Blockchain Training

An initiative of the Lagos State Ministry of Education

Week 1

What is CodeLagos?

- CodeLagos is an initiative of the Lagos State Ministry of Education aimed at making coding education accessible to Lagos State residents.

- The program launched a successful pilot phase in 2017 with 23 Government schools and 32 Private schools. Since then, it has expanded to 130 Government schools and 145 Private schools.

- Started with 4 Out of School centres but has since expanded to 12 with the introduction of Blockchain Technology.

How We Got Here

Decade of Women
Hackathon

Course Content

- Overview of Blockchain (Ethereum)

- Solidity Programming

- Launching a Node to setup a Blockchain project

- Creation and Deployment of Smart Contracts

- Creation of a Crytotoken

The Goal

Ability to Create Your Own
Smart Contracts

We Don't Cover

- Cryptocurrency speculation
- Bitcoin

What is a Blockchain?

- A blockchain is a fully-distributed, peer-to-peer software network which makes use of cryptography to securely host applications, store data, and easily transfer digital instruments of value that represent real-world money.

- Cryptography is the art of communication via coded messages.

Simulating a Blockchain

Debit (Expenditure)	Credit (Income)
$10 Soldier 1	$10 Doctor
$5 Hunter 1	$5 Blacksmith
$5 Hunter 2	$5 Blacksmith
$1 Cook	$1 Engineer
$1 Architect	$1 Engineer
$1 Doctor	$1 Engineer
$1 Gardener	$1 Engineer
$1 Soldier 1	$1 Engineer
$1 Soldier 2	$1 Engineer
$1 Blacksmith	$1 Engineer
$1 Hunter 1	$1 Engineer
$1 Hunter 2	$1 Engineer
$10 Gardener	$10 Hunter 1
$5 Gardener	$5 Hunter 2

Simulating a Blockchain

https://hackernoon.com/why-decentralized-consensus-blockchain-is-good-for-business-5ff263468210

https://hackernoon.com/how-to-run-a-blockchain-on-a-deserted-island-with-pen-and-paper-899949ec555b

Cryptocurrencies and Blockchain

"**Bitcoin**" can indicate:
- The currency –*bitcoin* or *BTC*
- The technology that enables the cryptocurrency to be exchanged-*Bitcoin*

Blockchain: computational principles and technologies that enable cryptocurrencies and other use-cases

Key Concepts

- **Consensus:** independent validation among multiple parties
- **Secure chain of data:** transparency and auditability
- **Transactions:** transfer of ownership of data, assets etc.
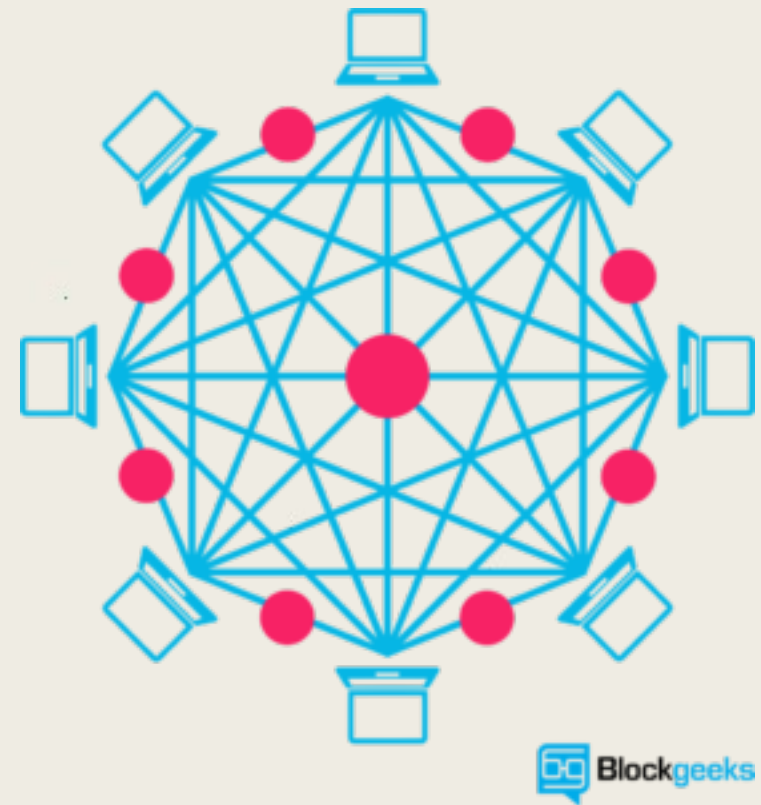
Kinds of Blockchain

Blockchains are categorized according to participants:

- Public if anybody can join the network (permission less)

- Private if participants need permission to join

Industries Ripe for Disruption

- Identity Management

- Healthcare

- Law & Intellectual Property

- Proof-of-Ownership

- Digital Assets & their Marketplaces

- Scientific Journals and Reviews

Disruptive Potential

- Removing Human Corruptibility

- Bypassing Human Inefficiency

- Automating the World

- Rapidly Prototyping Distributed Systems

Use Cases Around the World

- Bitpesa – Remittances
- AidTech – Tracking of Payment
- Consent – Digital ID
- Seso – Real Estate Marketplace

Bitpesa

- Forex/Money Conversion

- Using Crytocurrencies as a means of exchange

- Greatly reduces cost

Aidtech

- Issuance of Digital ID to those in need

- Tracking of funds throughout process

- Transparent donations, remittances and aid

Consent

- Digital identity on the Blockchain

- Ownership of one's personal information

- Ability to give consent to others

Seso

- Digital Extended Land Registry on Blockchain

- Marketplace for all land transactions

Conclusion

- The Blockchain revolution is just getting started

- We can either take the bus or get left behind

- There is enormous opportunity for developers in this space

- The world over there is a shortage of Blockchain developers

- Understanding the core infrastructure of the Blockchain gives you a head start as a developer

Setting Up Your Development Environment

- Bitcoin has a Blockchain

- We will be using Ethereum to learn about the Blockchain

- Ethereum is programmable unlike Bitcoin

Setting Up Your Development Environment

- Geth

- Ganache

- Node

- Truffle

- Solidity

- Visual Studio Code

- Git

Geth

- Geth is a command line interface that allows you to run a full Ethereum node.

- It is implemented in Go and allows you to mine blocks, to generate ether, to deploy and interact with smart contracts.

- It can connect to the public Ethereum like the main net or to create your own private network for development purposes.

Geth

Download Geth – Sacrosancter (v1.8.10) – Release Notes

You can download the latest 64-bit stable release of Geth for our primary platforms below. Packages for all supported platforms, as well as develop builds, can be found further down the page. If you're looking to install Geth and/or associated tools via your favorite package manager, please check our installation guide.

| Geth 1.8.10 for Linux | Geth 1.8.10 for macOS | Geth 1.8.10 for Windows | Geth 1.8.10 sources |

https://ethereum.github.io/go-ethereum/
downloads/

Geth

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Click the Windows Link

Geth
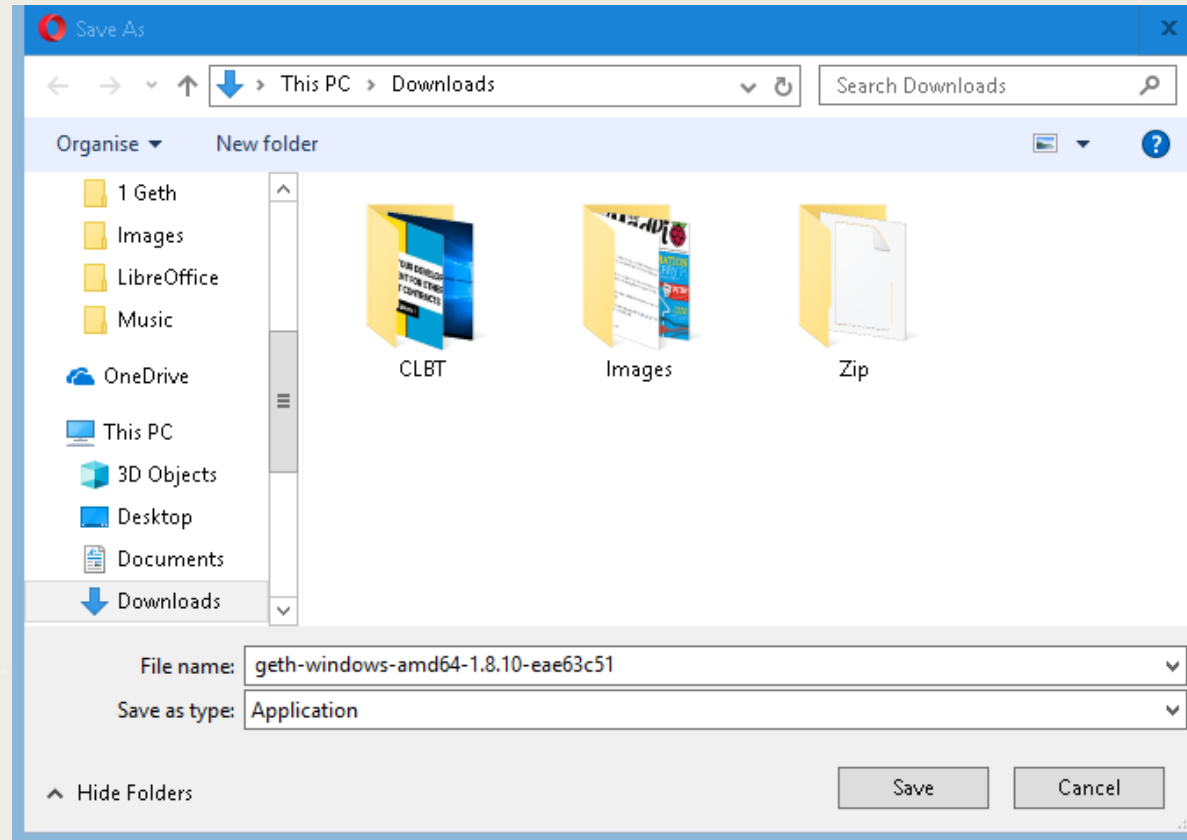
The Popup Opens

Geth
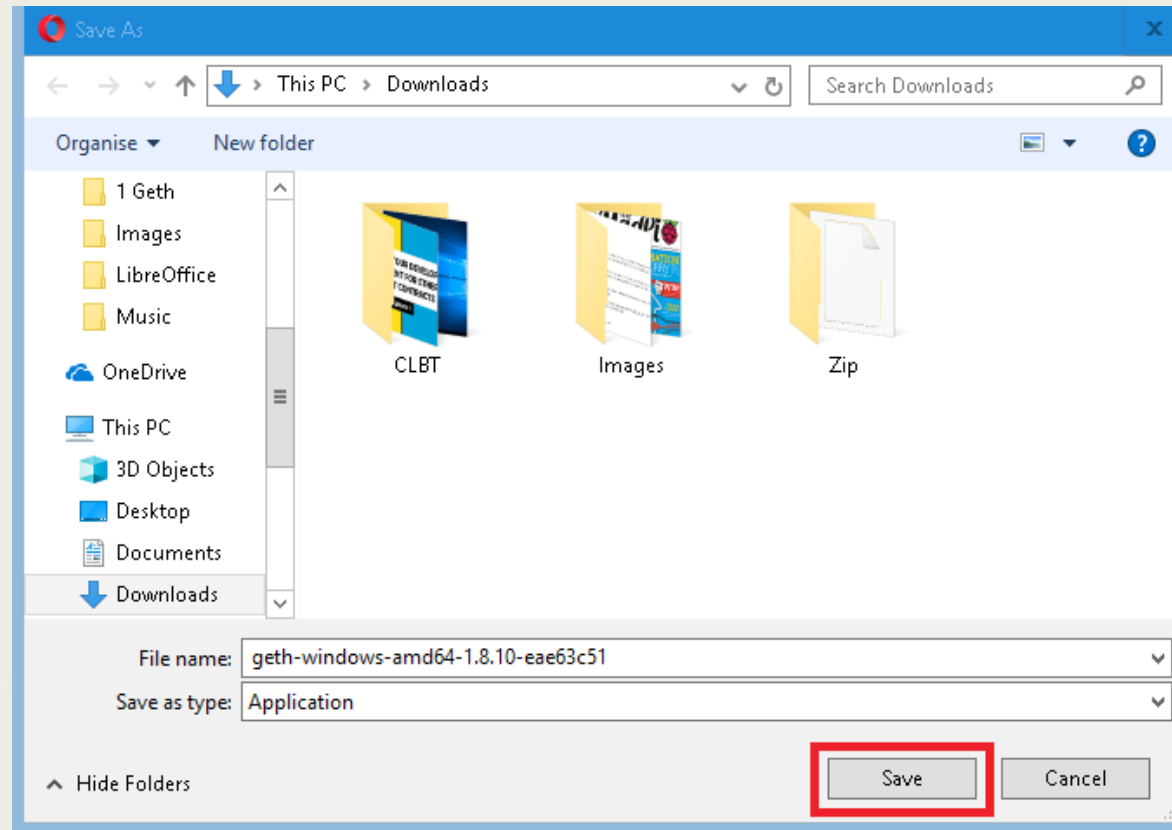
Click on Save to Begin Download

Geth
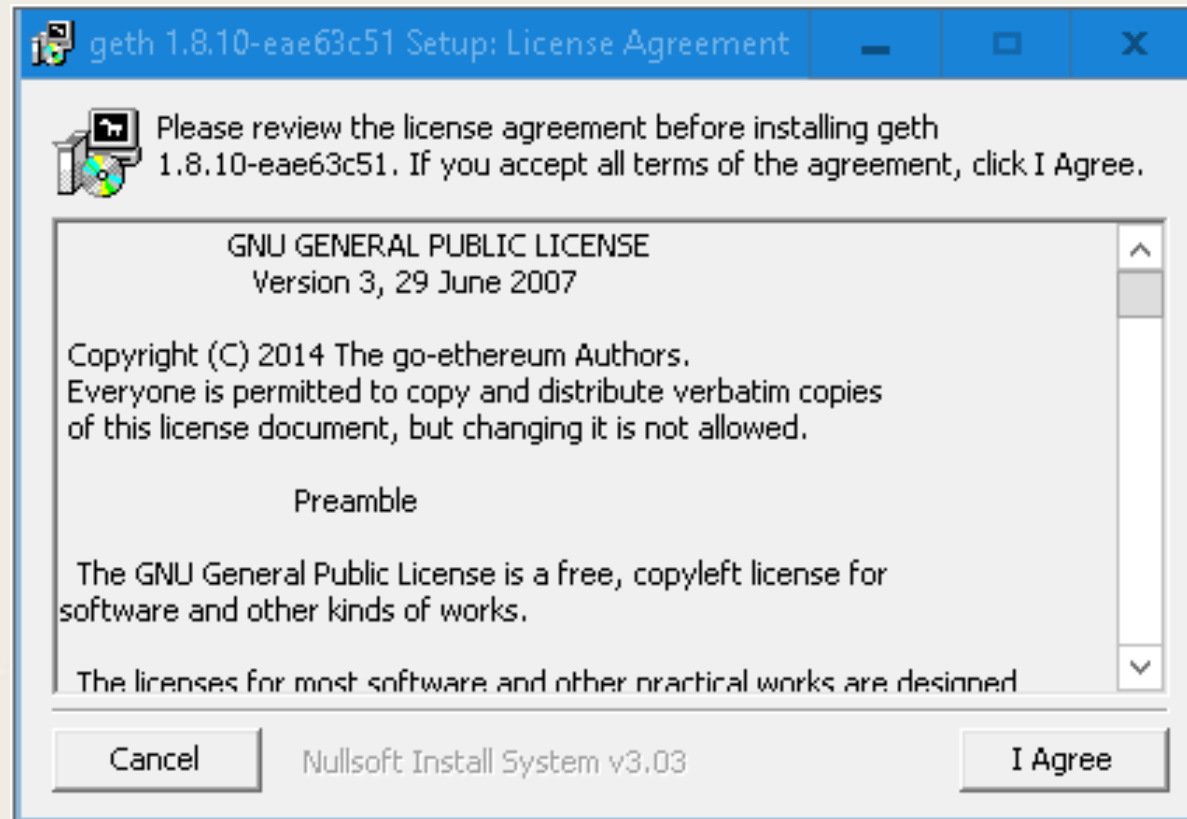
Begin Installation

Geth
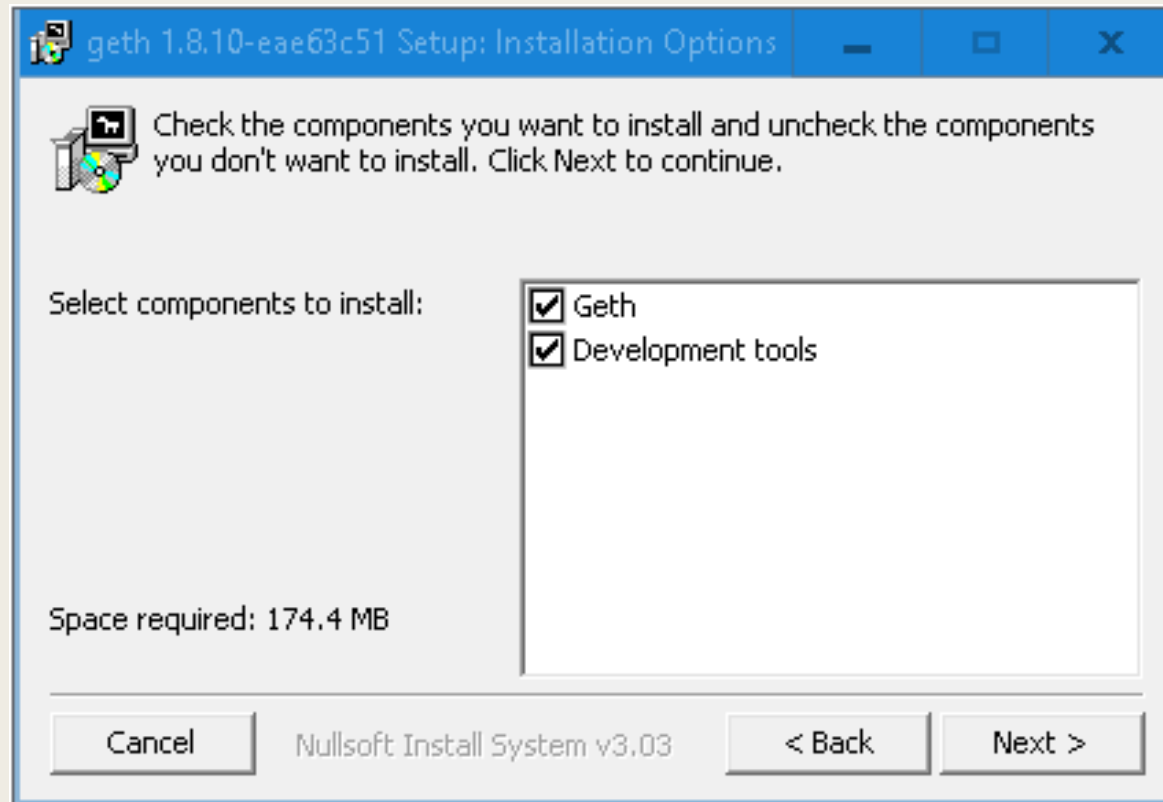
Check the Development Tools Option

Geth
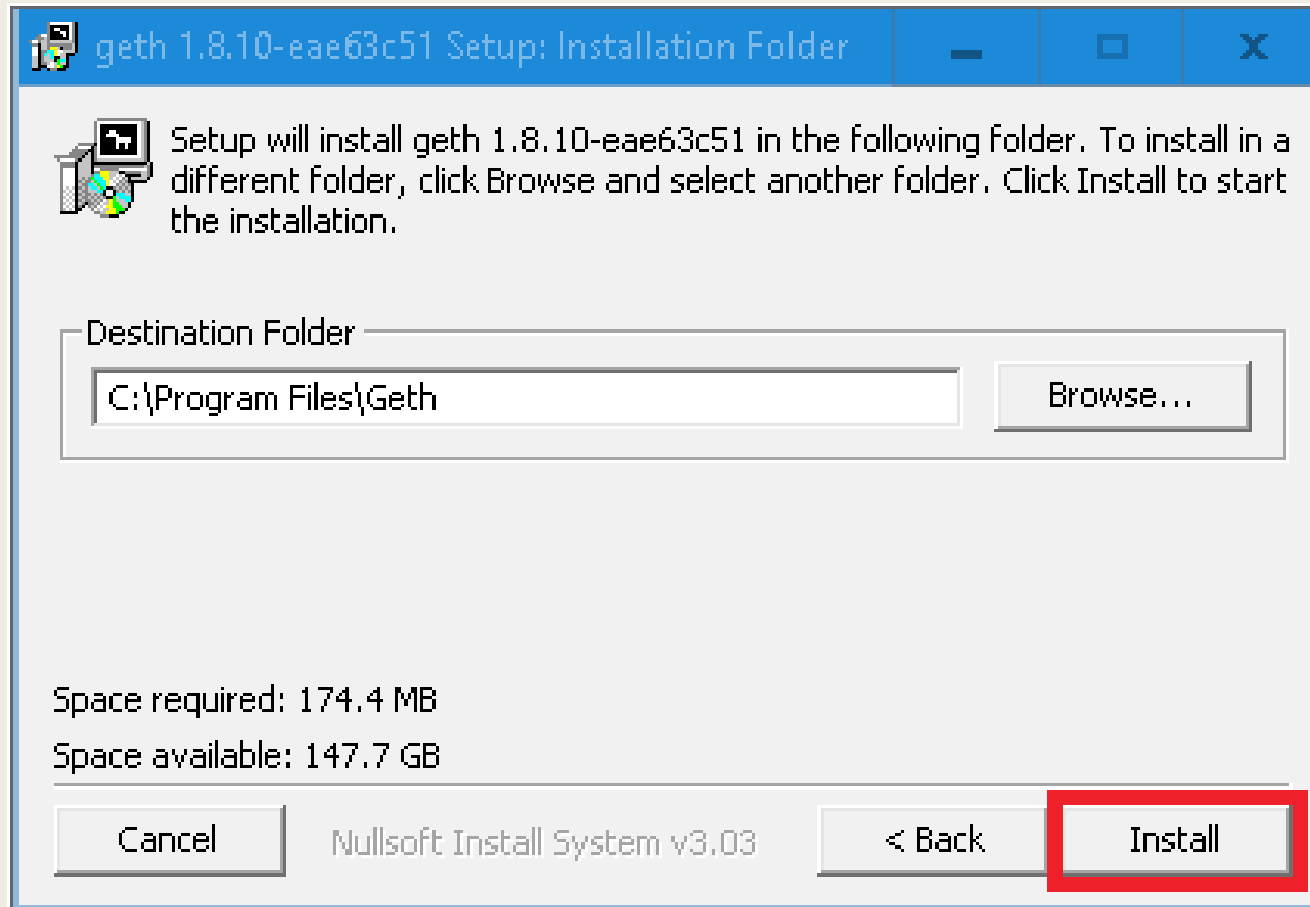
Click Install

Geth
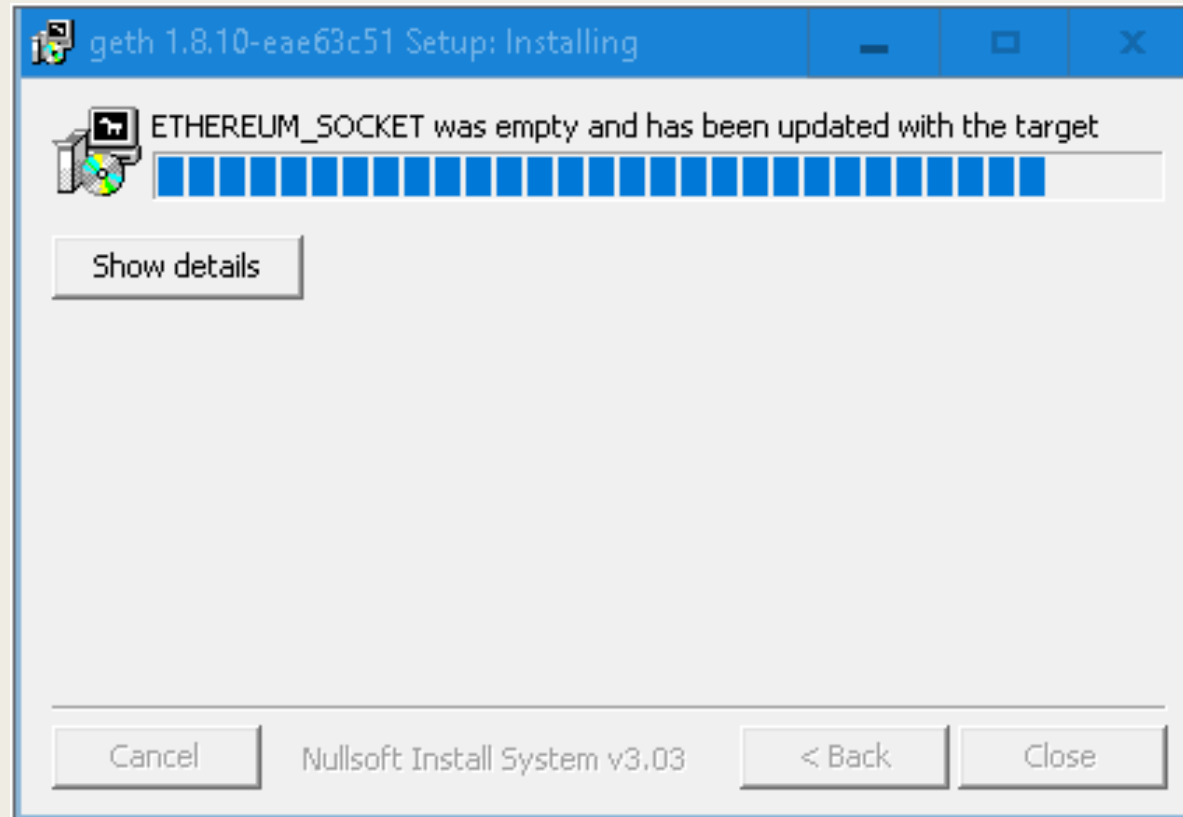
Wait for the Installation to finish

