Cities Going Green

Application for the Development of a Green and Smart City

TEACHER'S IOT HANDBOOK

Contents

1. IoT - Introduction

Introduce the concept of Internet of Things

The Internet of Things (IoT) in simple terms is like a **big, magical network that connects everyday objects or "things'" to the Internet,** share **data** with other objects and systems**,** and also can store the data in a **cloud.**

Objects or "things": any physical devices that have sensors, software, and communications abilities.

Connectivity: "Things" are connected through the internet or other networks, using communication and network protocols

Data: or information can be numbers, words, code, etc.

Cloud: a virtual place on the internet (online) where you can store, and access the data.

Examples

1. **Smart thermostat:**
    - **Object:** smart thermostat, which has a temperature sensor and controller
    - **Connectivity:** Wifi or Bluetooth, allows remote access from phone or computer
    - **Data:** temperature values
    - **Cloud:** data/temperature values are transferred to a digital storage, which allows you to access the data of your thermostat from anywhere, anytime.

2. **Smart pet feeder:**
    - **Object**: smart pet feeder which gets the data and automatically feeds the pet
    - **Connectivity:** Wifi or Bluetooth, allows remote access from a phone or computer
    - **Data:** feeding schedule or pet activity
    - **Cloud:** feeding schedules are transferred to the cloud which allows you to access the data of your feeder.

3. **Allow them to give their examples and discuss (optional)**
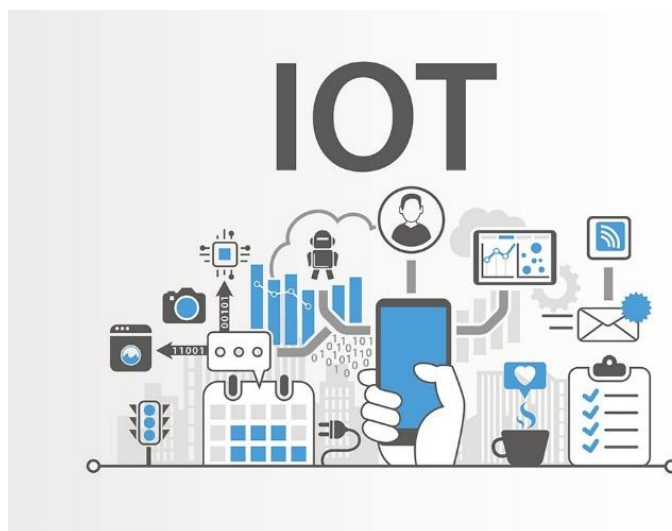
2. IoT USAGE and CGG game

Introduce the M5 stack IoT device

M5 STACK BASIC (ESP32) *(Fig.1)* is a cost-effective entry-level main controller for IoT applications.
M5stack can be programmed using a low-code development environment, such as **UIFlow** *(Fig.2),*
which is a graphical programming platform (drag and drop).
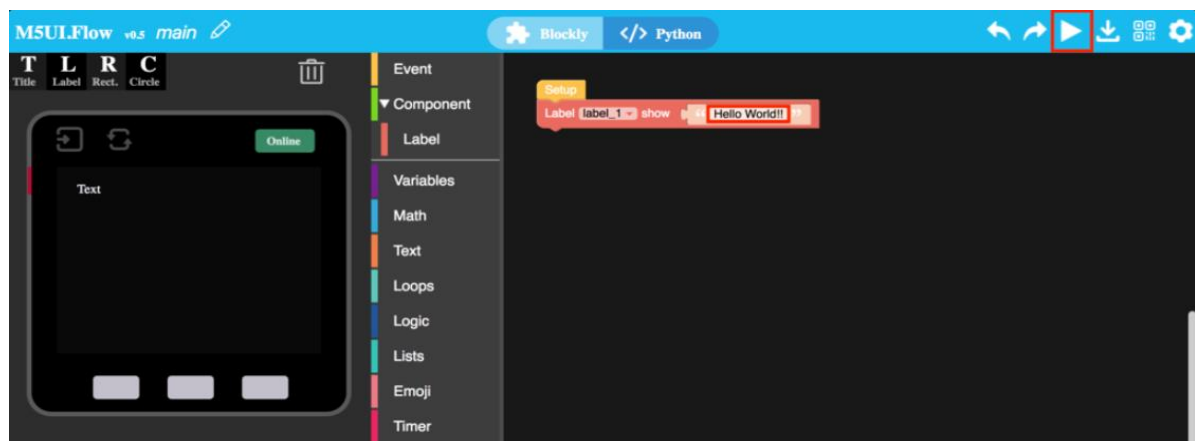

