FIRST Robotics Competition
Software Setup Guide

Programming Subteam | MacOS X

Table Of Contents

INTRODUCTION

This guide will give you the tools you need to set up all necessary software for FRC Programming on a FRC team. The following sets of instructions will make sure you have the tools required to contribute to the robot's code.

YOU WILL NEED:

1. An internet connection for software downloads.
2. Recommended:
   ○ Logging in to your system as an administrator, this will save you time as you will not be required to enter a password for every install.

THINGS TO REMEMBER:

● If you need help, you can always reach out to your team leadership on Discord or via email. We are here to help you! This document just serves to cover frequently asked questions and our normal instructions.
● Wait for a step to finish before moving on, as programs may perform unexpected actions.
● The white on black text represents a file path.
● The grey highlighted text represents shell commands; run them in cmd.
● This guide focuses on Mac OS X with HIgh Sierra (HIgh Sierra is highly recommended however it is not required).
   ○ However, we do have an Windows version: [insert view-only link here]
   ○ Along with an Ubuntu version: [insert view-only link here]
   ○ Stay tuned on our website, www.FIRSTrobotics1923.org for more resources!

Installation Guide:
# Java (JRE and JDK)

INTRODUCTION

Java is one programming language option for FRC robots. Note that you can run either Java or C++ on the robot; our team uses Java. Because it is the language for the AP Computer Science exam, many schools offer a Java course. Java's syntax and structure is also more concise and easier to understand then C++, making it easier to learn.

INSTALLATION

Java Development Kit (JDK)

With the Java Development Kit (JDK), you have the ability to not only run Java programs but to also create them! This will take your code and compile it into a format your computer can understand and execute. This is an easy download:

1. Visit:
   http://www.oracle.com/technetwork/java/javase/downloads/jdk8-downloads-2133151.html
2. You should see a number of grey sections. Focus on "Java SE Development Kit 8u181".
3. Agree to the license agreement by selecting the grey radio button.
4. Click the link next to your operating system to start the download.
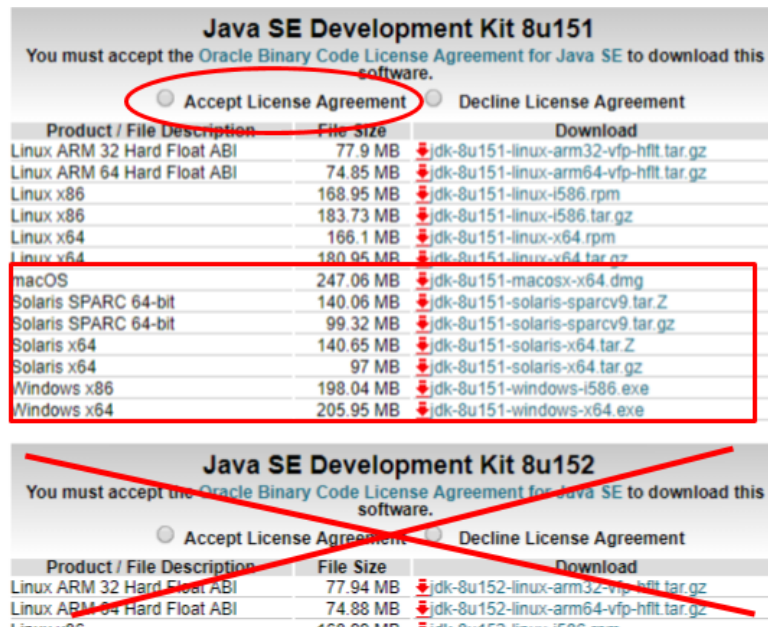
5. Save the file & run it.
6. Double-click the icon shown
7. Click continue and then install when shown how much space the install will take on your computer
8. Enter your password if prompted
9. Click close once the installation is completed..

Validating the install:
1. Open up a terminal (⌘ + <space>, then type in Terminal in Spotlight Search)
2. Enter java -version the terminal - if it returns something then the install was successful.

Notes:

For information on how the compile and execute process works in Java check out the following:
- How compilers work: https://youtu.be/QXjU9qTsYCc
- Java Program Execution: https://youtu.be/G1ubVOl9IBw?t=1m2s
- Add Java to PATH: https://www.javatpoint.com/how-to-set-path-in-java

You should now have java installed. Now you can begin setting up your development environment.

Installation Guide:
Eclipse

INTRODUCTION

Eclipse is an Integrated Development Environment (IDE). Eclipse assists with development by providing features such as error reporting, suggestions, warnings and code autocompletion.

