LAB 5: DATA VISUALIZATION USING MIT APP INVENTOR 2

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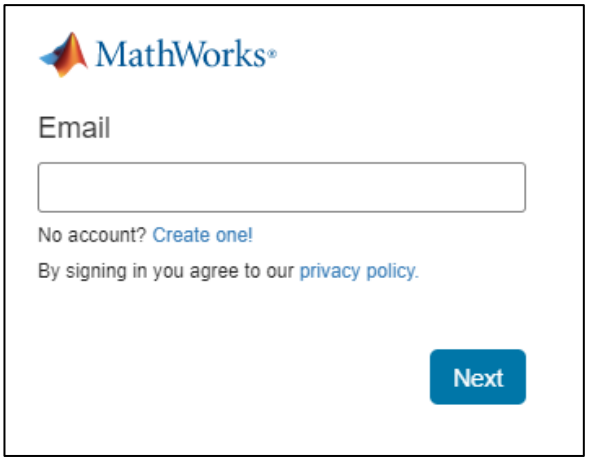
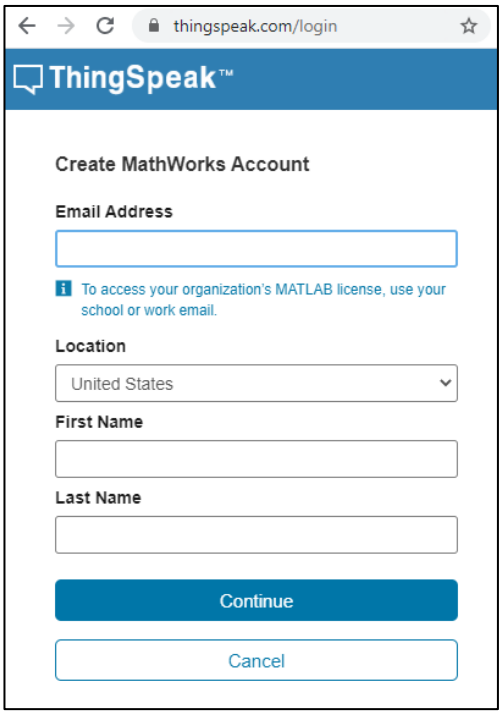
Objective:
In this lab we are going to go through steps by steps on creating a data visualization. We will be using a visualization chart from ThingSpeak and a MQTT Client Desktop to simulate data transfer. In this lab we will be utilising the MQTT Key instead of the API Key.

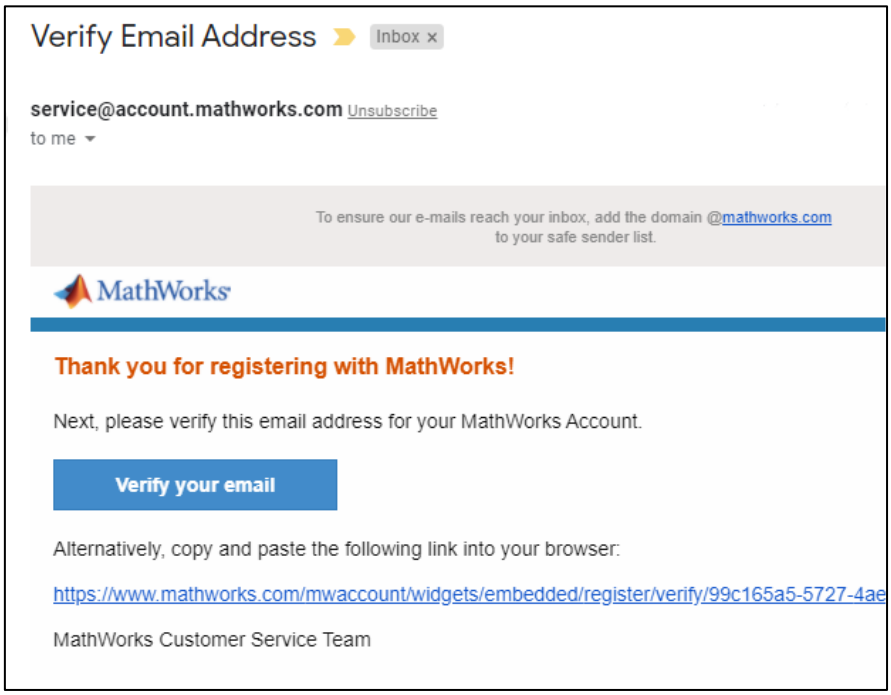
1. Create an account at ThingSpeak. Go to this link https://thingspeak.com/login



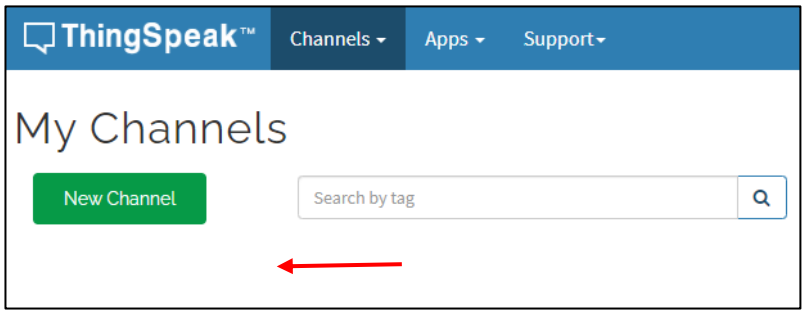
2. Fill in your details in the fields below



