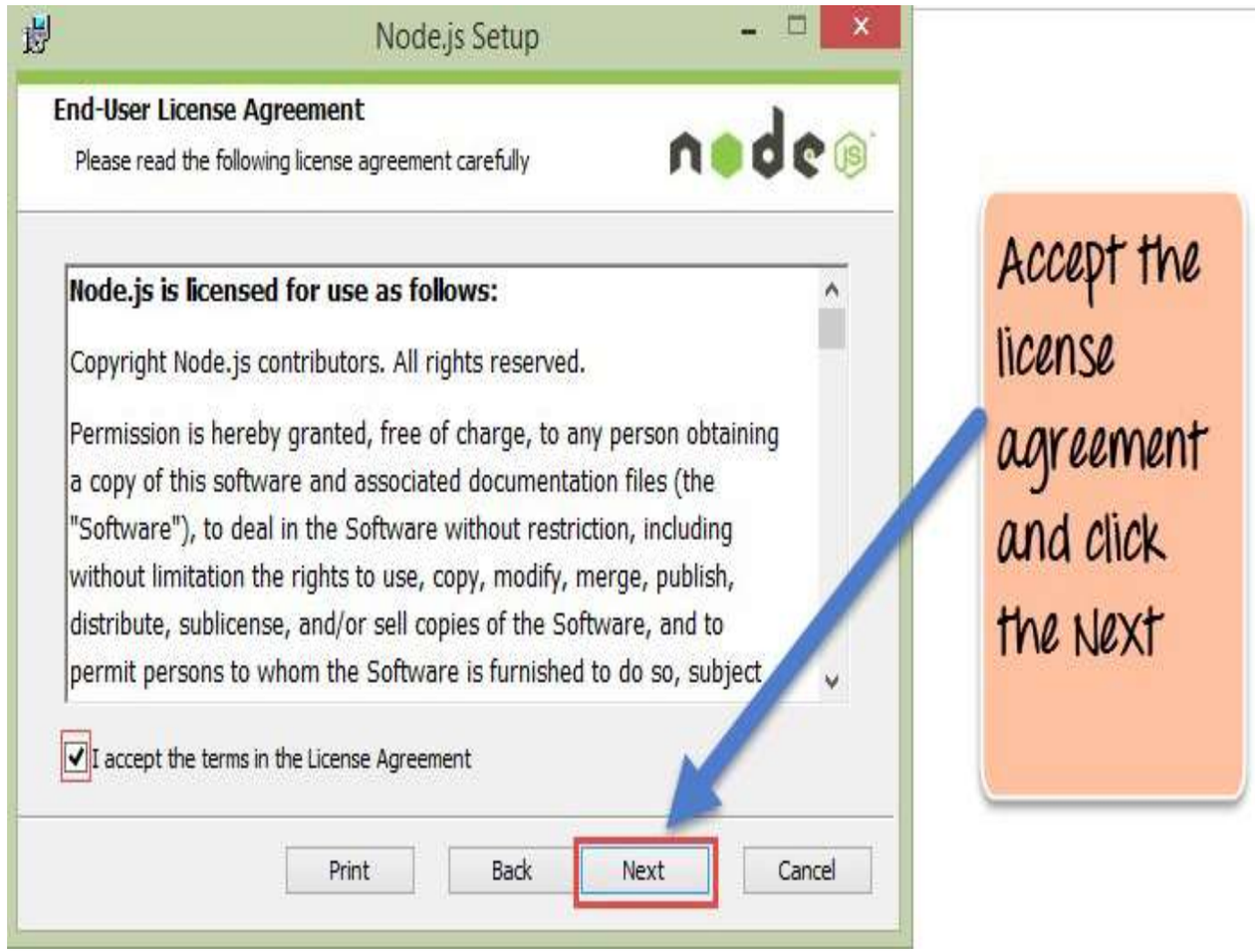
Step 2 :


Open File - Security Warning
Do you want to run this file?
Name: C:\All Downloads\Chrome\node-v4.2.3-x86.msi
Publisher: Node.js Foundation
Type: Windows Installer Package
From: C:\All Downloads\Chrome\node-v4.2.3-x86.msi
Run
Cancel
Always ask before opening this file
While files from the Internet can be useful, this file type can potentially harm your computer. Only run software from publishers you trust.
What's the risk?
Click the Run button

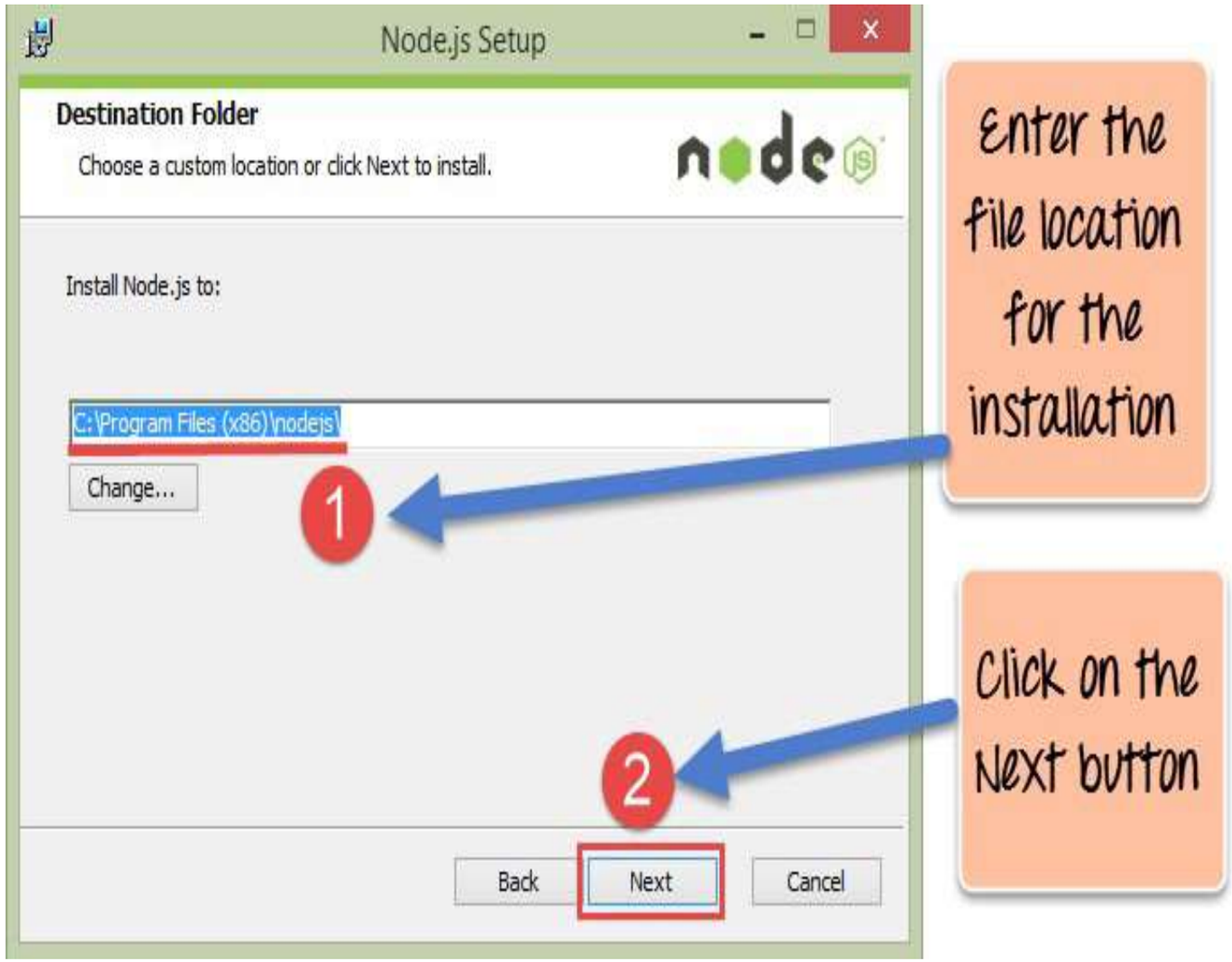
Step 3 :