Geth
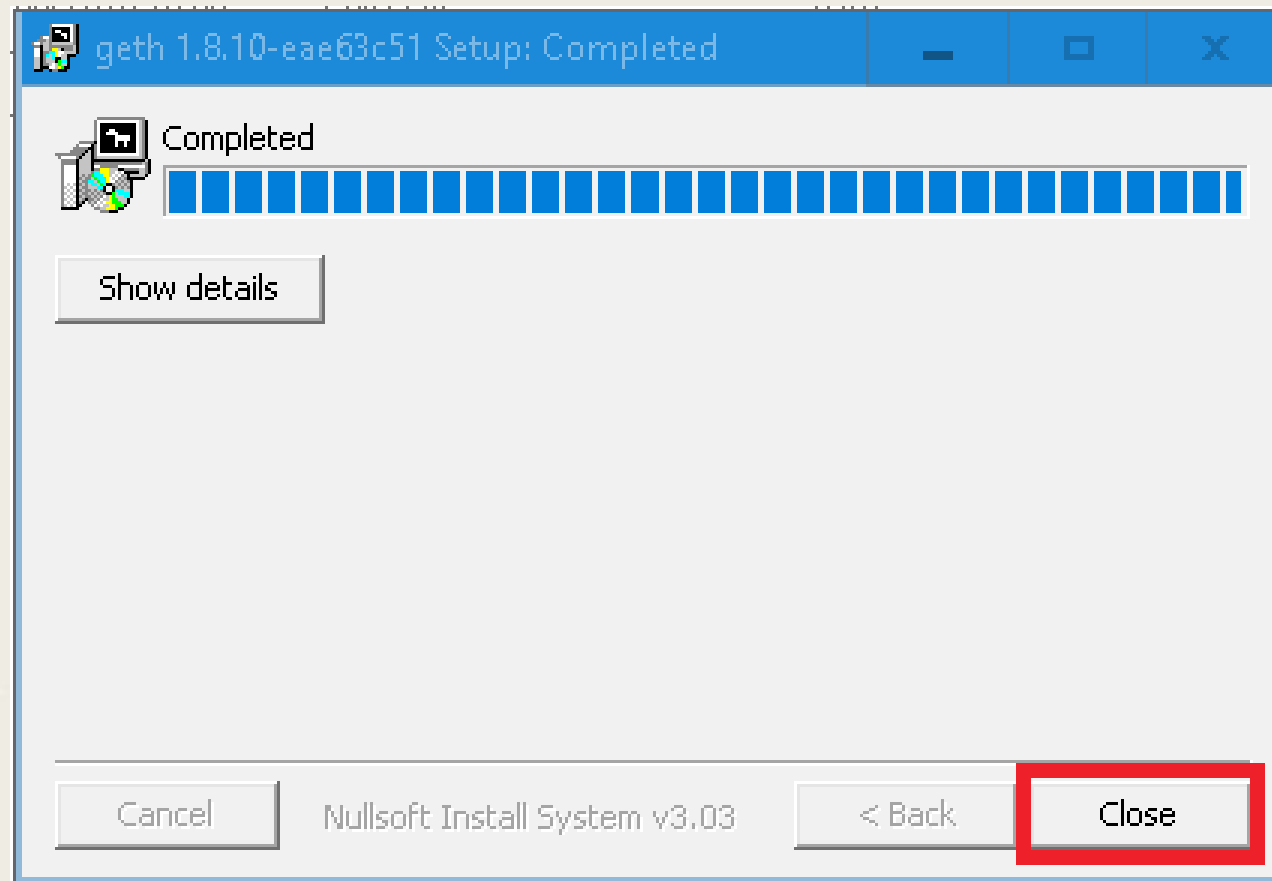
Close the Dialog

Test in Powershell

```
PS C:\Users\Truston Ailende> geth version
Geth
Version: 1.8.10-stable
Git Commit: eae63c511ceafab14b92e274c1b18bf1700e2d3d
Architecture: amd64
Protocol Versions: [63 62]
Network Id: 1
Go Version: go1.10.2
Operating System: windows
GOPATH=
GOROOT=C:\go
PS C:\Users\Truston Ailende>
```

Ganache

- Ganache is an ethereum blockchain emulator that you can use for development purposes

- It has a UI that allows you to inspect blocks and transactions

- It allows you test your contracts locally

Ganache

truffleframework.com/ganache

Ganache
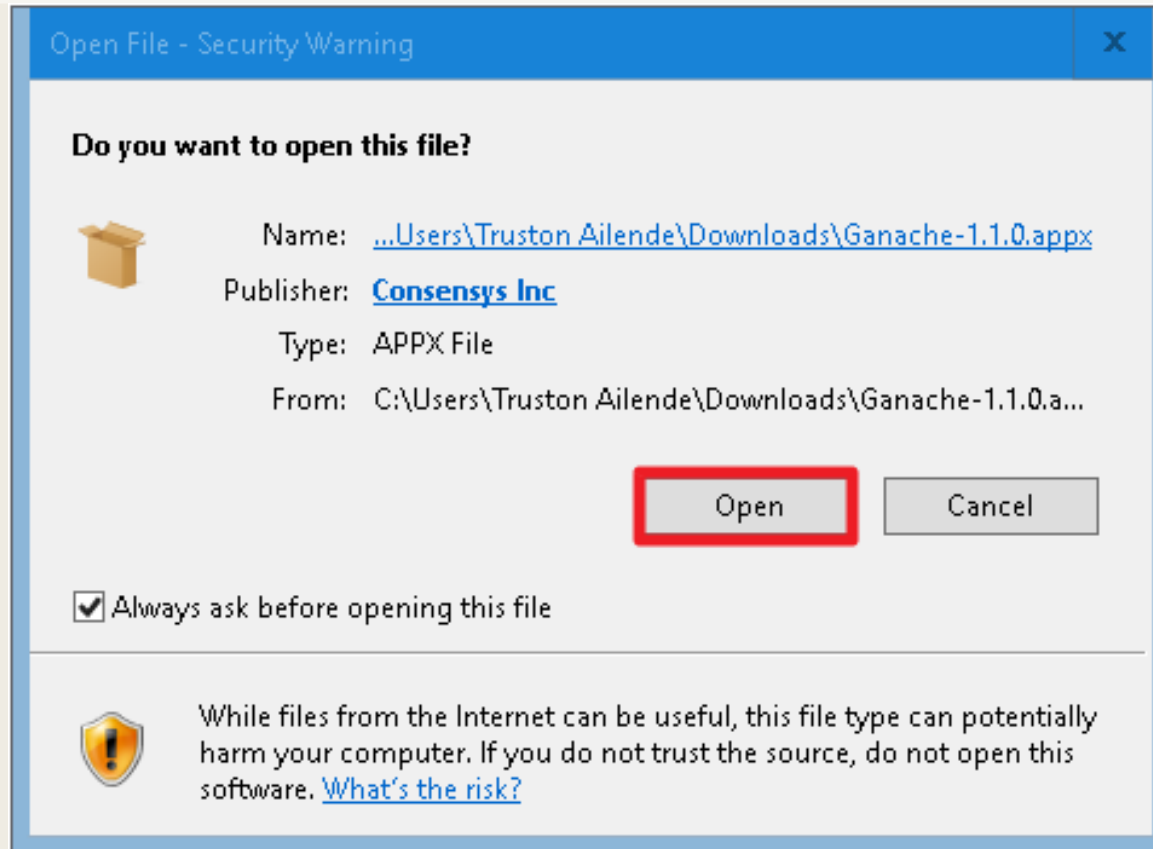
Run the Program

Ganache
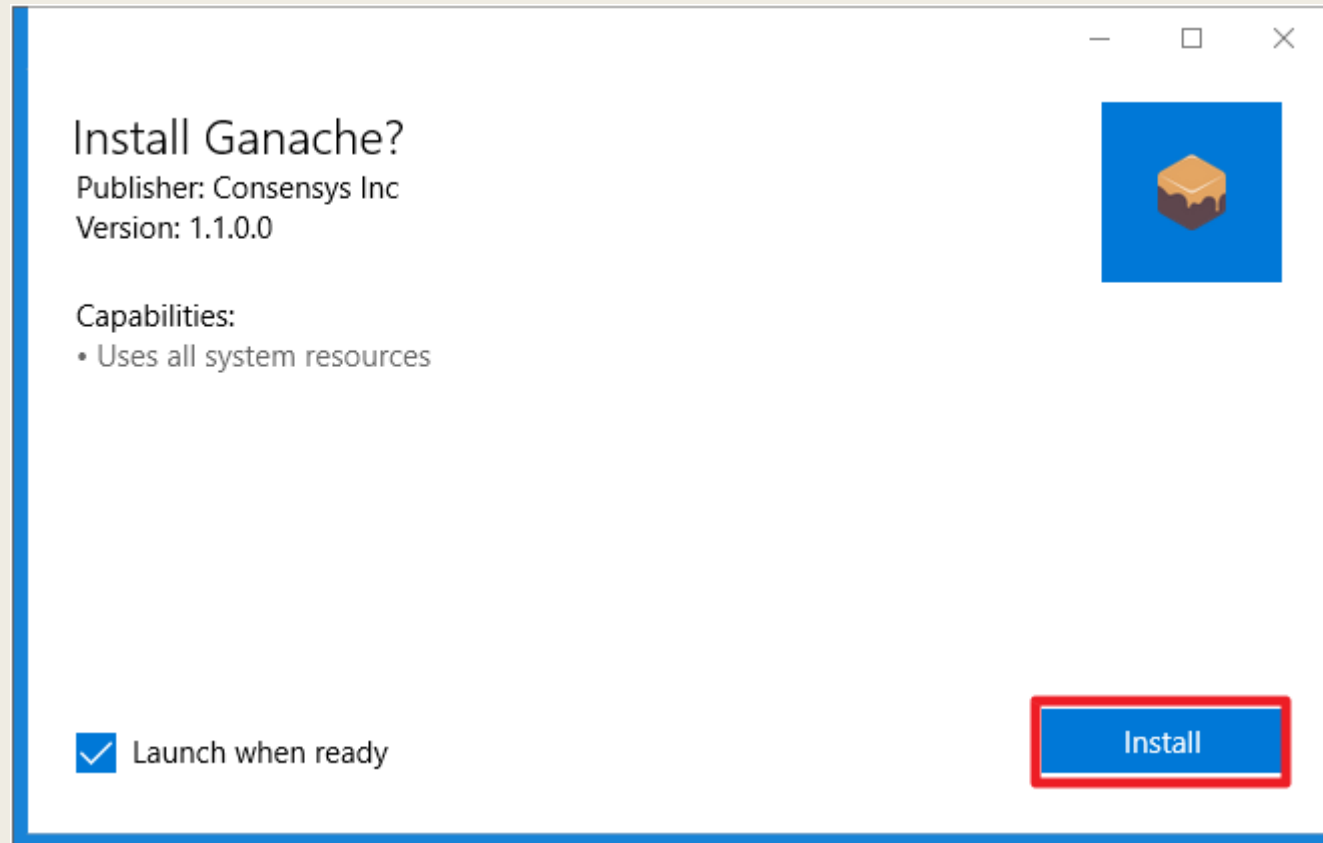
Start the Installation

Ganache

SUPPORT GANACHE

Ganache includes Google Analytics tracking to help us better understand how you use it during your normal development practices. You can opt-out of this tracking by selecting the option below.

By enabling this feature, you provide the Truffle team with valuable metrics, allowing us to better analyze usage patterns and add new features and bug fixes faster.

Thanks for your help, and happy coding!

-- *The Truffle Team*

WHAT WE TRACK

- A unique UUID generated upon first use
- Window width and height
- Ganache version
- Exception messages (without paths)
- Screens viewed during use

We do not collect addresses or private keys.

Analytics enabled. Thanks!

CONTINUE

Click the Continue Button

Ganache

Installation Successful

Node

- Node is a server side JavaScript platform to create applications that will interact with your Ethereum node

- To know if Node is on your machine, in Powershell, type in the following command:

  node -v

  If you see an error, it means that Node isn't installed

Node

Node.js® is a JavaScript runtime built on Chrome's V8 JavaScript engine. Node.js uses an event-driven, non-blocking I/O model that makes it lightweight and efficient. Node.js' package ecosystem, npm, is the largest ecosystem of open source libraries in the world.

June 2018 Security Releases

Download for Windows (x64)

8.11.2 LTS
Recommended For Most Users

10.4.0 Current
Latest Features

Other Downloads | Changelog | API Docs   Other Downloads | Changelog | API Docs

nodejs.org

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Click to start download

Node
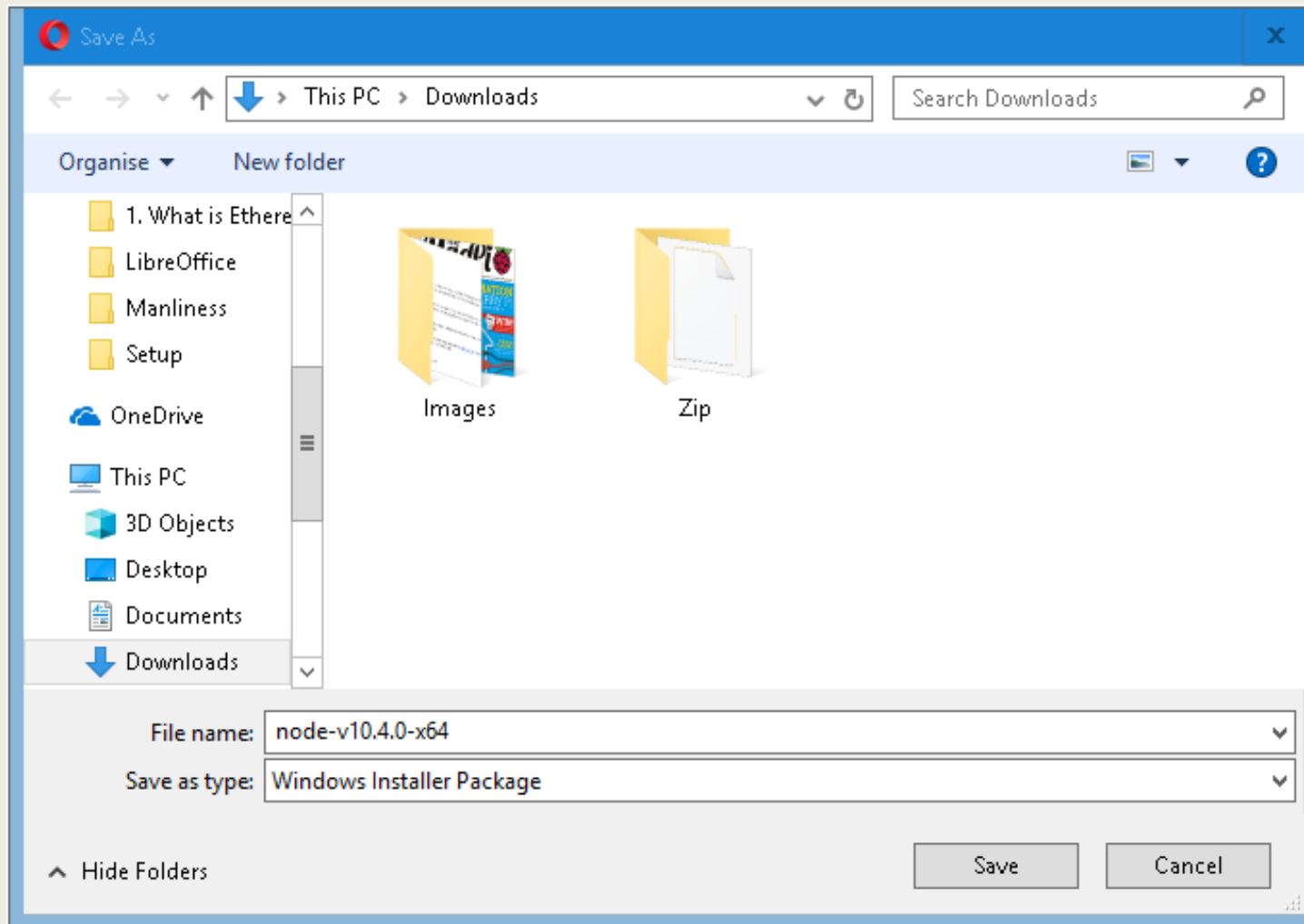
Popup opens

Node

Start Download

44
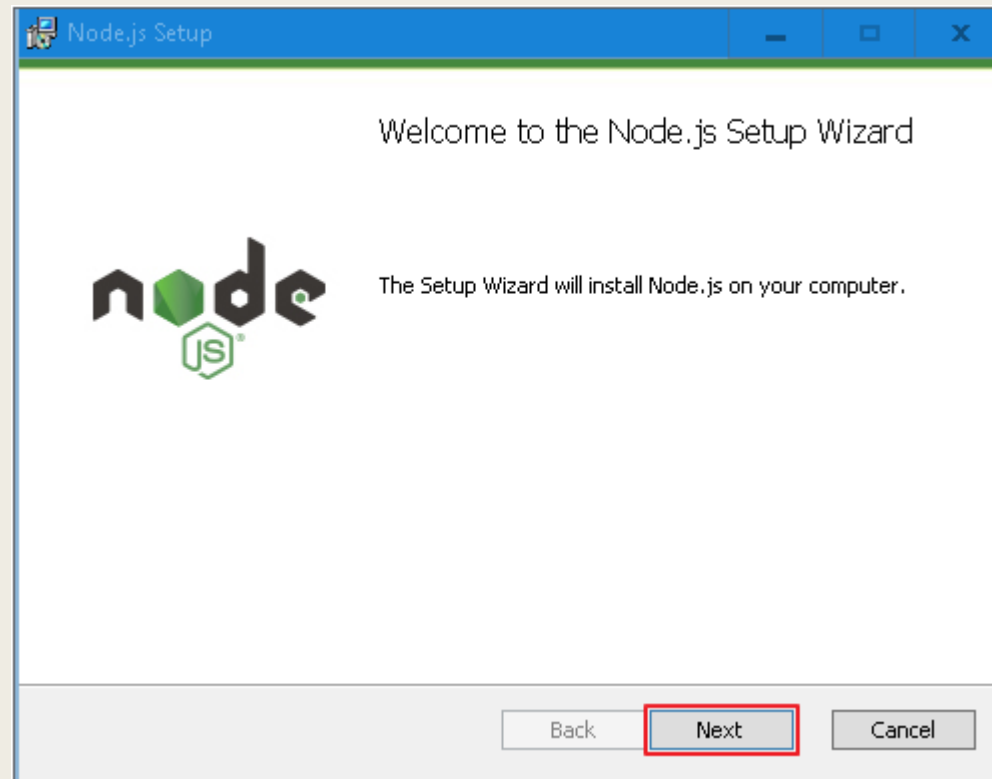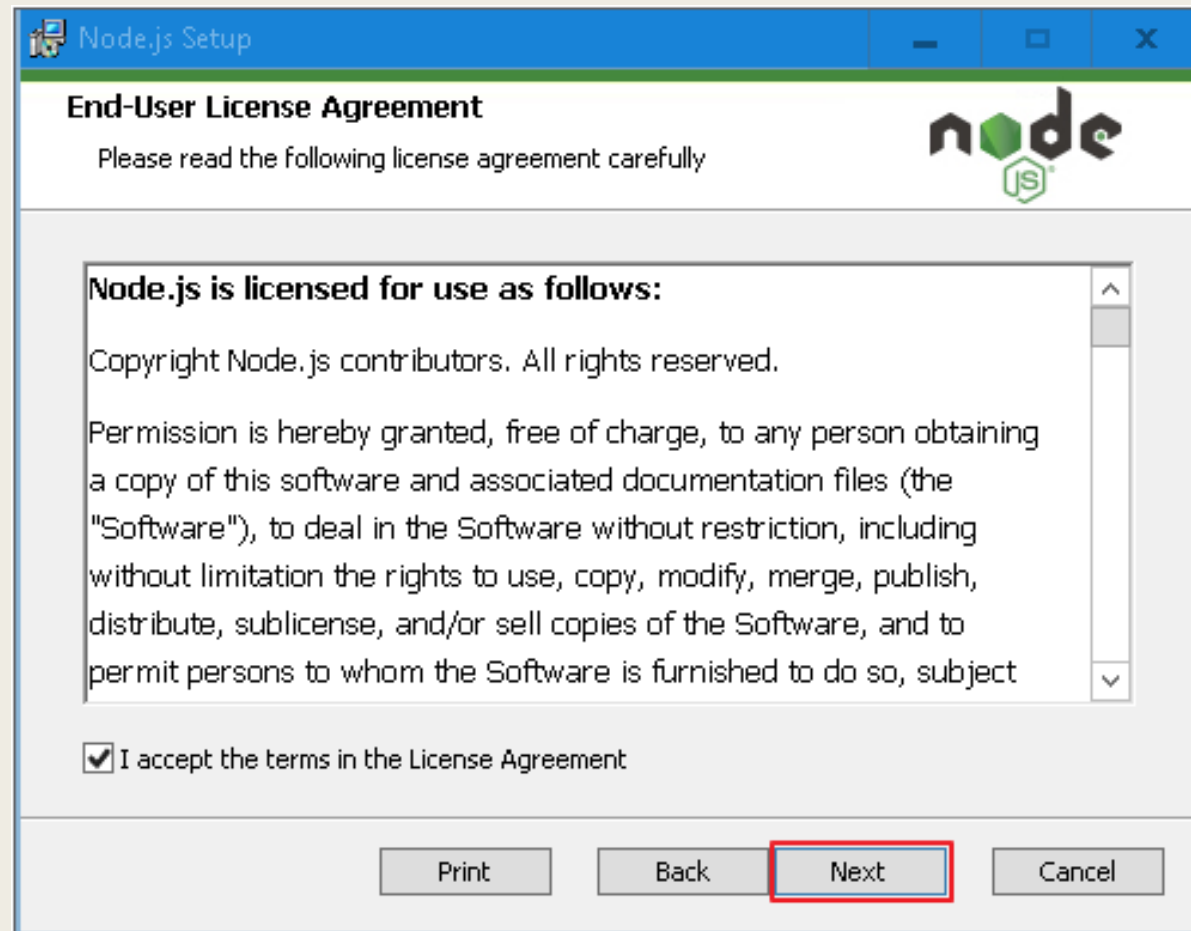
Node

