



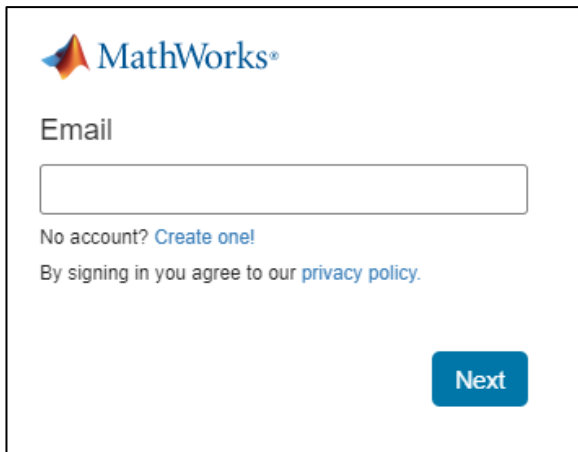
LAB 5: DATA VISUALIZATION USING MIT APP INVENTOR 2

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Objective:

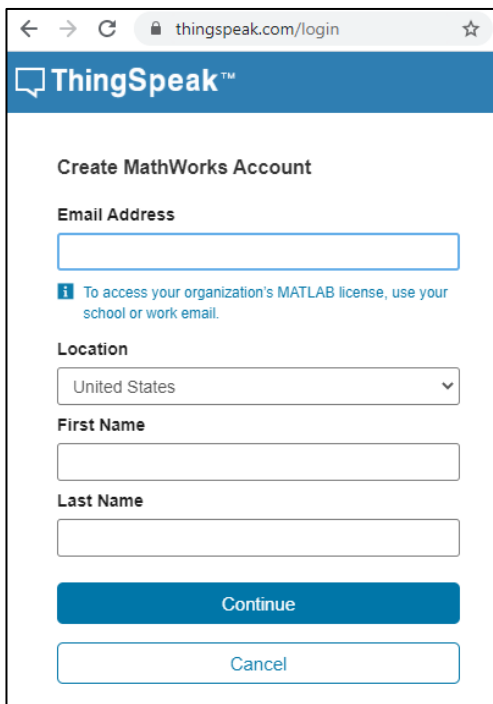
In this lab we are going to go through steps by steps on creating a data visualization. We will be using a visualization chart from ThingSpeak and a MQTT Client Desktop to simulate data transfer. In this lab we will be utilising the MQTT Key instead of the API Key.

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



The screenshot shows the MathWorks login interface. At the top left is the MathWorks logo. Below it is the label "Email" followed by a text input field. Under the input field, there is a link "No account? Create one!" and a line of text "By signing in you agree to our [privacy policy](#)." At the bottom right is a blue button labeled "Next".

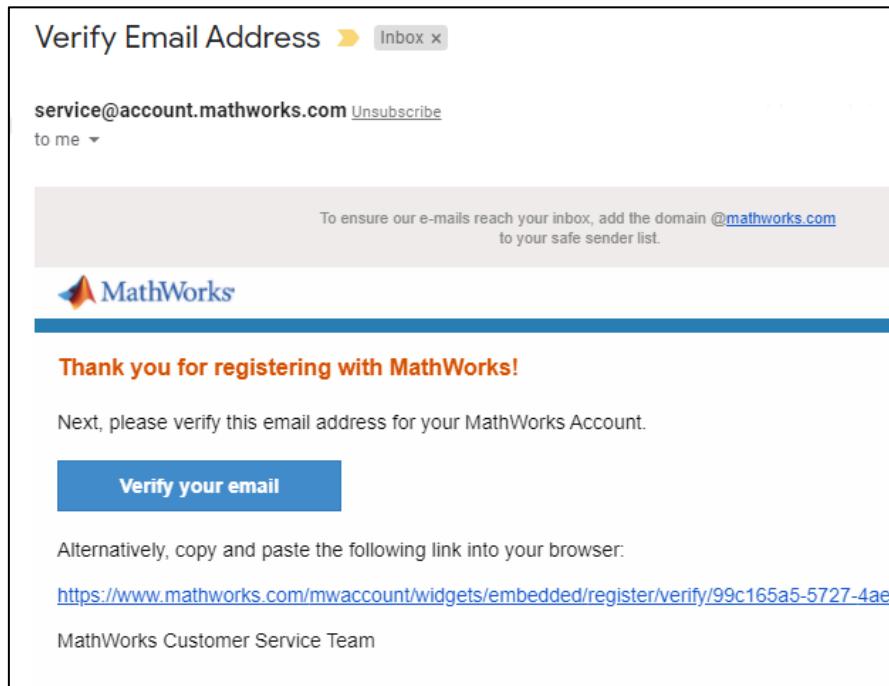
2. Fill in your details in the fields below



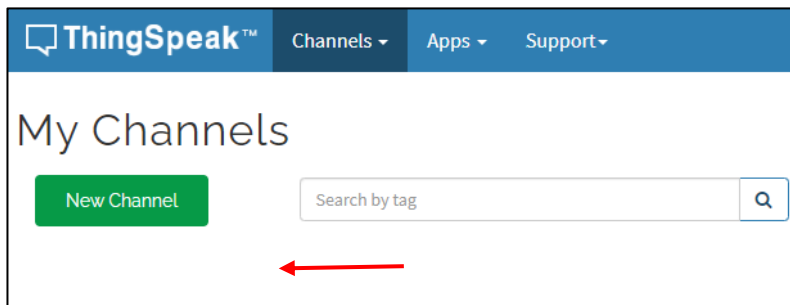
The screenshot shows the ThingSpeak account creation page in a web browser. The browser's address bar shows "thingspeak.com/login". The page has a blue header with the ThingSpeak logo. Below the header, the title "Create MathWorks Account" is displayed. The form includes an "Email Address" field, a location dropdown menu currently set to "United States", and separate fields for "First Name" and "Last Name". At the bottom of the form are two buttons: a blue "Continue" button and a white "Cancel" button with a blue border. A small informational message is visible below the email field: "To access your organization's MATLAB license, use your school or work email."