Node.js Setup
Welcome to the Node.js Setup Wizard
The Setup Wizard will install Node.js on your computer.
Back
Next
Cancel
Click the Next button

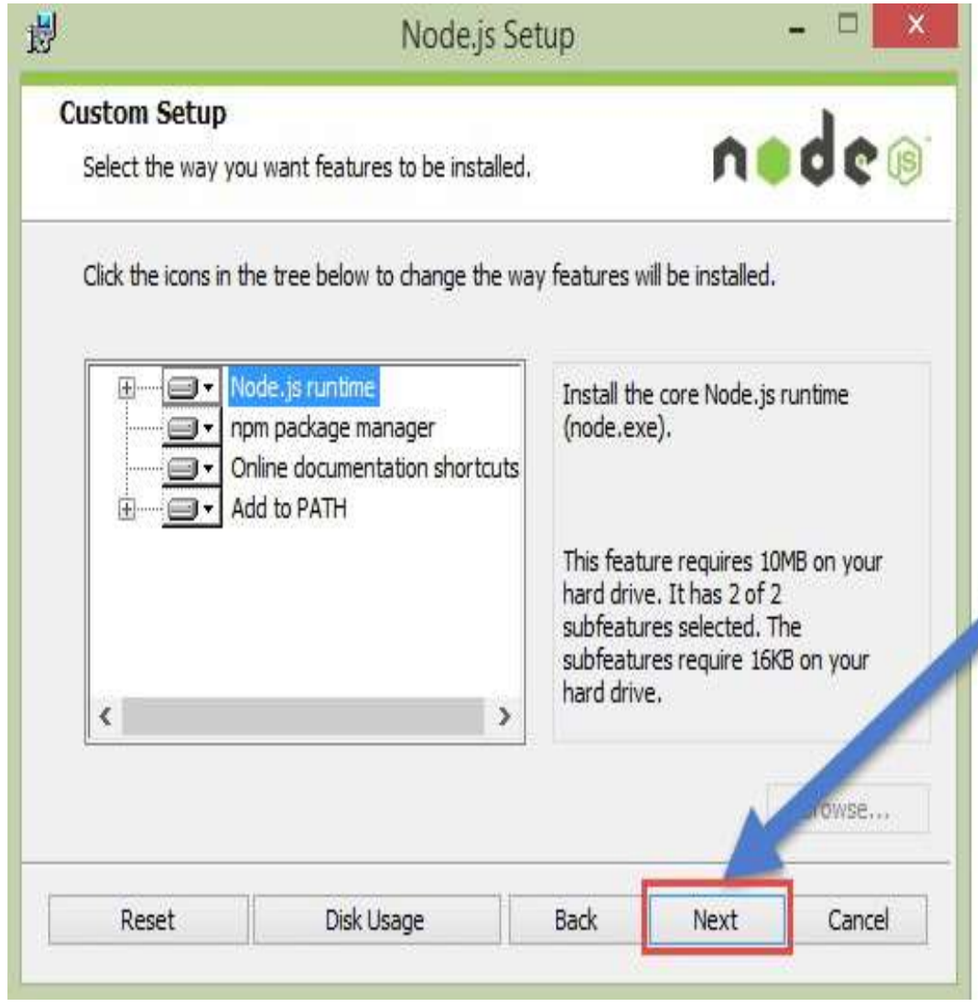
Step 4 :


Node.js Setup
End-User License Agreement
Please read the following license agreement carefully
node
Node.js is licensed for use as follows:
Copyright Node.js contributors. All rights reserved.
Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject
I accept the terms in the License Agreement
Print
Back
Next
Cancel
Accept the license agreement and click the Next

Step 5 :

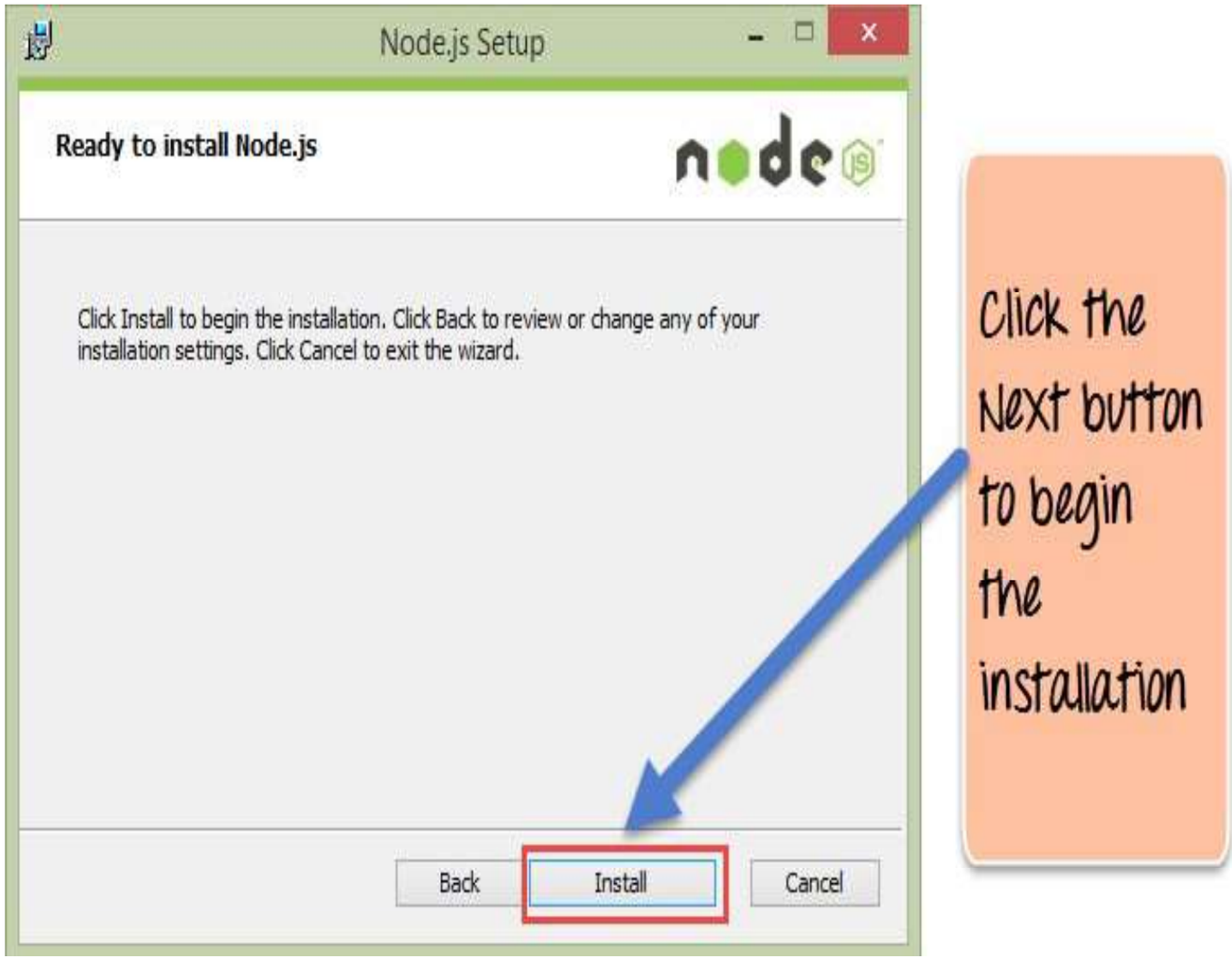

Node.js Setup
Destination Folder
Choose a custom location or click Next to install.
Install Node.js to:
C:\Program Files (x86)\nodejs\
Change...
1
2
Back
Next
Cancel
Enter the file location for the installation
Click on the Next button

Step 6 :