Accept License Agreement

Node
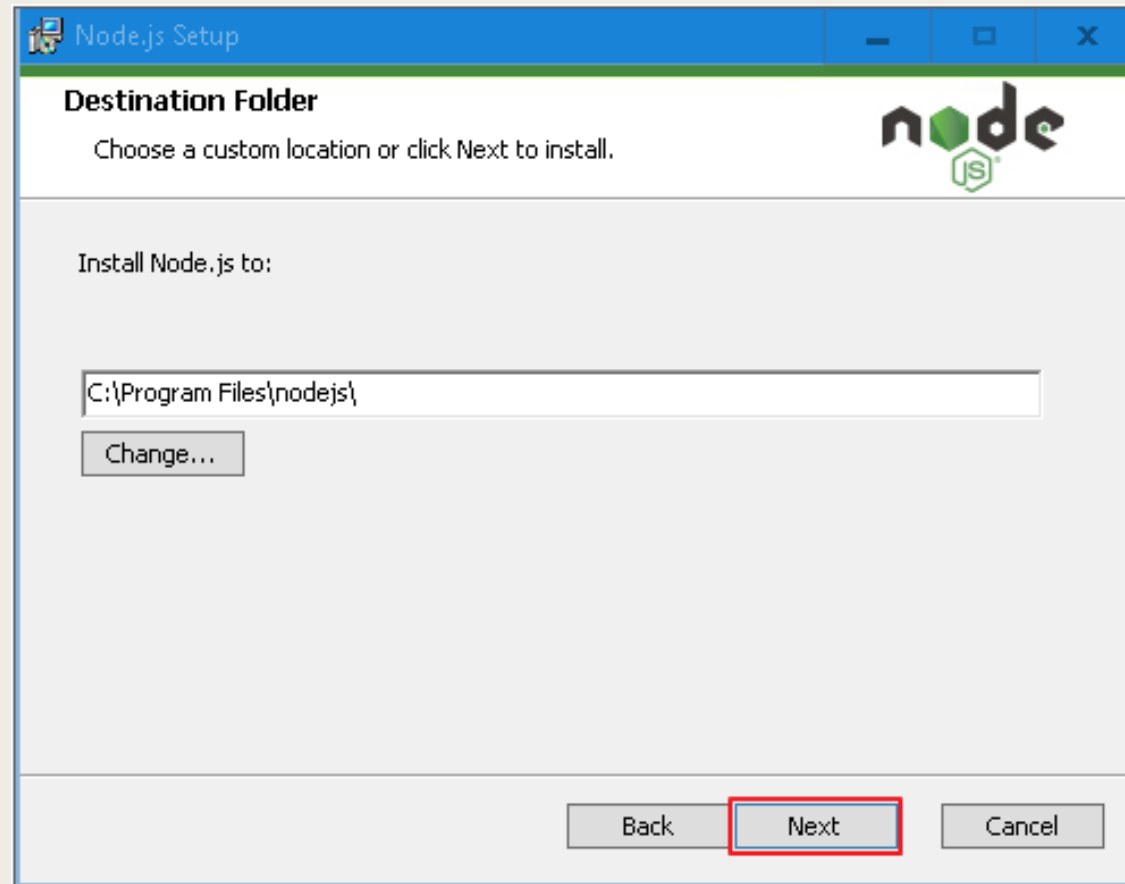
Destination Folder

Node
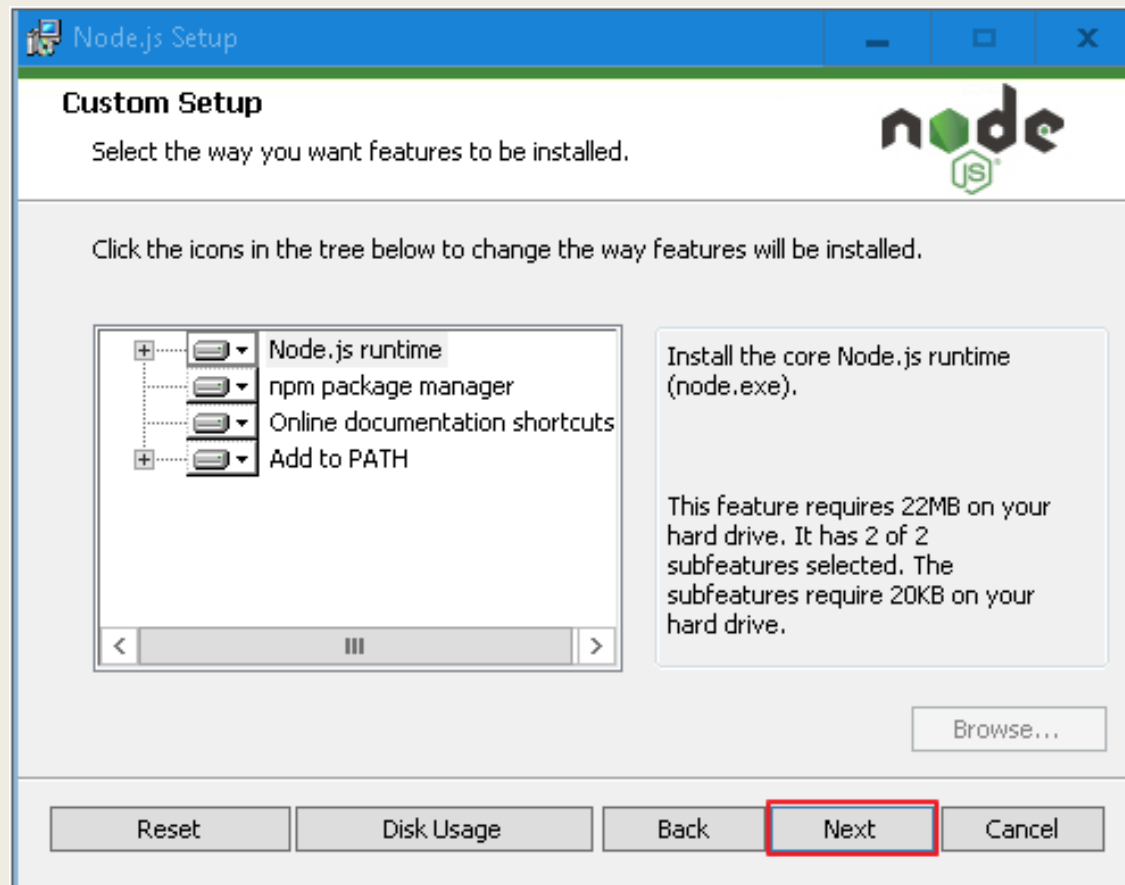
Accept Defaults

Node
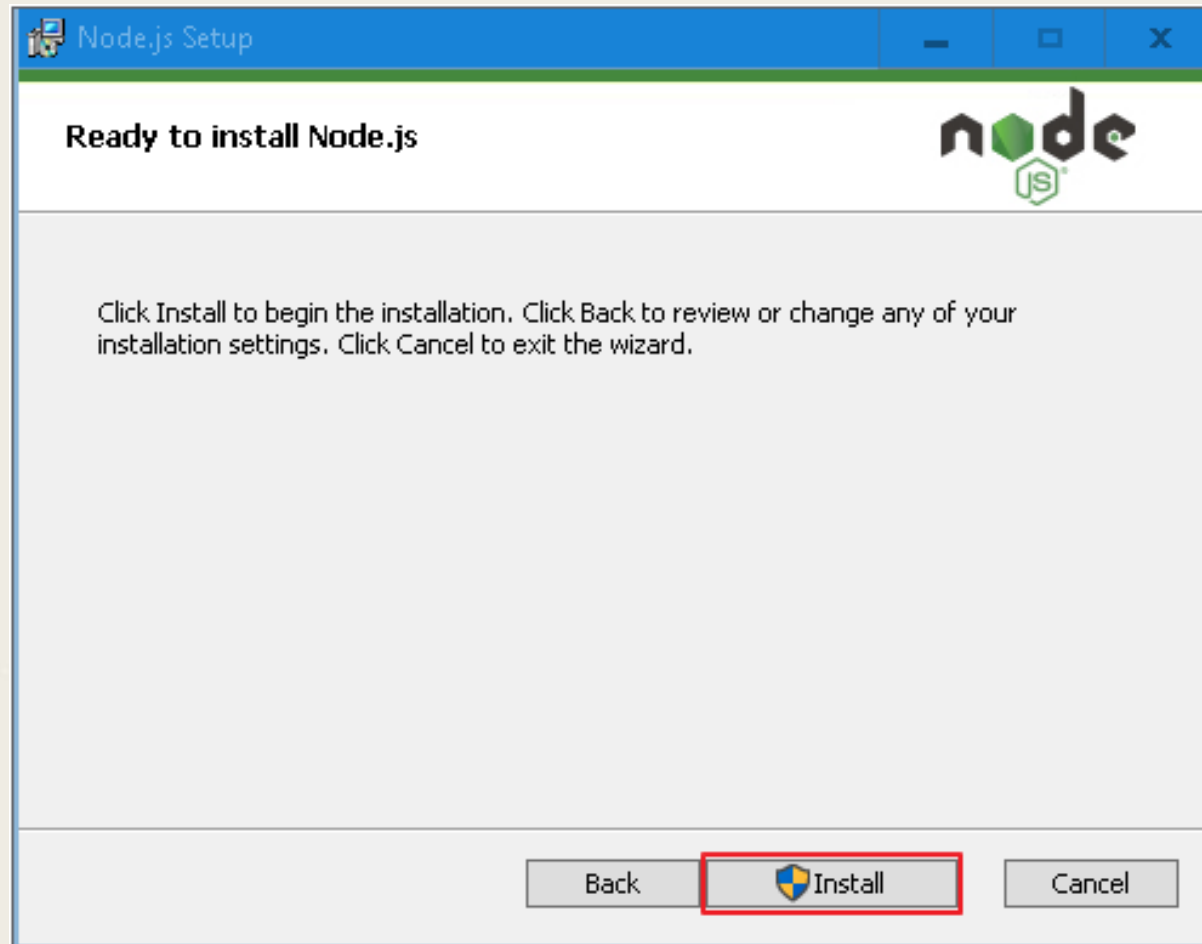
Begin Installation

Node
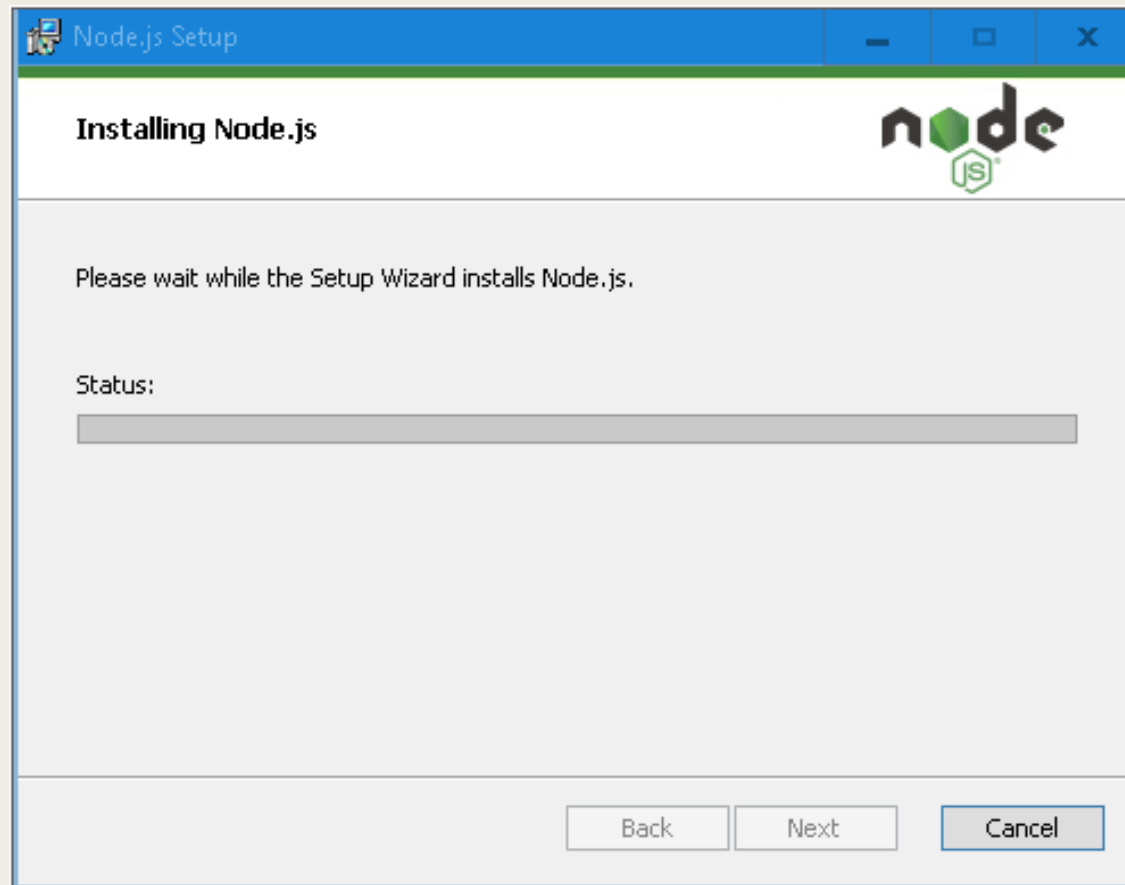
Setup Begins

Node
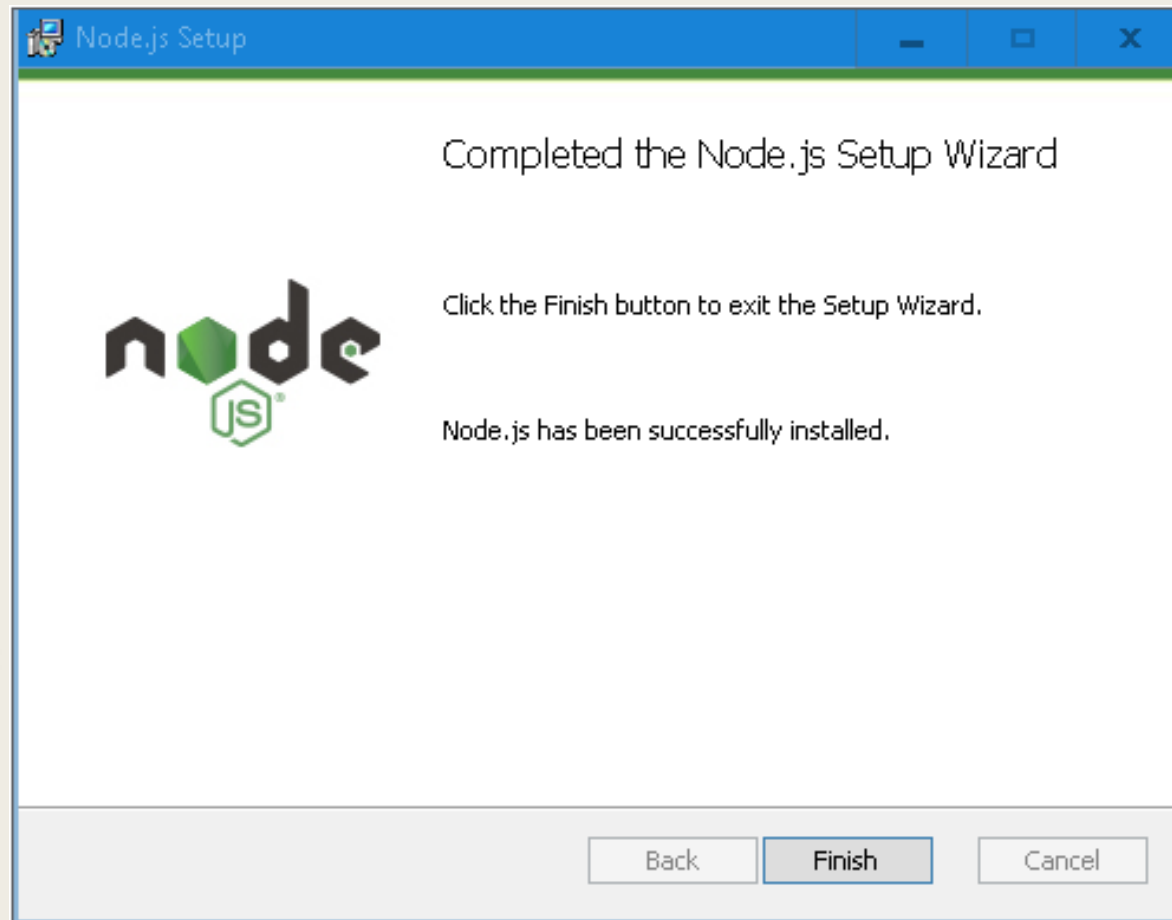
Installation Successful

Truffle

- To compile, test and deploy your smart contracts, you need a build framework that will increase your development speed

- If you have a previous version, uninstall it in Powershell using the code shown below:

  npm uninstall -g truffle

Install a recent version in Powershell using the command shown below:

  npm install -g truffle

Truffle

```
PS C:\Users\Truston Ailende> npm install -g truffle
C:\Users\Truston Ailende\AppData\Roaming\npm\truffle -> C:\Users\Truston Ailende
\AppData\Roaming\npm\node_modules\truffle\build\cli.bundled.js
+ truffle@4.1.11
added 81 packages from 309 contributors in 59.713s
PS C:\Users\Truston Ailende> truffle version
Truffle v4.1.11 (core: 4.1.11)
Solidity v0.4.24 (solc-js)
PS C:\Users\Truston Ailende>
```

Installation Successful

Solidity

- Solidity is a contract-oriented programming language for writing smart contracts

- Solidity is a statically-typed programming language designed for developing smart contracts that run on the EVM

- Solidity is compiled to bytecode that is executable on the EVM

Solidity

- In Powershell, type this command:

  npm install -g solc

```
PS C:\Users\Truston Ailende> npm install -g solc
C:\Users\Truston Ailende\AppData\Roaming\npm\solcjs -> C:\Users\Truston Ailende\AppData\
Roaming\npm\node_modules\solc\solcjs
+ solc@0.4.24
added 66 packages from 31 contributors in 20.915s
```

Solidity

```
PS C:\Users\Truston Ailende> solcjs
Must provide a file
PS C:\Users\Truston Ailende>
```

Test Your Installation

Visual Studio Code

- Visual Studio Code is a source code editor developed by Microsoft for Windows, Linux and MacOS.

- It includes support for debugging, embedded Git control, syntax highlighting, intelligent code completion, snippets, and code refactoring.

- We will use it for syntax highlighting of our Solidity code

Visual Studio Code
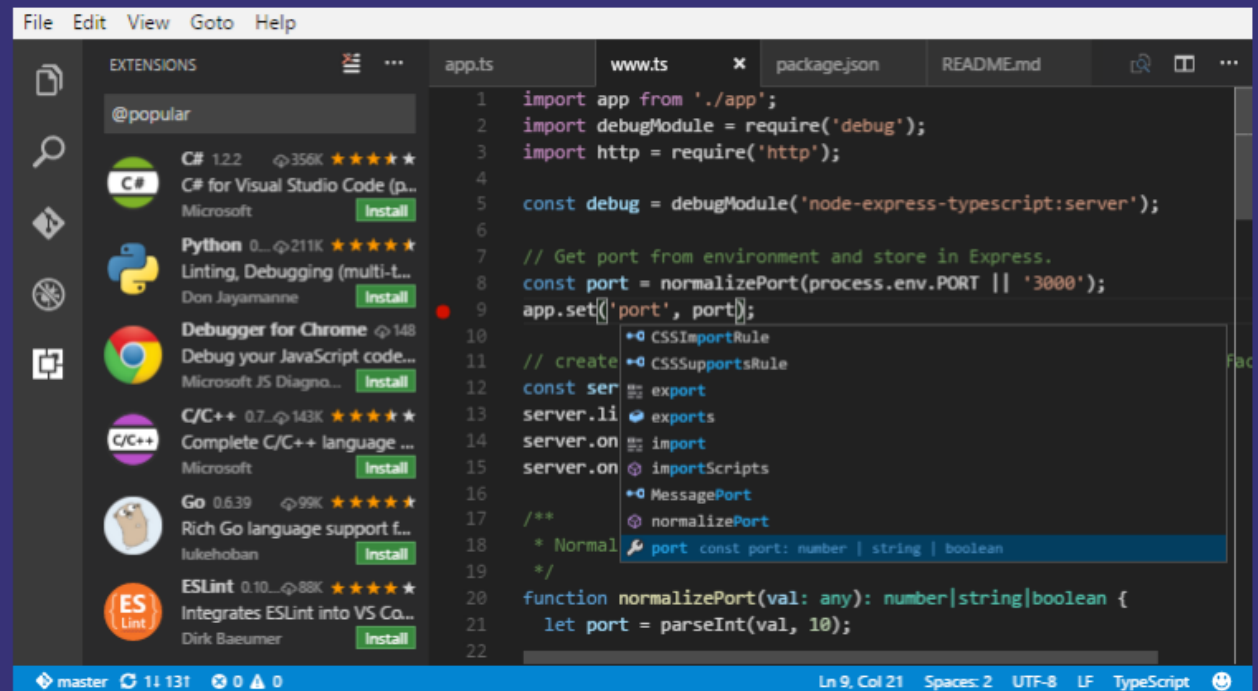
https://code.visualstudio.com
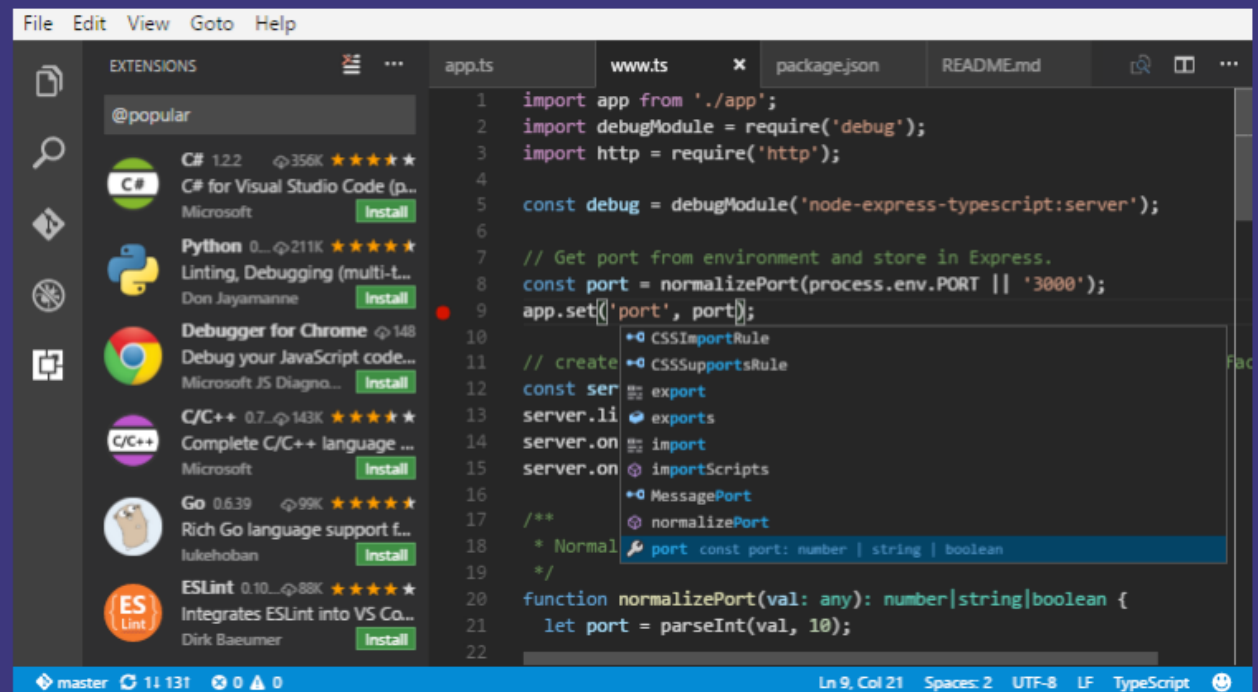
Visual Studio Code