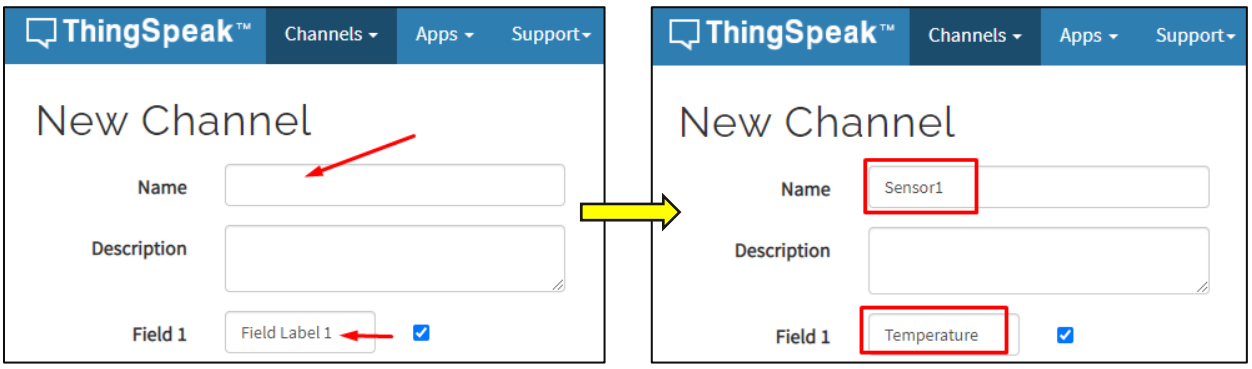
3. You will receive a verification email from mathworks. Click on Verify your email button.



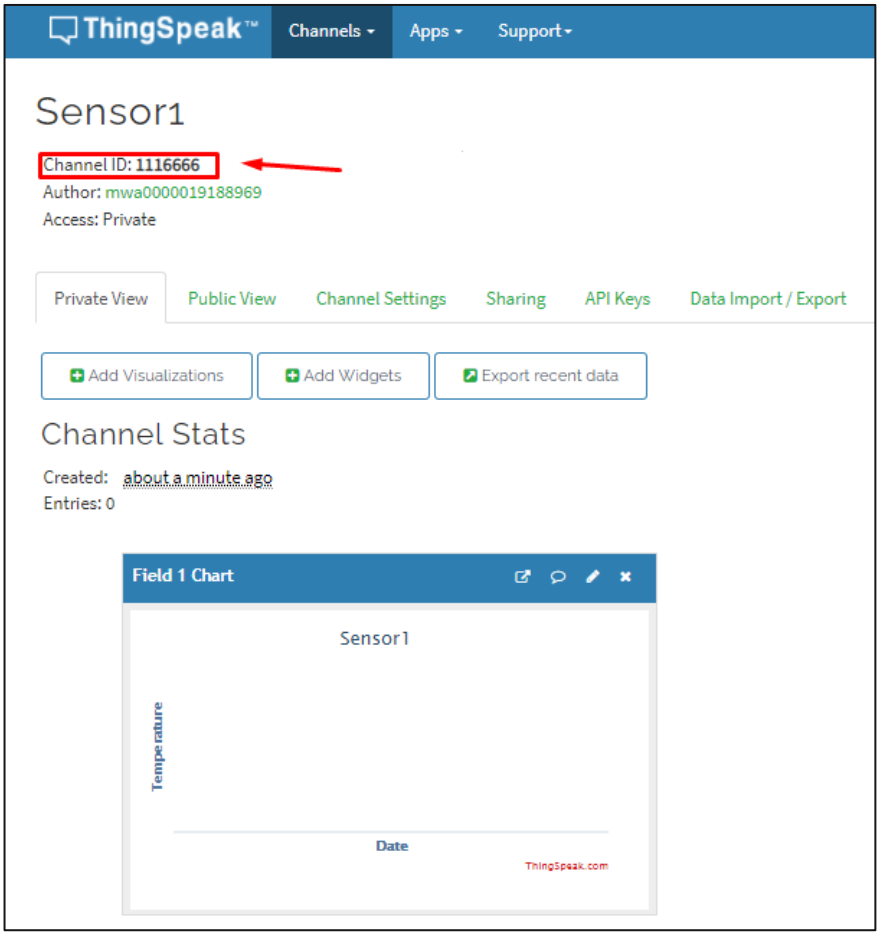
4. Once, you have verified your email, you will be prompt to keyed in your Password.
5. After that you will be brought to your channels as shown in figure below. Click on **New Channel** button.



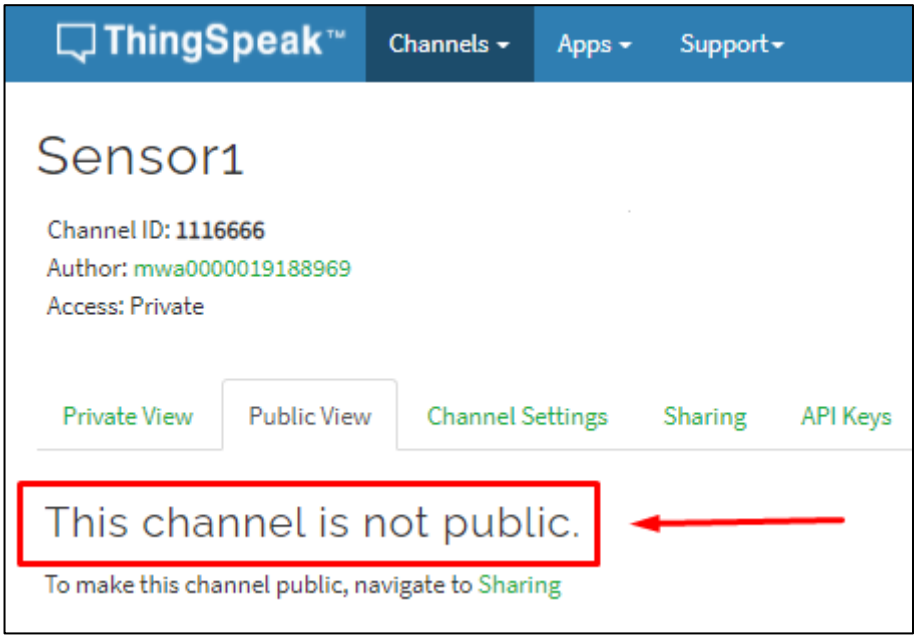
6. Fill in the name as Sensor1, and change the Field Label 1 to Temperature and scroll down to Save Channel.



