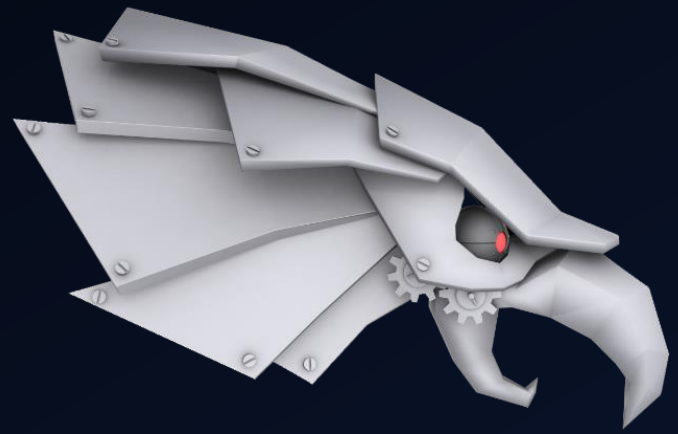
An Introduction to Google Blocks Programming for FTC

Rover Ruckus Kickoff 2019-2020

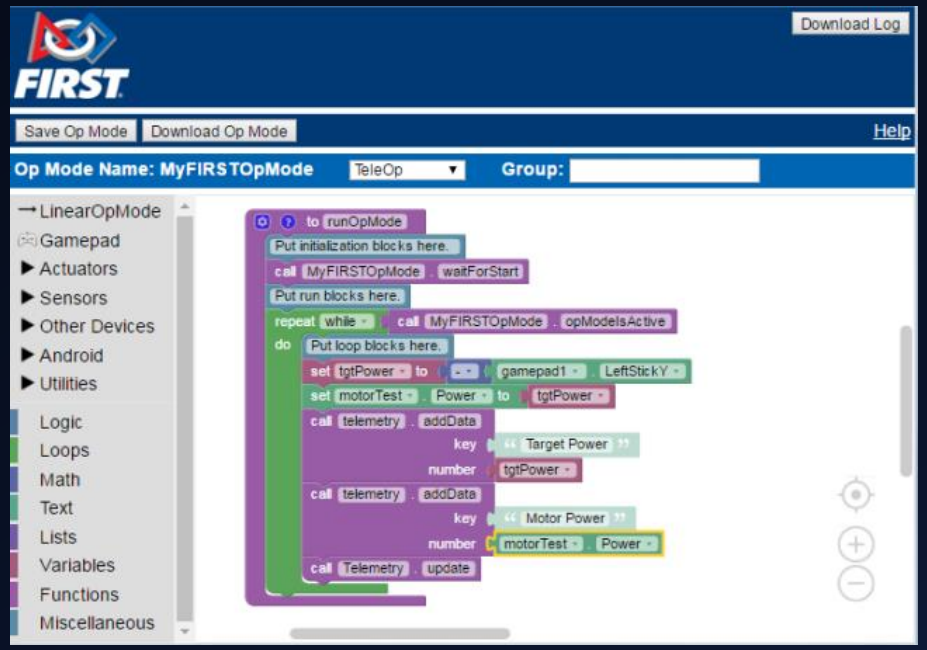
EAGLE ROBOTICS TEAM 7373 CARBON FIBER



Introduction

What will you learn?

- You will not be a Google Blocks expert
  - This is merely an overview of the basics and how to get started
- Cover the benefits of Blocks, how it works (live demo), settings to configure, and our tips and tricks
- Answer questions and clarify



FTC Blocks Programming

What is it?

- A version of the Blockly language (made by Google) adapted for use in *FIRST®* Tech Challenge
  - added as a programming option in the 2017-18 season
- Compatible with both REV and Modern Robotics hardware
- Integrated into the FTC Robot Controller/Driver Station App