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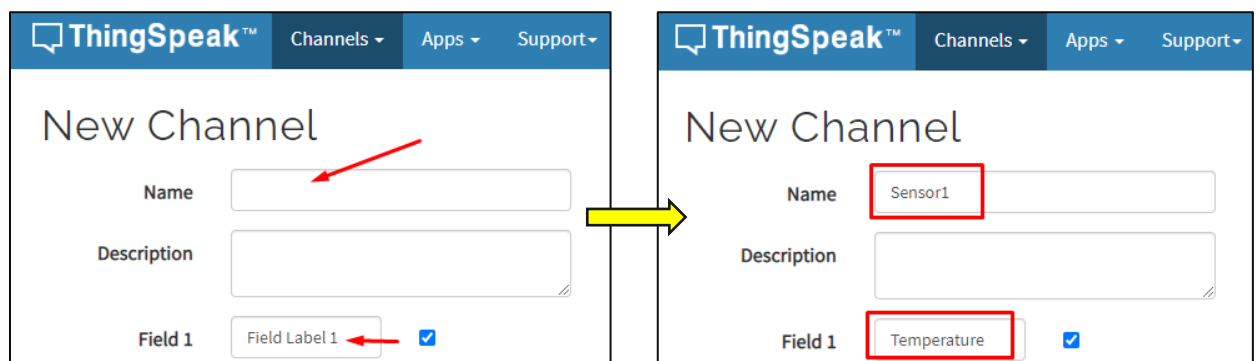
3. You will receive a verification email from mathworks. Click on Verify your email button.



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.