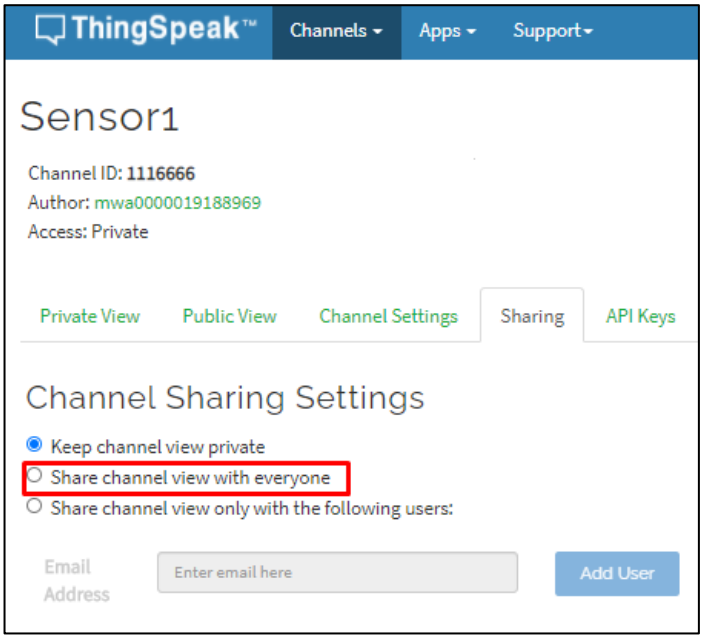
7. Your Channel will look something like this. Please take note of the channel ID.



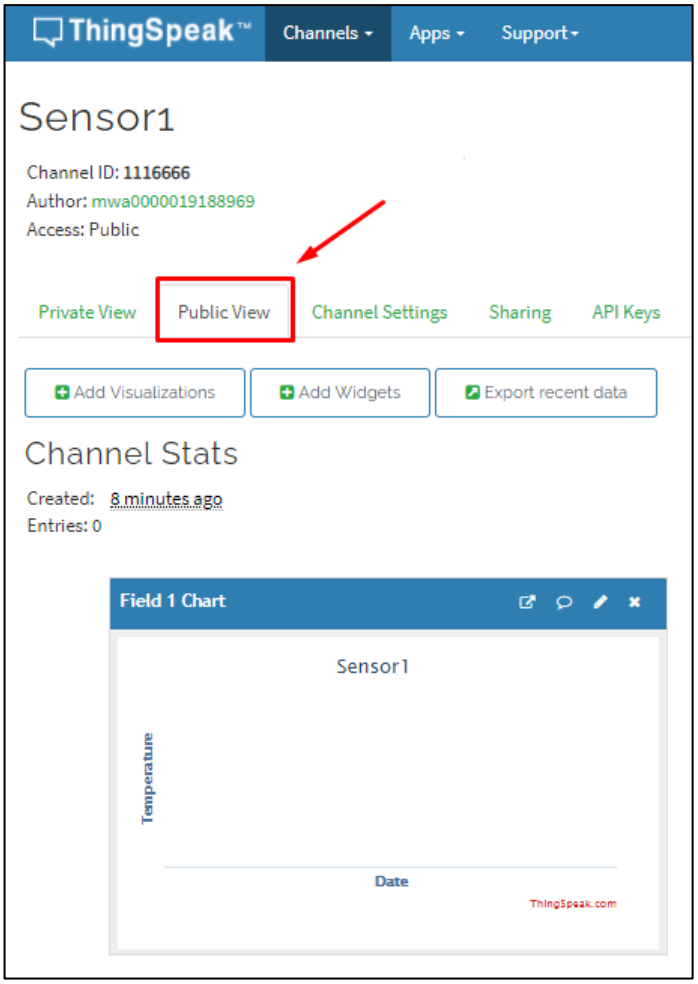
8. Now, change the access to the channel to be publically available.



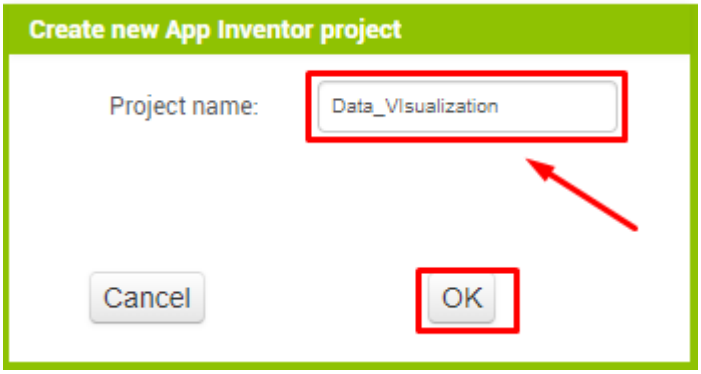
9. Go to Sharing tab and choose the Share channel view with everyone.