Figure 1: M5stack - ESP32 Basic Core

Figure 2: UIFlow programming tool

Interact with the game

STEP 1: Power the device by connecting the USB cable (USB C-USB A) to a computer or laptop port.

STEP 2: Wait for the Wi-Fi to connect - "Connected".

STEP 3: Interact with the weather of the game by pressing the buttons (Button 1: Sunny, Button 2:
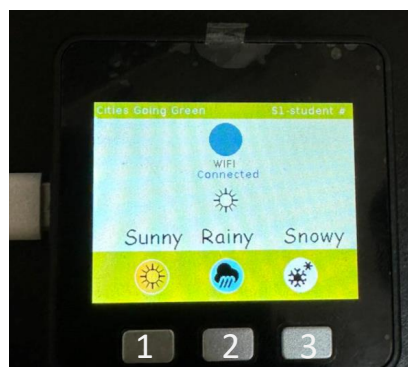Rainy, Button 3: Snowy).

Figure 3: The device is ready to be used and interact with the weather of the game

ANNEX

IoT initial setup (ONLY ONCE)

STEP 1: Use the BURNING TOOL to update the firmware of the device. Click the button below to download the corresponding M5Burner firmware burning tool according to your operating system. Open the application after decompression (preferably use Windows) - https://docs.m5stack.com/en/quick_start/core2/uiflow

M5Burner_Windows	Download
M5Burner_MacOS	Download
M5Burner_Linux	Download

Note:
For MacOS users, please put the application in the Application folder after the installation is complete, as shown in the figure below (Fig 4). For Linux users, please switch to the unzipped file path and run /M5Burner in the terminal to run the application.
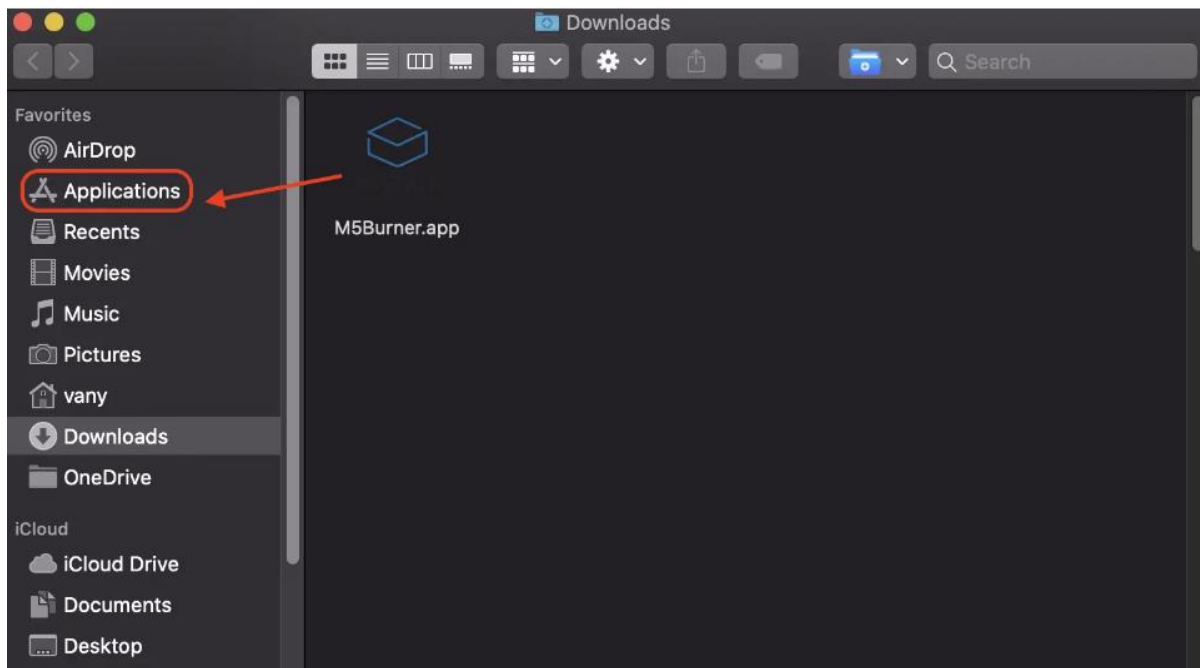