FTC Blocks Programming

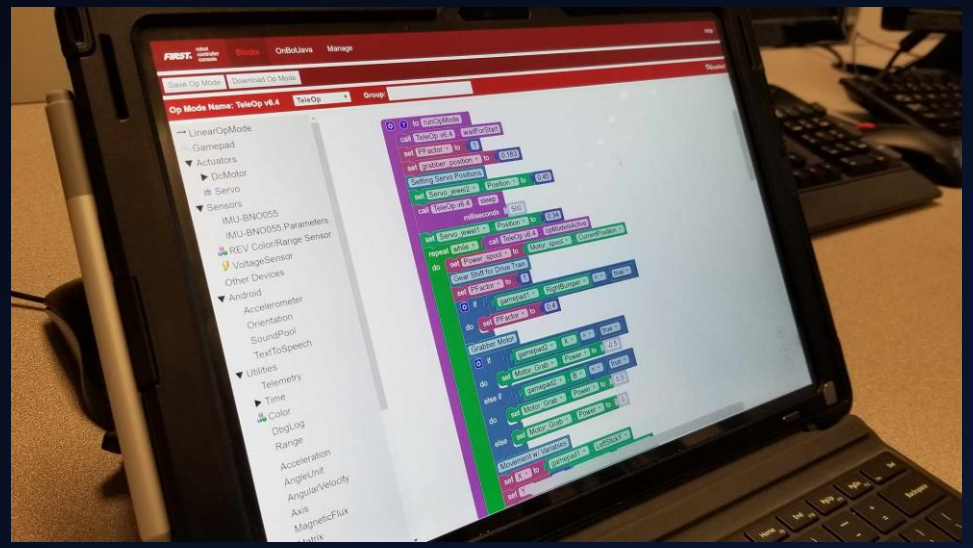
How does it work?

- Teams can create, modify, & store custom programs through a computer and Android devices
  - Code is made in the Blocks website and linked with the phone
- Programs made through connecting a series of block statements to accomplish a task

FTC Blocks Programming

What are the benefits?

- Setup is minimal and easy (we will cover this)
- Op modes exist on the Blocks website
- Much easier learning curve compared to Java alternatives
- No extra software needed

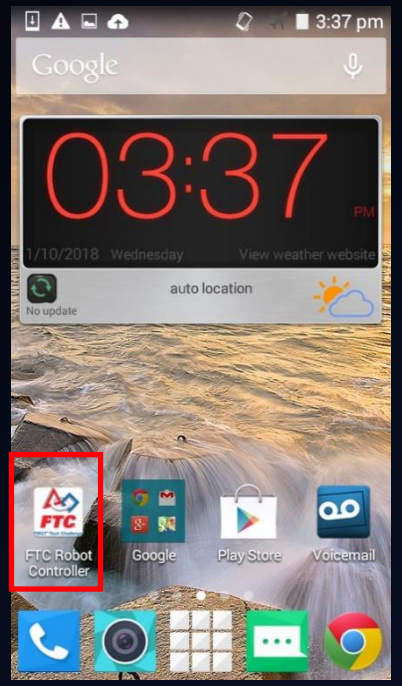


Connecting

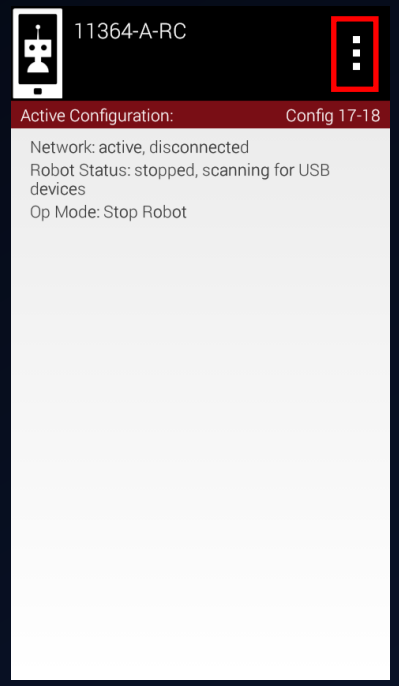
How do I connect the robot controller to my computer?

- Blocks relies on a Wi-Fi connection made between the phone and the computer being used for programming