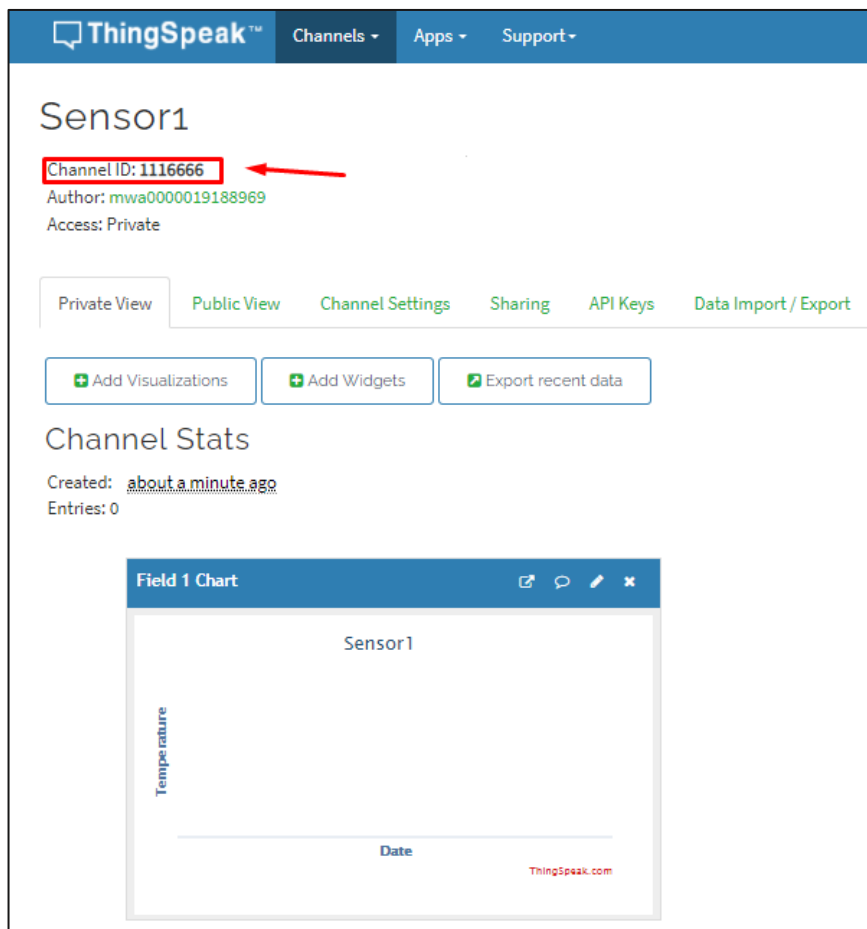


6. Fill in the name as Sensor1, and change the Field Label 1 to Temperature and scroll down to Save Channel.

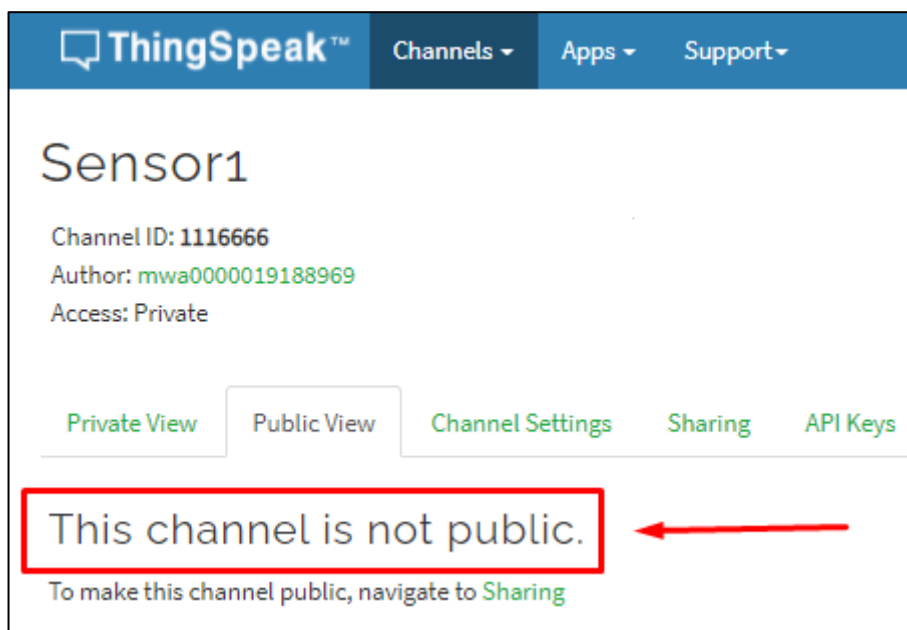


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7. Your Channel will look something like this. Please take note of the channel ID.



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



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

ThingSpeak™ Channels Apps Support

Sensor1

Channel ID: 1116666
Author: mwa0000019188969
Access: Private

Private View Public View Channel Settings **Sharing** API Keys

Channel Sharing Settings

☒ Keep channel view private
☐ **Share channel view with everyone**
☐ Share channel view only with the following users:

Email Address

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

ThingSpeak™ Channels Apps Support

Sensor1

Channel ID: 1116666
Author: mwa0000019188969
Access: Public

Private View **Public View** Channel Settings Sharing API Keys

Channel Stats

Created: 8 minutes ago
Entries: 0

Field 1 Chart

Sensor1

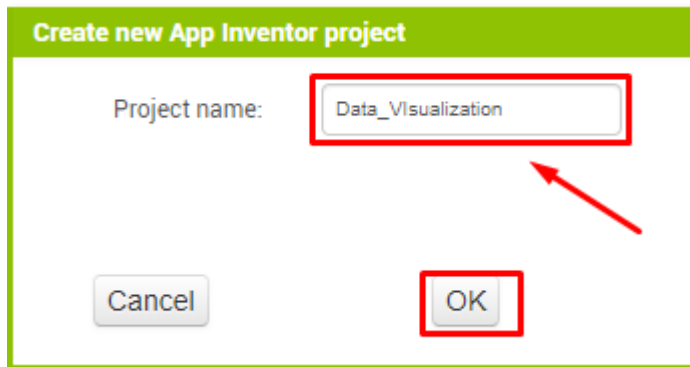
Temperature

Date

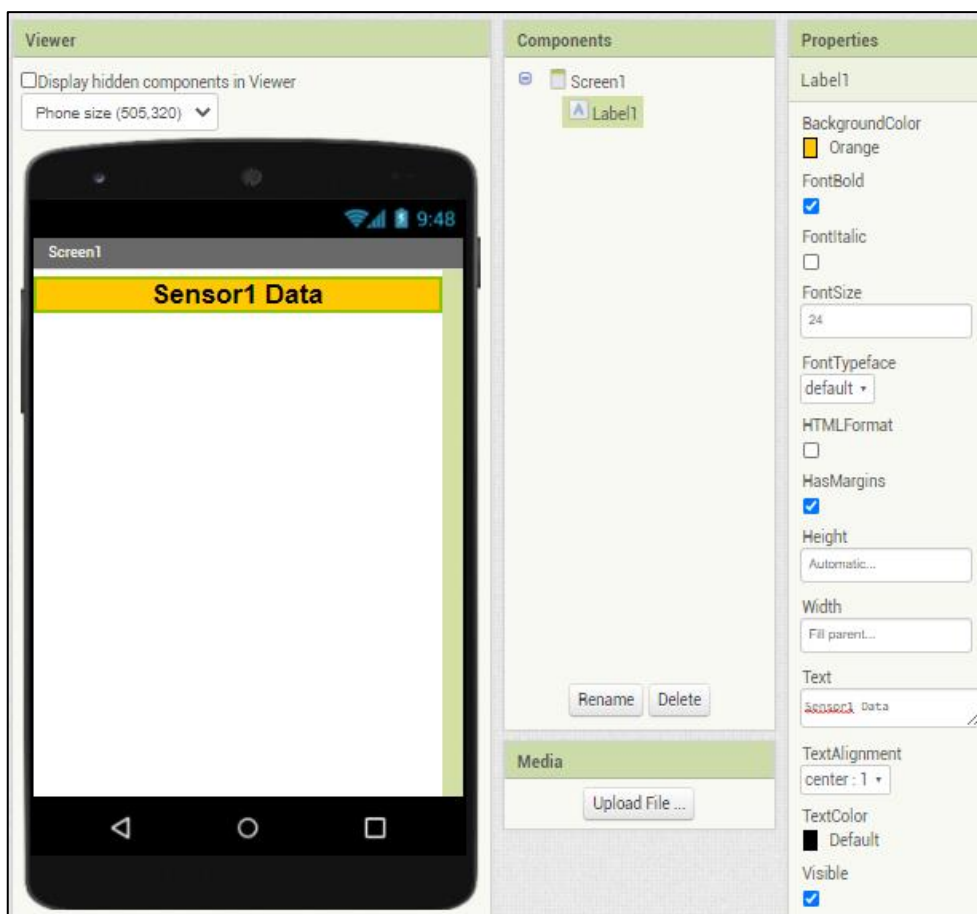
ThingSpeak.com

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

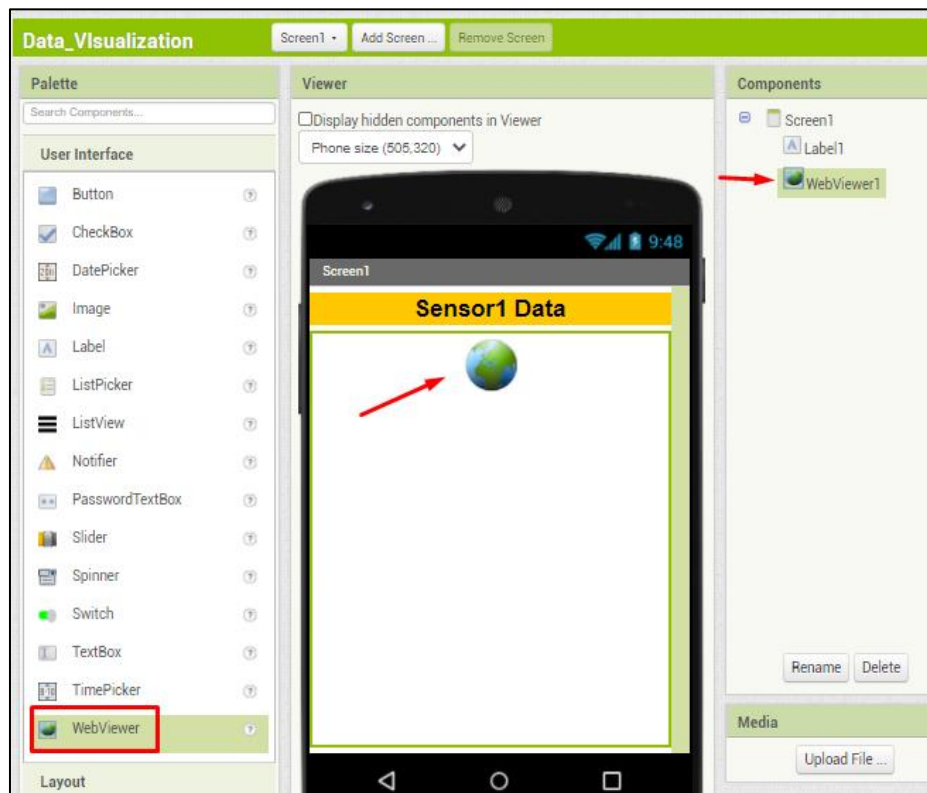


12. Add a label to Screen1. Change the following Properties for Label 1:
- a. BackgroundColor: **Orange**
 - b. FontBold: **checked**
 - c. FontSize: **24.0**
 - d. Width: **Fill parent**
 - e. Text: **Sensor1 Data**
 - f. TextAlignment **center:1**

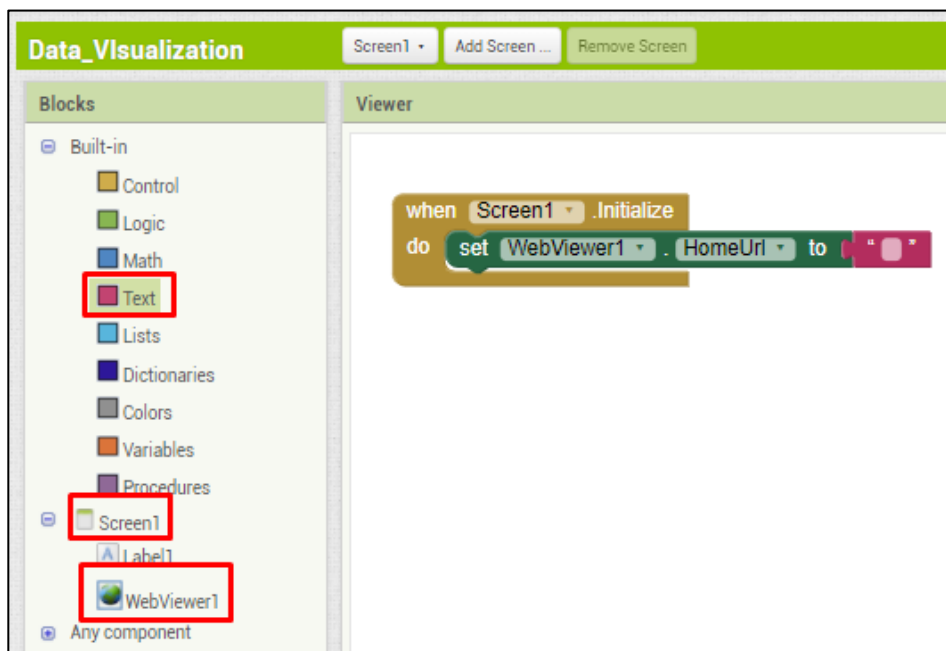


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13. Then, add a WebView as shown in figure below.