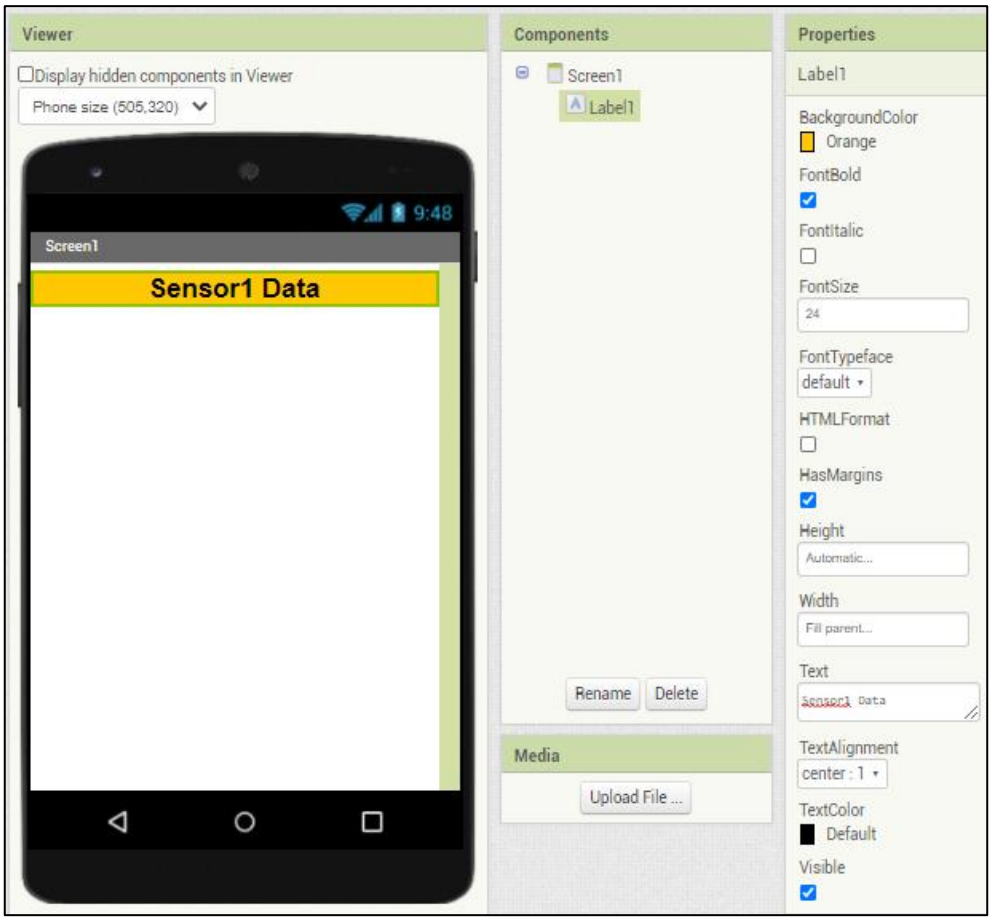
10. Now, the channel is ready for the public to Publish and Subscribe.



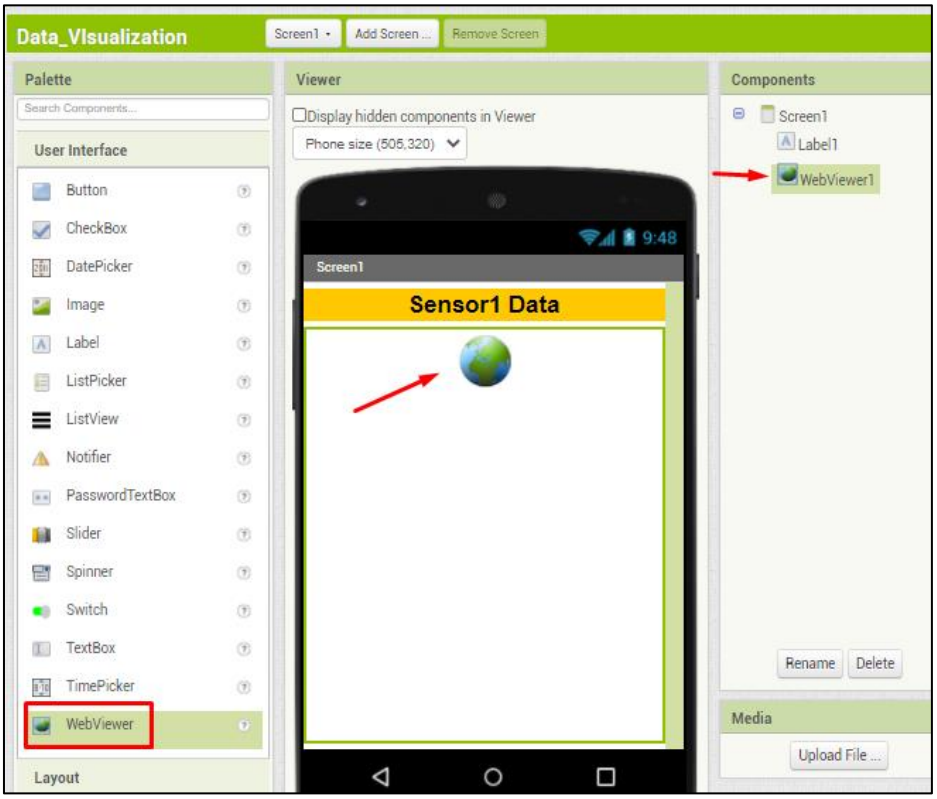
11. Let's create our app. Login to your MIT App Inventor account and Start new project called Data_Visualization. Click OK to continue.