Click to Download

Visual Studio Code
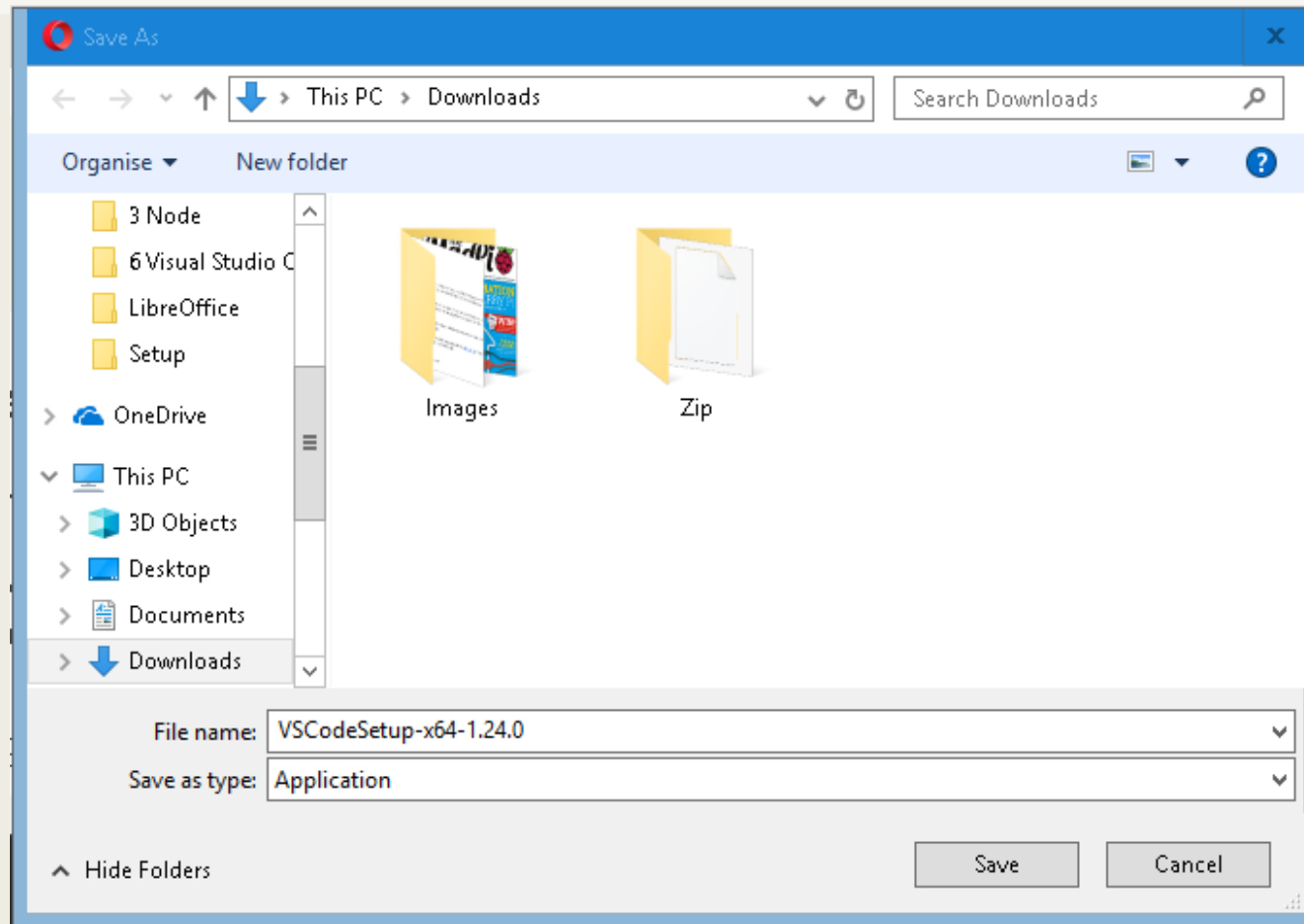
Popup comes up

Visual Studio Code
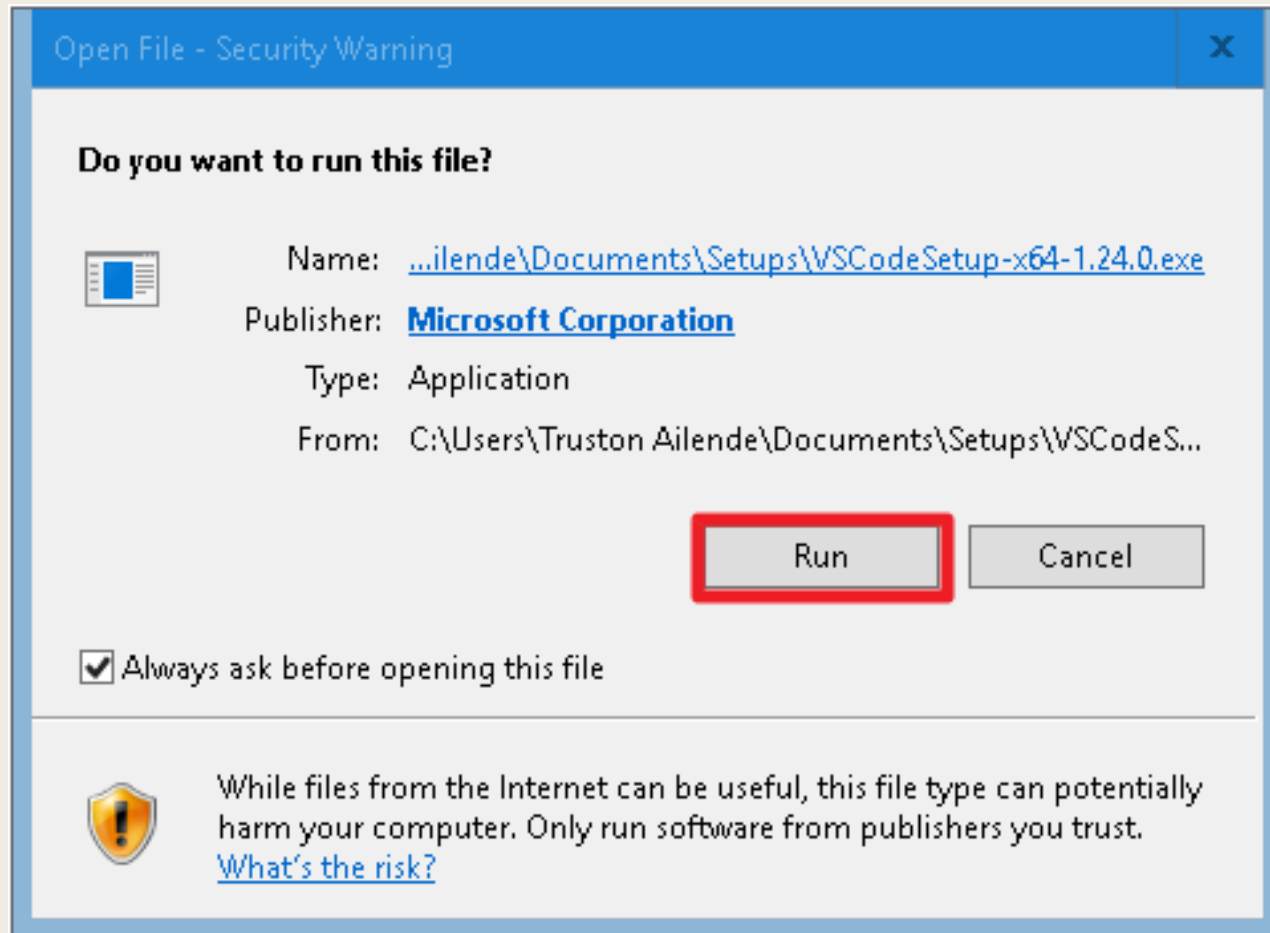
Run the Program

Visual Studio Code
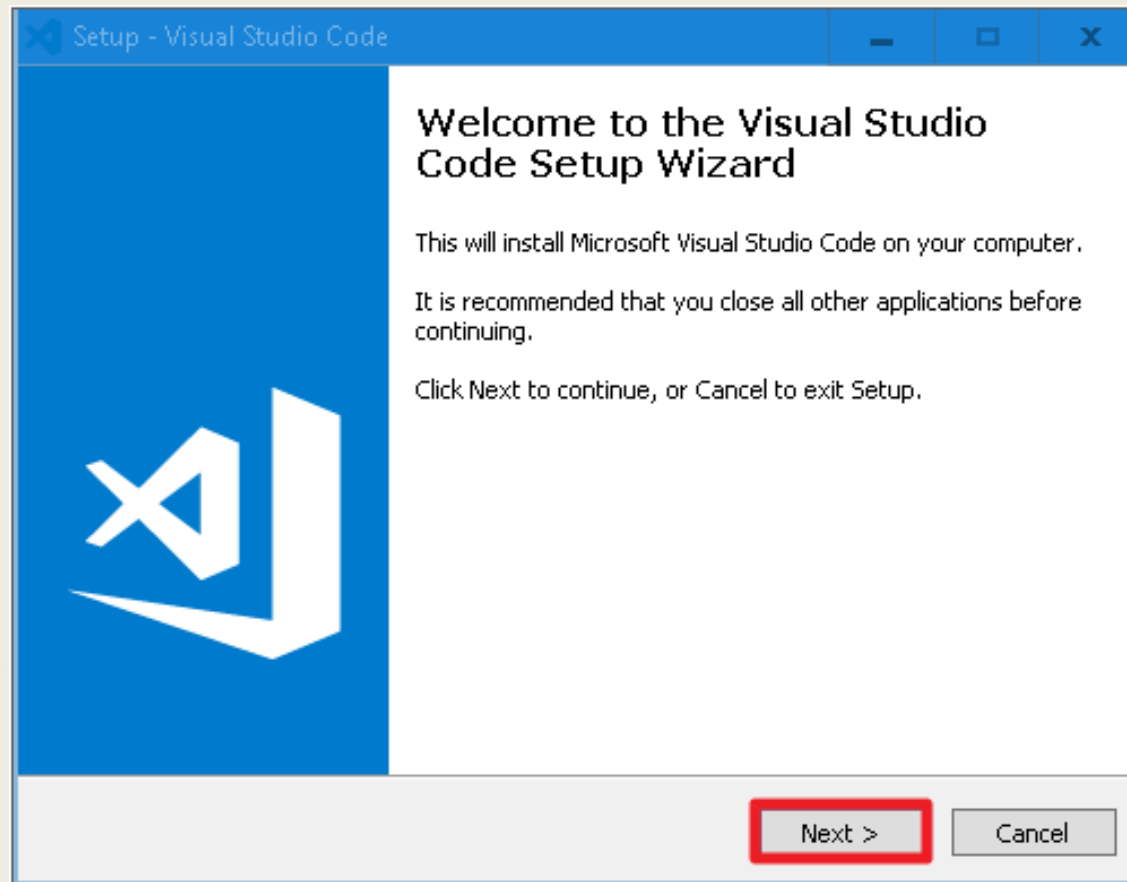
Start Your Installation
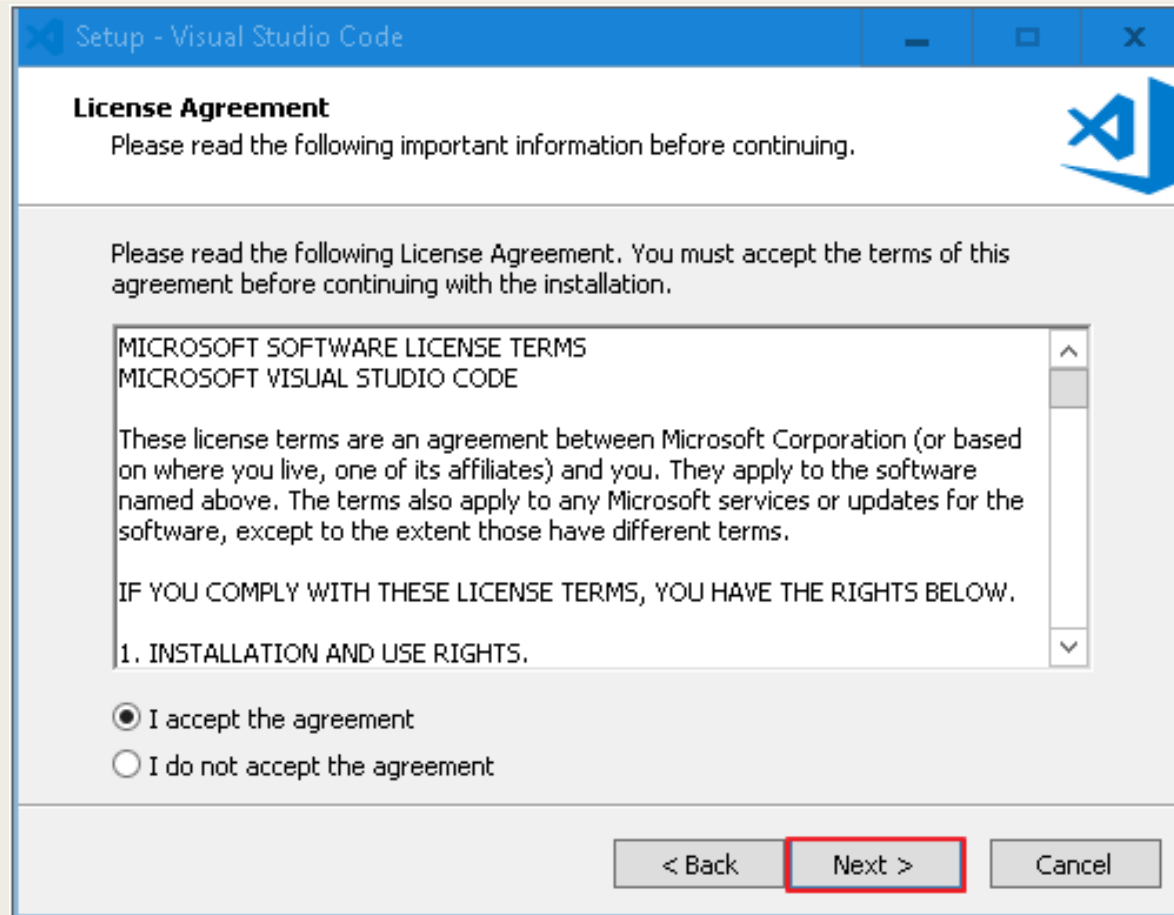
Visual Studio Code

Accept the License Agreement

Visual Studio Code
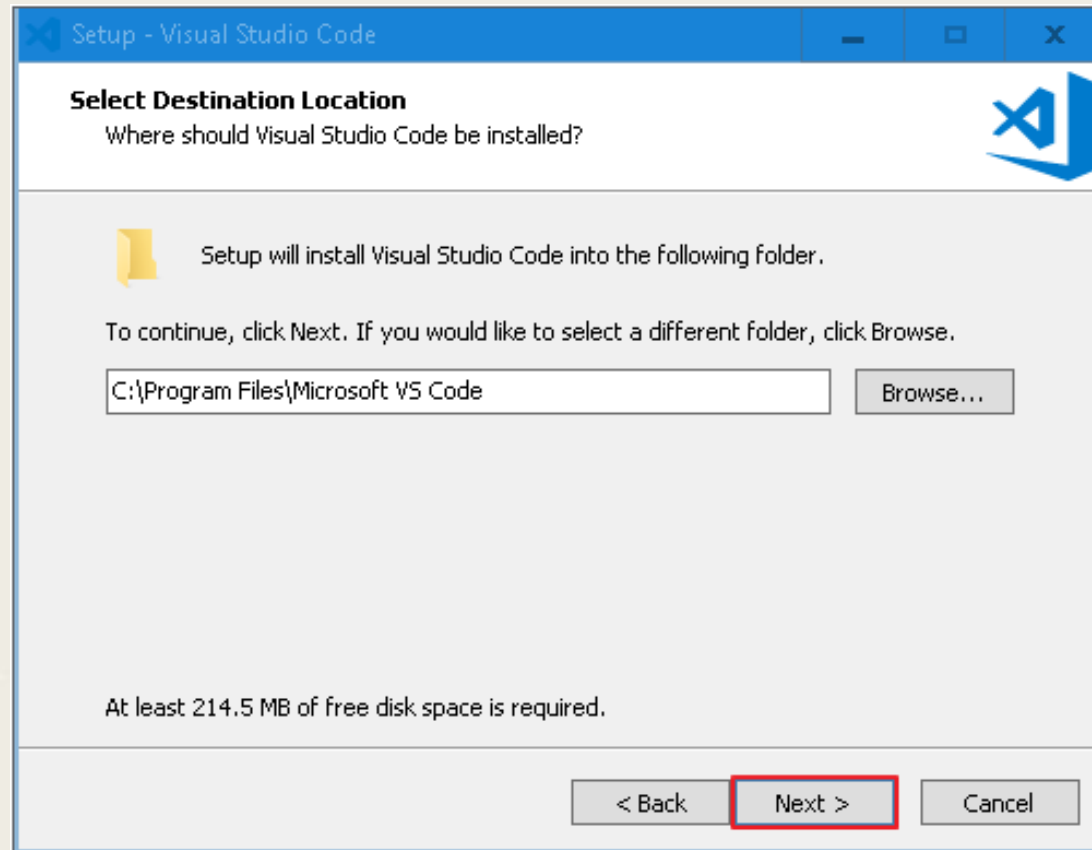
Accept Default Destination