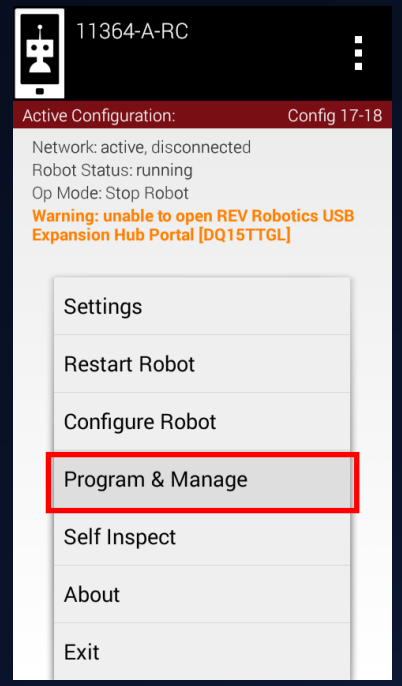
1. Open Robot Controller App



2. Open settings

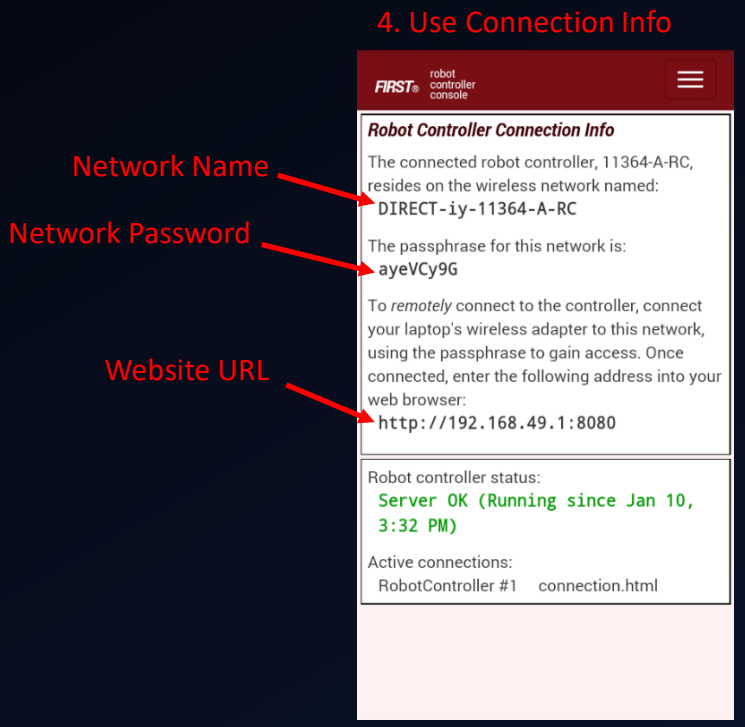


3. Select Program & Manage



Connecting

How do I connect the robot controller to my computer?

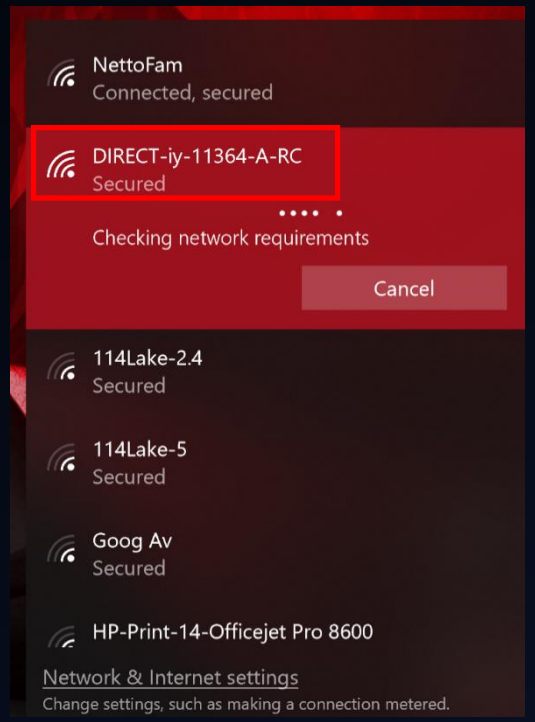


Connecting

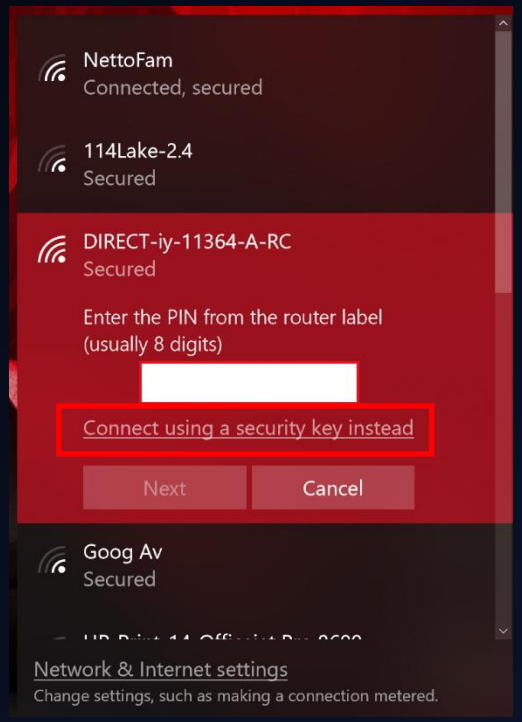
How do I connect the robot controller to my computer?

