AoM IoT Bit User Guide

Author: Mark Hofmeister, (716) 261-0079, mah473@pitt.edu

Assembly v2.1, Electronics v2.1, Code v3.2

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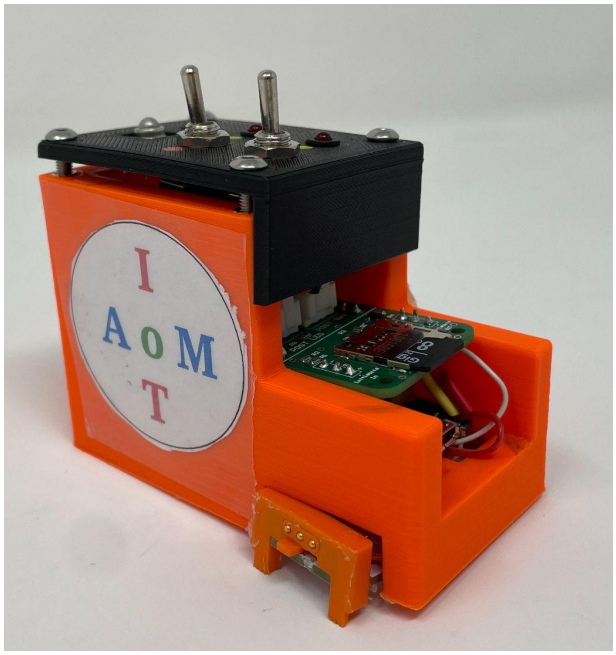
You've just picked up one of the most sophisticated and useful LittleBits in the AoM repository of snap electronics. You've made a **fantastic** decision. This is the opportunity of a lifetime – and **this video will show you why**. Below will detail how to make the IoT bit come to life and a few basic example applications.

The IoT bit can either upload ("post") or download ("get") digital values from a cloud on the web. This means that it will be posting/getting values that are either HIGH or LOW, i.e. ON or OFF. This means that the Littlebits that you connect to the IoT Bit should be operated **digitally.** For example, you **will** be able to turn an LED ON or OFF with IoT bit. You will **not**, however, be able to adjust the brightness of the LED with a PWM signal. This means that you may need to make use of the "threshold" and "latch" to digitize analog signals, which can be explored both through the links and through hands-on experimentation.



(Color may vary)

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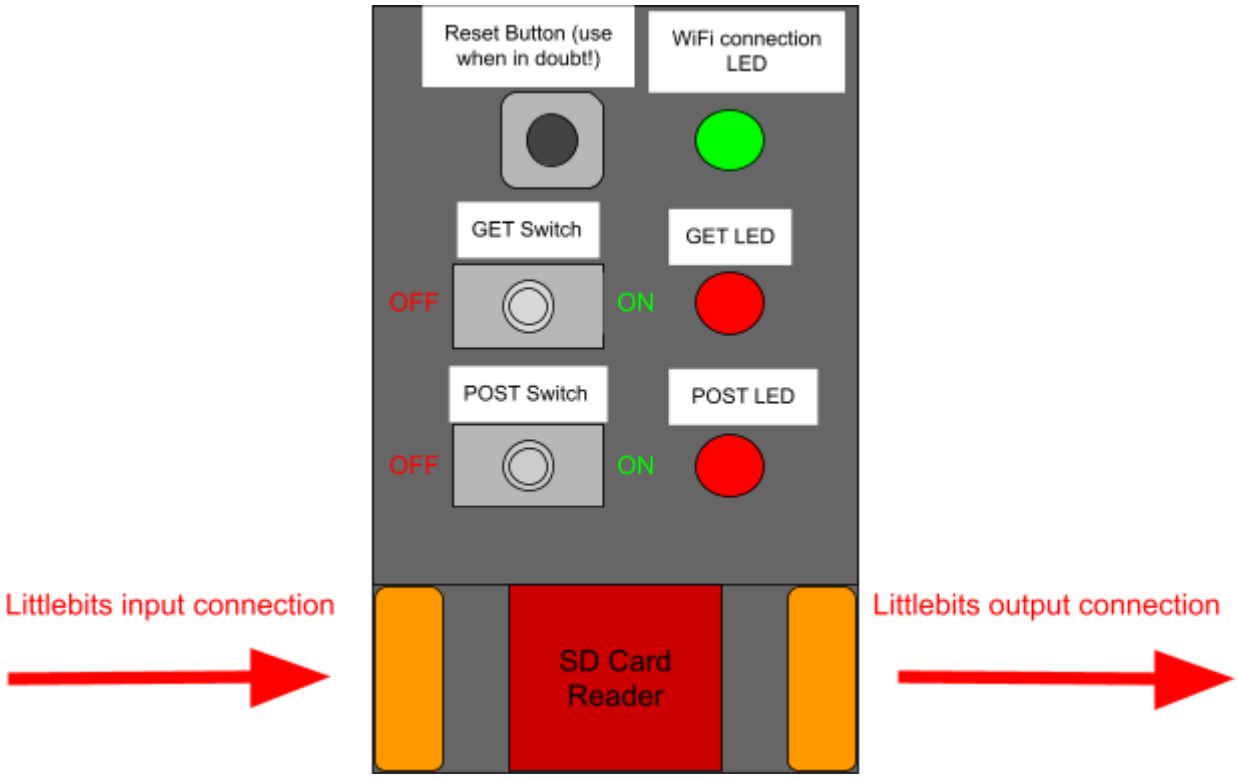
How Do I Use this Thing?