Visual Studio Code
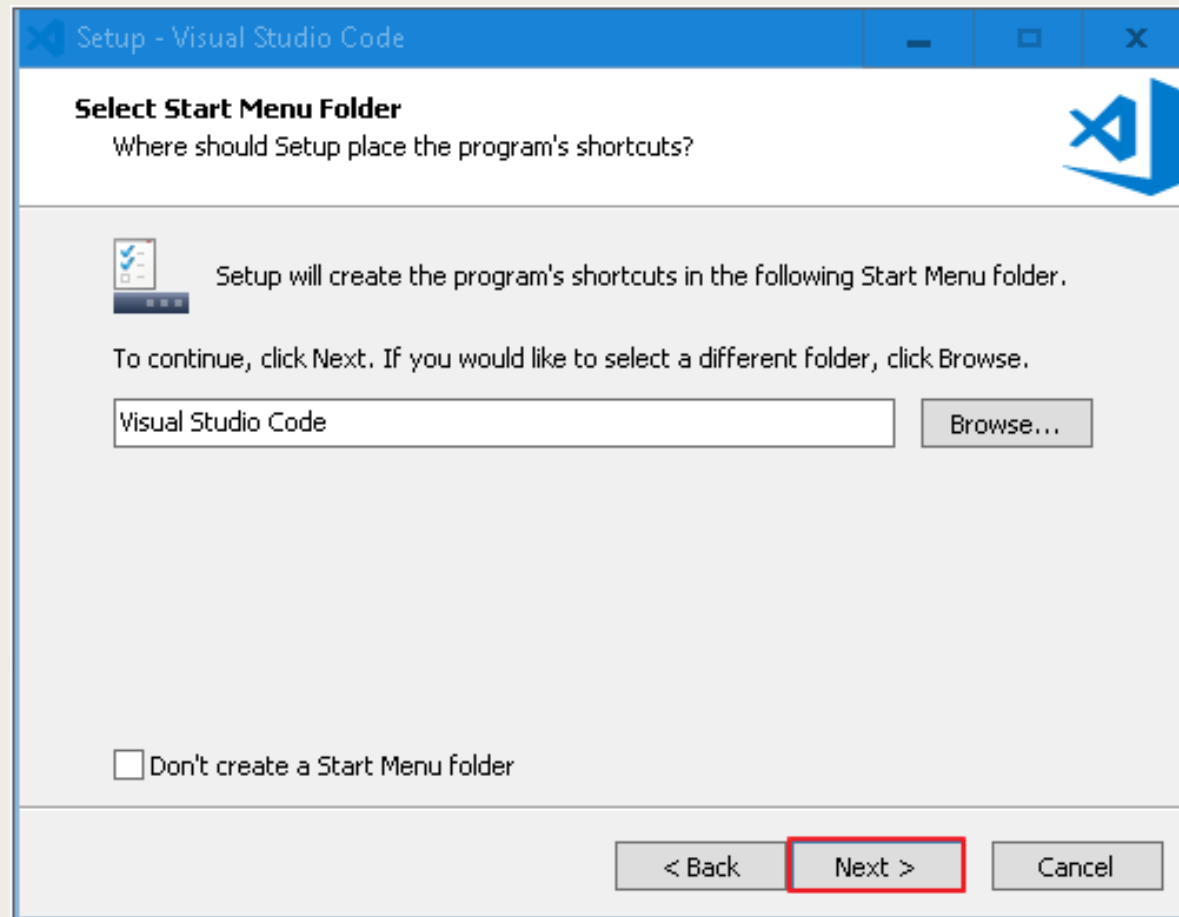
Start Menu Folder

Visual Studio Code
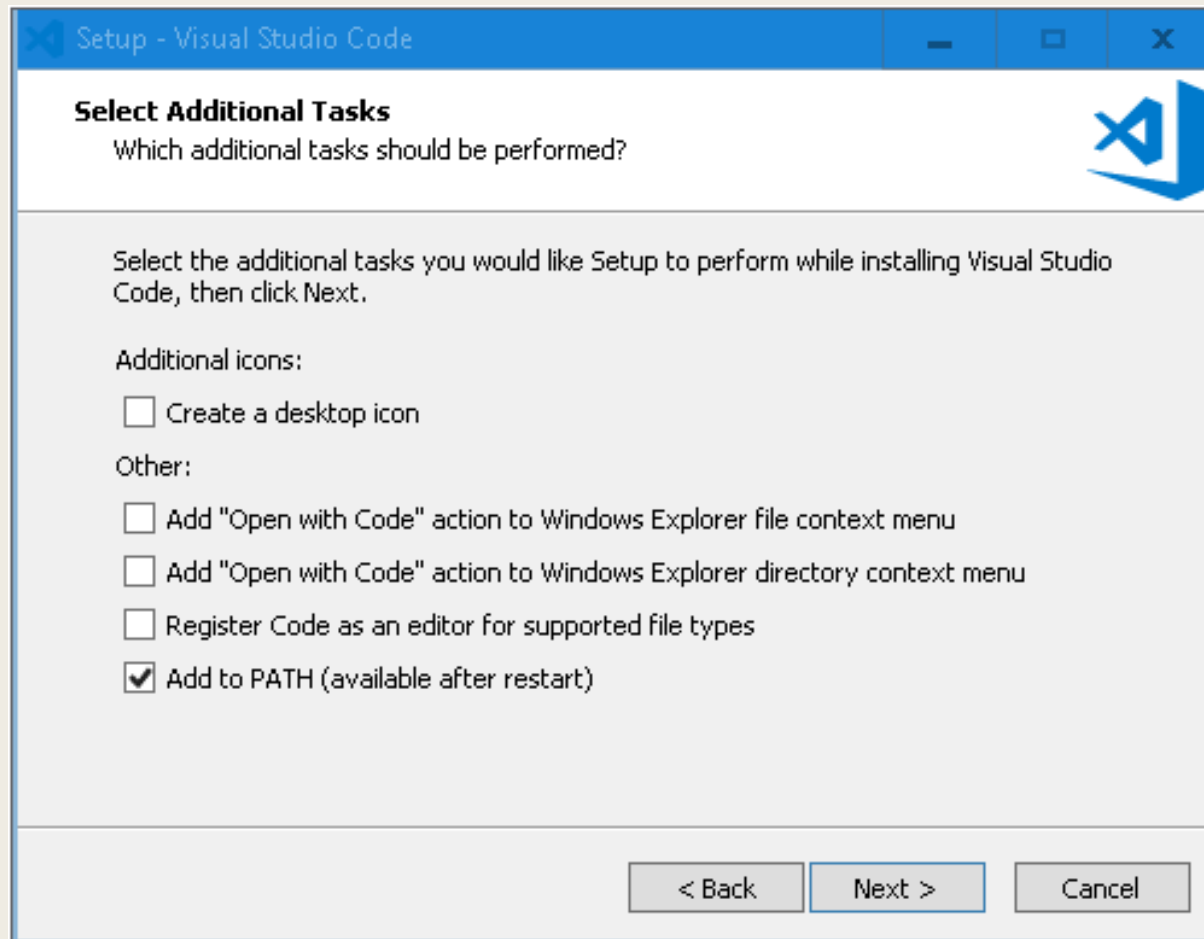
Additional Tasks

Visual Studio Code
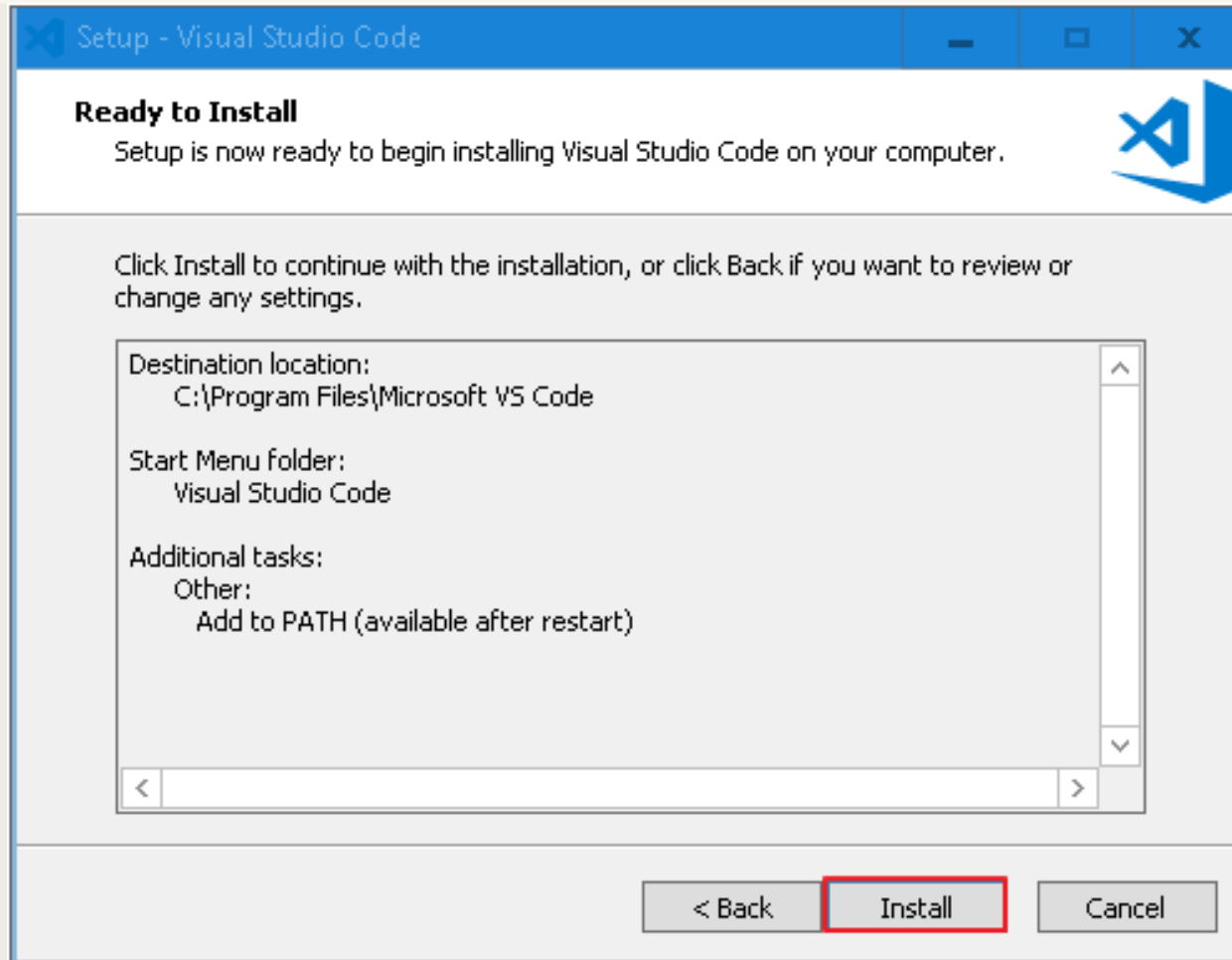
Start Installation

Visual Studio Code
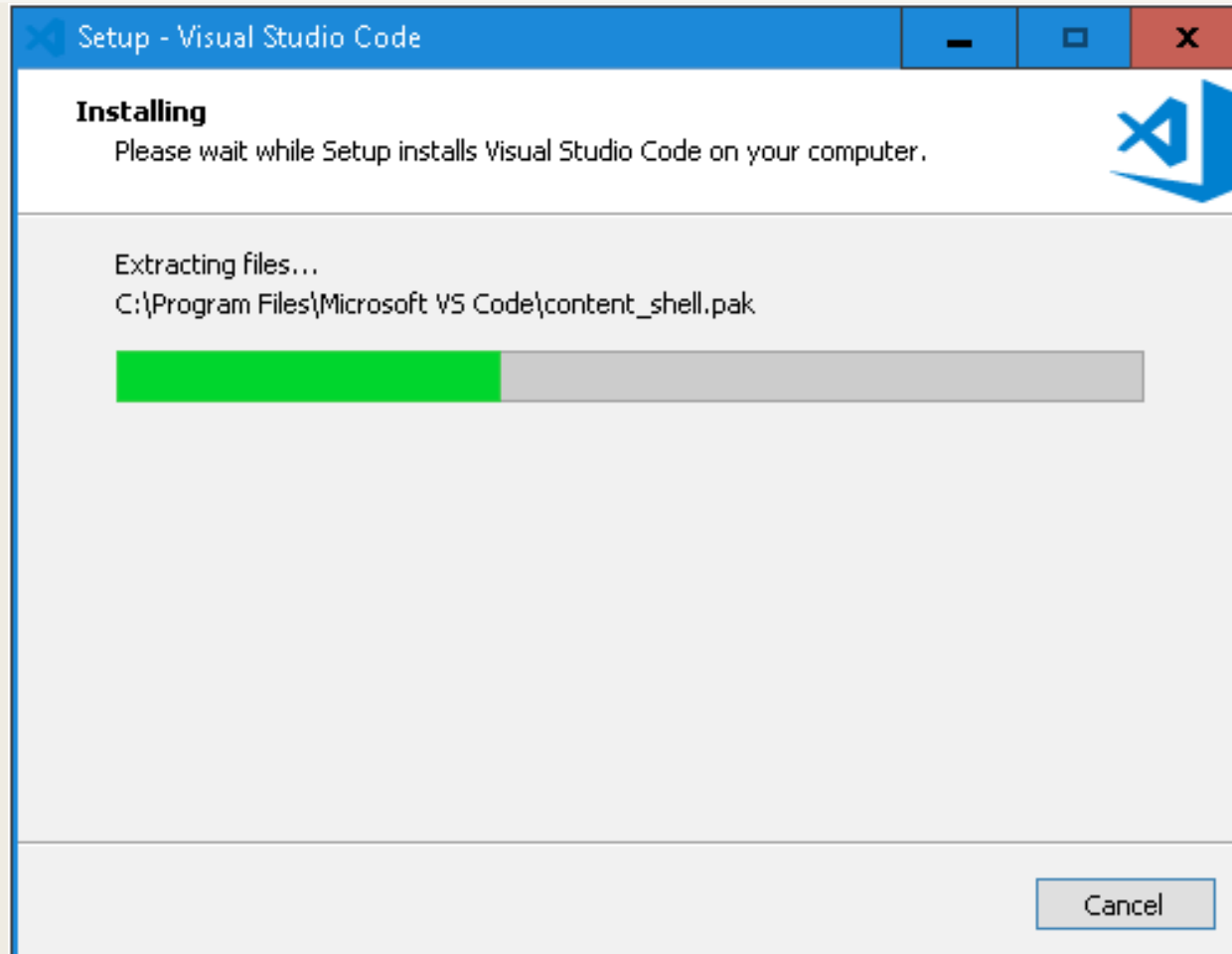
Installation in Progress
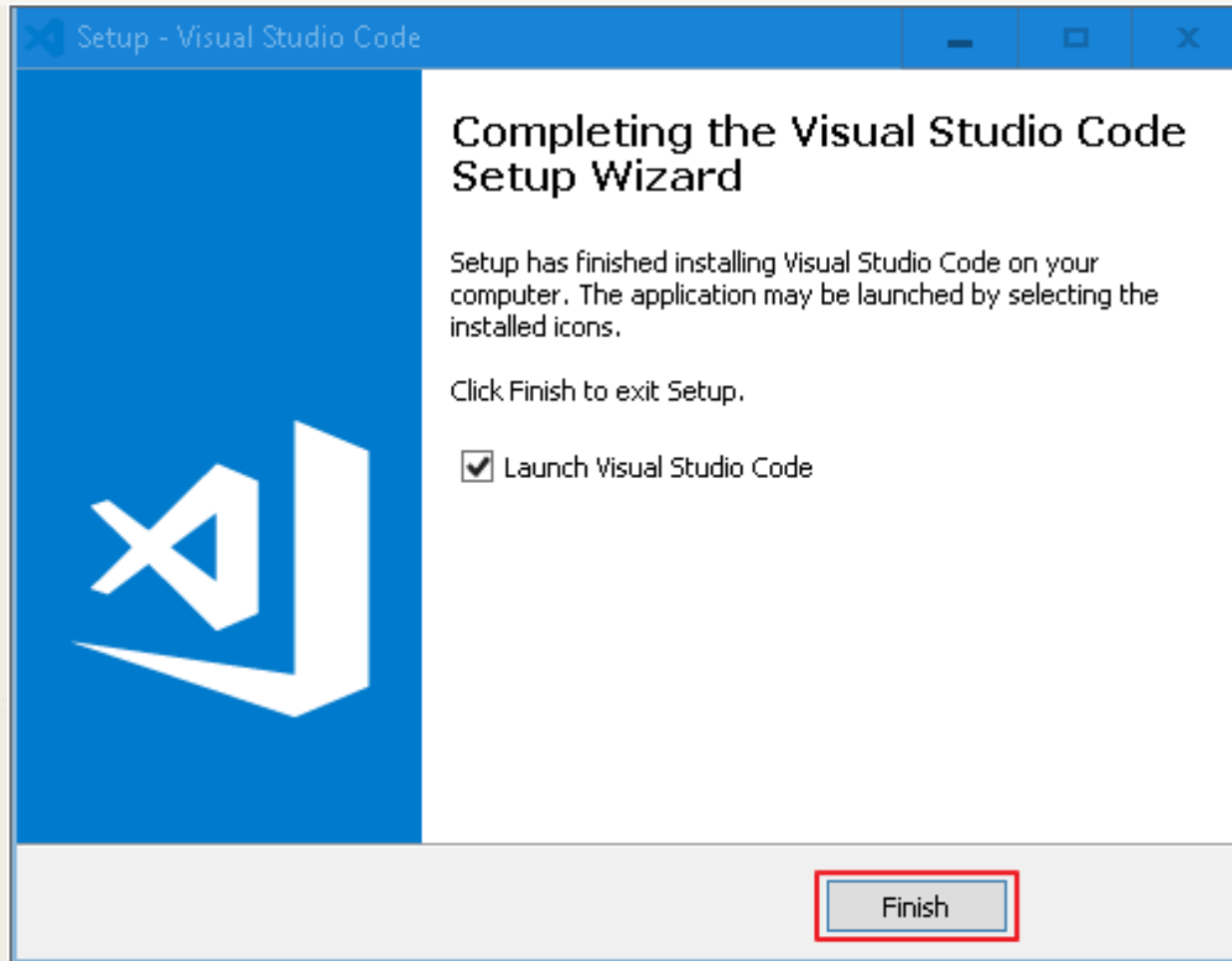
Visual Studio Code

Installation Completed
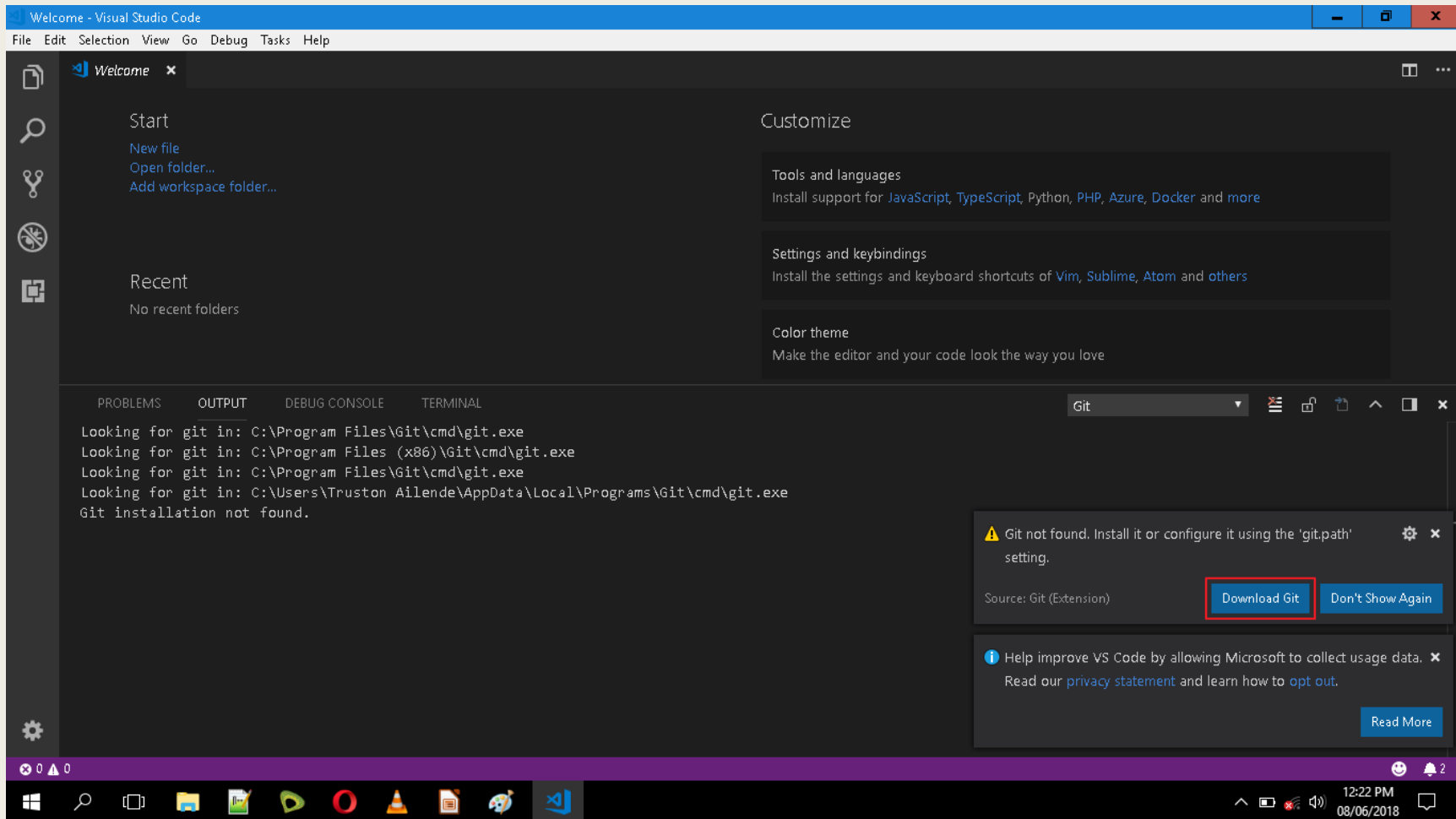
Visual Studio Code

First Run

Visual Studio Code
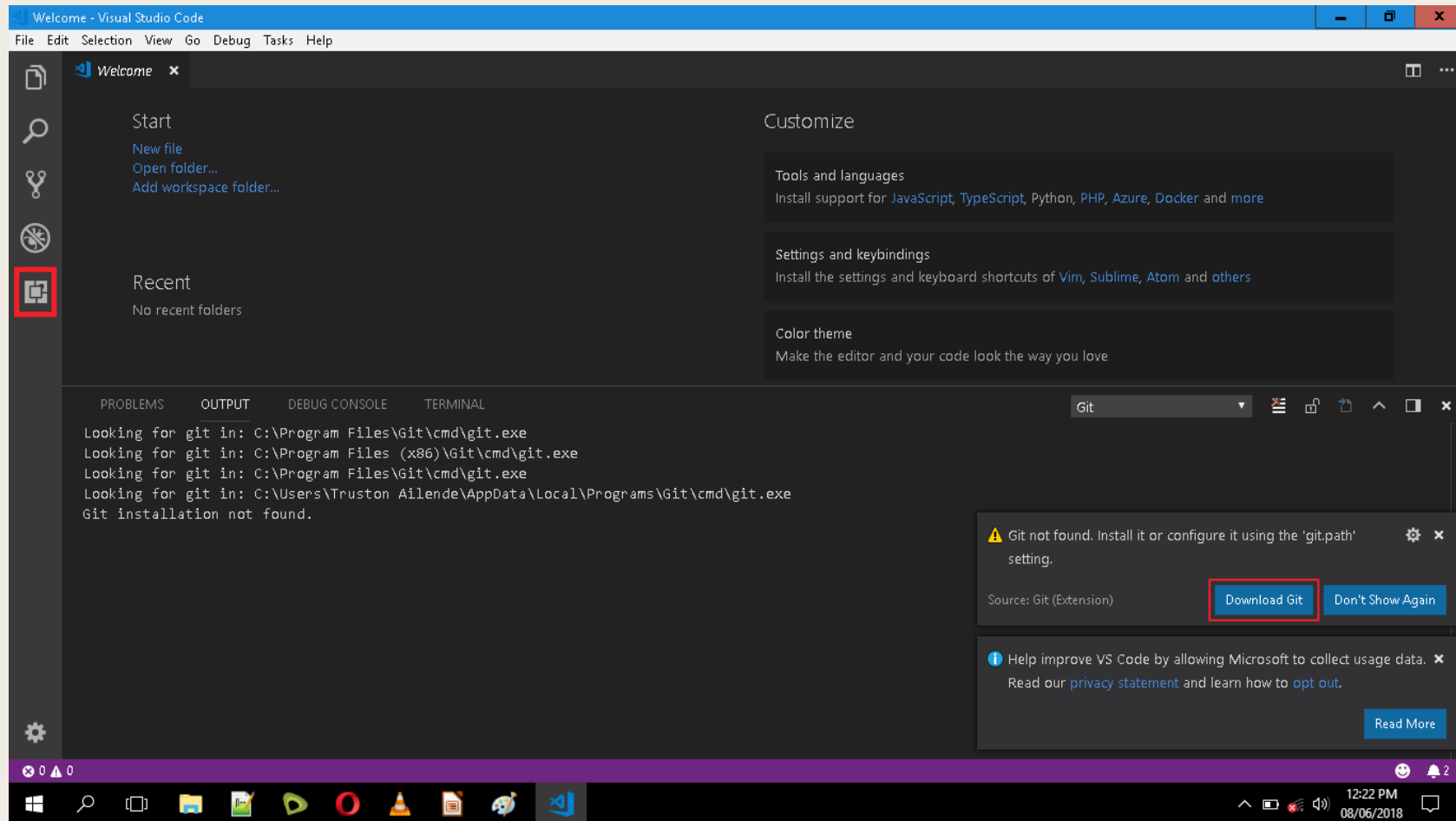
Install Extension
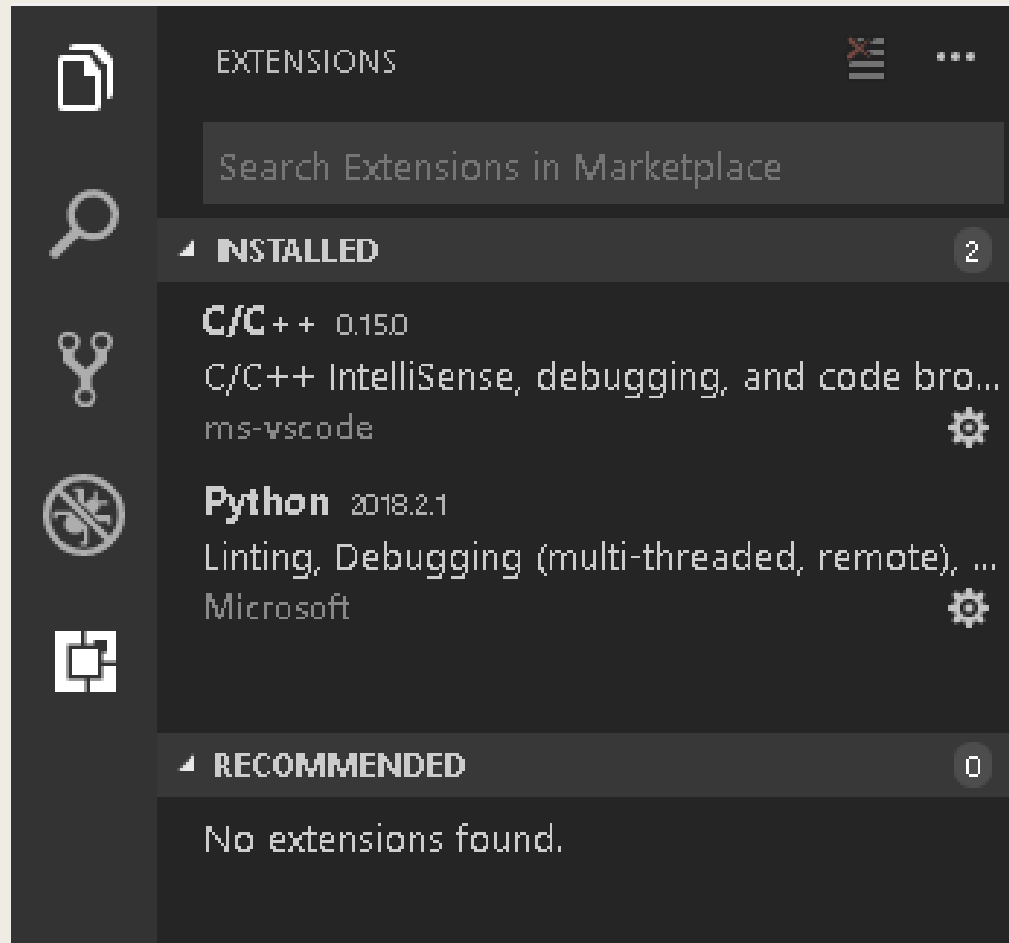
Visual Studio Code