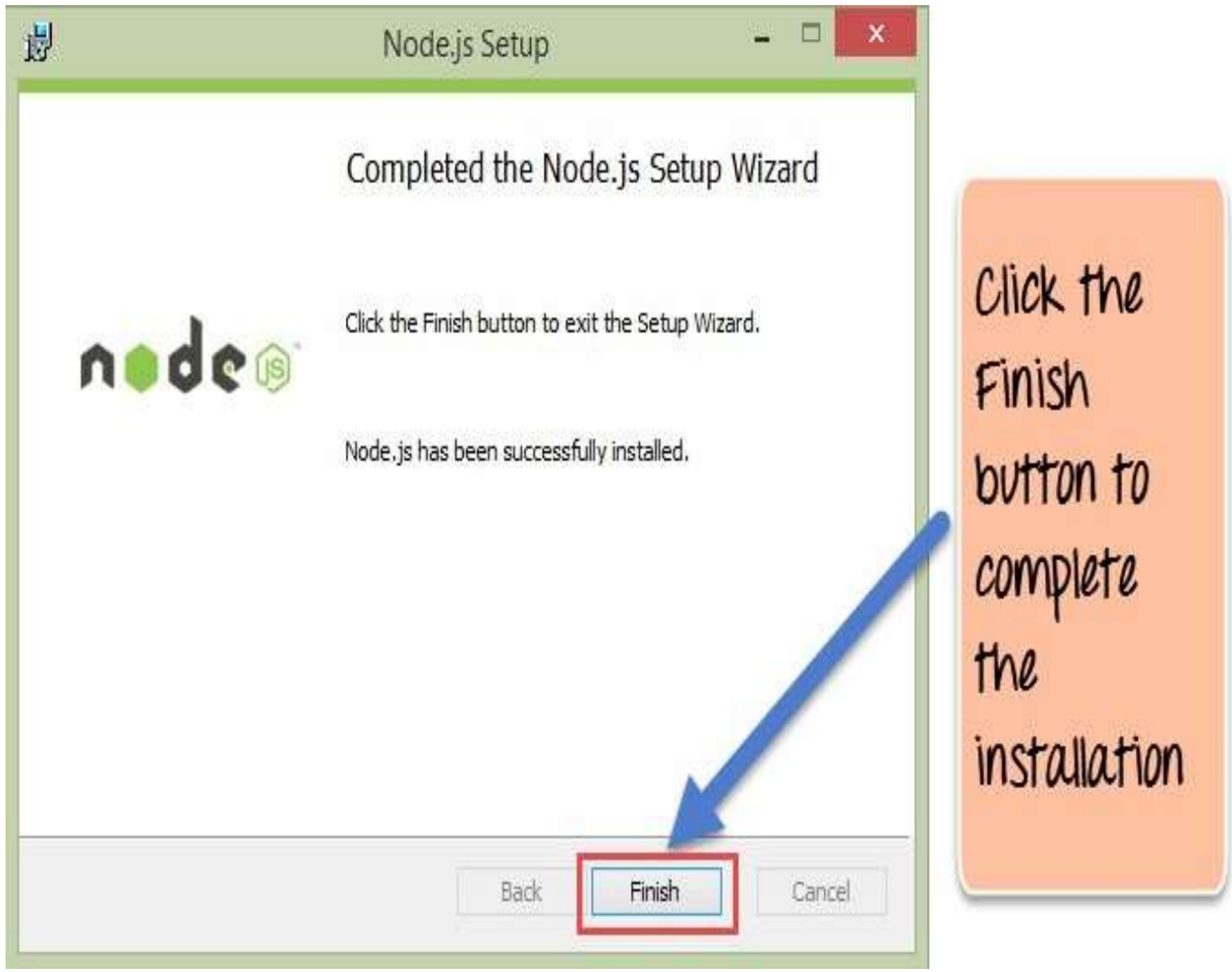


Accept the default components and click on Next

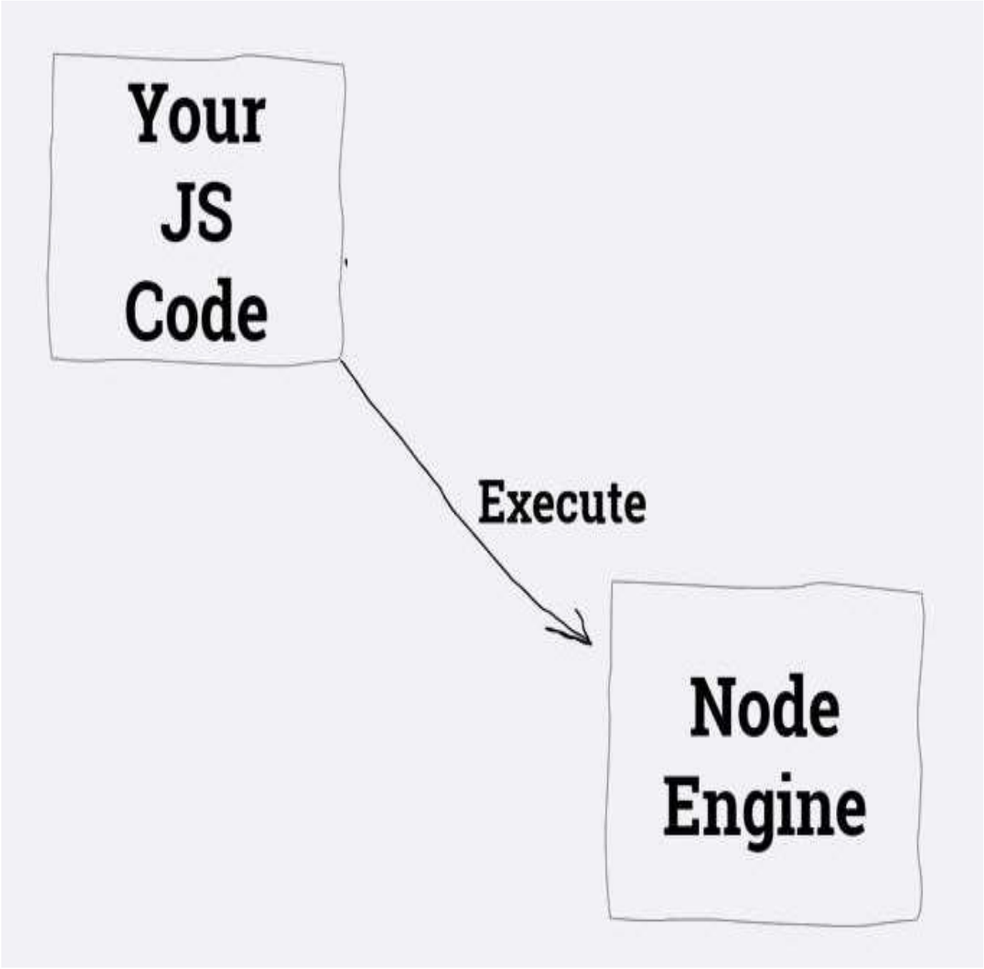
Step 7 :


Node.js Setup
Ready to install Node.js
Click Install to begin the installation. Click Back to review or change any of your installation settings. Click Cancel to exit the wizard.
Back
Install
Cancel
Click the Next button to begin the installation