- Change over to your programming computer to continue
  - Keep the robot controller app open during this process

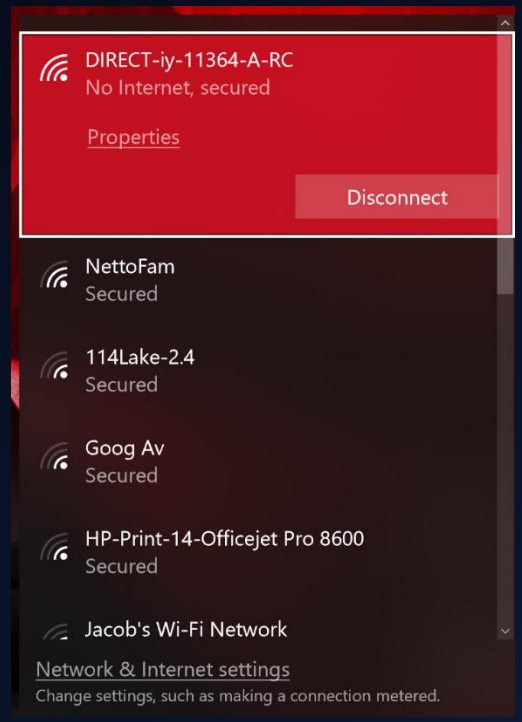
1. Discover phone's network



2. Click "Connect using a security key instead"



3. Enter password and connect

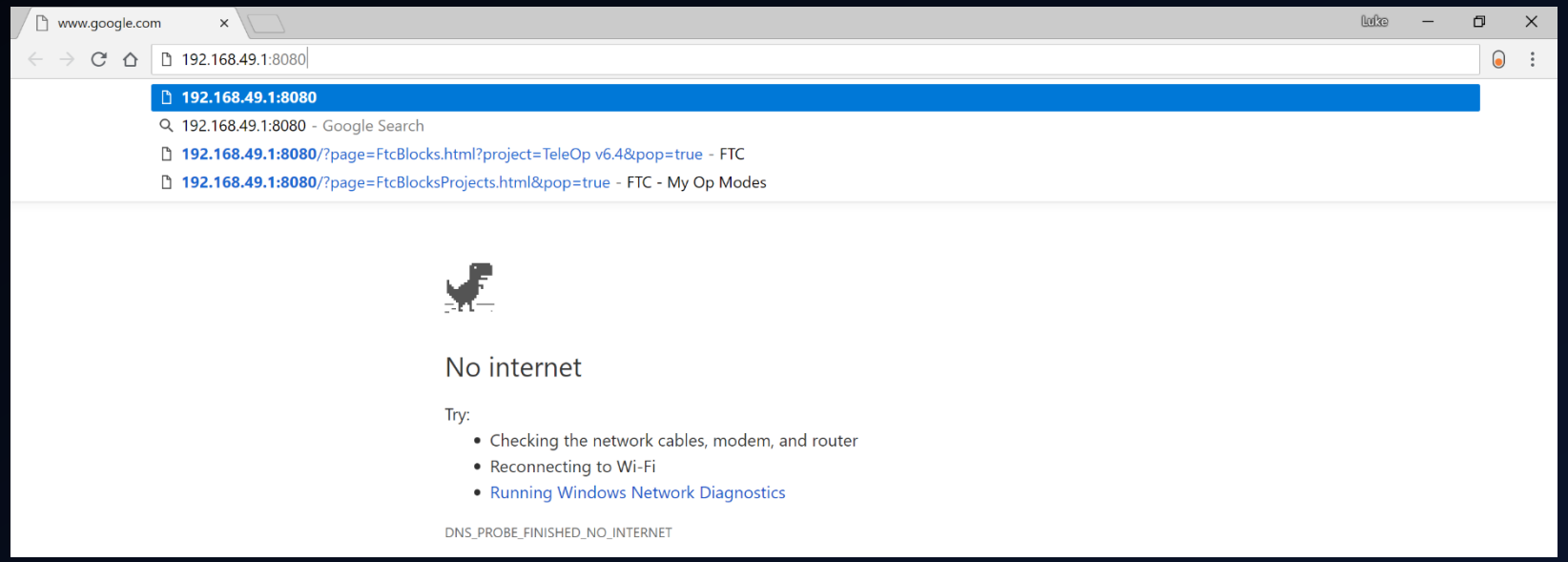


Connecting

How do I connect the robot controller to my computer?