Good question.

Here's a diagram of the interface's functionality:



When you snap your IoT bit in series with (powered) Littlebits, you'll see the IoT bit configure itself through these steps:

1. **All 3 LEDs will blink 3 times quickly** - This indicates that the IoT bit is going to attempt to read from the SD card. This flashing will repeat every ~3 seconds until the IoT Bit reads the SD card's data successfully. If the flashing keeps repeating, make sure the SD card is seated in the SD card reader properly.
2. **All 3 LEDs will blink for a full second** - This indicates that the IoT bit has successfully read from the SD card and is ready to connect to the cloud.
3. **The Green LED illuminates (and stays illuminated)** - This indicates a successful WiFi connection. **Be patient when connecting to WiFi - a secure connection can take ~10 seconds to establish.**

4. From here, the IoT bit will enter a loop **depending on the state of the switches.** Below are the 4 operations:
    a. **No switches are turned on** - IoT Bit will remain idle and do nothing.
    b. **The GET Switch is turned on** - The IoT Bit will “get” the latest value from the cloud. If the latest value in the cloud is “HIGH,” the IoT bit will output a HIGH electrical signal. If the latest value in the cloud is “LOW,” the IoT bit will output a LOW electrical signal.
    c. **The POST Switch is turned on** - If the IoT Bit detects a change in the state of the digital input signal, it will “post” it to the cloud. If the IoT Bit’s electrical input signal value changes to “HIGH,” the IoT bit will post a HIGH value to the cloud. If the IoT Bit’s electrical input signal value changes to “LOW,” the IoT bit will post a LOW value to the cloud.
    d. **The GET switch and POST switch are both turned on** - the IoT bit will both POST a changing incoming signal to Adafruit IO **and** GET the signal back from the cloud. Use this if you want to upload a value to the cloud as well as send that signal through the IoT bit to sequential LittleBits.
5. Log in to the AoM Cloud and select the feed that your IoT Bit is connected to to view the latest data!