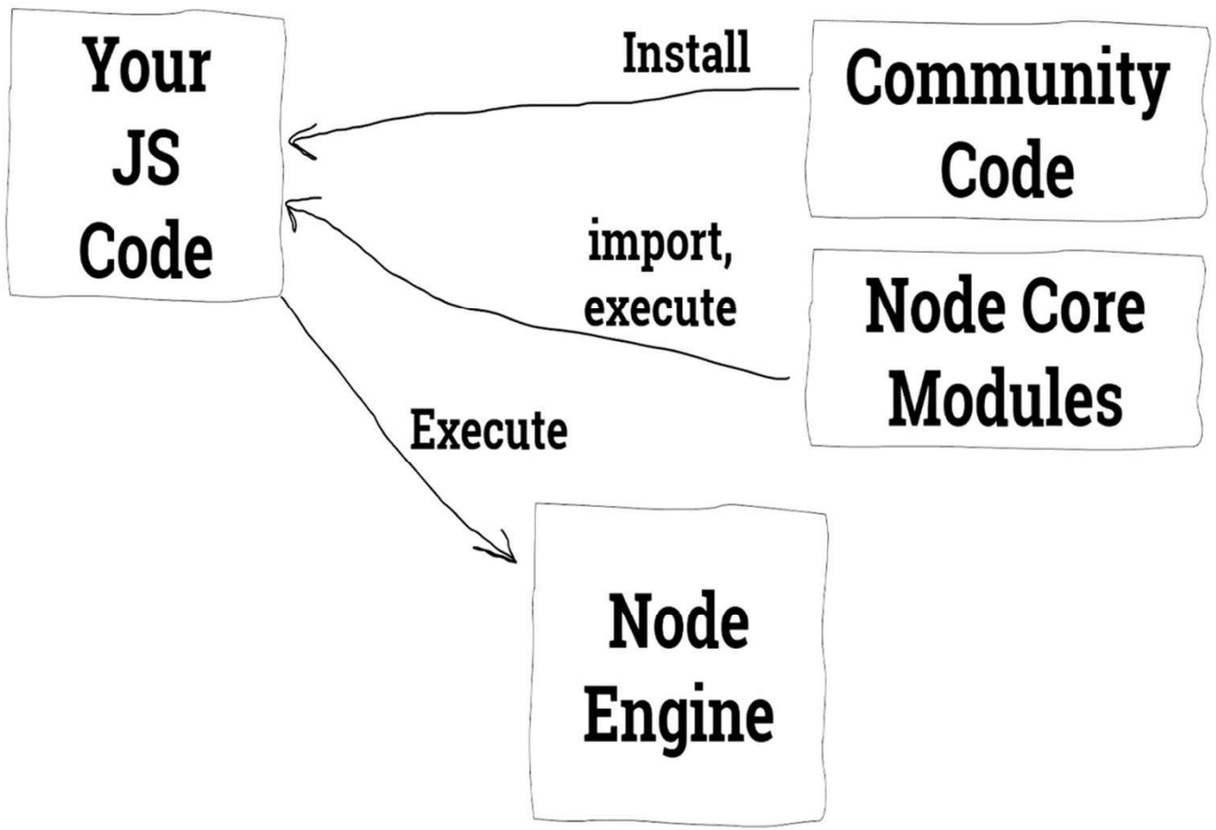
Step 8 :


Node.js Setup
Completed the Node.js Setup Wizard
Click the Finish button to exit the Setup Wizard.
Node.js has been successfully installed.
Back
Finish
Cancel
Click the Finish button to complete the installation

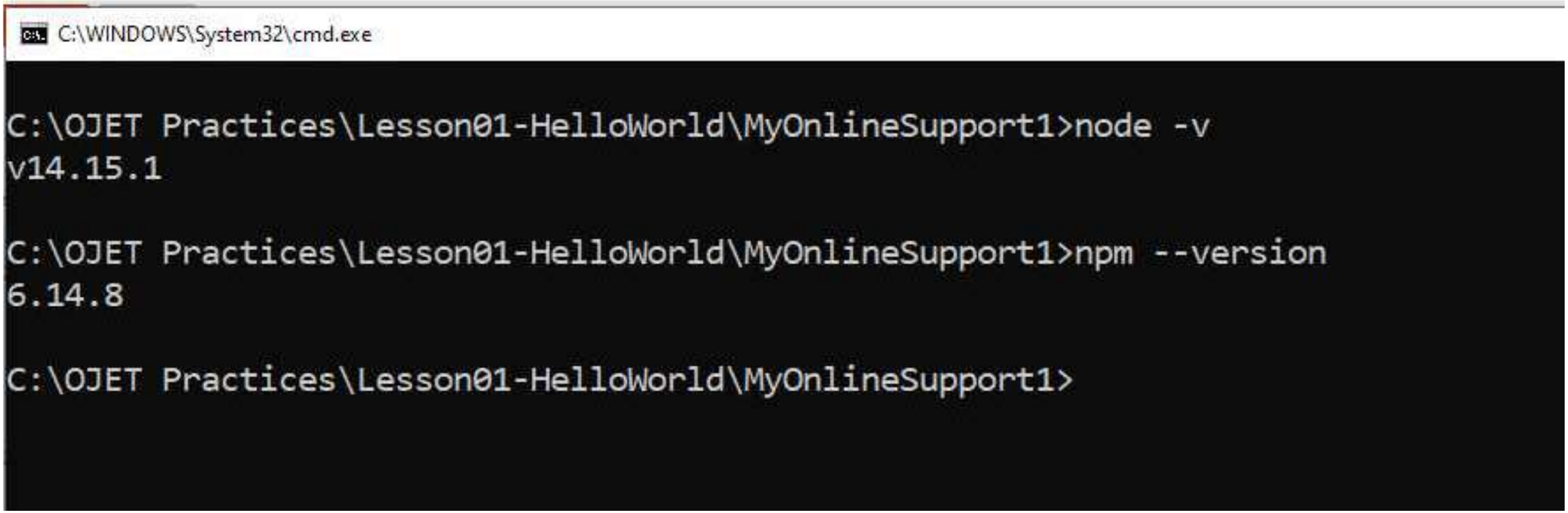
The Basic Pillars - JS



The Basic Pillars - Modules

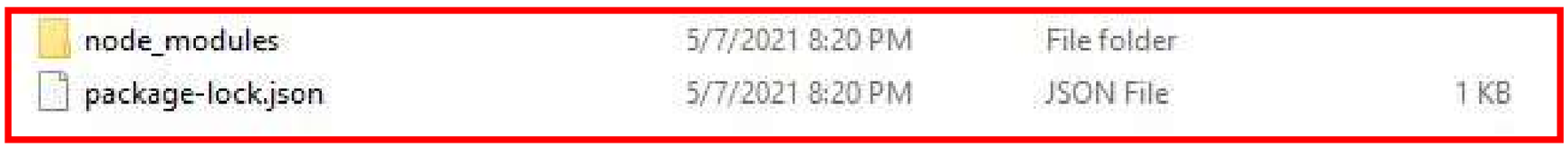


Type these Commands in Command Prompt



```
npm install [insert library name]
```

- The command npm install will look up the specified library on the NPM repository and install the library into a folder called node_modules.
- This folder will store all the JavaScript libraries installed via NPM, such as Typescript, RequireJS and KnockoutJS.
- Running the command npm install jquery in an empty directory will download jQuery into an automatically created node_modules folder.



Installing TypeScript

- We will need Node.js and Npm
- The easiest way to setup TypeScript is via npm. Using the command below we can install the TypeScript package globally, making the TS compiler available in all of our projects:

```
npm install -g typescript
```

- By opening a terminal anywhere and running tsc -v to see if it has been properly installed

```
tsc -v
```

Running With Errors

If you're on Windows and got the following error:

```
'tsc' is not recognized as an internal or external command,
operable program or batch file.
```

... then you should add the following path `C:\Users\<user>\AppData\Roaming\npm` to the `PATH` variable. Notice that you should change the `<user>` to your windows user.