INSTALLATION

1. Visit https://www.eclipse.org/downloads/ and download the latest version
2. Run the installer.
3. Select "Eclipse IDE for Java Developers"
4. Click install
5. A popup with the licence agreement should appear. Click "Accept Now"
6. You may be asked to accept additional licenses, you should accept them as well
7. Wait until the installer is finished - this may take especially long depending on the mirror you chose

SETUP

1. Open Eclipse:
   - The installer installs a shortcut on the desktop in the default settings
2. When eclipse opens the following screen appears:
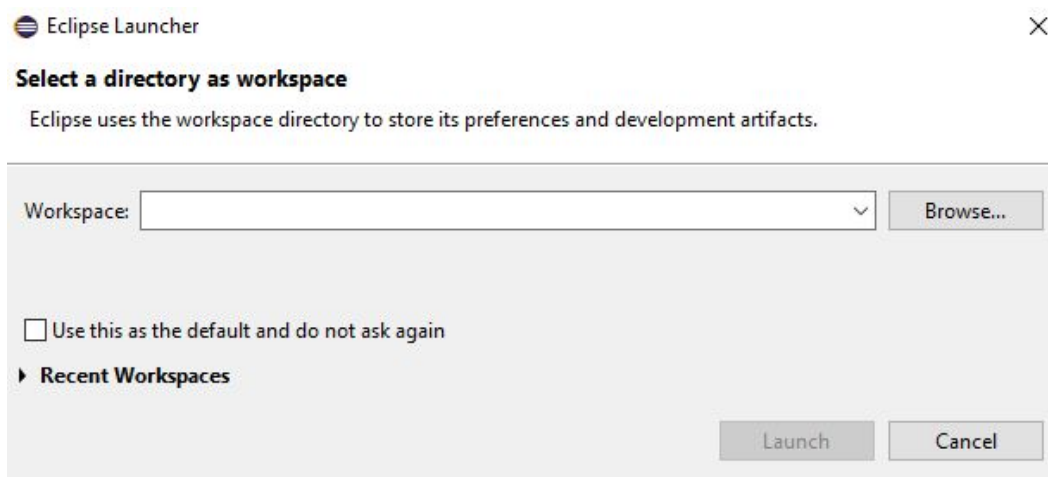
3. You need to select a "workspace". Click the "Browse" button and select a folder.
   - A workspace is a folder on your computer where all projects are stored.
   - If you are creating a new workspace, select an empty folder.
   - To use an existing workspace, select that folder.

Notes

Once eclipse is setup you can start writing in java.

The following resources will help you learn the Java language:
- Java Beginners: https://www.youtube.com/playlist?list=PLFE2CE09D83EE3E28
- Object Oriented Java: https://www.youtube.com/playlist?list=PLonJJ3BVjZW6_q8gh7XoLUIhRIyBcYJLP
- Java AP review: https://www.youtube.com/watch?v=3Ky9MZyL8r4
- Online Guide: https://www.tutorialspoint.com/java/
- Online Practice: http://codingbat.com/java

The following resources will help you write useful, concise and effective code that is easily understood:
- Java Documentation: https://docs.oracle.com/javase/8/docs/api/
- Reading javadocs: https://www.tutorialspoint.com/java/java_documentation.htm
- UML diagrams: https://www.ibm.com/developerworks/rational/library/769.html
- Standardized java code style: https://google.github.io/styleguide/javaguide.html

You should have eclipse up and running. Now you can write basic java code!

Try printing "Hello, World!" to the console to make sure that everything works!

Installation Guide:
WPILIB

INTRODUCTION

WPILIB is the tool that enables communication with the robot hardware. This tool allows communication to the drivers station and controllers. WPILIB is a plugin for eclipse. Plugins are small add ons that enable new features. WPILIB provides code, as well as debugging tools and a way to easily deploy your code to the robot.