Figure 4: M5Burner for MacOS users

STEP 2: Double-click to open the Burner burning tool, select the corresponding device class in the left menu, select the firmware of the matching device, and click the download button to download.
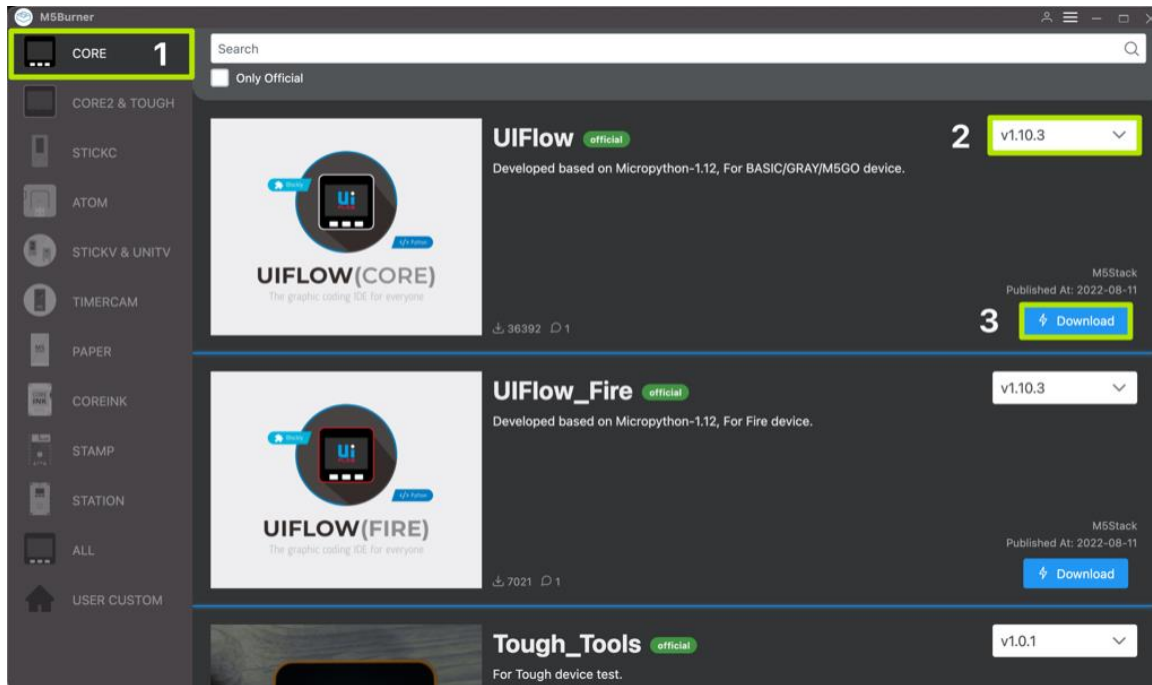