- Navigate to your preferred browser (Chrome, Edge, Firefox)

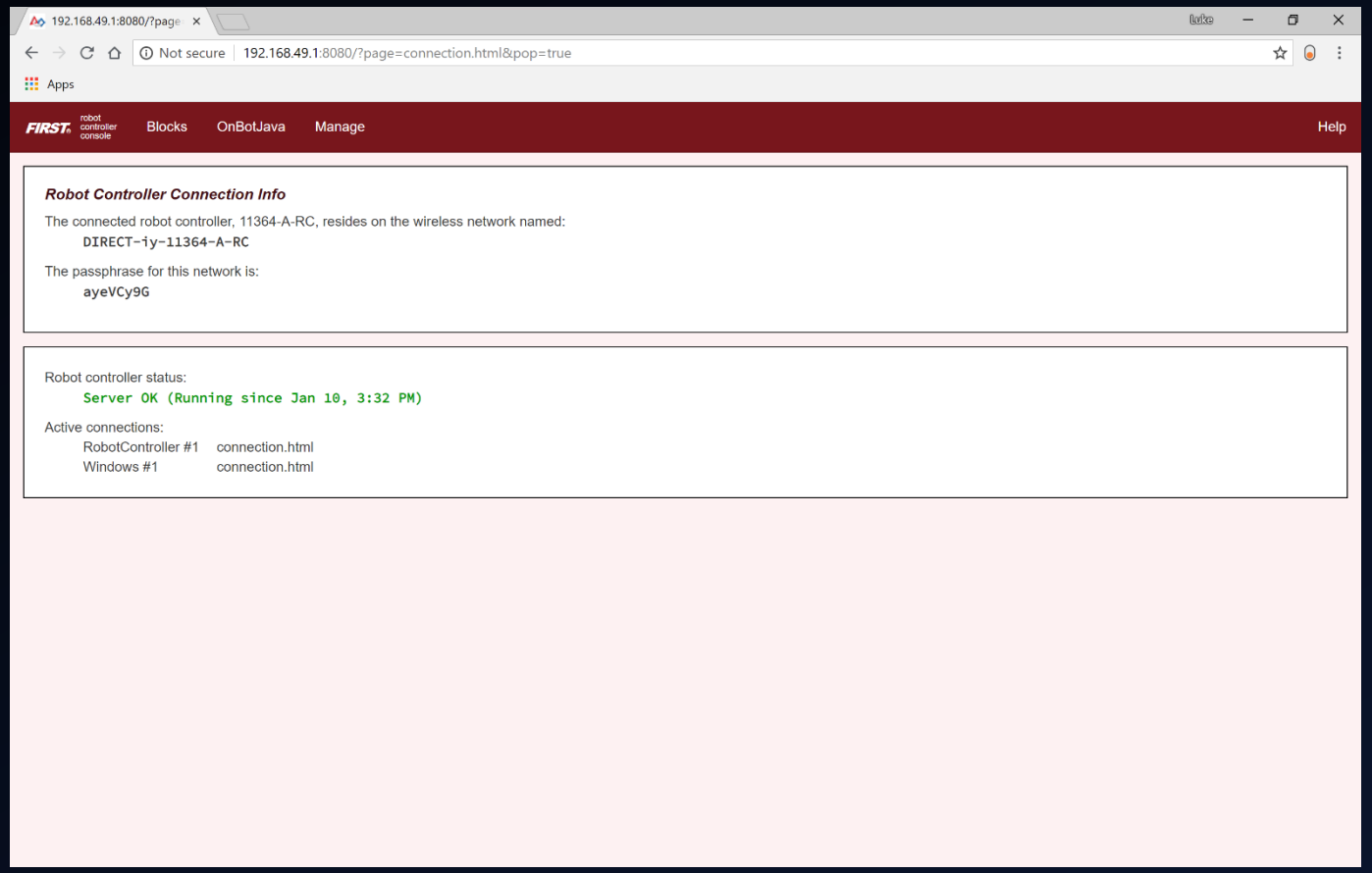
4. Enter website URL



Connecting

How do I connect the robot controller to my computer?

- You are now connected to the phone and ready to program!