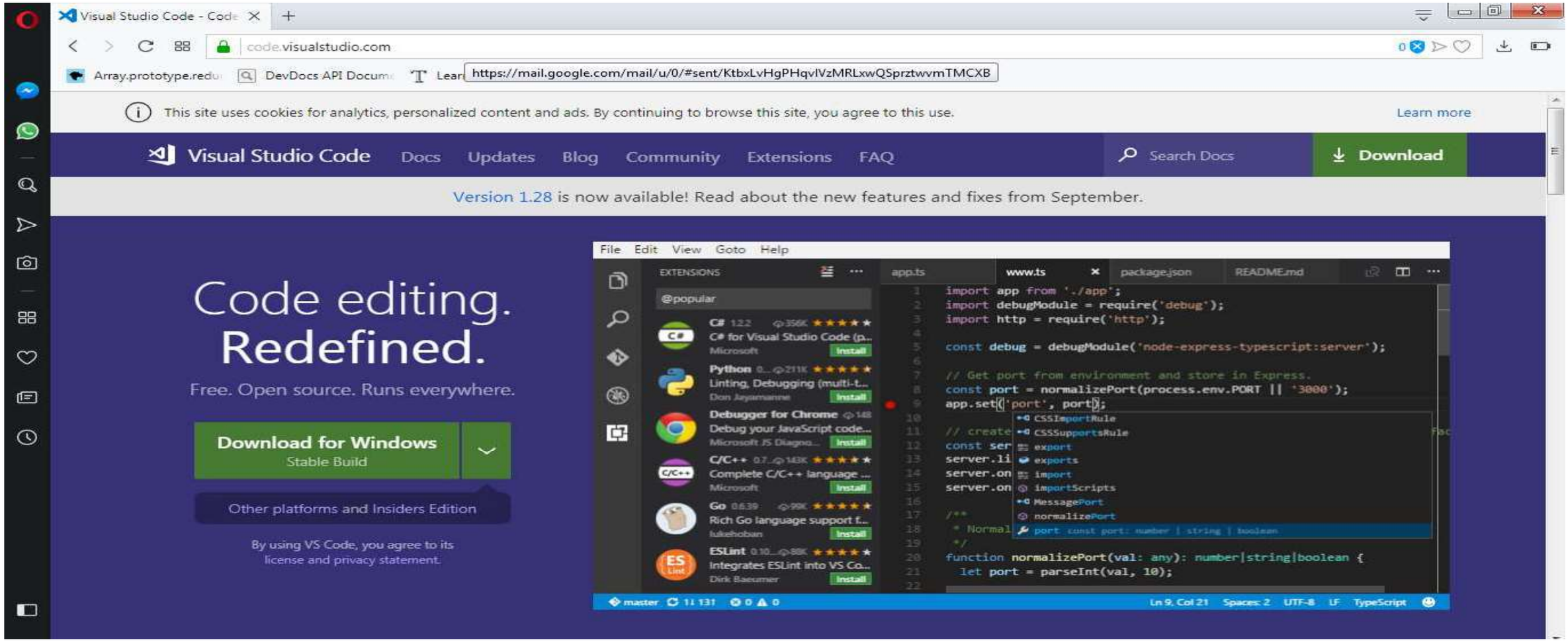
To install the `ts-node` module globally, you run the following command from the Terminal on macOS and Linux or Command Prompt on Windows:

```
npm install -g ts-node
```

Editors

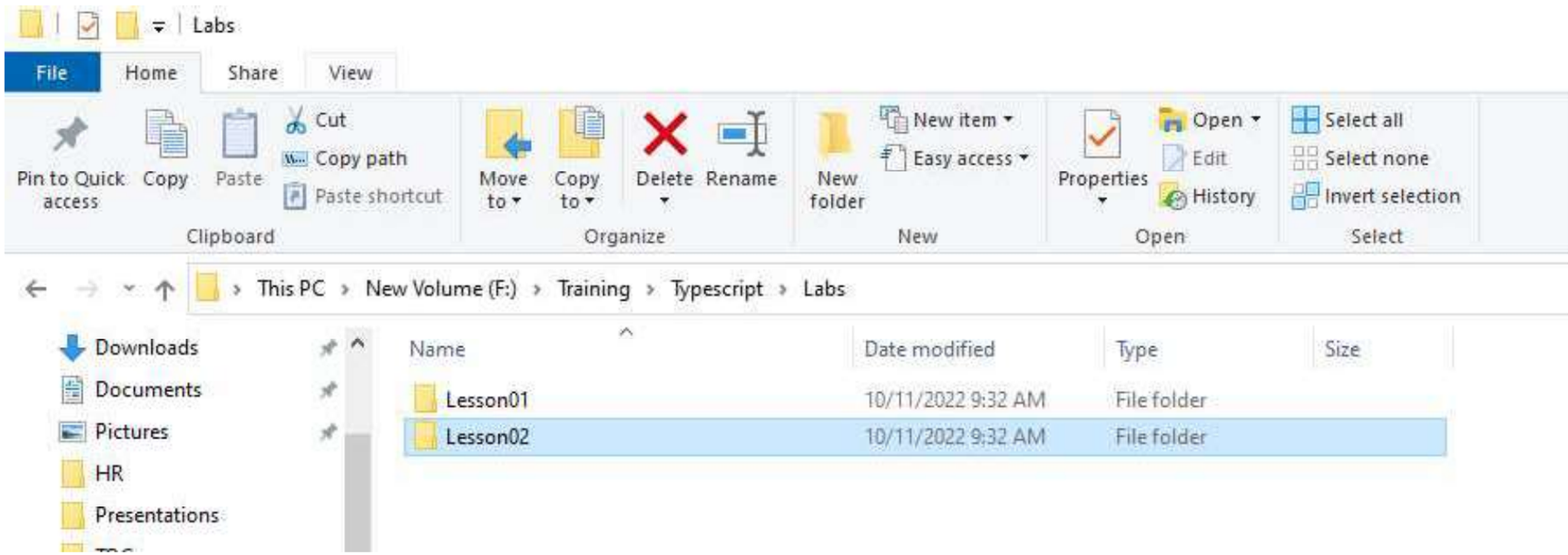
- TypeScript is an open-source project but is developed and maintained by Microsoft and as such was originally supported only in Microsoft's Visual Studio platform.
  - Visual Studio Code - Microsoft's other, lightweight open-source code editor. TypeScript support is built in.
  - Official Free Plugin for Sublime Text.
  - The latest version of WebStorm comes with built in support.
  - More including Vim, Atom, Emacs and others.