INSTALLATION

Installation is the same for all operating systems, all you need is eclipse and an internet connection. (Note that you need to restart eclipse, so you should save all open files before installing WPILib)
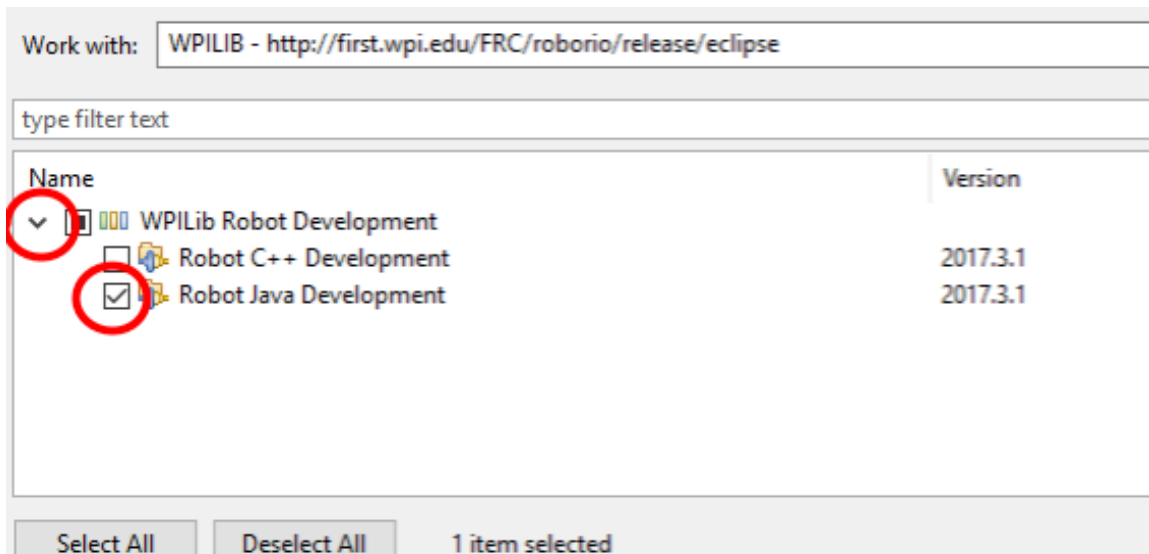
1. Open Eclipse.
2. Go to Help -> Install New Software
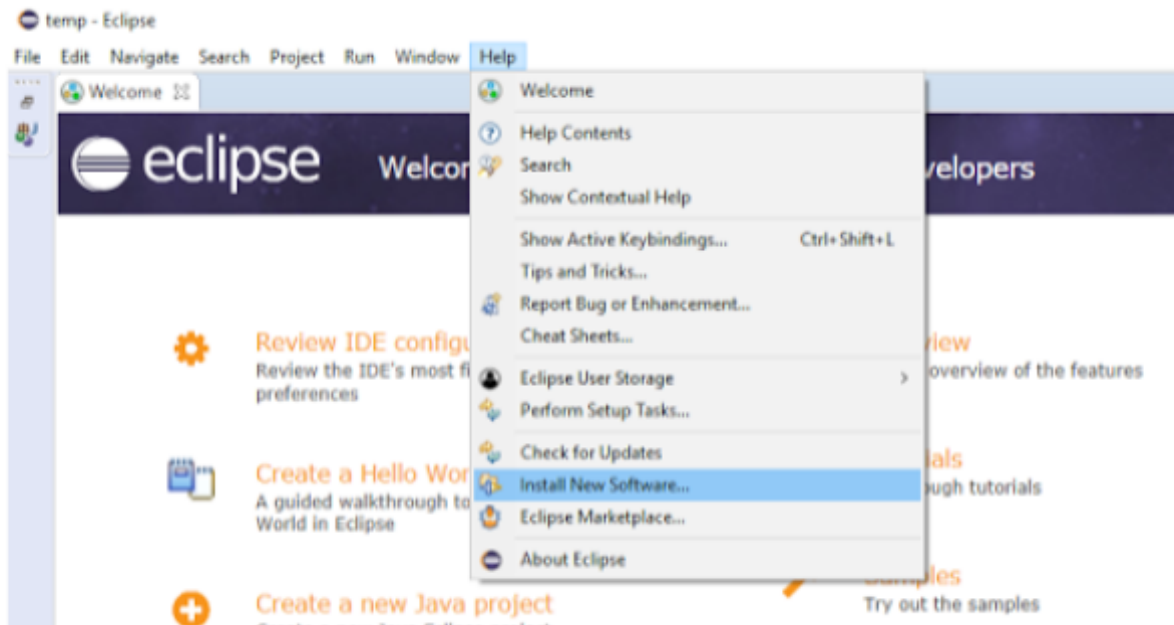
3. Click the "Add" button. A popup should appear

4. In the popup:
    a. Type "WPILIB" in the "Name" textbox
    b. Type http://first.wpi.edu/FRC/roborio/release/eclipse
    c. Click "Add"
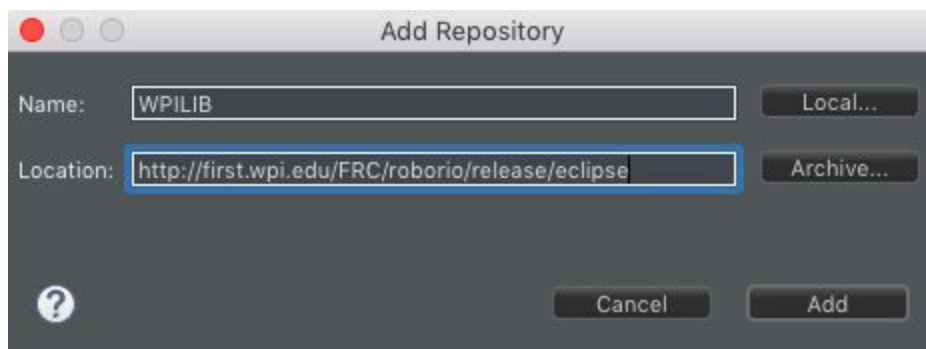
5. The center area of the window should now have "WPILib Robot Development"

a. Click the arrow on the left to expand the selection
b. Select "Robot Java Development"

6. Click the "Next" button on the bottom of the window.
7. A new window will open. Click the "Next" button on the bottom.
8. Accept the license agreement and click "Finish"
9. You can check the installation progress at the bottom right of the eclipse window
10. You will see a security warning around halfway through the installation. If you see this warning click "Install Anyway" even though it usually is not ideal.
11. Leave eclipse alone while it installs WPILib in the background, this may take a while depending on your internet connection.
12. Click the "Restart Now" button when prompted.

Validating the install:
1. If you see "WPILib" on the menu bar (the one with "File", "Edit", etc) then you have correctly installed WPILib.

SETUP

Adding WPILib to a robot project

Even though you have the plugin installed, you may still encounter errors in your project. If you know your code should work, then the primary issue is probably that your project does not reference the correct jar files. If you have no errors, then you can skip this section.