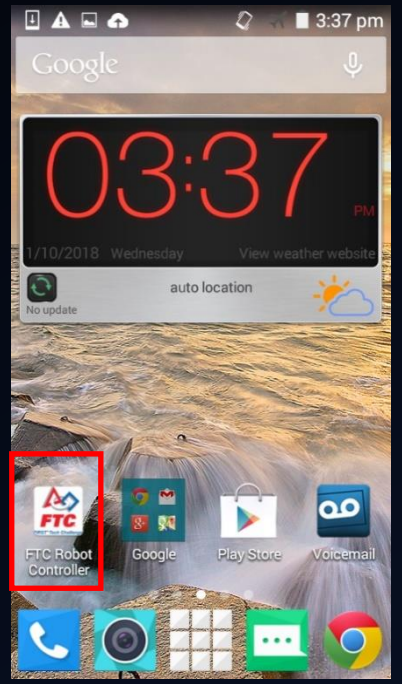


Configuring

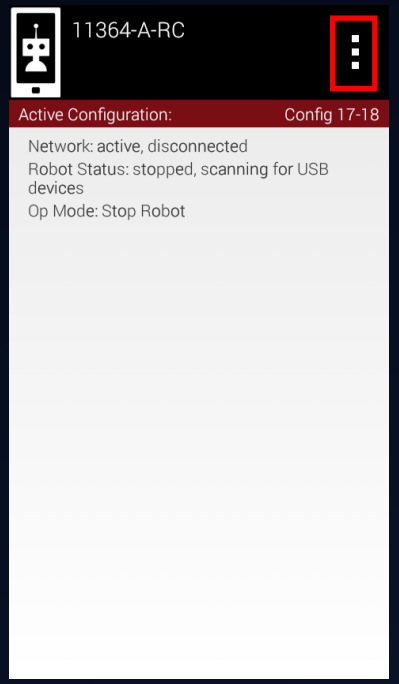
How do I configure the phones?

- Hardware (motors, servos, sensors) need to be recognized and named to be used by Blocks
  - Can then add hardware commands to Blocks code after this is done properly

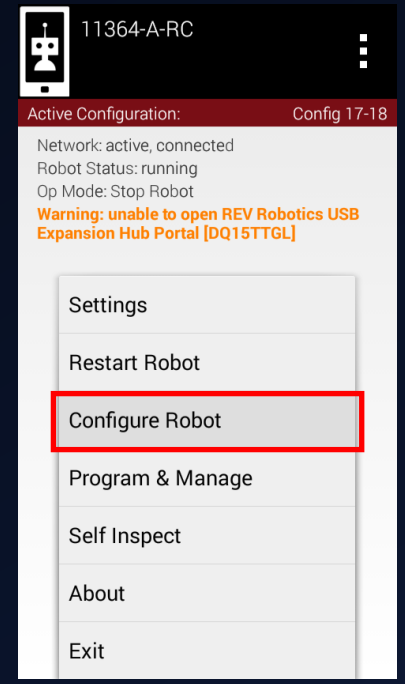
1. Open Robot Controller App



2. Open settings



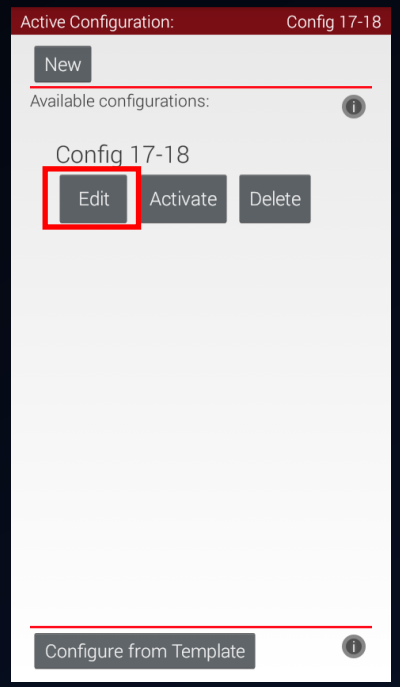
3. Select Configure Robot



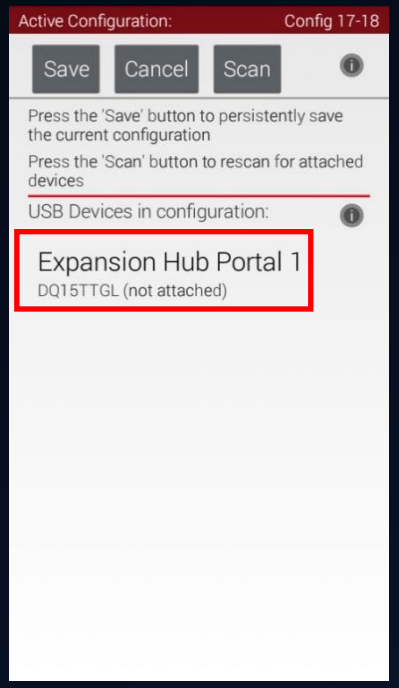
Configuring

How do I configure the phones?