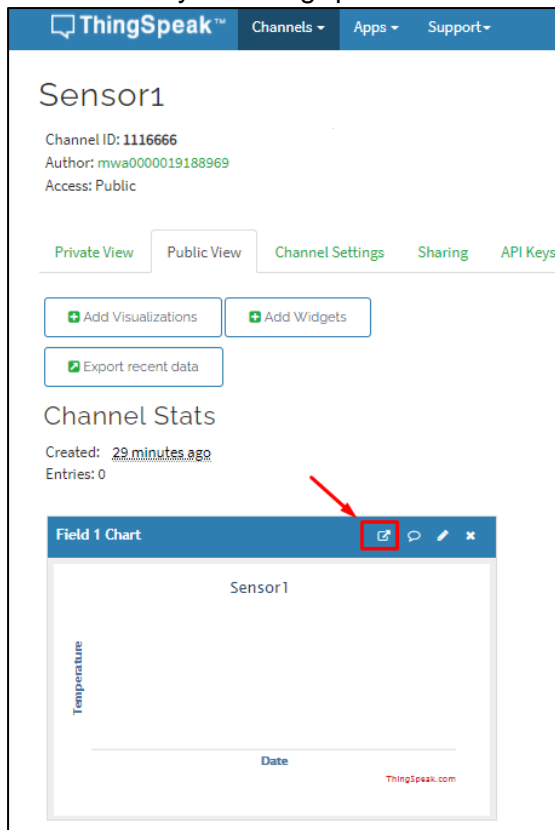


14. Then, go to the MIT App Inventor Blocks and add the following blocks.

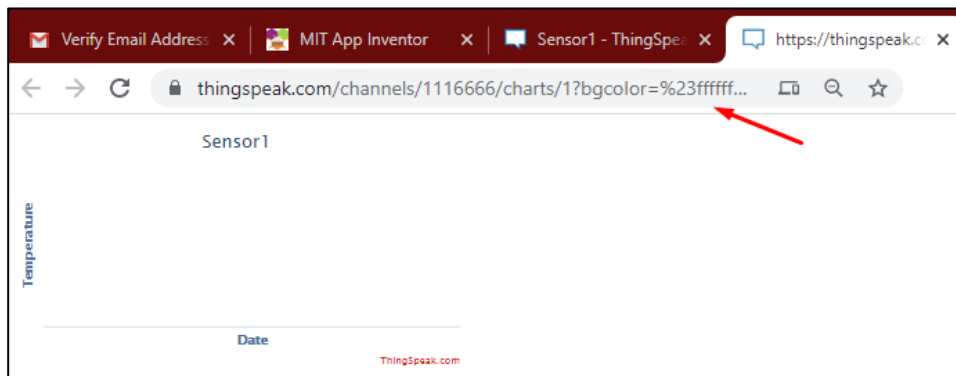


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15. Go back to your ThingSpeak account and click on Field 1 Chart.