Search Extensions

Visual Studio Code
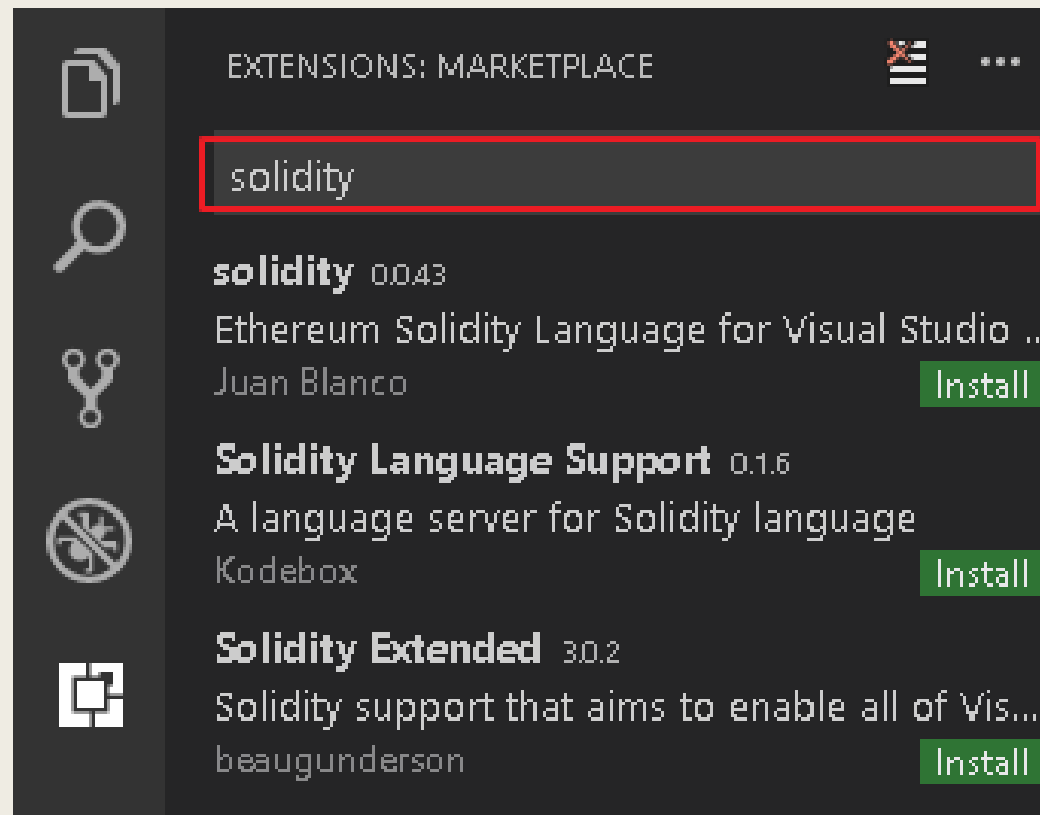
Search for the Solidity Extension

Visual Studio Code
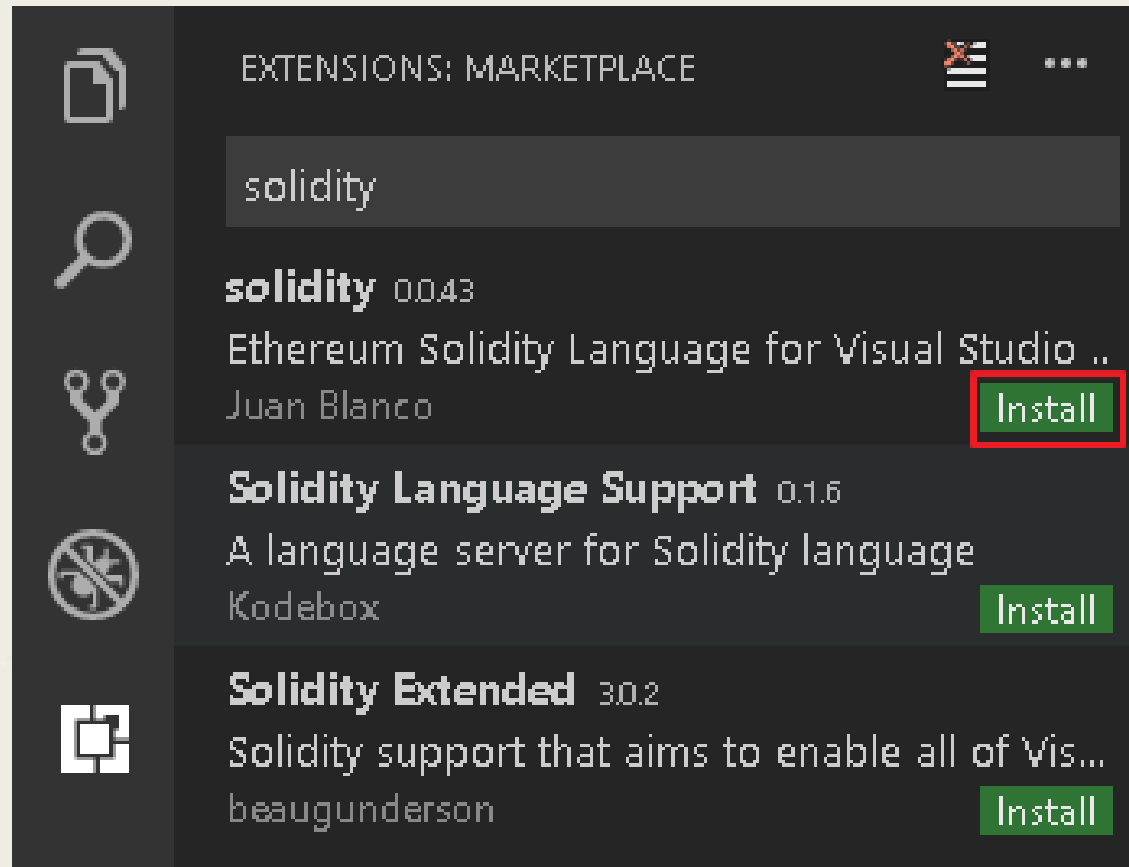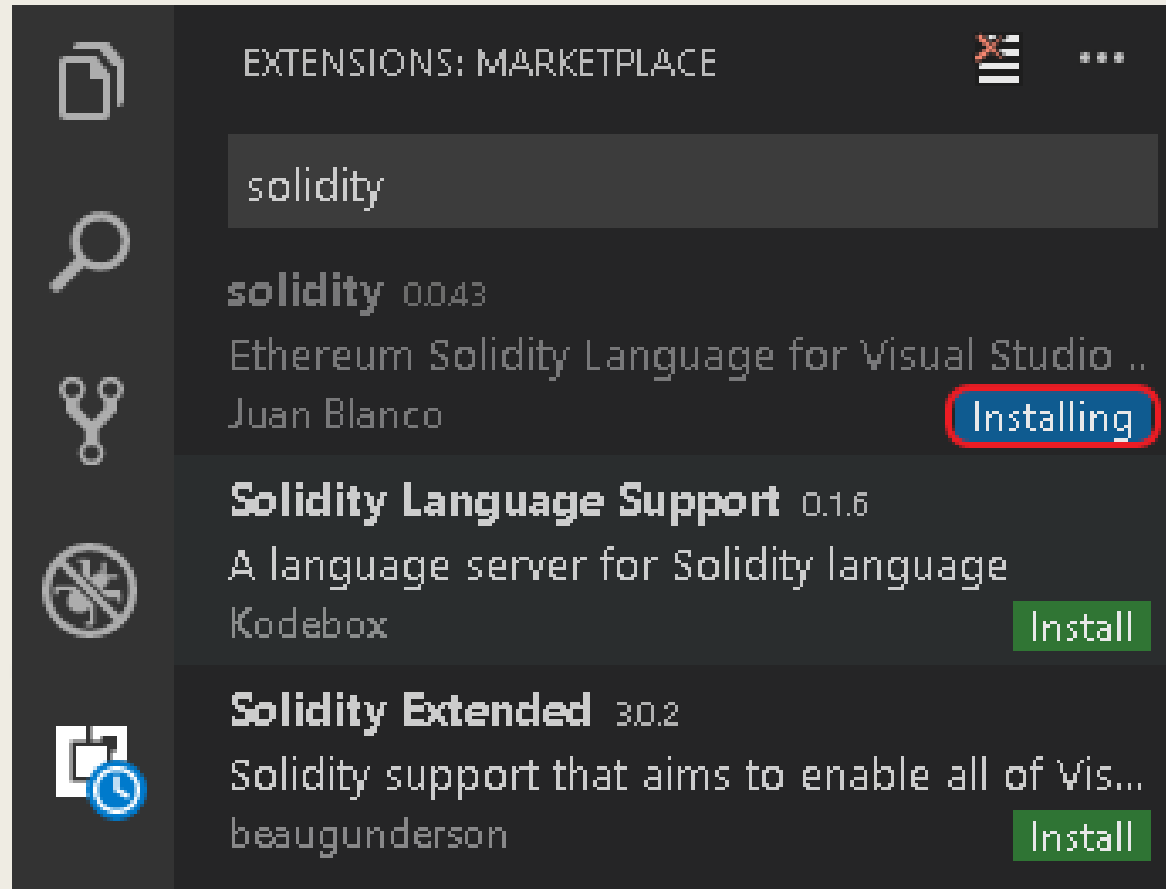
Install Extension

Visual Studio Code

Installation in Progress
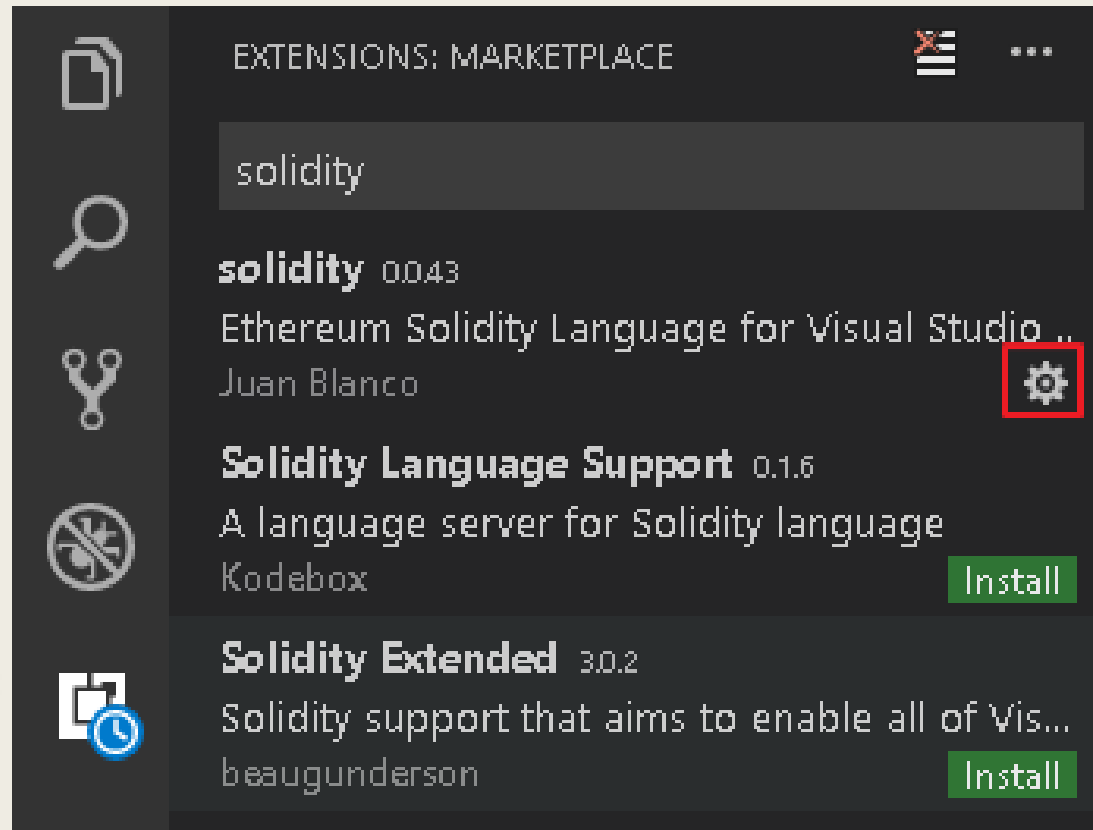
Visual Studio Code

Installation Completed

Visual Studio Code
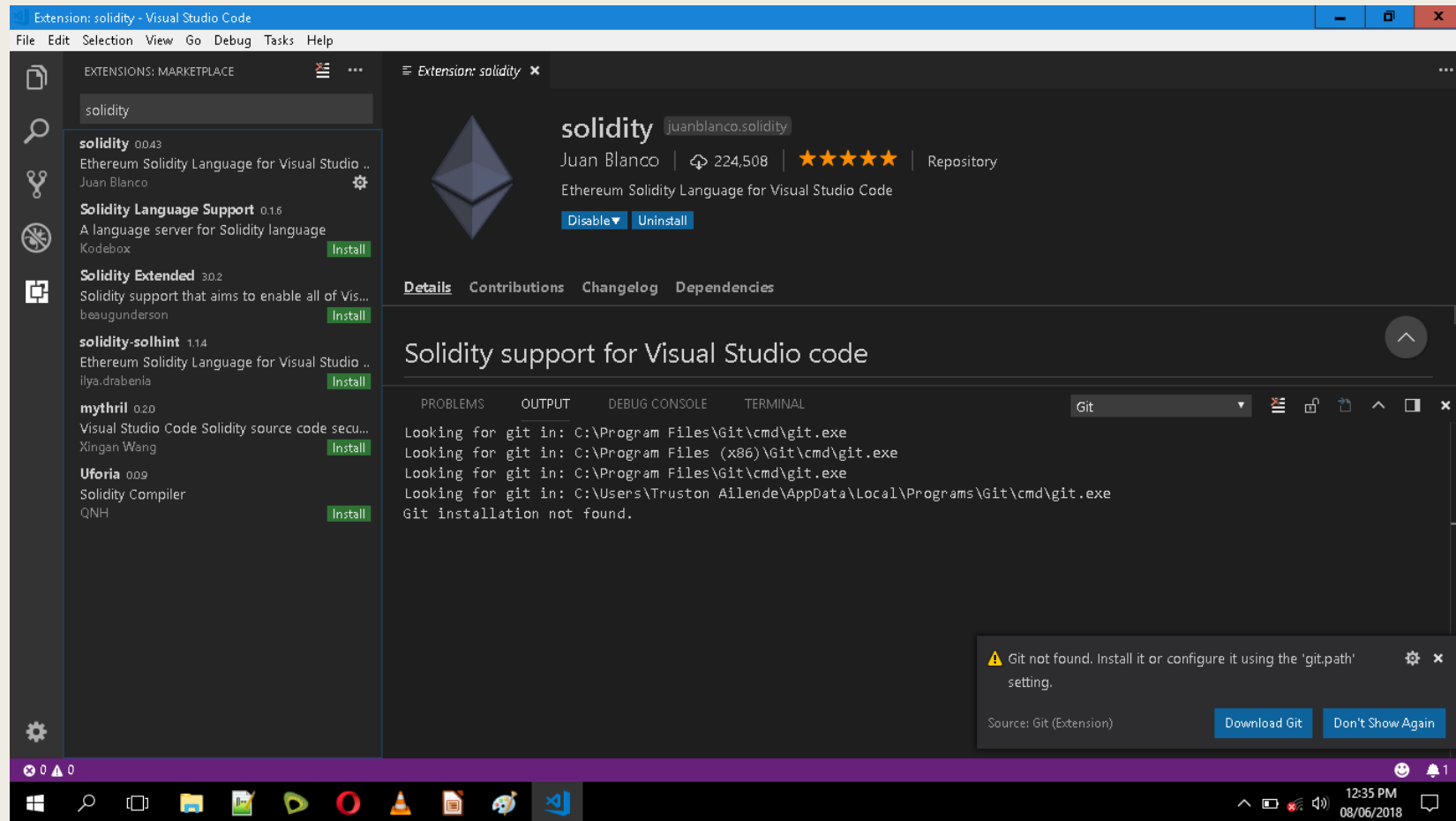
Current Screen

Git
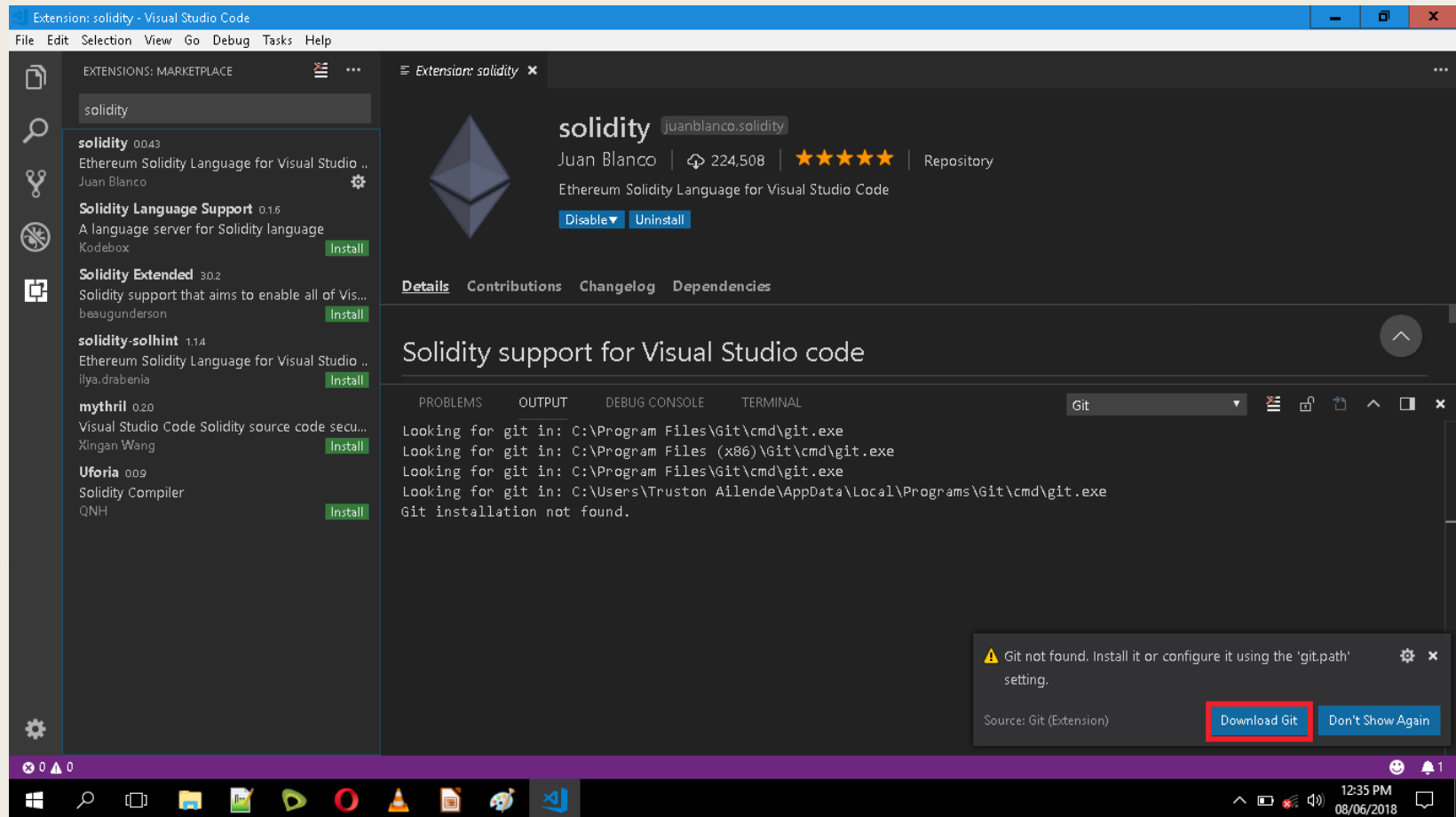
Git

- Git is a version control system for tracking changes in computer files and coordinating work on those files among multiple people.

- It is primarily used for source code management in software development, but it can be used to keep track of changes in any set of files.