Figure 5: Burning tool download

STEP 3: Connect the M5 device to the computer through the Type-C data cable, Burner will automatically select the corresponding COM port, the baud rate can use the default configuration in M5Burner, click on Burn.
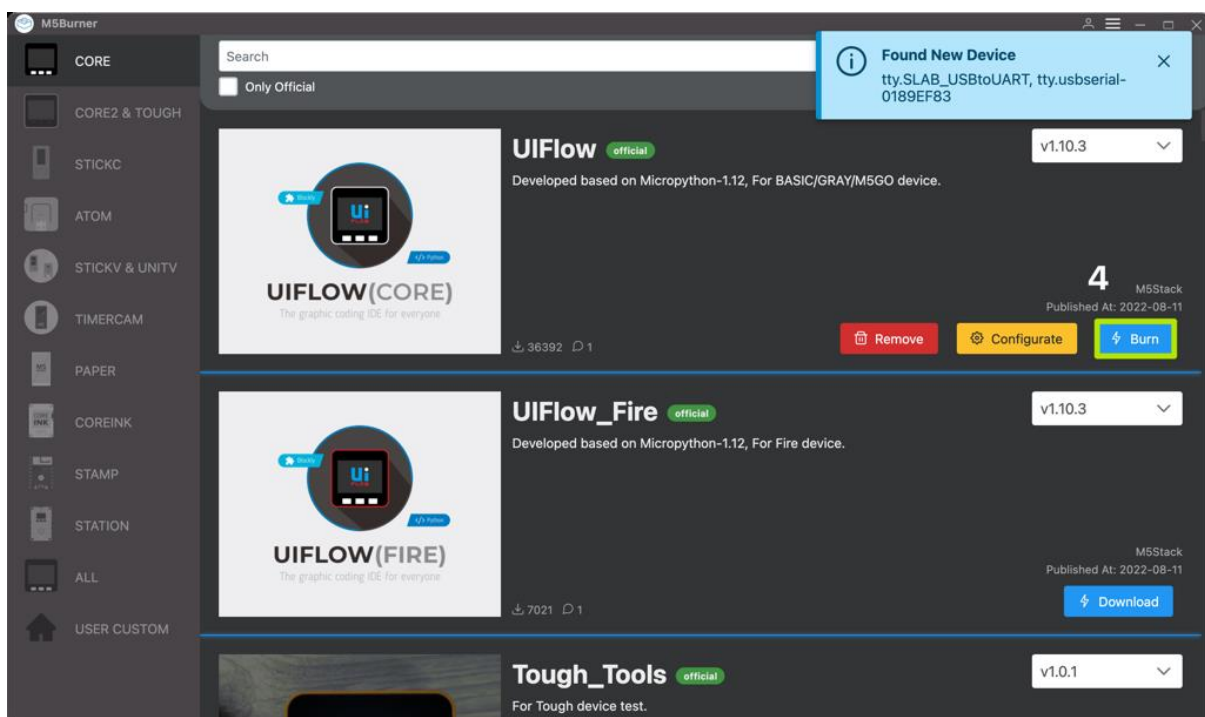

Figure 6: Firmware burning

In the firmware burning stage, you need to fill in the WiFi information into the WiFi configuration box. The information will be burned and saved to the M5 device along with the firmware, and click on Start to start burning. Note: If the programming timeout occurs, try to reduce the baud rate to 115200.
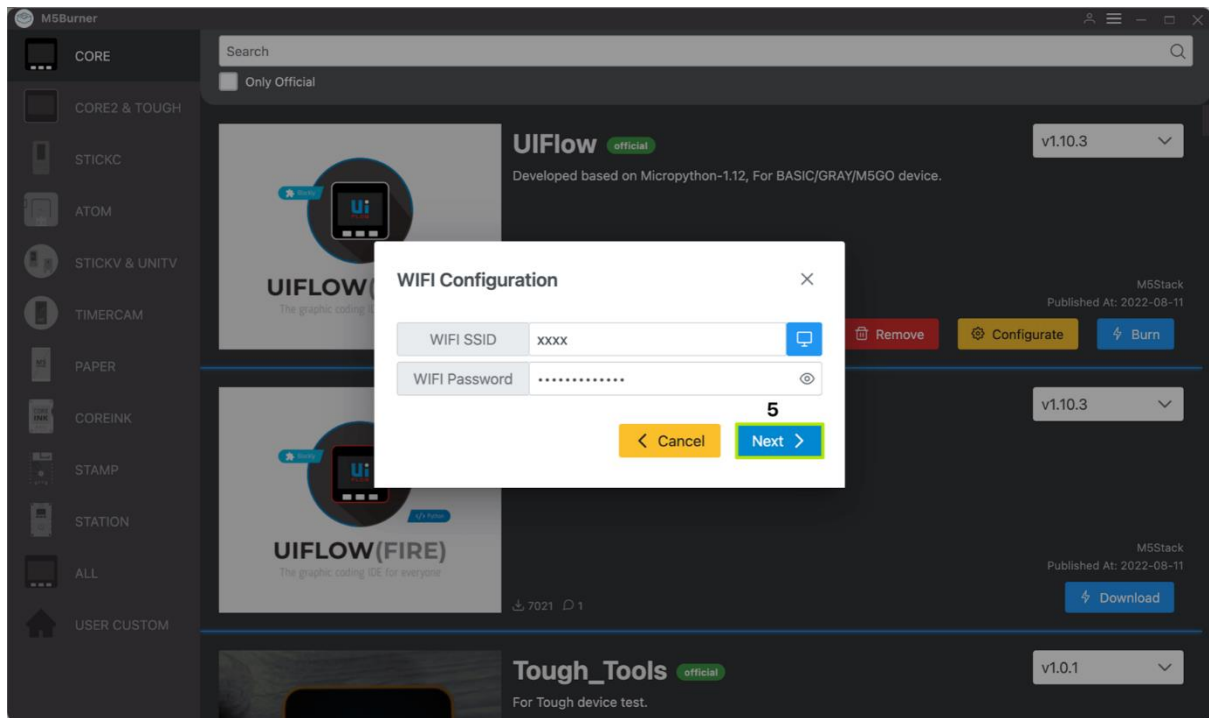