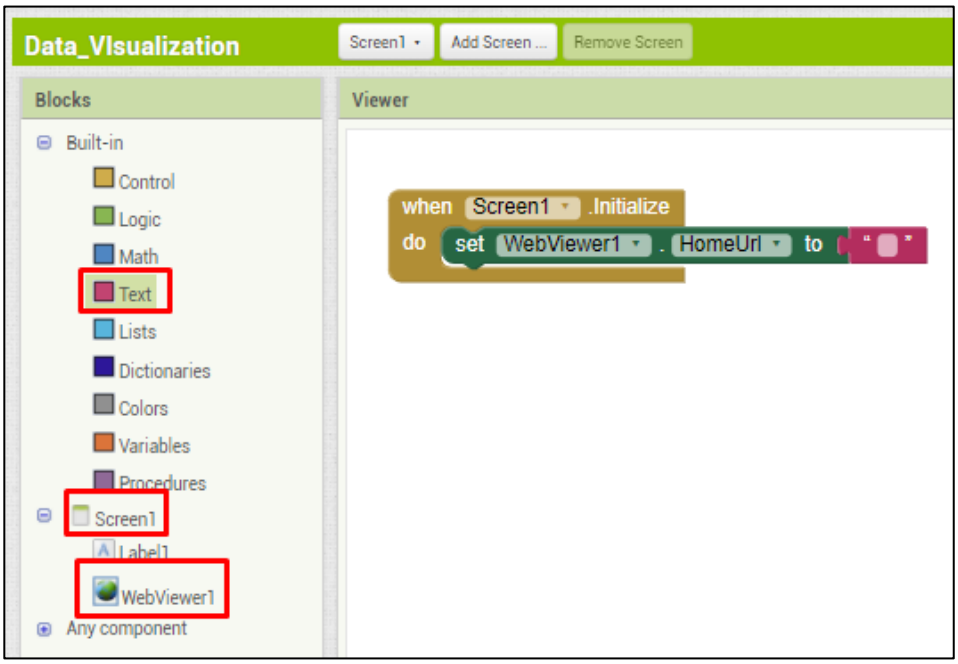
12. Add a label to Screen1. Change the following Properties for Label 1:
    a. BackgroundColor: **Orange**
    b. FontBold: **checked**
    c. FontSize: **24.0**
    d. Width: **Fill parent**
    e. Text: **Sensor1 Data**
    f. TextAlignment **center:1**



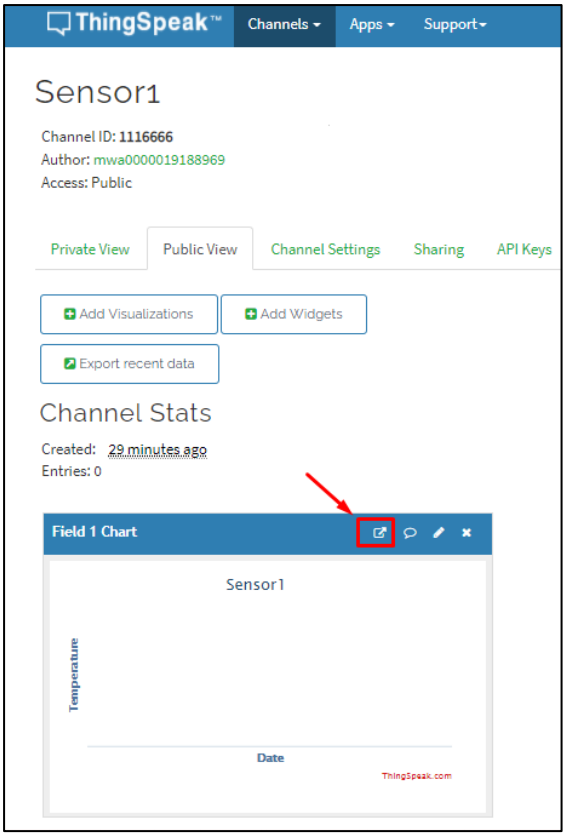
13. Then, add a WebViewer as shown in figure below.



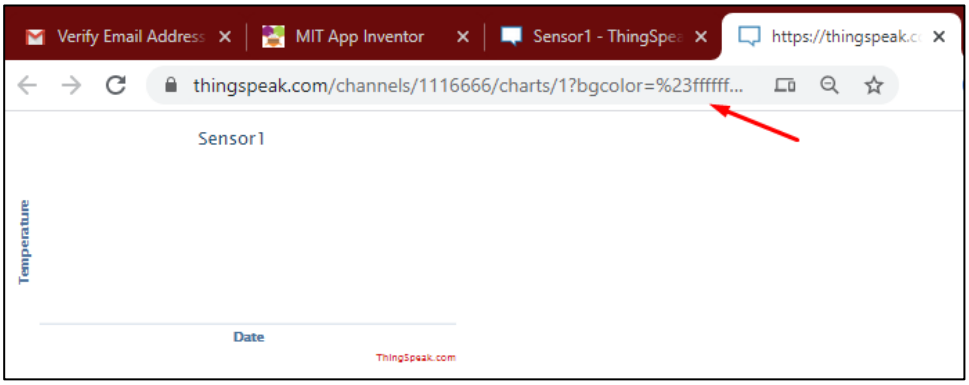
14. Then, go to the MIT App Inventor Blocks and add the following blocks.