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

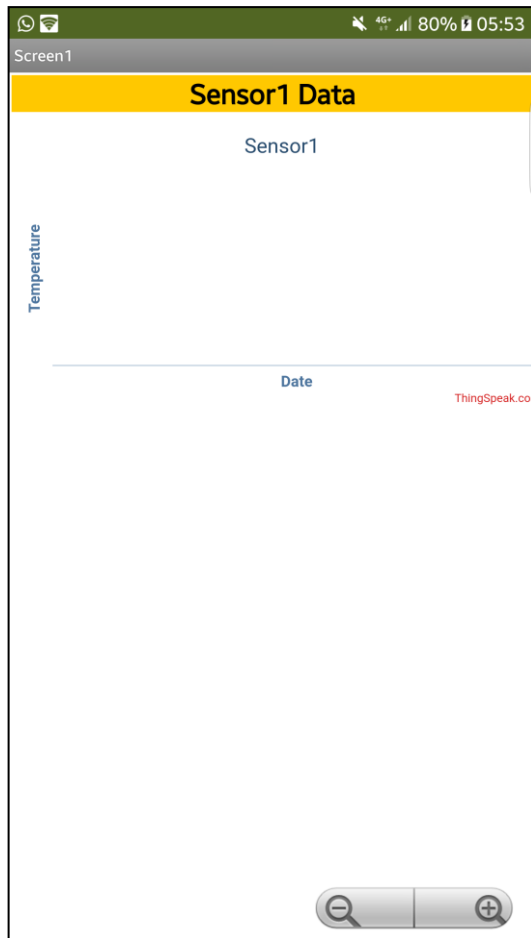


17. Next, paste the URL in the String block



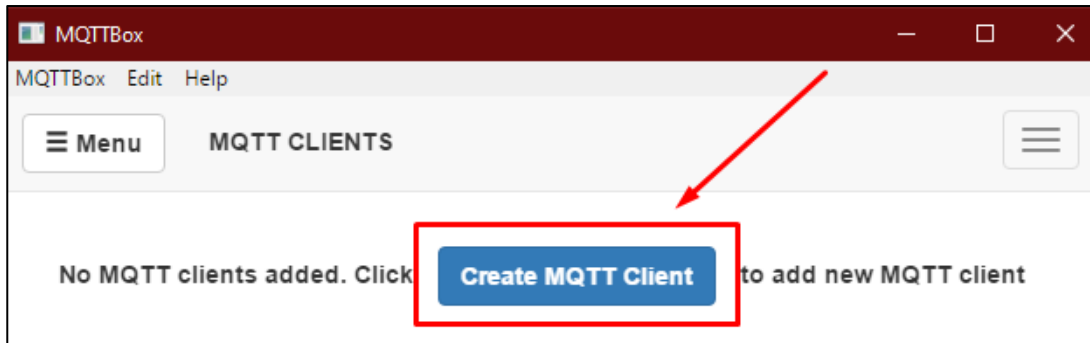
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18. Lastly, we will test it in our Android device. As you can see there are no chart being plot because there is no data being sent to ThingSpeak.

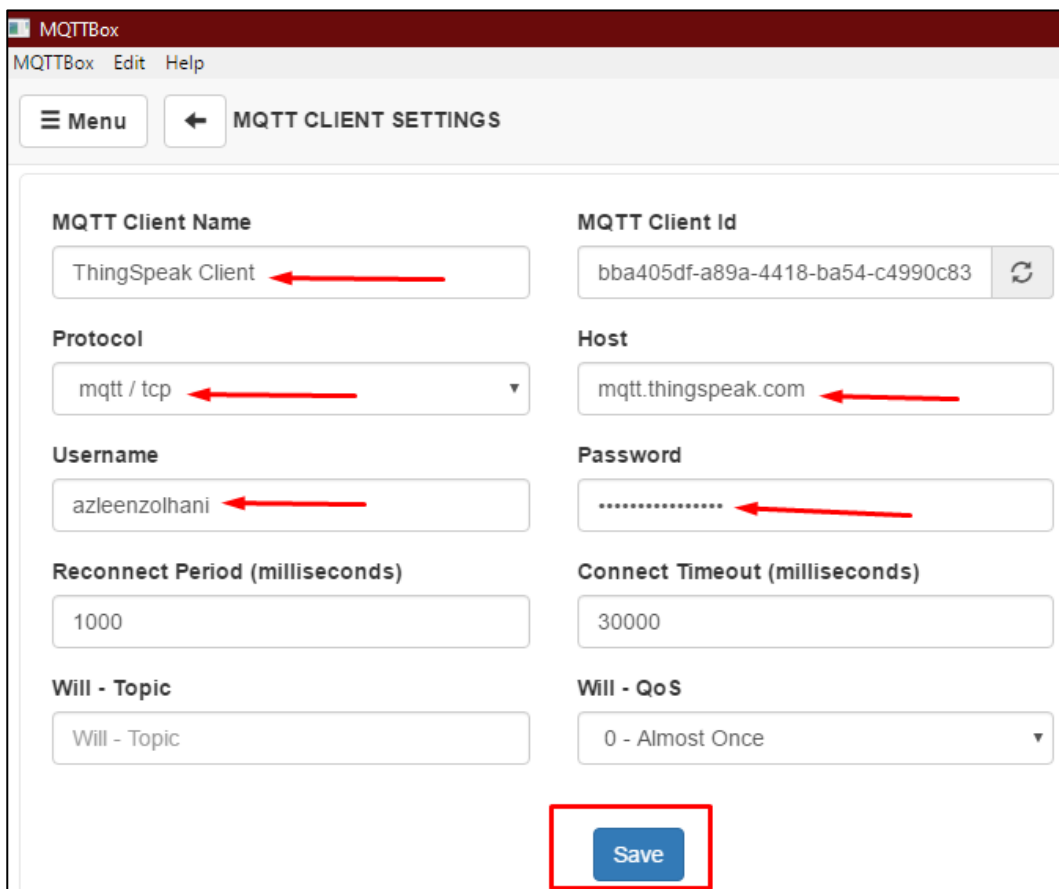


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19. Now, we will use MQTTBox to transfer data to ThingSpeak. Launch your MQTTBox. And click on Create MQTT Client