Figure 7: Wifi information during firmware burning

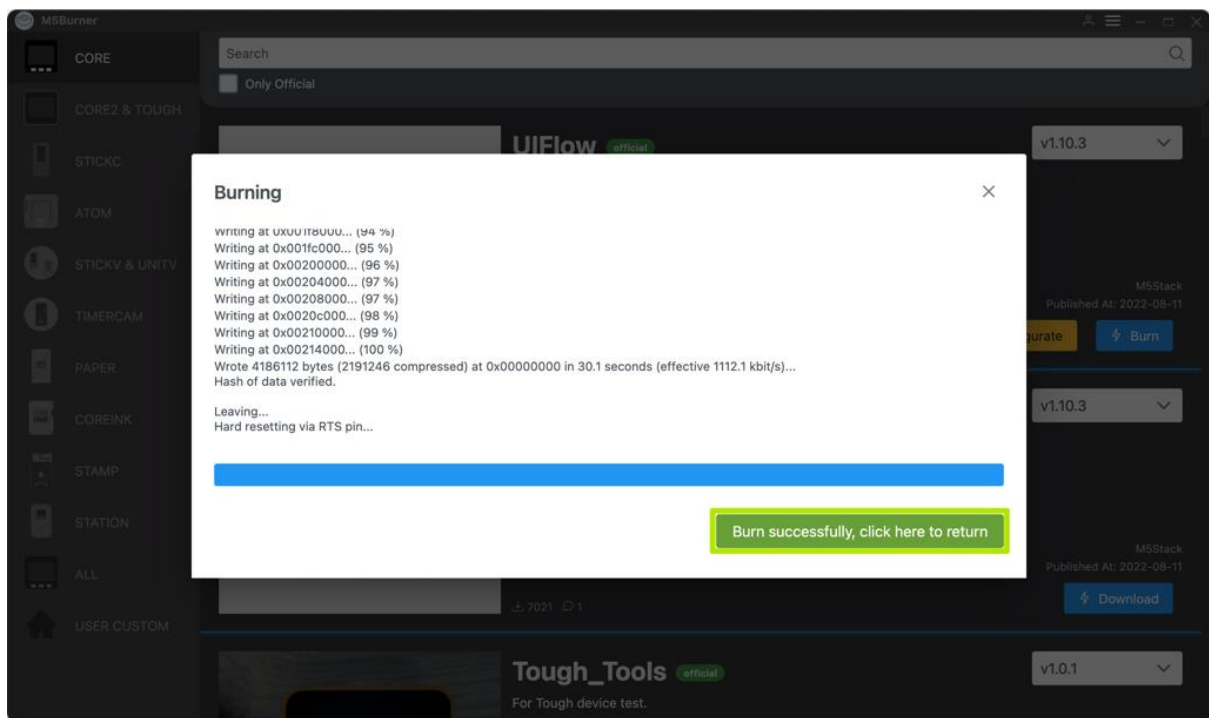When the burning log prompts Burn Successfully, it means that the firmware has been burned.