15. Go back to your ThingSpeak account and click on Field 1 Chart.

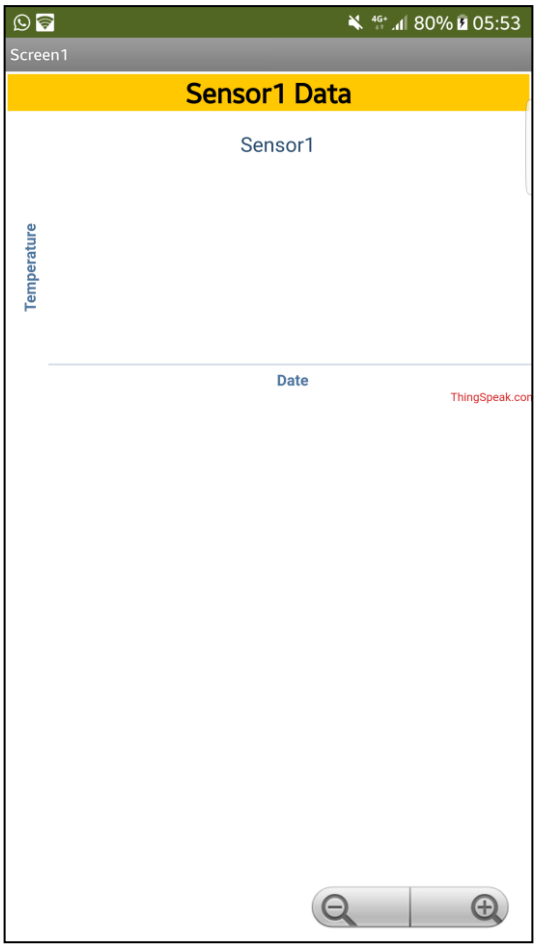


16. A new tab will open the Field 1 Chart as show in figure below. Copy the URL to the Chart.

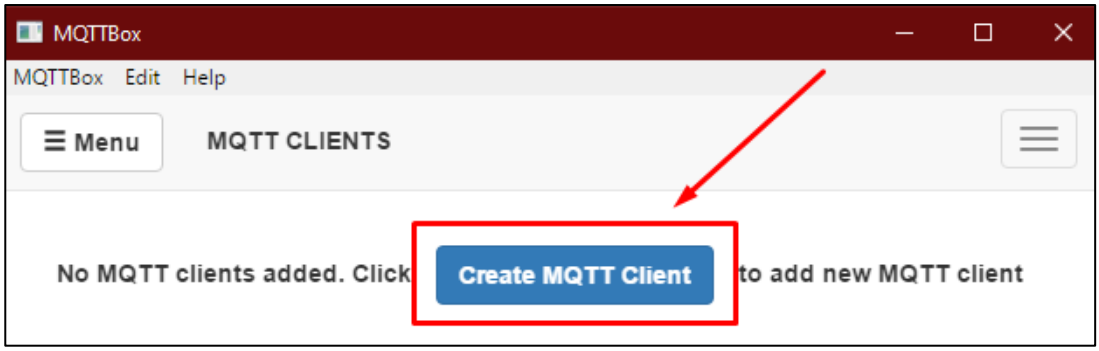


17. Next, paste the URL in the String block

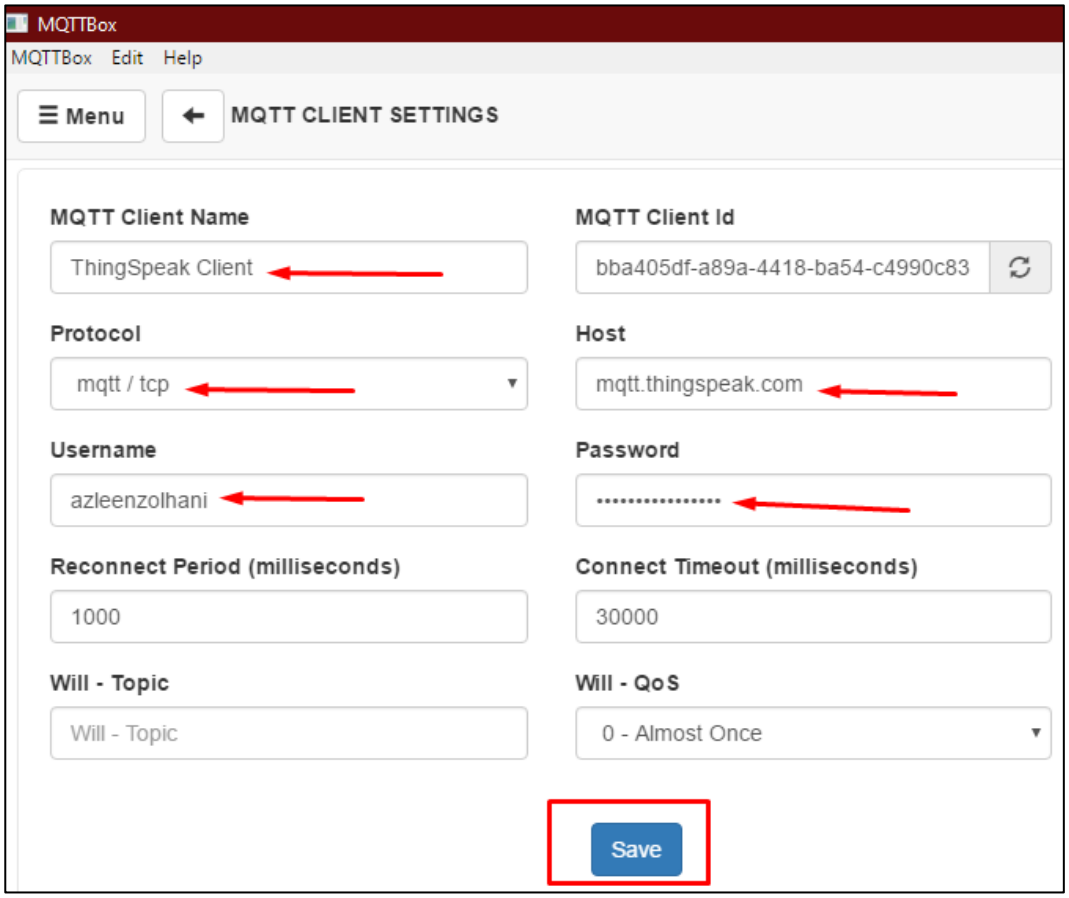
18. Lastly, we will test it in our Android device. As you can see there are no chart being plot because there is no data being sent to ThingSpeak.