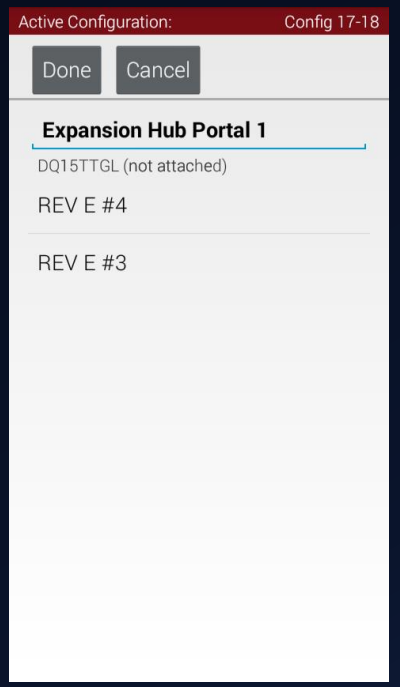
4. Select Edit



5. Select Scan/Choose Hub Portal



6. Select Expansion Hub

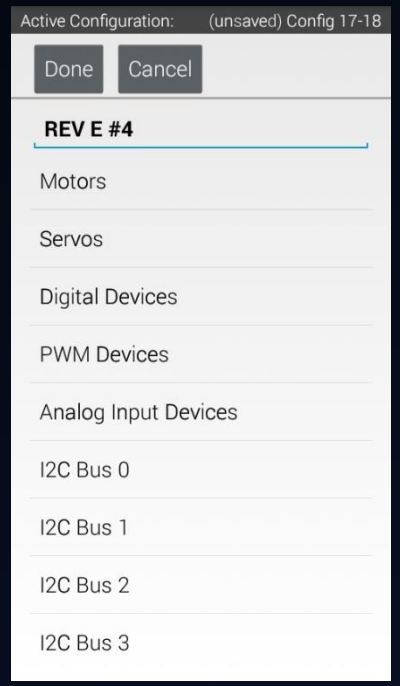


Configure

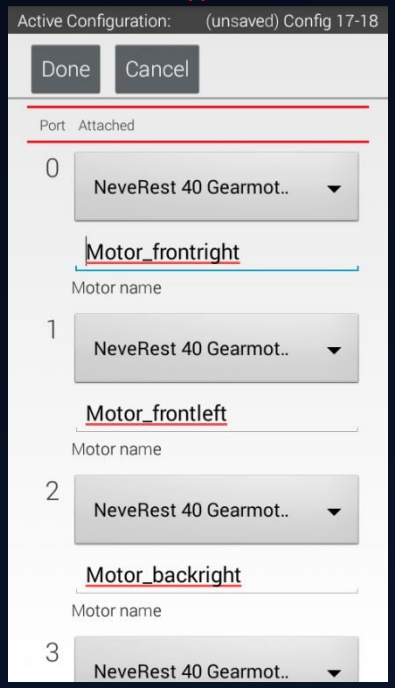
How do I configure the phones?

- Now you are able to define your hardware, based on its type, name, and port

7. Select hardware type



8. Define type & name



Interface

What does Blocks actually look like?

- We will now move on to a live demonstration of the Blocks interface

Interface

What does Blocks actually look like?

Category	Description
Logic	• logical processes, mainly if else, and, or, =, not equal to statements
Loops	• repeating loops for number of iterations, times, repeat while or until a statement is true or false
Math	• deals with mathematical blocks such as adding, subtracting, multiplying, dividing, exponents, square roots, absolute value of a number, etc.
Text	• deals with text and actual words that appear somewhere
Lists	• deals with lists of items
Variables	• deals with variables and setting certain words or number to equal different values
Miscellaneous	• Comments, null

Interface

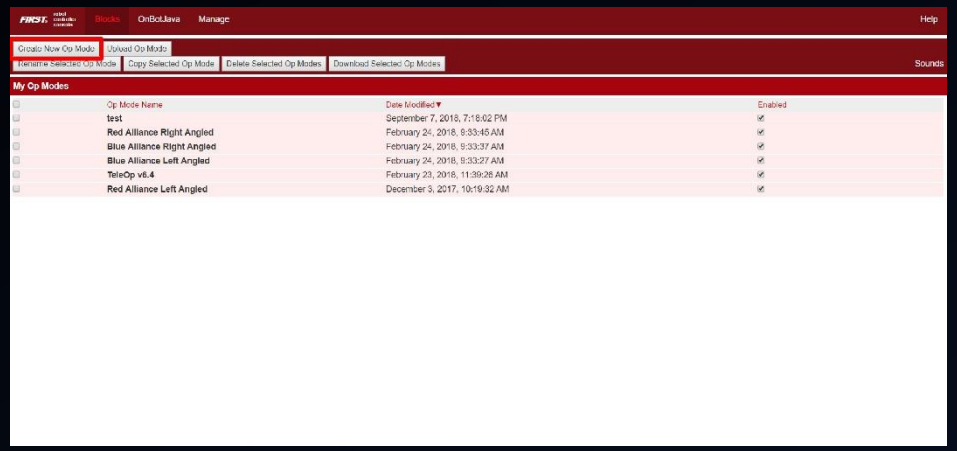
What does Blocks actually look like?