1. Right click your robot project, go to Build Path -> Add External Archives
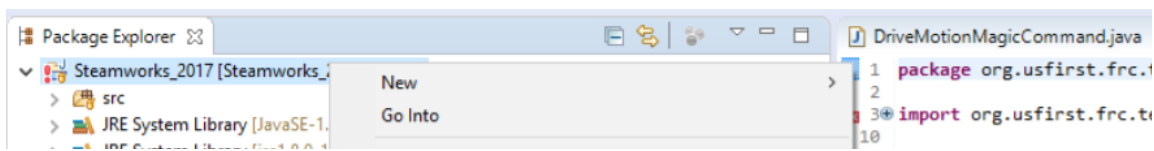
2. Navigate to `Applications/wpilib/java/current/lib`
3. Highlight all the jar files, then click "Open"

Notes

For information on using WPILib check out the following resources:
- WPILib Documentation: https://wpilib.screenstepslive.com/s/4485
- WPILIB API: http://first.wpi.edu/FRC/roborio/release/docs/java/
- Working project, 1923 Steamworks:
  https://github.com/Team1923/Steamworks_2017

You should have WPILib up and running. Now you can write and test robot code!

Try writing a basic program, like moving the robot forward, to make sure everything's running.

Installation Guide:

CTRE Toolsuite

INTRODUCTION

In addition to WPILib, you'll need to install the CTRE Toolsuite. As of 2016, WPILib no longer provides direct CAN Talon SRX support. This means that CTRE provides the interface for the talons as a 3rd party integration. We will be downloading the CTRE installer which places their libraries into the correct location on your system. WPILib tools will automatically detect the libraries and allow them to be used in FRC programs.

INSTALLATION

The installer is only for Windows, so you will have to install the toolsuite manually.

1. Download the CTRE Toolsuite zip here:
   http://www.ctr-electronics.com//downloads/lib/CTRE_Phoenix_FRCLibs_NON-WINDOWS_v5.7.1.0.zip (The download is about 80 MB)
2. Unzip the folder
3. Open up your terminal (⌘ + <space>, then type in Terminal in Spotlight Search)
4. Run this cmd in terminal:
   cp -r ~/Downloads/CTRE_Phoenix_FRCLibs_NON-WINDOWS_v5.7.1.0/java ~/wpilib/user && ls -a ~/wpilib/user
5. CTR should now be installed!

SETUP

1. Once installed, find where the CTRE jar is located in your filesystem, an example path is: Applications/
2. Open up eclipse, and right click on the project that uses Talons and add the CTRE.jar jar to the build path

Installation Guide:

Git

INTRODUCTION

Git is a version control system. It tracks changes and allows collaboration between large groups of people. Think Google Drive, but for code.

You might be confused between git and github. Git is a technology used for code collaboration. GitHub is a company that provides hosting services for git repositories. You can learn more about the difference here: https://www.codefellows.org/blog/git-and-github-what-s-the-difference/

Before you start this installation we recommend that you create a GitHub account here: https://github.com/join

For this guide we will install GitHub Desktop: a GUI git client that makes it easy to use git, so we recommend it for beginners. If you are an advanced user, you can install the command line only version here: https://git-scm.com/downloads. Note that eclipse contains a git client as well.

INSTALLATION

1. Visit https://desktop.github.com/ and click "Download".
2. Run the file you just downloaded.
3. Let the installer run.
   - There should be nothing to do here, except to agree to a licence agreement if one appears. GitHub installation is very straightforward, and is already configured for your system.
4. Sign-in to your github account

Alternatively, if you are experienced with git or an advanced user you should install git from the terminal.

1. Open up a terminal (⌘ + <space>, then type in Terminal in Spotlight Search), then type:
   git
2. Once you have pressed enter, a popup should appear asking you to install git along with the MacOS Dev Tools. Click 'install now' and you should be good!

Notes

- Some teams have their code on a private repository, to access the code you will need to contact your programming leadership. Make sure you include your GitHub username and email address in your request.
- For information on using Git and GitHub check out the following resources:
  - What is GitHub: https://youtu.be/w3jLJU7DT5E
  - Using GitHub Desktop: https://help.github.com/desktop/guides/contributing-to-projects/
  - Using git (basic): https://www.git-tower.com/learn/git/ebook/en/desktop-gui/basics/what-is-version-control#start
  - Command Line Tutorial: https://youtu.be/SWYqp7iY_Tc
  - Git documentation: https://git-scm.com/doc
  - Using git (advanced): https://www.git-tower.com/learn/git/ebook/en/command-line/basics/what-is-version-control#start

You should have Git and GitHub setup and running. Now you can send off your contributions to your team!

Try creating a simple repository and tracking changes to it via git. Then try contributing to someone else's repository!

Once you feel comfortable with the GUI, move on to the command line!

Installation Guide:

GRIP

INTRODUCTION

FIRST designed the field with elements that encourage teams to implement vision processing in their robot. GRIP is a program that enables teams to effectively use vision processing in their code.

INSTALLATION

1. Visit https://github.com/WPIRoboticsProjects/GRIP/releases and download the appropriate file for your system (.dmg for MacOS).
2. Run the file
3. Click Install
4. Let the installer run.
   a. There should be nothing to do here, except to agree to a licence agreement if one appears. This is a straightforward install.

Notes

You may need to allow accepting software from an unverified source for GRIP to work correctly.

GRIP obviously requires a webcam, unless you are connecting to a live feed from the robot.

For information on using GRIP we recommend using the documentation and tutorials here: https://github.com/WPIRoboticsProjects/GRIP/wiki

You should have GRIP running setup. Now you can contribute to the forefront of computer vision programming! As a practice try isolating the image of a small brightly colored object.