Figure 8: Successful firmware burning

When burning for the first time or the firmware program runs abnormally, you can click Erase in the upper right corner to erase the flash memory. In the subsequent firmware update, there is no need to erase again, otherwise the saved Wi-Fi information will be deleted and refreshed API KEY.

STEP 4 (OPTIONAL): You can start programming with UIFlow (test the device), https://flow.m5stack.com/. The following will demonstrate a simple program for you to drive the screen to display "Hello M5". (1. Place the label 2. Add the label block. 3 Click the run button in the upper right corner)

STEP 5: To upload your code to UIFlow, go on the top right press "**open button**" and then choose the file "weathercontrol.m5f" and press open (Fig.9).

Figure 9: Upload the weathercontrol.m5f file to UiFlow

The interface should now look like the figure below:
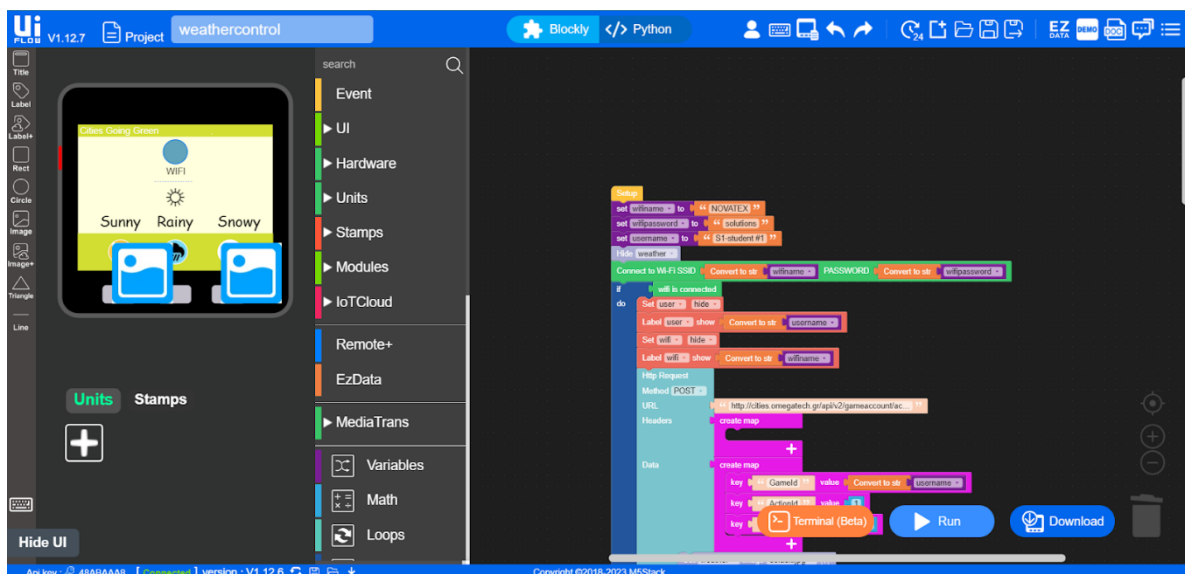

Figure 10: UiFlow interface with the weathercontrol.m5f code

STEP 6: Navigate to the **NETWORK DETAILS** and **USERNAME** and change the following values: wifiname, wifipassword and username by entering your values in the "orange box"(see below):
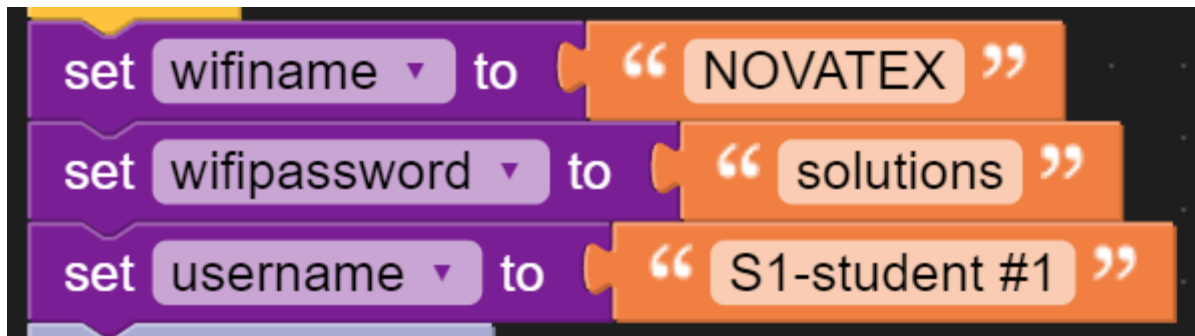
Figure 11: Example of the Wi-Fi, password and username values