➢ Visual Studio Code

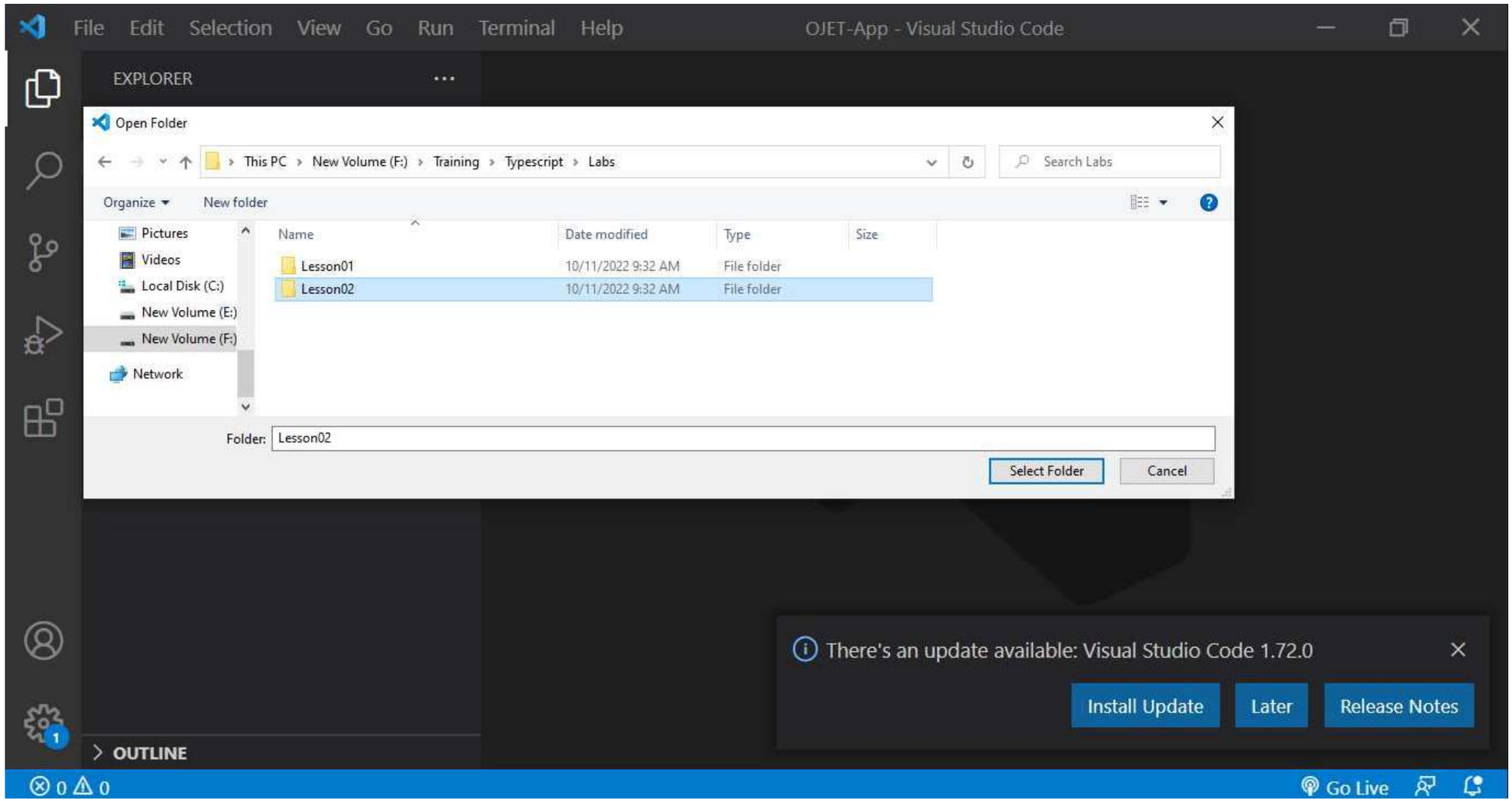


Developing First TypeScript App

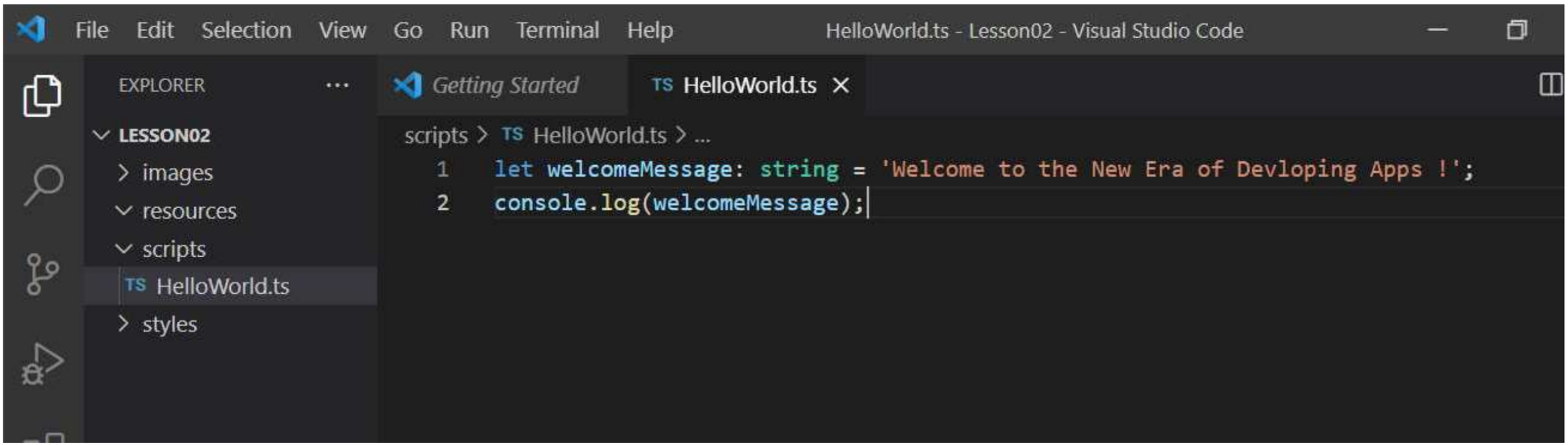
1. First, create a Lesson02 Folder to store the code under Labs



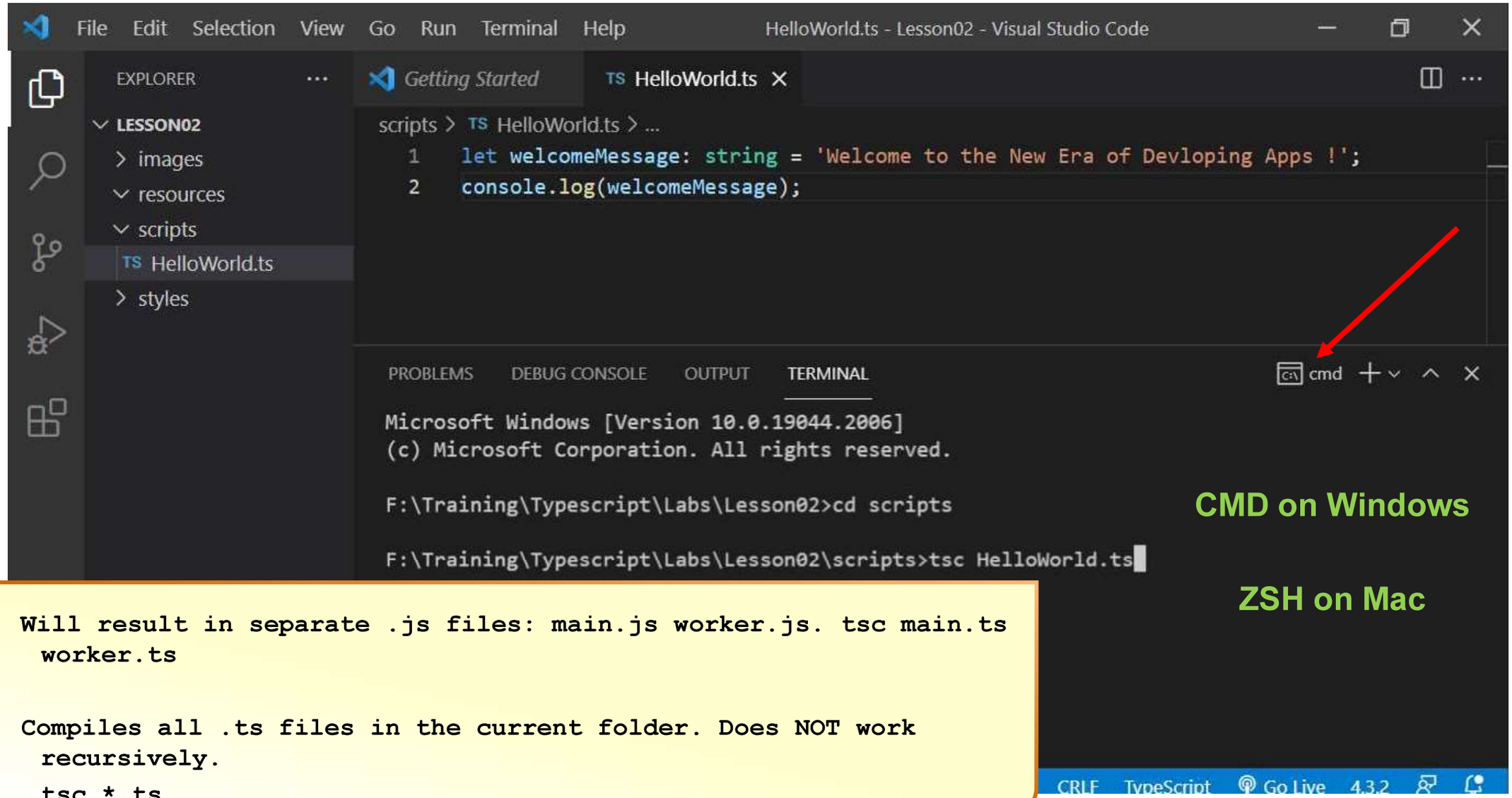
2. Second, launch VS Code and open that folder.