Installation Guide:

VS Code

INTRODUCTION

FIRST deprecated the eclipse plugins and is now extending VS Code support.
VS Code is actually a text editor
Not an IDE

INSTALLATION

1. Visit https://code.visualstudio.com/download and download the zip file for your system (Click on the MacOS button for MacOS).
2. Extract and Run the file
3. Click Install
4. Let the installer run.
   a. There should be nothing to do here, except to agree to a licence agreement if one appears. This is a straightforward install.

Setup

Launch VS Code. Now open the Command Palette (F1 or ⇧+⌘+P on Mac) and type shell command to find the Shell Command: Install 'code' command in PATH command.
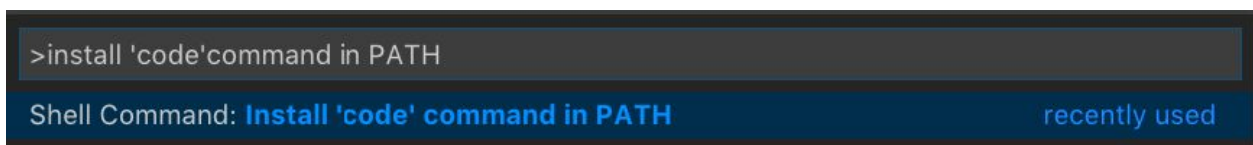
More setup for VSCode is detailed after npm is installed; below

Notes

You should have Code running. Now you can test and contribute to the programming! As a practice try editing a .java file.

**Installation Guide:**

NodeJS

INTRODUCTION

FIRST deprecated the eclipse plugins and is now extending VS Code support. For VS Code to work requires installing NodeJS

INSTALLATION

1. Visit https://nodejs.org/en/download/ and download the latest (It should be version 8.x.x right now) LTS (Long Term Support) installer for your system (It should install a .pkg for MacOS).
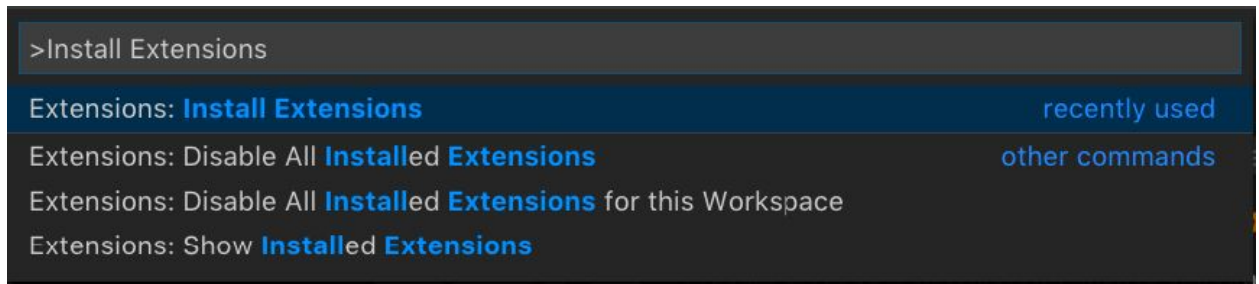
2. Run the installer:
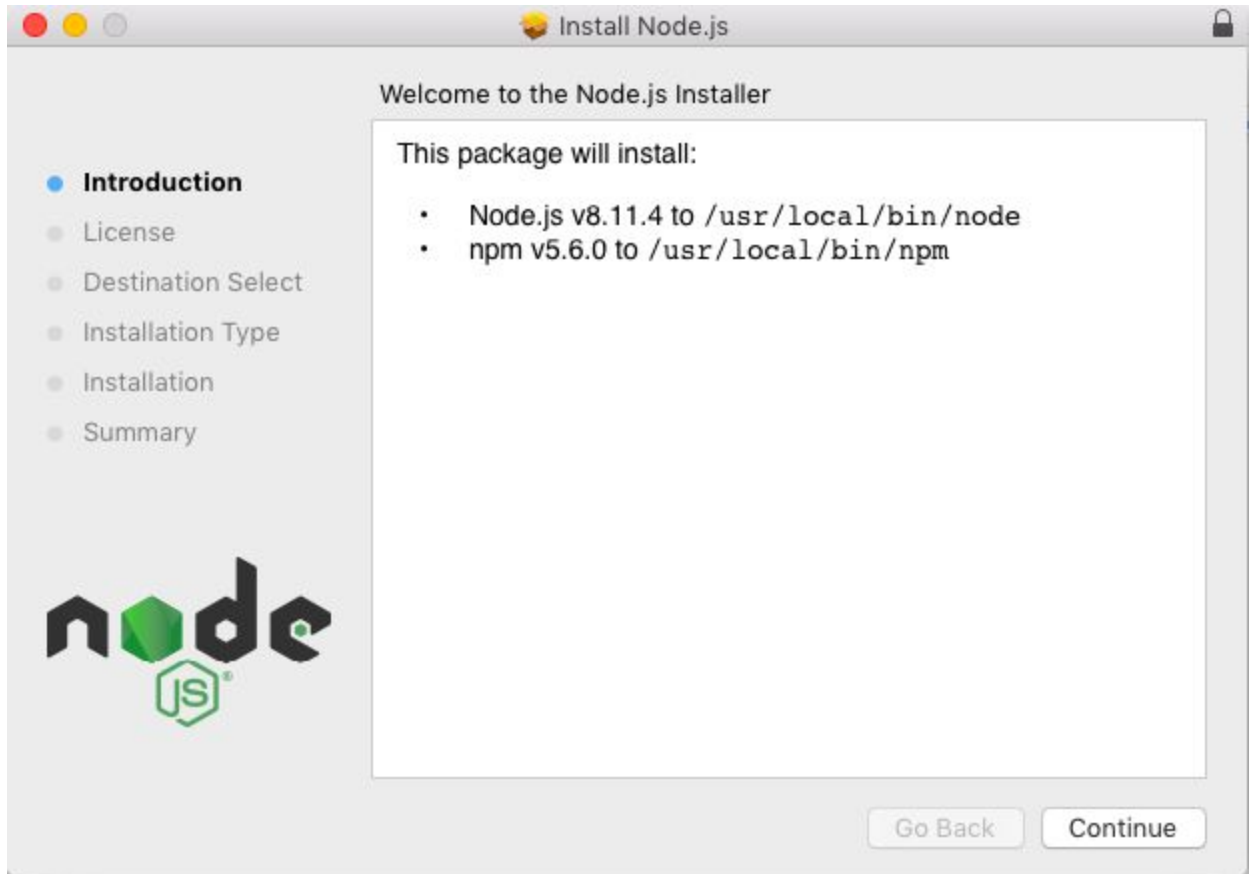
3. Click Continue and accept the license agreements until you reach the end.
4. You may need to put in your password after clicking the install button which should replace continue after a few confirmations.
5. If you are running any modern version of Mac OS (at least Yosemite) you can ignore the 'Make sure that /usr/local/bin is in your $PATH.' warning as it should be included by default; regardless you should check that /usr/local/bin appears when you type in: echo $PATH in your terminal.
6. .Check that node is installed by running node -v in your terminal.
   a. You can now close the installer and move it to trash if you have not done so already