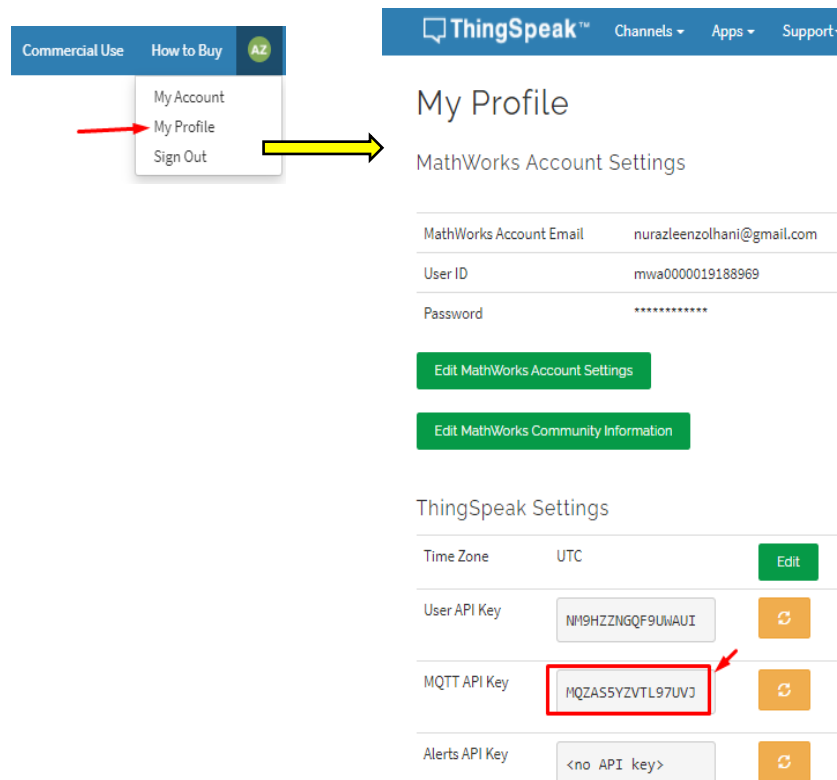


20. Change the following settings:
- a. MQTT Client Name: ThingSpeak Client
 - b. Protocol: mqtt/tcp
 - c. Host: mqtt.thingspeak.com
 - d. Username: <yourname> ← It can be anything
 - e. Password:<MQTT API Key>

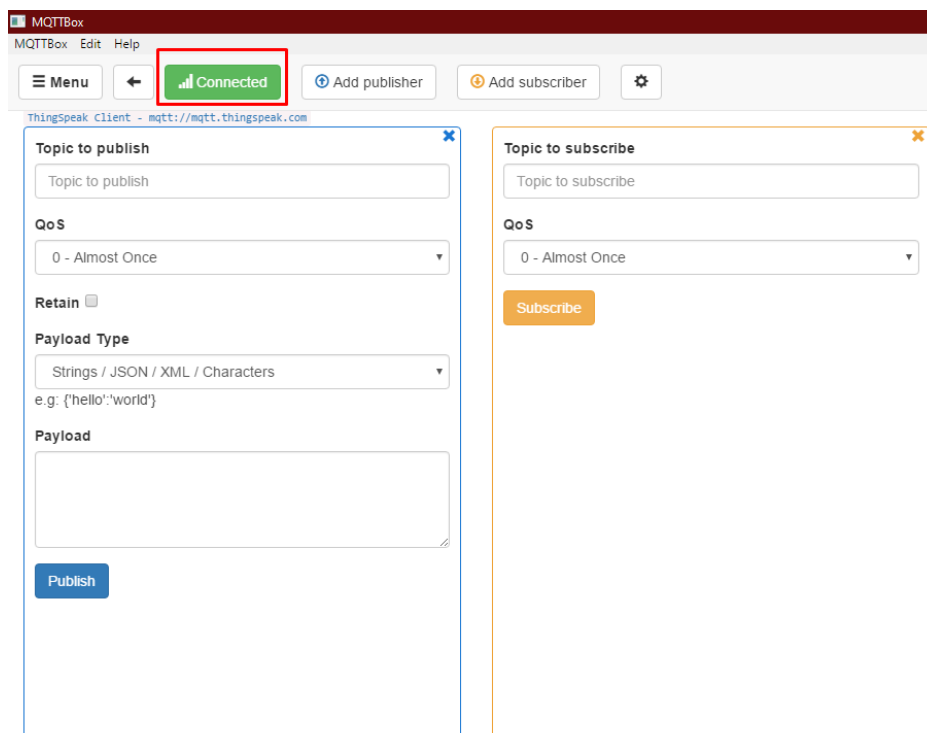


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21. To retrieve the MQTT API Key, go to ThingSpeak, click My Profile and scroll down till you see MQTT API Key as shown in figure below. Copy and paste the key as Password



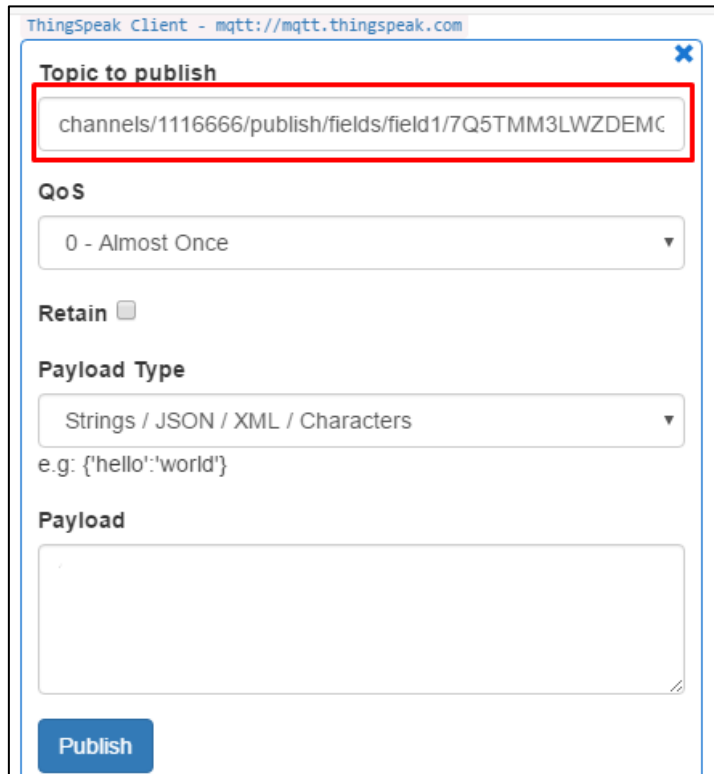
22. Make sure that your MQTTBox is successfully connected to the ThingSpeak broker.