3. Create a new TypeScript file called HelloWorld.ts. The extension of a TypeScript file is .ts.



Compiling



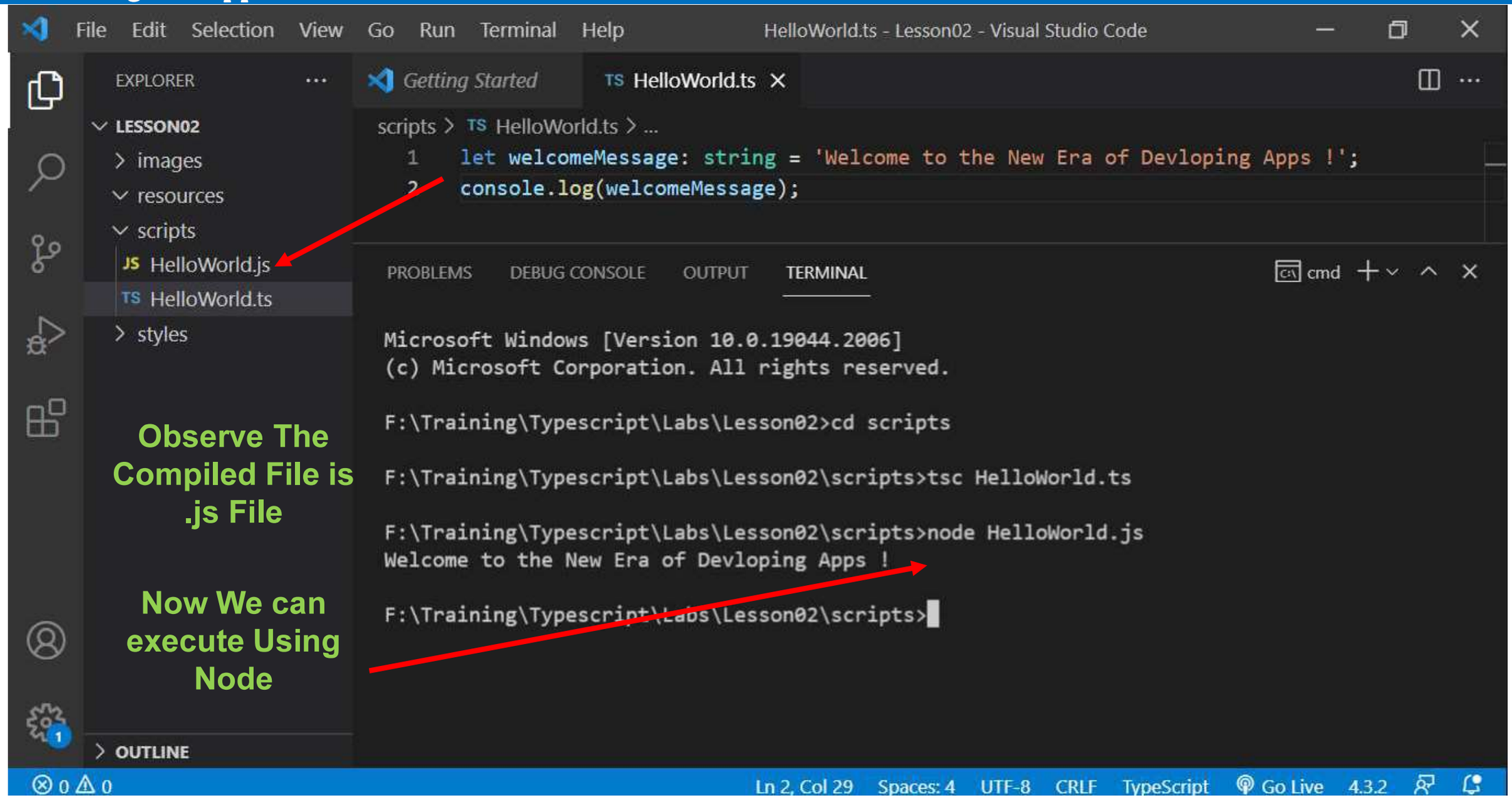
CMD on Windows

ZSH on Mac

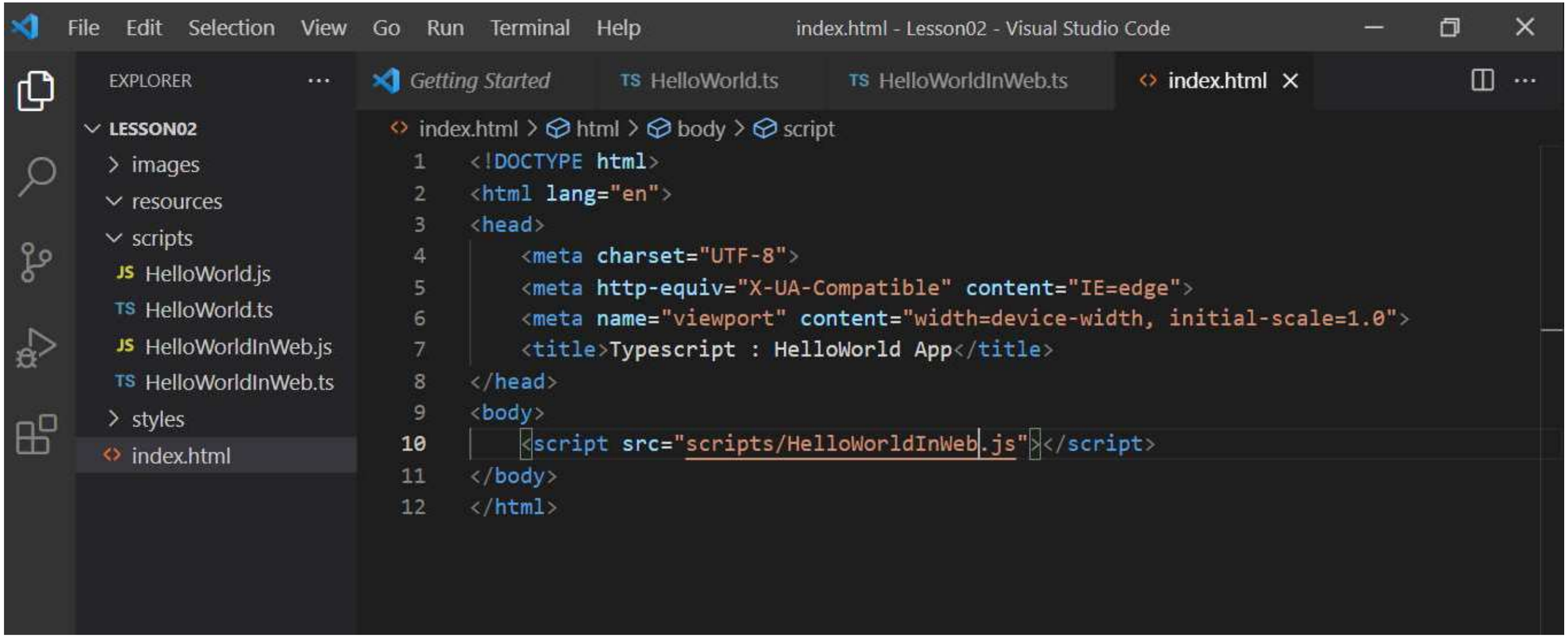
```
#  Will result in separate .js files: main.js worker.js. tsc main.ts
    worker.ts

#  Compiles all .ts files in the current folder. Does NOT work
    recursively.
    tsc *.ts
```