Category	Description
Gamepad	• deals with buttons on the gamepad such as the bumpers or triggers or dpads
Actuators: Motors	• Motors can be either defined 1 by 1 or can be defined 2 at a time. Motors can either be set using power from –1 to 1 or in orientation such as REVERSE or FORWARD
Actuators: Servos	• Servos come in 180 degree and continuous rotation. With 180-degree position positions are between 0 and 1. Limits need to be defined with continuous rotation servos
Sensors	• Include IMU – inertial measurement unit which measures angular velocity or how much the REV Expansion hub turns in degrees and acceleration. REV Color/Range Sensors and voltage sensors
Utilities	• displays values on the driver controller in either text or numbers. Need to have a telemetry update block after if you want telemetry to be real time

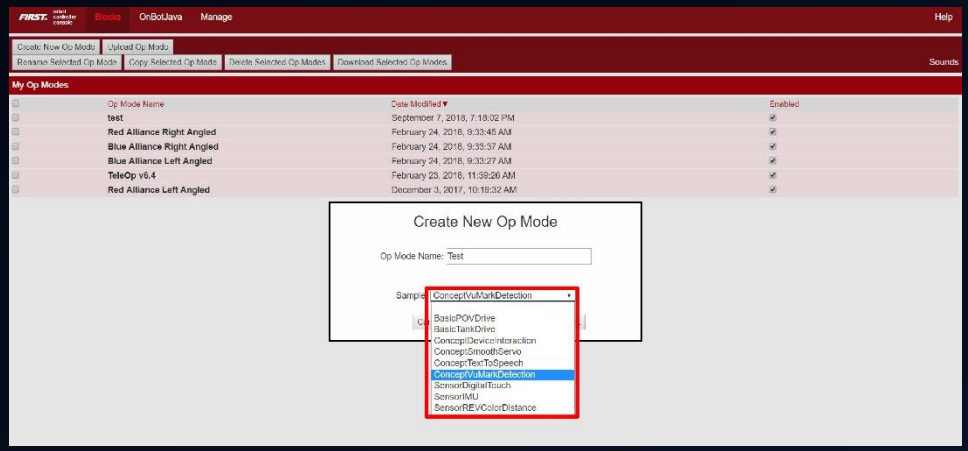
Interface

Google Blocks Programming Samples

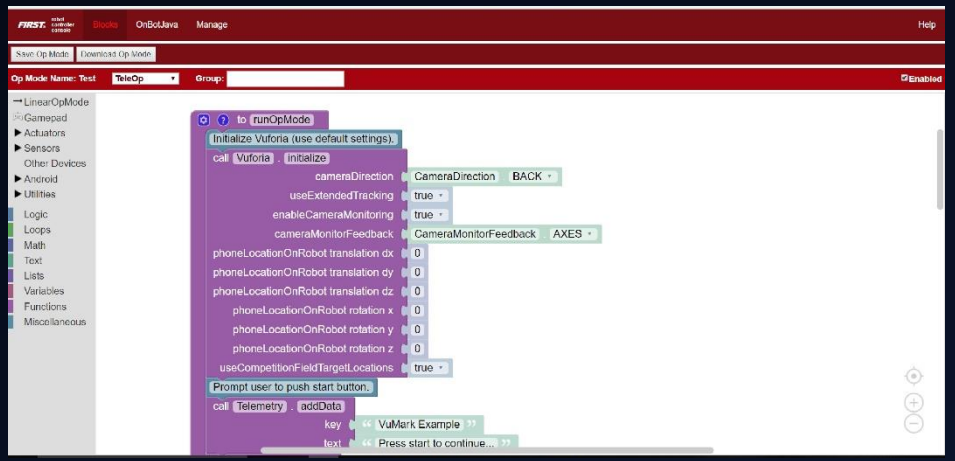
Press Create New Op Mode



Name Op Mode, Select Sample Type, and Press Ok



Vuforia Program Sample



Our Experiences

What have we learned?

- Had two programmers: one for Autonomous and one for TeleOp
- Make sure to backup programs on a computer or hard drive before every competition
  - Manage versions (0.1 for minor changes, 1.0 for major changes)
- Experiment with variables
  - Define variables at the beginning of code
- Comment each section/function

Contact Information

Contact & Resources

- Ben Mueller: benjaminmuellerusa@yahoo.com
- Luke Spinetto: lukespin21@gmail.com
- Brad Smith (Coach): bsmith@mtparanschool.com
- Website: https://www.eaglerobotics.net
  - Blocks Resources: Scan the QR code on pamphlet