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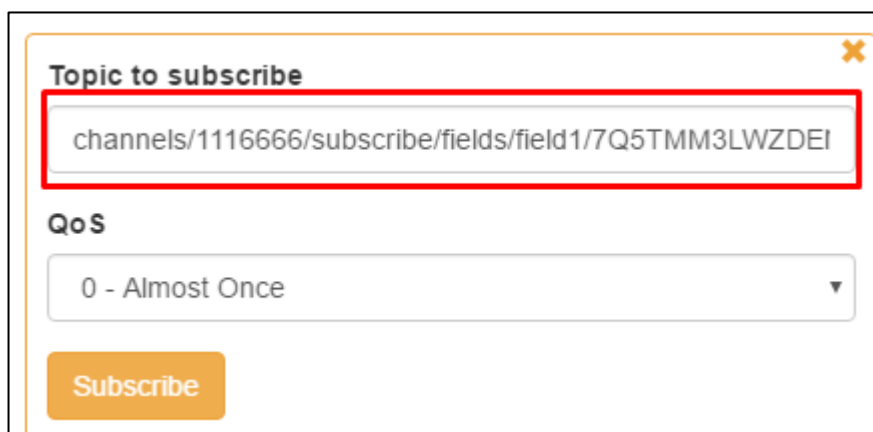
23. Now, to test we will be publishing and subscribing data at the MQTTBox. To publish data to a ThingSpeak broker we must follow the following settings:

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



The screenshot shows the 'ThingSpeak Client - mqtt://mqtt.thingspeak.com' window. The 'Topic to publish' field is highlighted with a red box and contains the text 'channels/1116666/publish/fields/field1/7Q5TMM3LWZDEMC'. Below this, the 'QoS' dropdown is set to '0 - Almost Once'. The 'Retain' checkbox is unchecked. The 'Payload Type' dropdown is set to 'Strings / JSON / XML / Characters'. Below this, there is an example payload 'e.g: {"hello": "world"}'. The 'Payload' text area is empty. At the bottom, there is a blue 'Publish' button.

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



The screenshot shows the 'ThingSpeak Client' window for subscribing. The 'Topic to subscribe' field is highlighted with a red box and contains the text 'channels/1116666/subscribe/fields/field1/7Q5TMM3LWZDEI'. Below this, the 'QoS' dropdown is set to '0 - Almost Once'. At the bottom, there is an orange 'Subscribe' button.

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

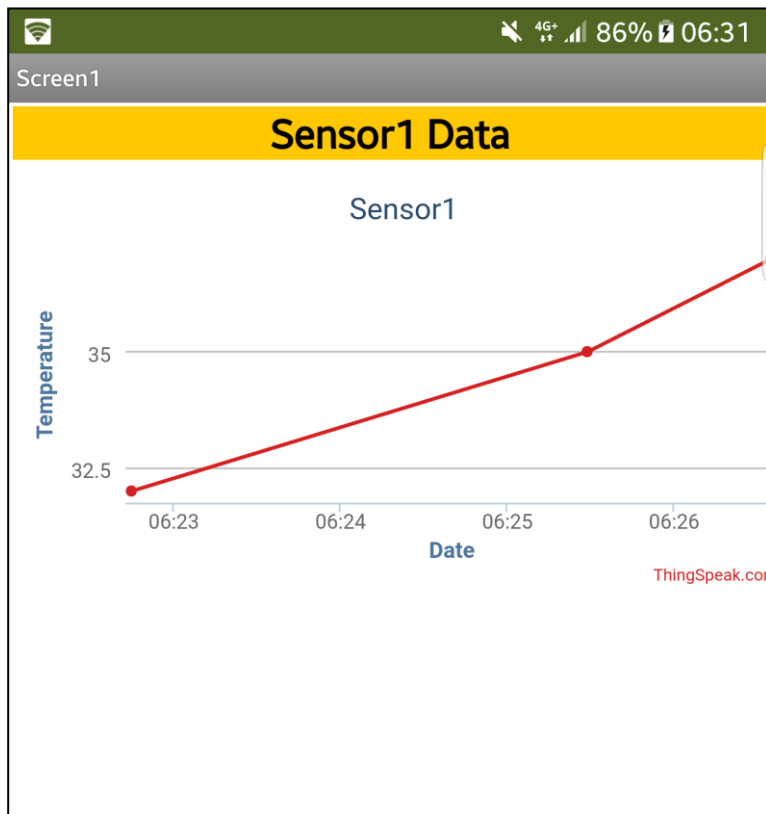


25. Make sure that we received a data 32, 35 and 37 at the subscriber.



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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>