Now you must connect the M5stack device and download the program (update the device's firmware). To do that you must reboot your device (see STEP 7).

STEP 7: Go to your device and press the "**power button**" once and then press and hold the "**middle button**" for 3 seconds.
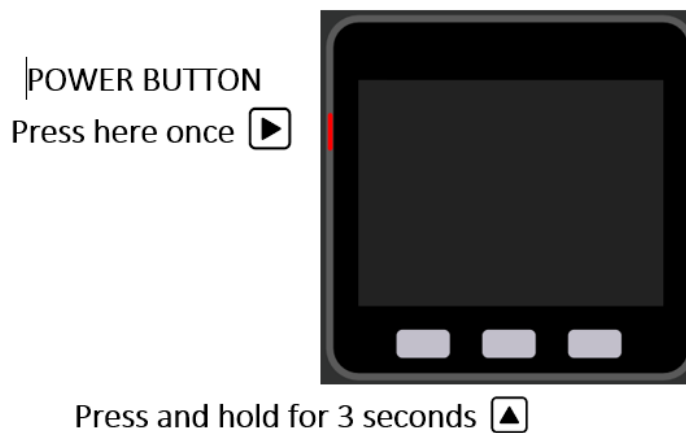

Figure 12: How to reboot your M5stack device

Once you release the button it will display the device's API KEY, an 8-digit character alphanumeric (eg. 48ABAAA8), which you must enter on Ui flow.

STEP 8: On the bottom left press " Api key : 🔑 Unknow " and in the settings pop-up window enter the **API KEY** and then **press OK.**

Figure 13: API Key settings on UiFlow and the device API Key

Once the device is "**Connected**" you can now press " " and wait for a few seconds for the program to download on your device. Once the is **successfully** uploaded on the device (updated firmware), the device will be ready to be used and interact with the game *(see STEP 9).*

STEP 9: Interact with the weather of the game by pressing the buttons (Button 1: Sunny, Button 2: Rainy, Button 3: Snowy).
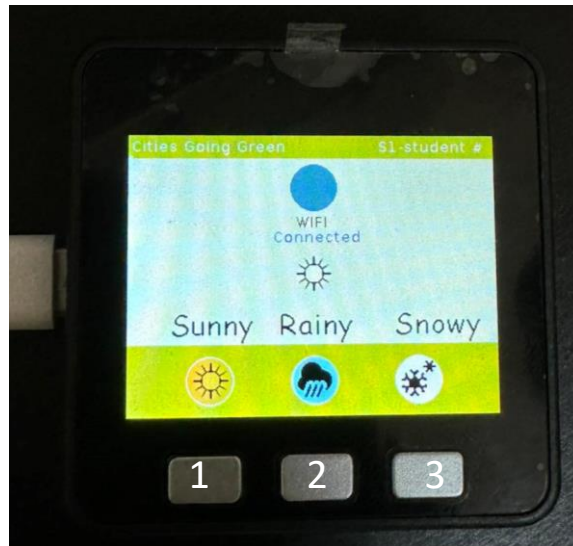

Figure 14: The device is ready to be used and interact with the weather of the game

Further material:

- https://flow.m5stack.com/
- https://docs.m5stack.com/en/quick_start/core2/uiflow
- https://docs.m5stack.com/en/quick_start/stamp_pico/uiflow
- https://shop.m5stack.com/products/basic-core-iot-development-kit
- https://www.youtube.com/playlist?list=PLgvIHLw9-cydbokzAKhi7lWcOVJ67RRTR