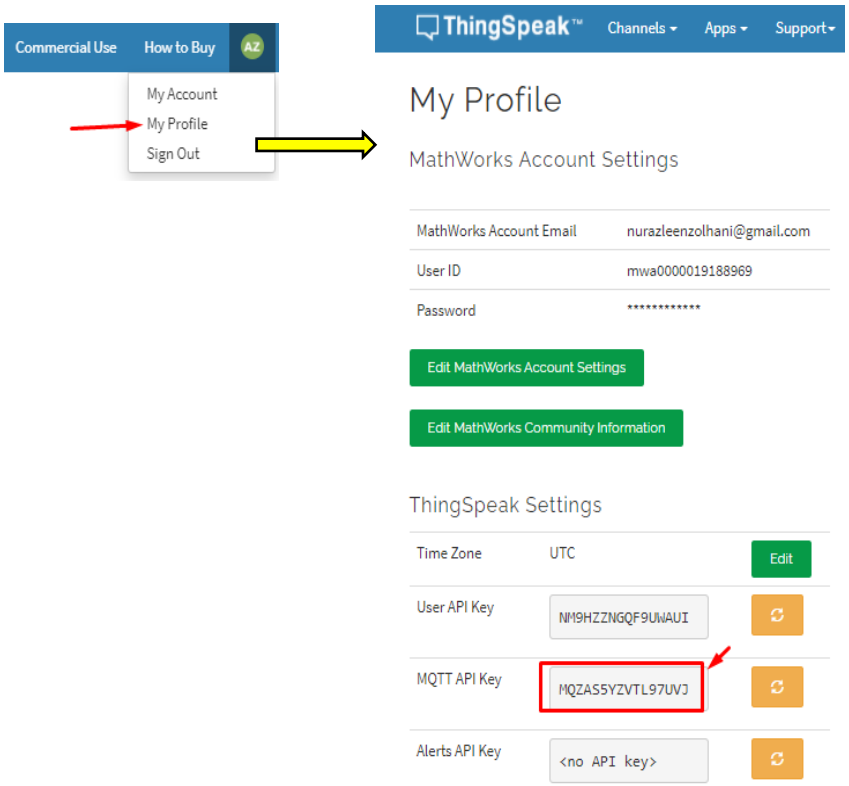
19. Now, we will use MQTTBox to transfer data to ThingSpeak. Launch your MQTTBox. And click on Create MQTT Client



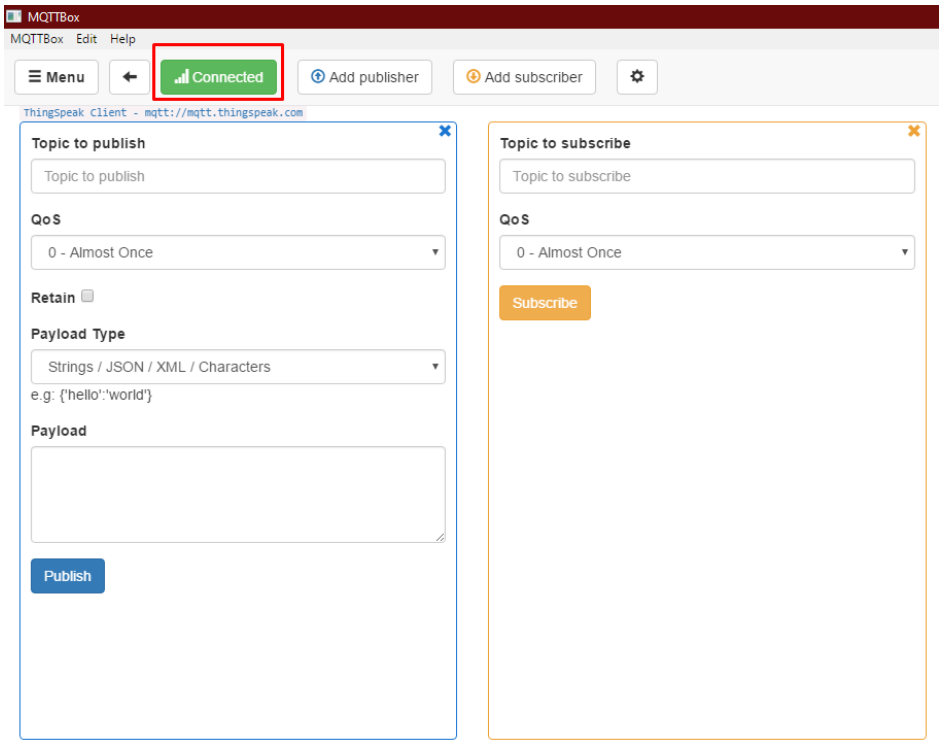
20. Change the following settings:
    a. MQTT Client Name: ThingSpeak Client
    b. Protocol: mqtt/tcp
    c. Host: mqtt.thingspeak.com
    d. Username: <yourname> ← It can be anything
    e. Password:<MQTT API Key>



21. To retrieve the MQTT API Key, go to ThingSpeak, click My Profile and scroll down till you see MQTT API Key as shown in figure below. Copy and paste the key as Password