Git

https://git-scm.com/downloads

Git
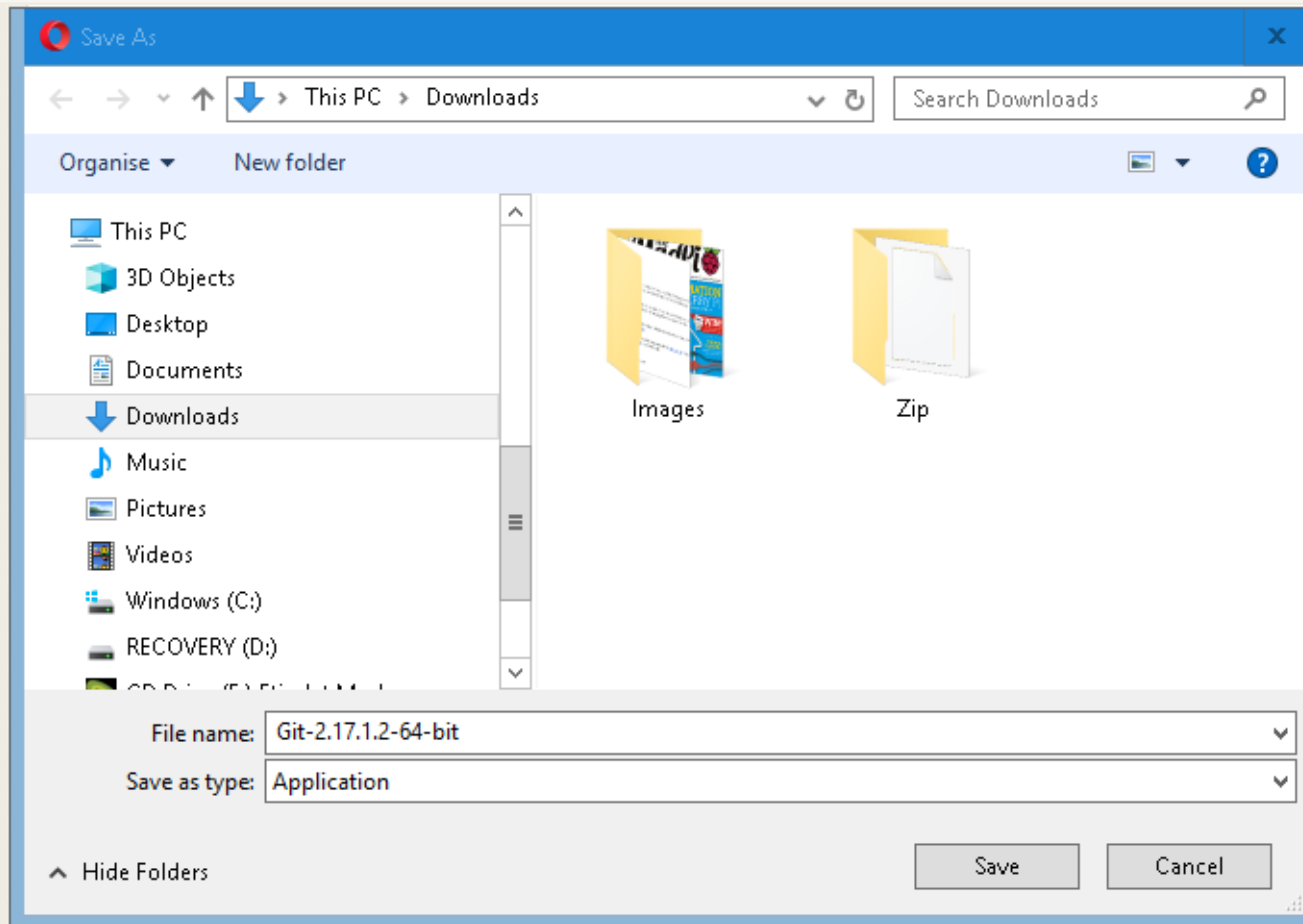
Popup Opens

Git
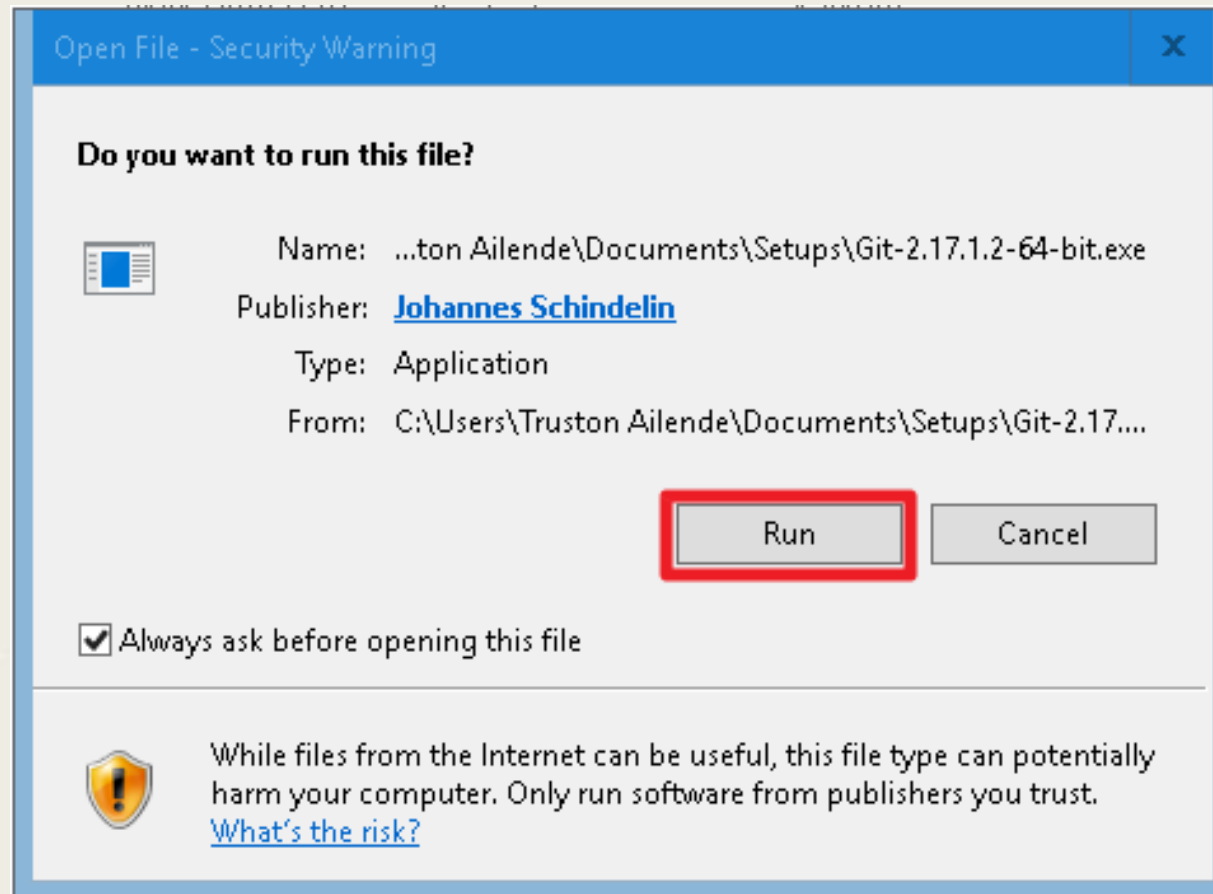
Start the Installation

Git

License Agreement

Git
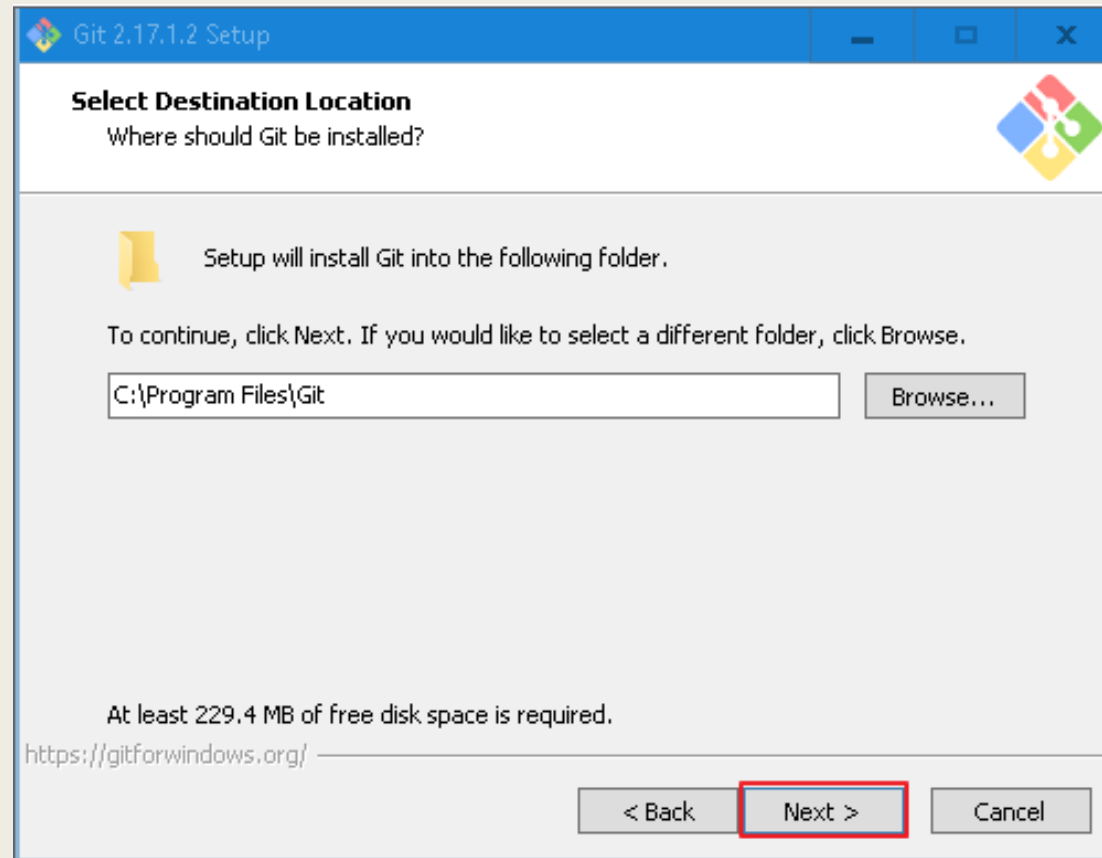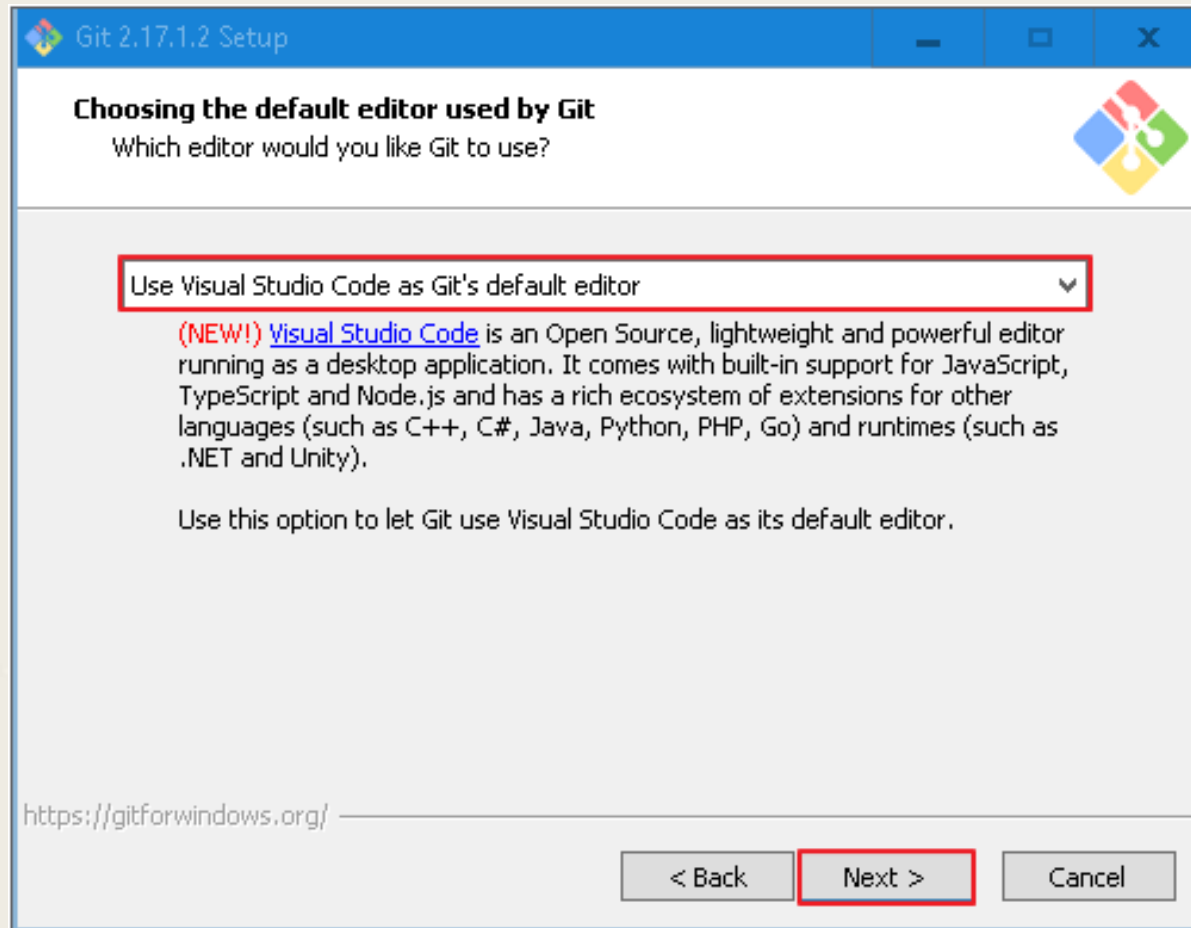

Select Destination Folder

Git
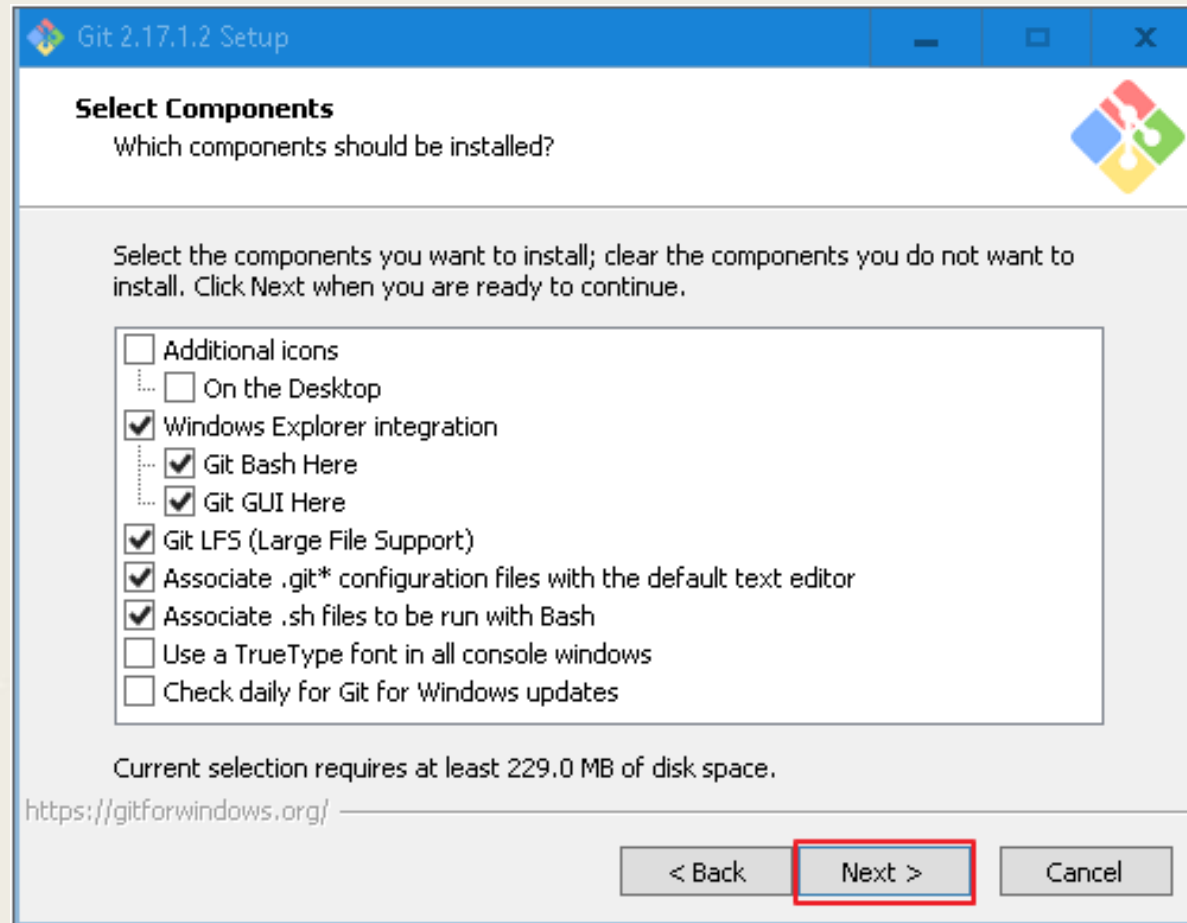
Select Components
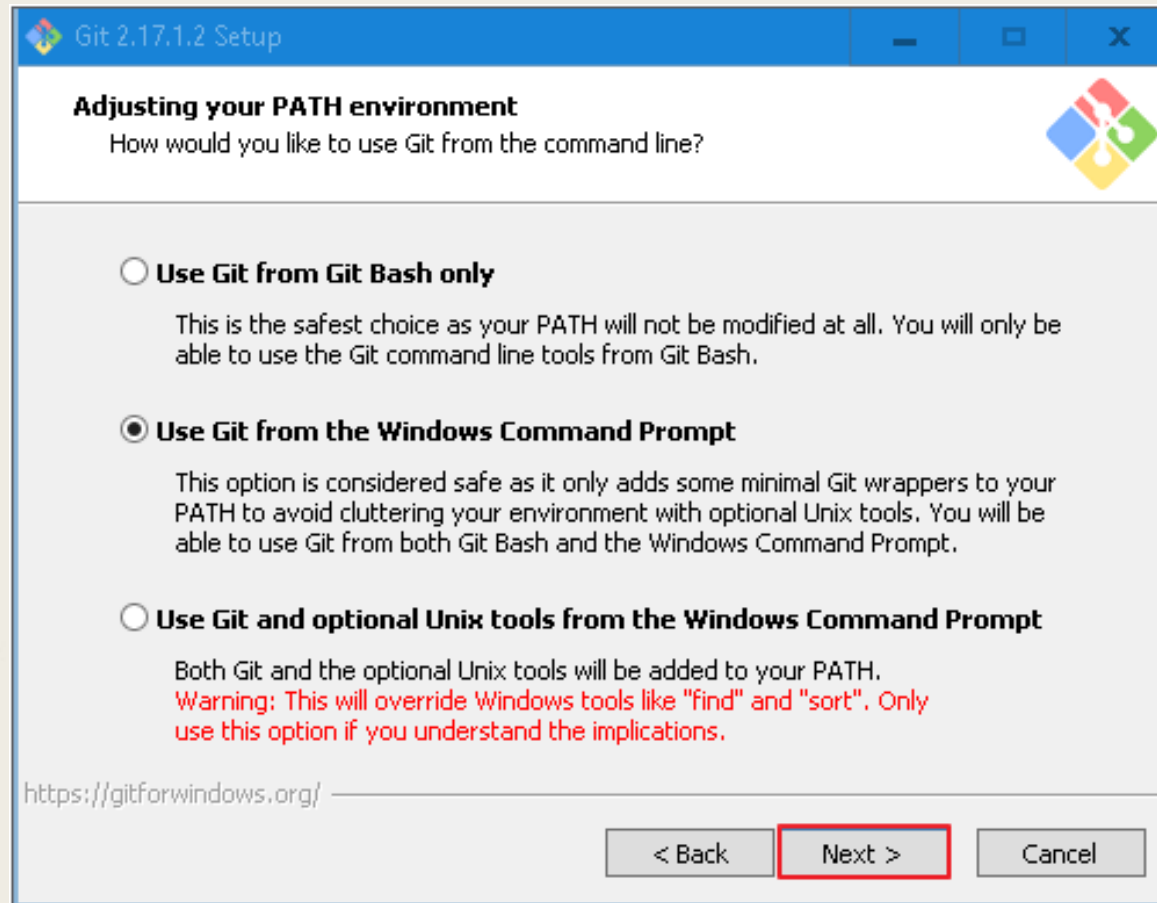
Git
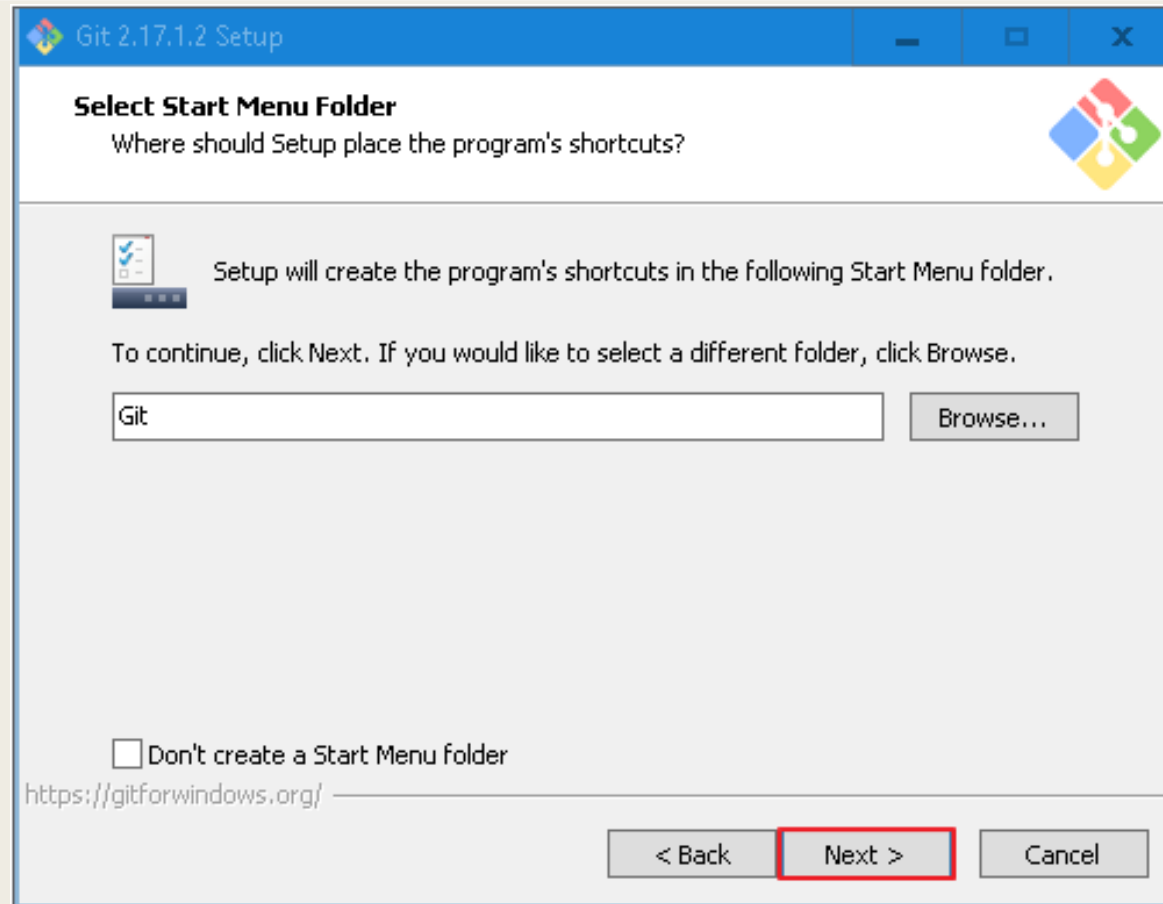
Start Menu Folder
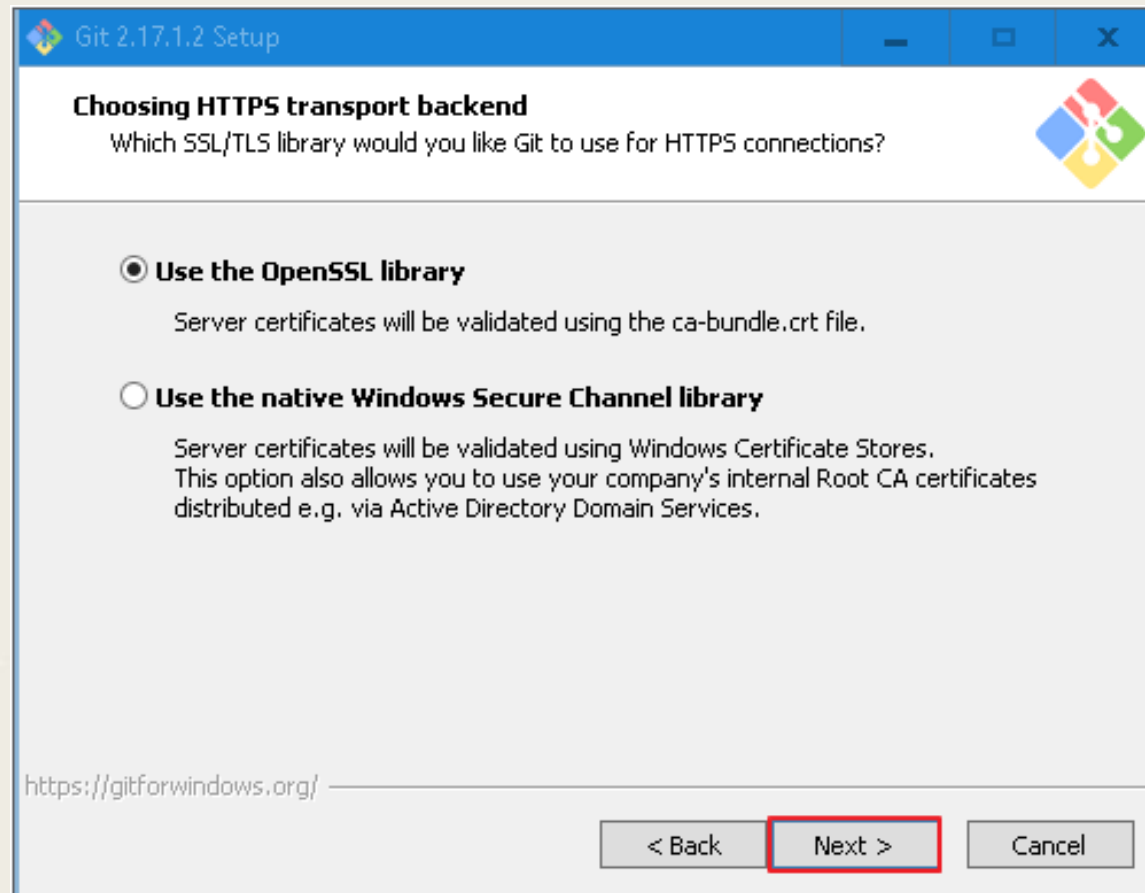
Git