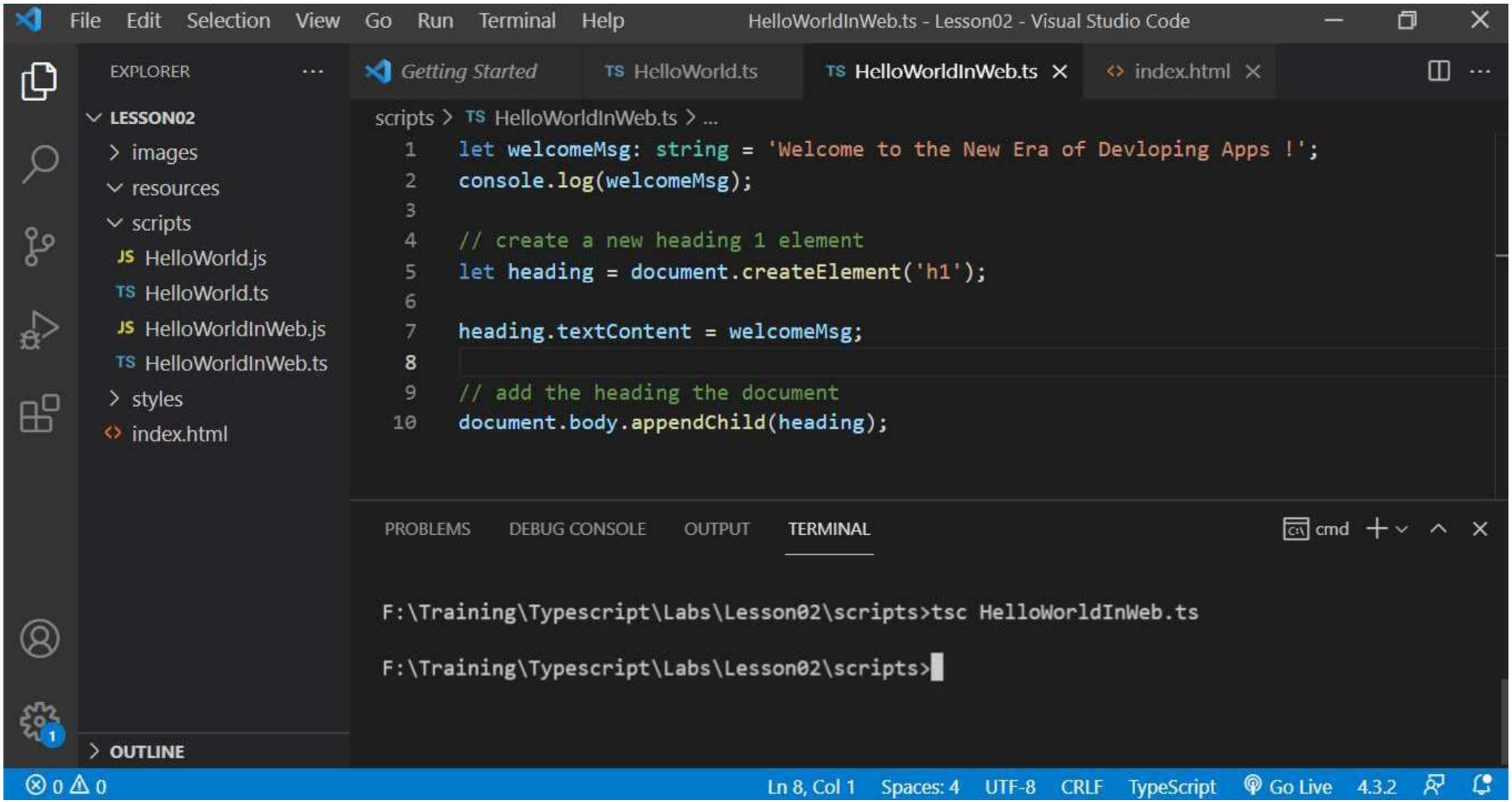
Running the App



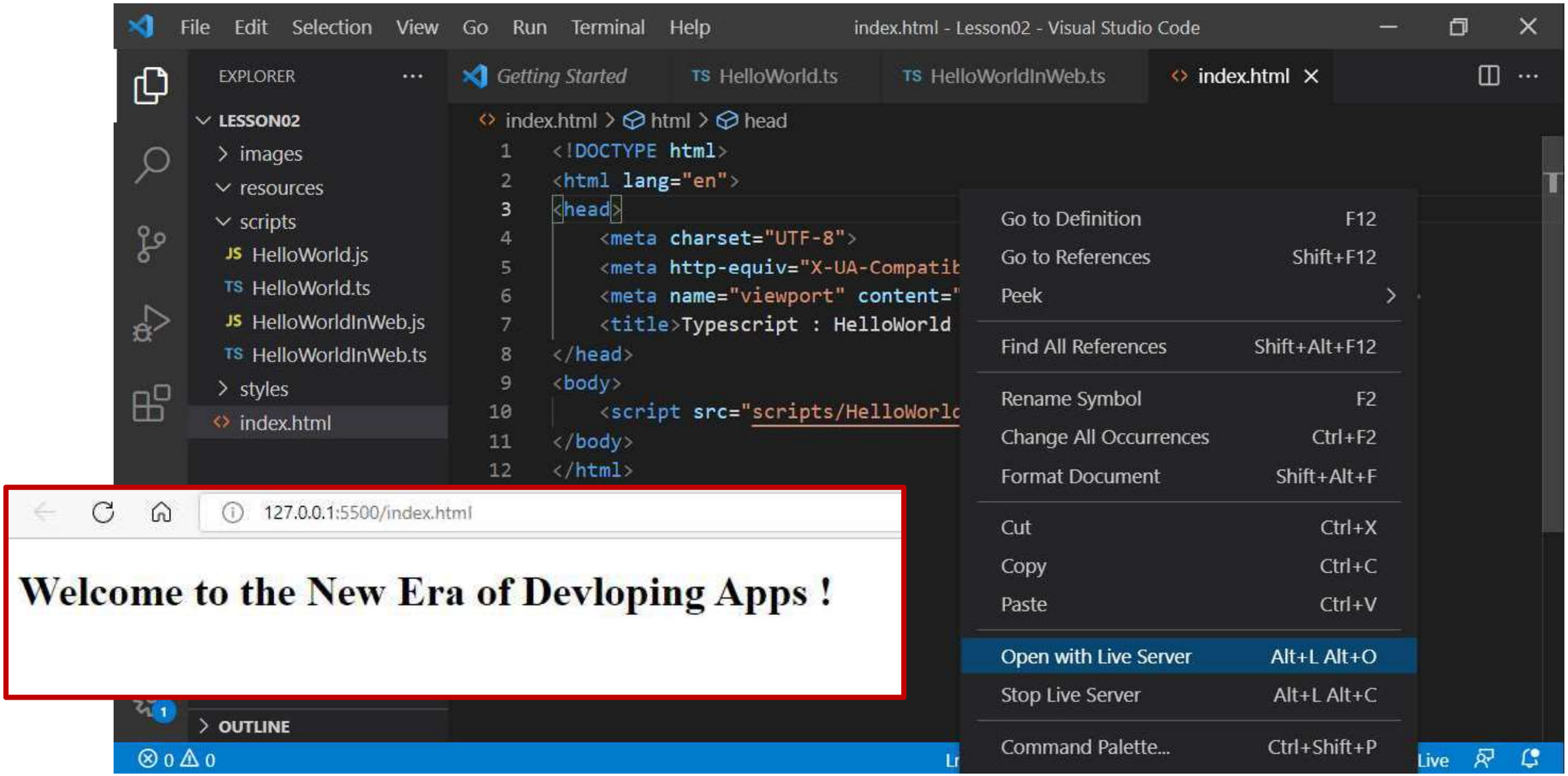
TypeScript Hello World program in Web Browsers



Create HelloWorldInWeb.ts and Compile



Execution :


File Edit Selection View Go Run Terminal Help
index.html - Lesson02 - Visual Studio Code
EXPLORER
LESSON02
images
resources
scripts
HelloWorld.js
HelloWorld.ts
HelloWorldInWeb.js
HelloWorldInWeb.ts
styles
index.html
Getting Started
HelloWorld.ts
HelloWorldInWeb.ts
index.html
index.html > html > head
<!DOCTYPE html>
<html lang="en">
<head>
<meta charset="UTF-8">
<meta http-equiv="X-UA-Compatit
<meta name="viewport" content="
<title>Typescript : HelloWorld
</head>
<body>
<script src="scripts/HelloWorlc
</body>
</html>
127.0.0.1:5500/index.html
Welcome to the New Era of Devloping Apps !
Go to Definition F12
Go to References Shift+F12
Peek
Find All References Shift+Alt+F12
Rename Symbol F2
Change All Occurrences Ctrl+F2
Format Document Shift+Alt+F
Cut Ctrl+X
Copy Ctrl+C
Paste Ctrl+V
Open with Live Server Alt+L Alt+O
Stop Live Server Alt+L Alt+C
Command Palette... Ctrl+Shift+P
OUTLINE
Live

Summary

In this lesson, you should have learned how to:

- What is TypeScript?
- TypeScript Philosophy
- Why Use TypeScript?
- Using TypeScript