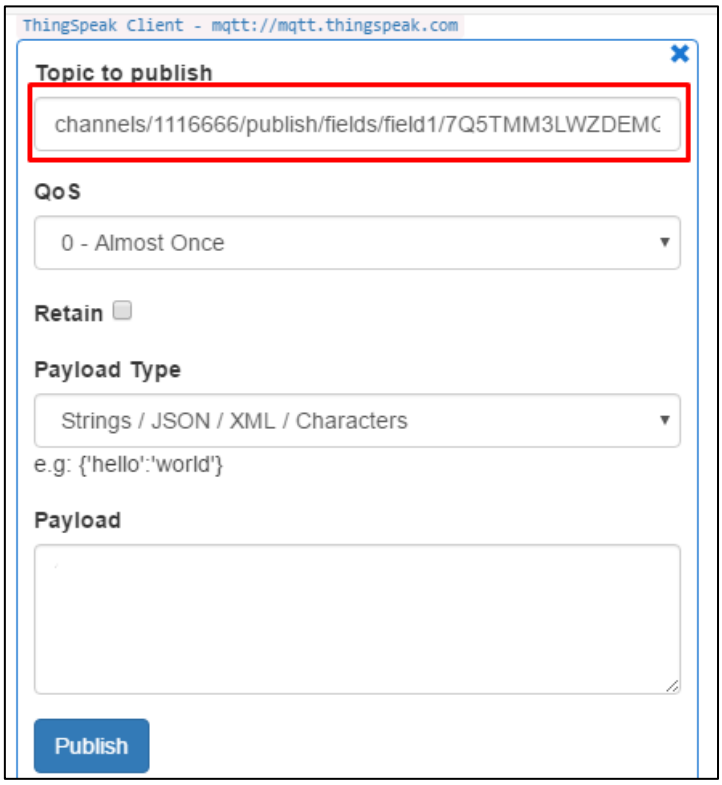


22. Make sure that your MQTTBox is successfully connected to the ThingSpeak broker.

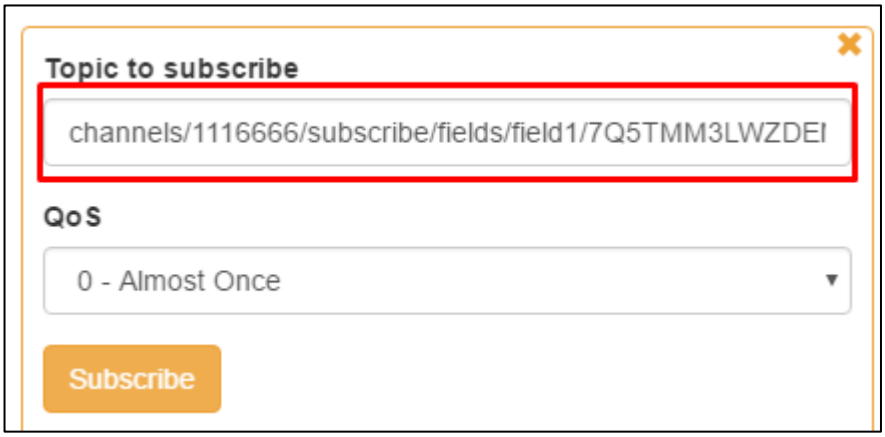


23. Now, to test we will be publishing and subscribing data at the MQTTBox. To publish data to a ThingSpeak broker we must follow the following settings:

```
channels/<channelID>/publish/fields/field<fieldnumber>/<apikey>
```



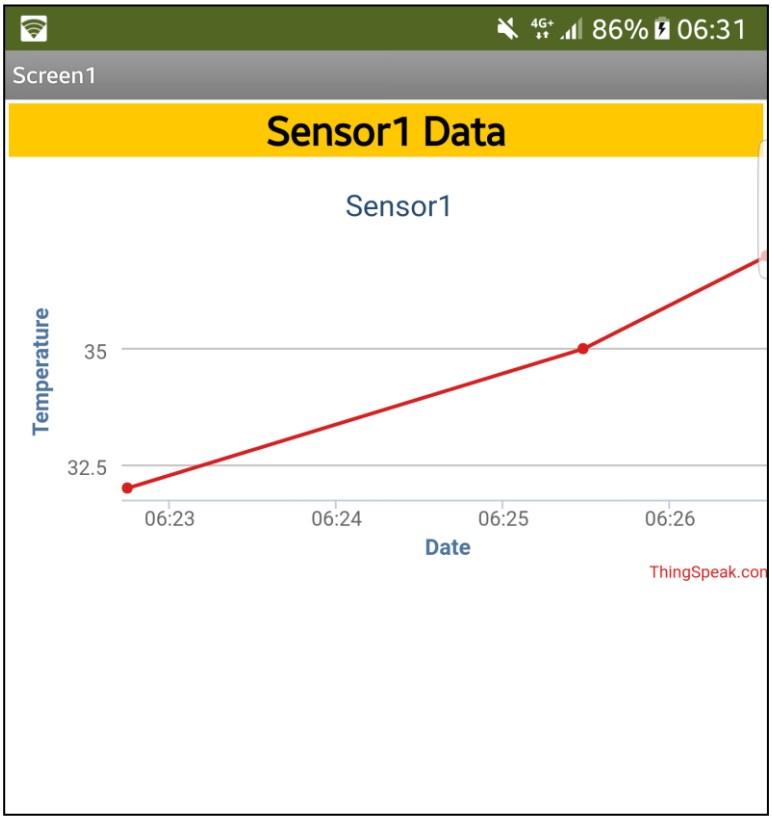

```
channels/<channelID>/subscribe/fields/field<fieldnumber>/<apikey>
```



24. We will publish three (3) data which are 32, 35 and 37.

25. Make sure that we received a data 32, 35 and 37 at the subscriber.

26. Now, check at your AI Companion, you should be able to see the chart.



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References:

1. http://appinventor.mit.edu/explore/sites/all/files/teachingappcreation/unit1/MagicTrickHandout.pdf
2. https://appinventor.mit.edu/explore/library
3. https://appinventor.mit.edu/explore/ai2/tutorials
4. https://www.programwithappinventor.org/
5. https://www.amazon.com/Learning-MIT-App-Inventor-Hands-On/dp/0133798631/
6. https://www.mathworks.com/help/thingspeak/use-desktop-mqtt-client-to-publish-to-a-channel.html