VS Code Plugins:

Now that NodeJS is installed, you can install the VSC extensions/plugins

1. Make sure node is updated by running sudo npm i -g npm in your terminal
2. Run git clone https://github.com/wpilibsuite/vscode-wpilib.git in your terminal
3. Then cd vscode-wpilib/vscode-wpilib/ and then run: sudo npm install
4. Then cd ../wpilib-utility-standalone/ and then run: sudo npm install once again

5. Install tslint and typescript globally through npm; open your terminal and run: `sudo npm install -g tslint typescript`
6. Open the Marketplace: (Command + shift + P) then type: Install Extensions
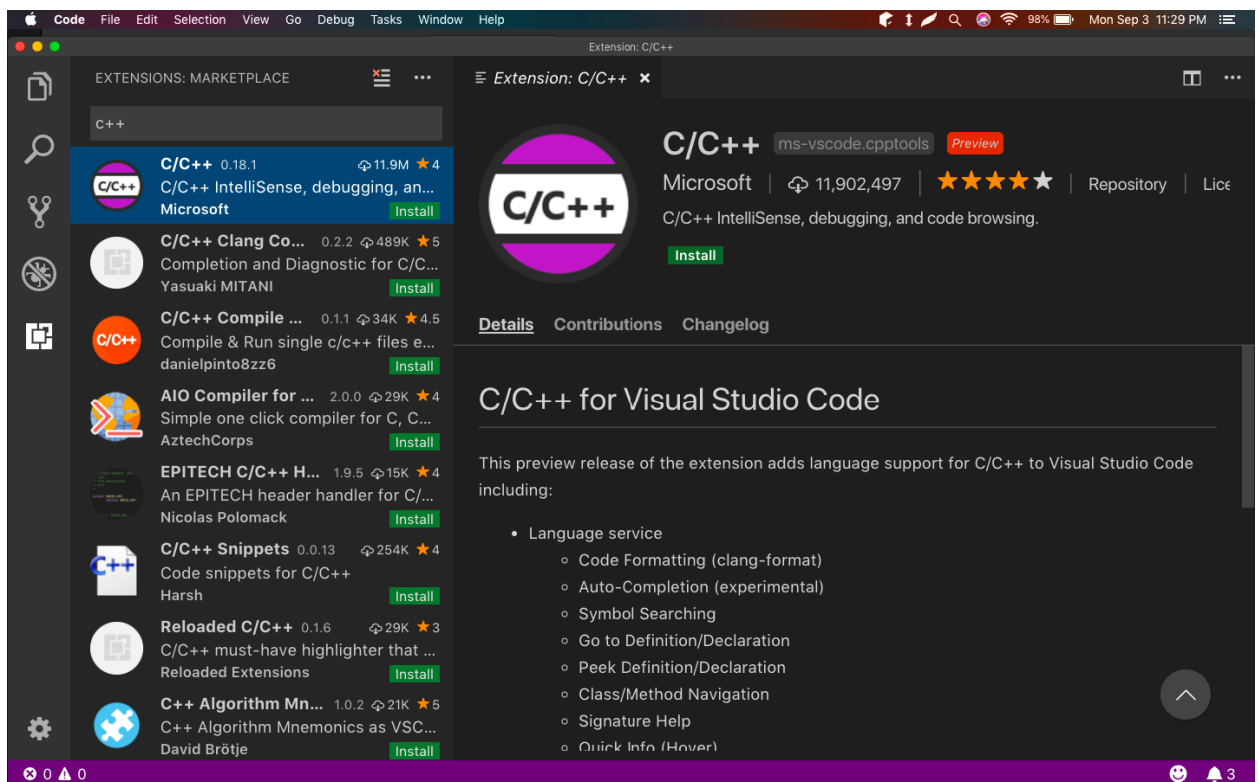