Choose Your Text Editor
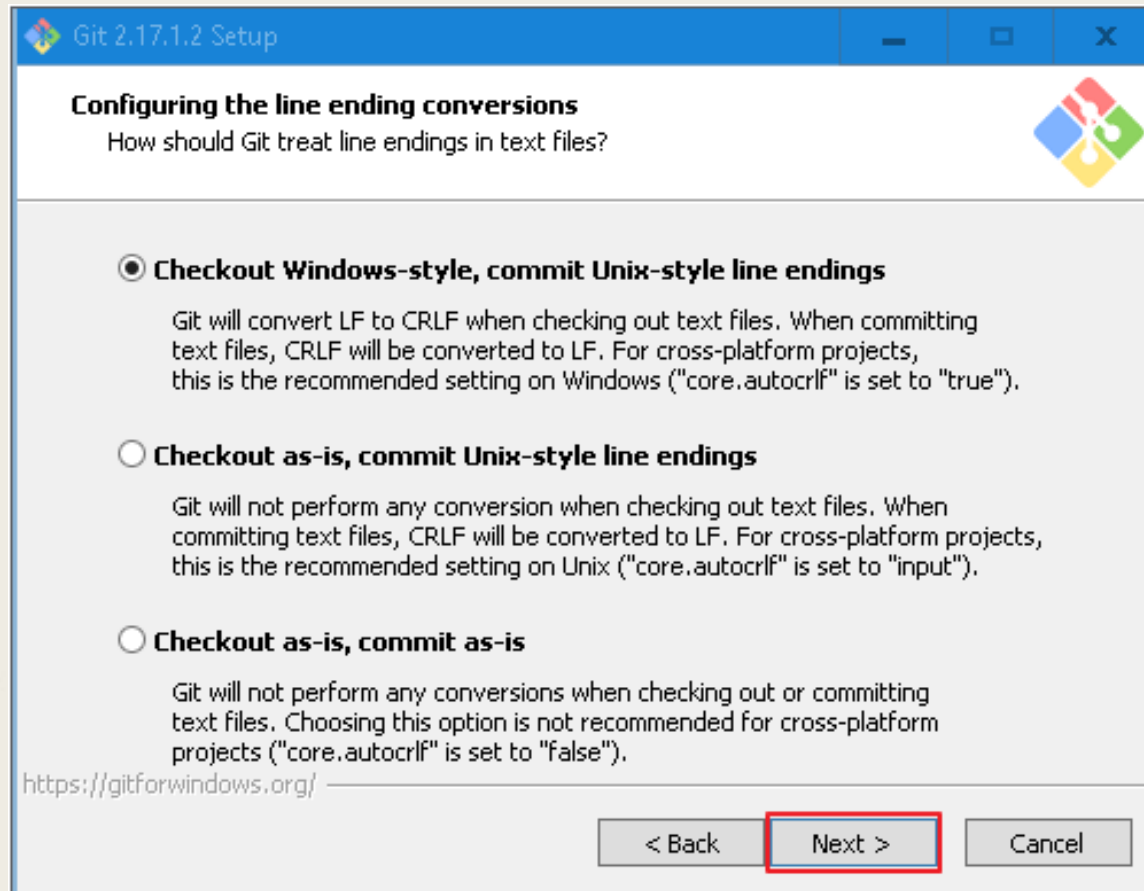
Git
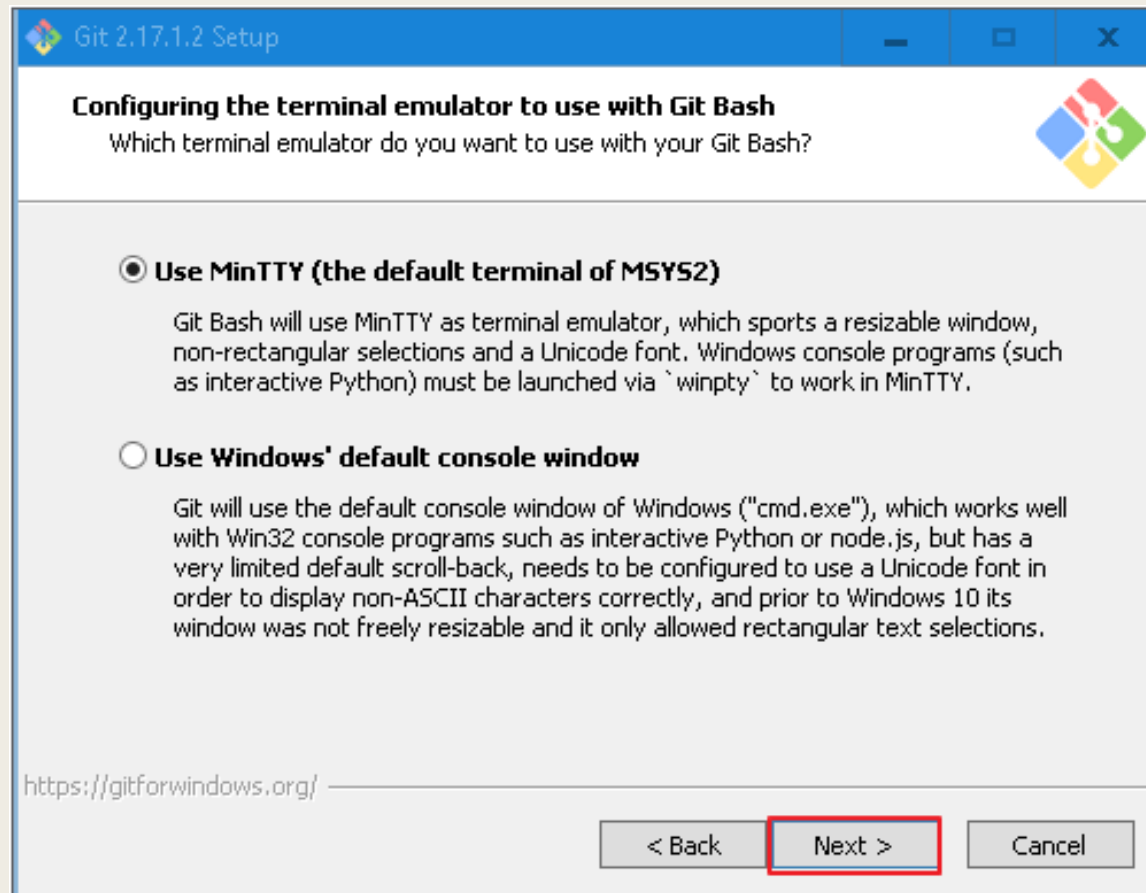

Adjust Your Path

Git

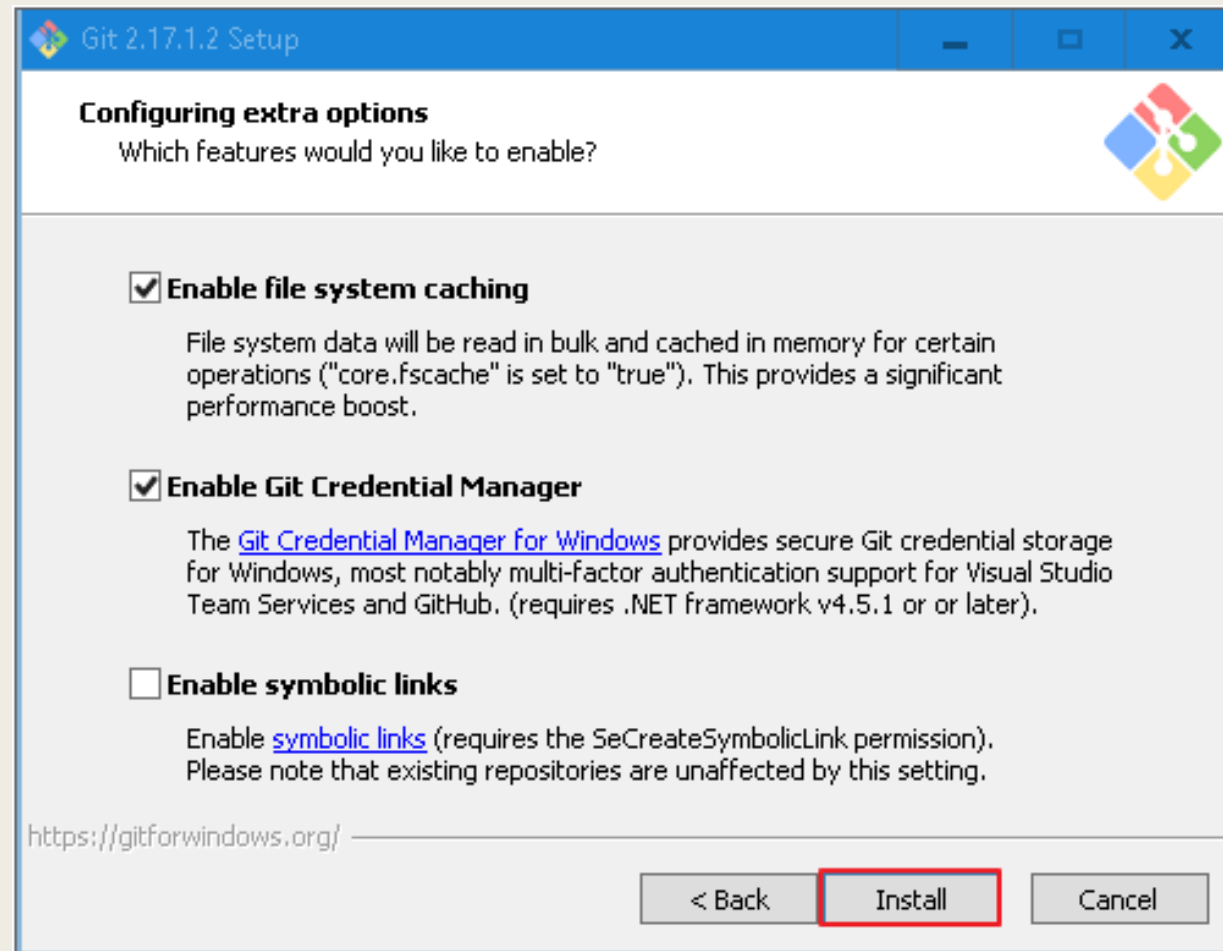Use the OpenSSL Library

Git

Configure Line Endings

Git

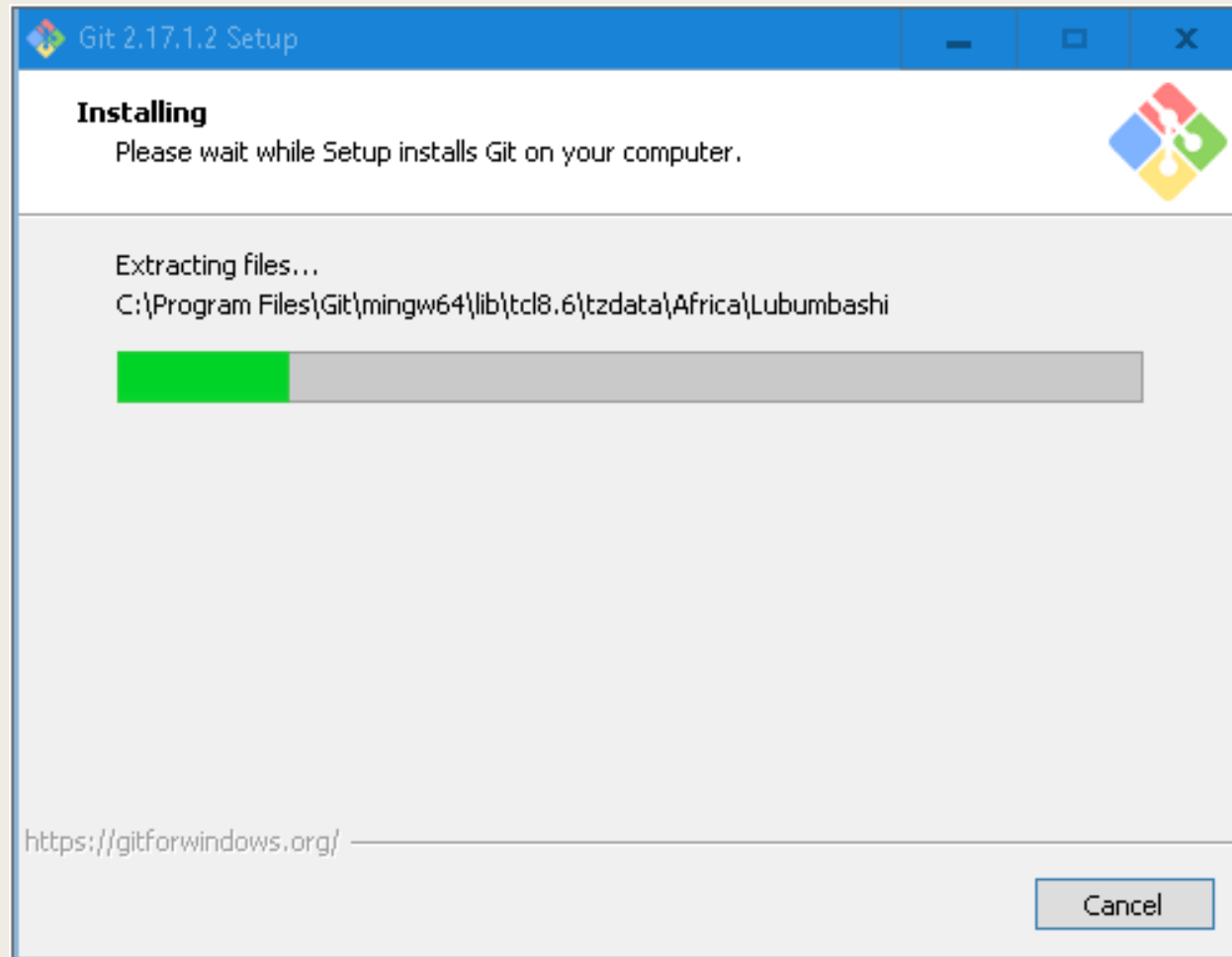## Configure Terminal
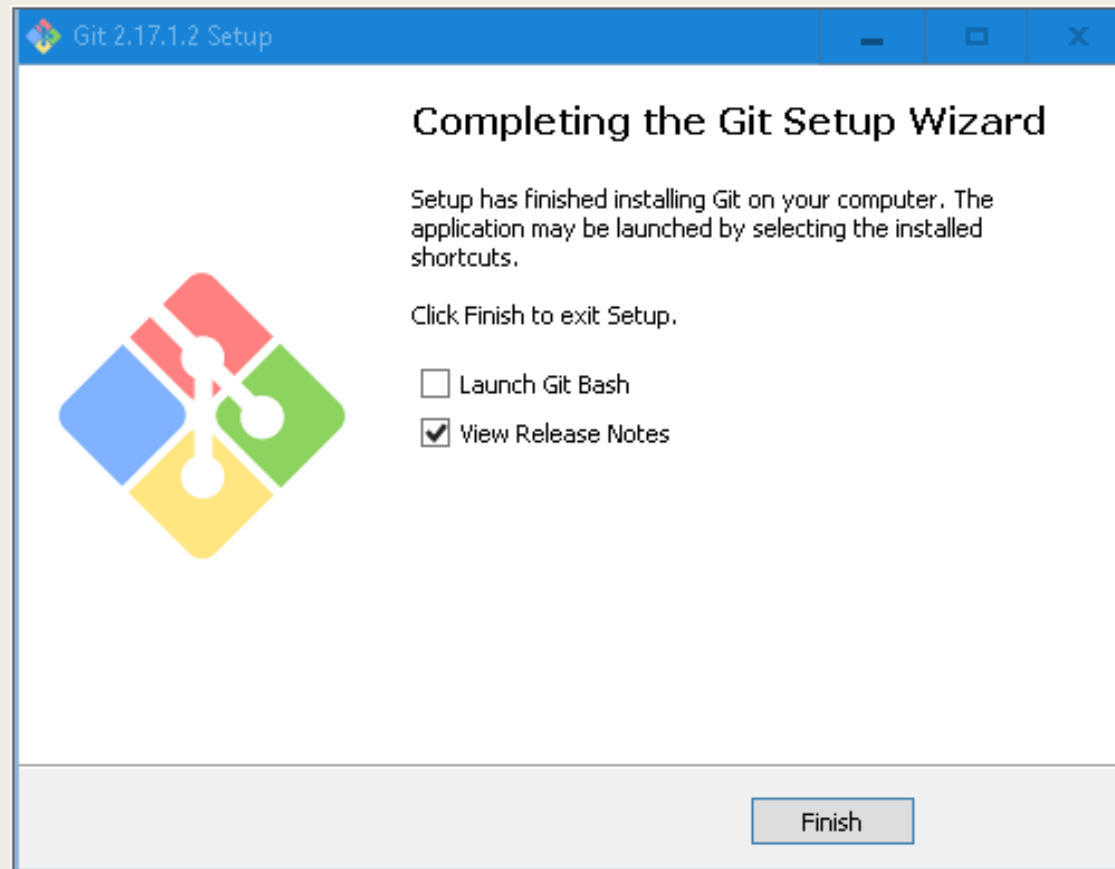
Git

Configure Extra Options

Git

Begin Installation

Git

Installation Completed

We Are Ready

- Congratulations on having a working Windows setup for Solidity

- This process was long and tedious

- If we don't want to go through it, there is another way

Remix

- Remix is a powerful, open source tool that helps you write Solidity contracts straight from the browser.

- Written in Javascript, Remix supports both usage in the browser or locally.

- Remix also supports testing, debugging and deploying of smart contracts and much more.

Remix

http://remix.ethereum.org/
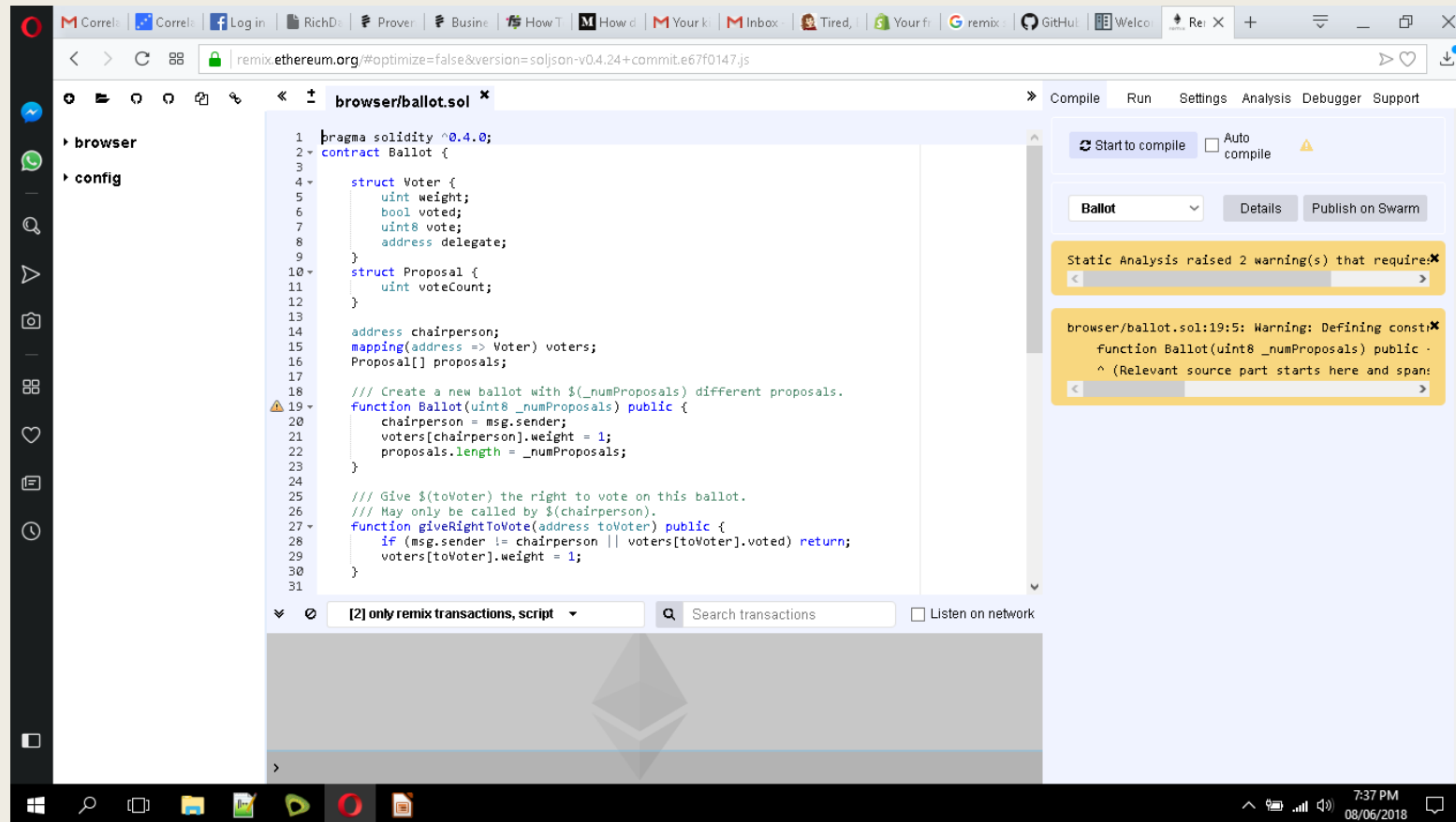
MetaMask

- MetaMask is an extension for accessing Ethereum enabled distributed applications, or "Dapps" in your normal Chrome browser!

- It allows you to run Ethereum dApps right in your browser without running a full Ethereum node

MetaMask

Visit the Chrome Web Store

98

MetaMask

Search and Add to Chrome

Conclusion

- At the end of this week, we have successfully configured our computer to run Solidity either in offline or online

- We shall take a look at Solidity programming in the coming weeks