and then type: TSLint
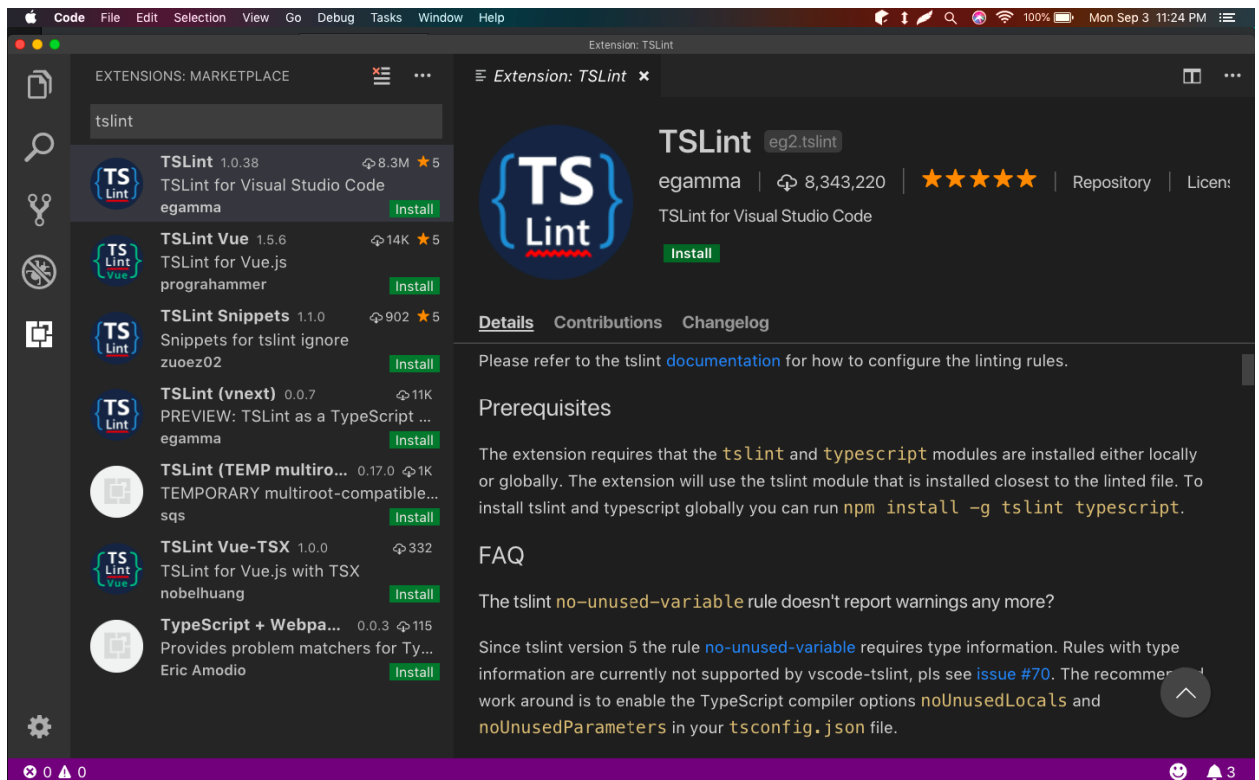
7. Click the green install button
8. Open the Install Extensions Marketplace (Command + shift + P) and then type: Chrome Debug
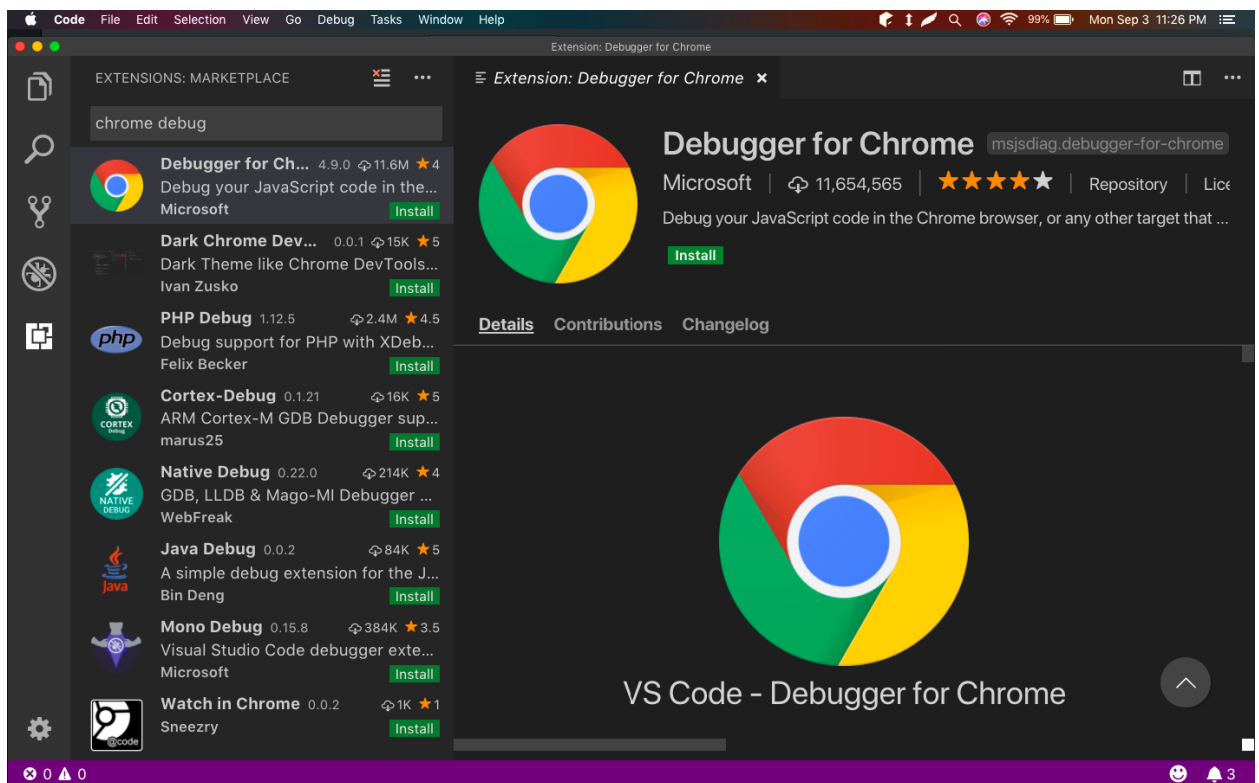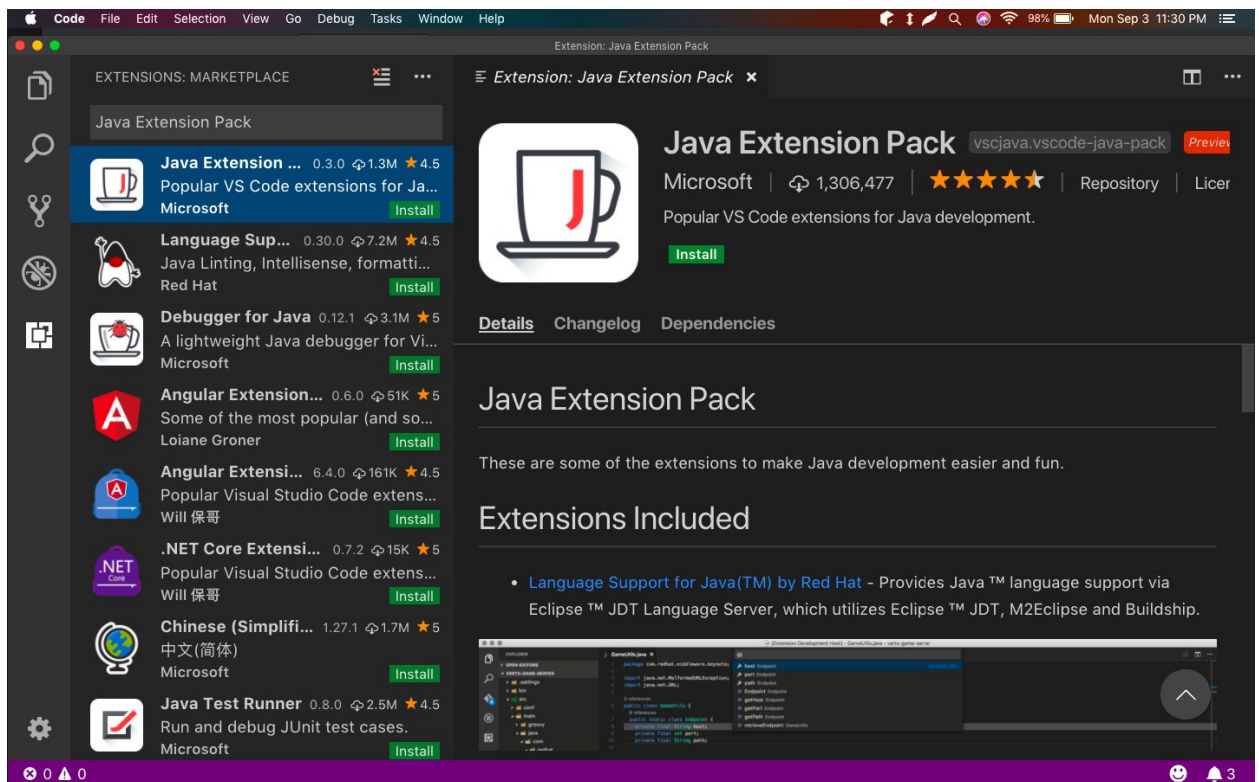
9. Click Install
10. Open the Install Extensions Marketplace (Command + shift + P) and then type:
    C/C++

11. Click Install

12. Open the Install Extensions Marketplace (Command + shift + P) and then type: Java Extension Path

13. Click install
14. You now have everything installed!

FIRST Team 1923: The MidKnight Inventors

West Windsor-Plainsboro Regional School District

www.FIRSTrobotics1923.org | twitter @FRC1923 | facebook.com/FRC1923