    AoM Cloud Username: aom_cloud
    AoM Cloud Password: designthinking

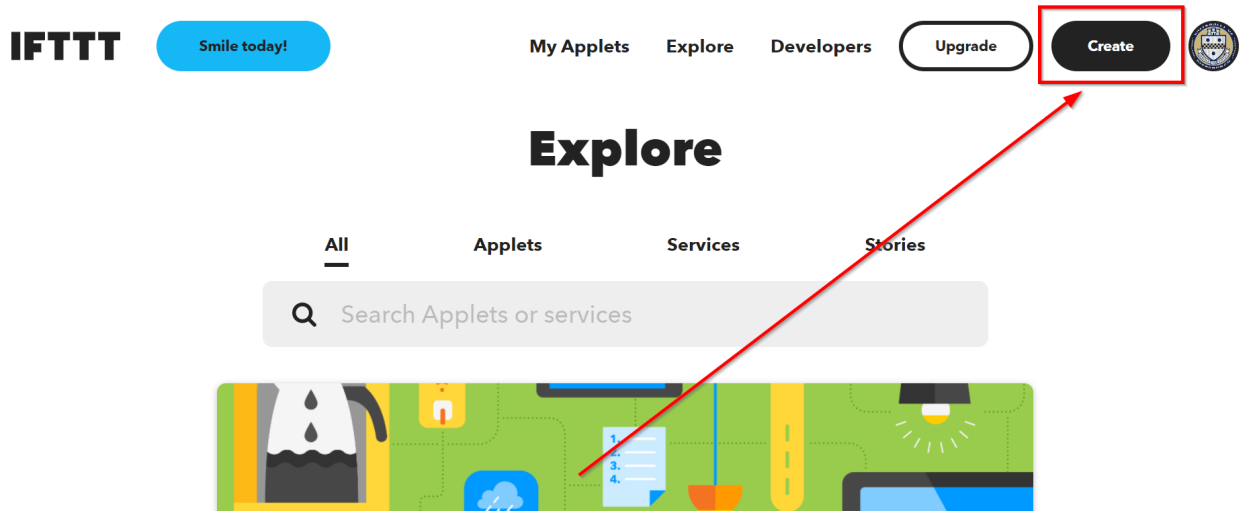
Do not hit “regenerate key” in Adafruit IO - this will change the access code and all IoT Bits will have to be reconfigured.

Again, be patient when connecting to WiFi - a secure connection (indicated by the illuminated green LED on the IoT Bit) can take ~10 seconds to establish.

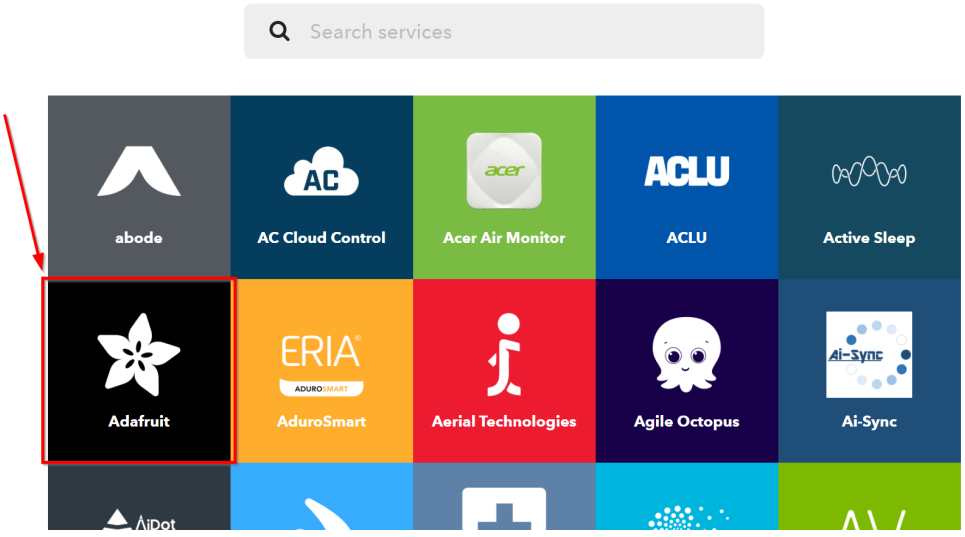
How Do I Connect to IFTTT?

OK - how do we use the IoT bit to control digital web services? Let's go through an example to show you the ropes.

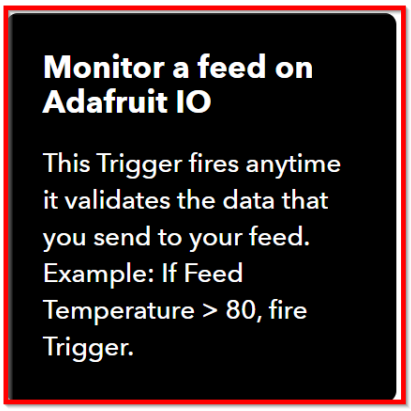
First, create an account on IFTTT and navigate to the "create" button:

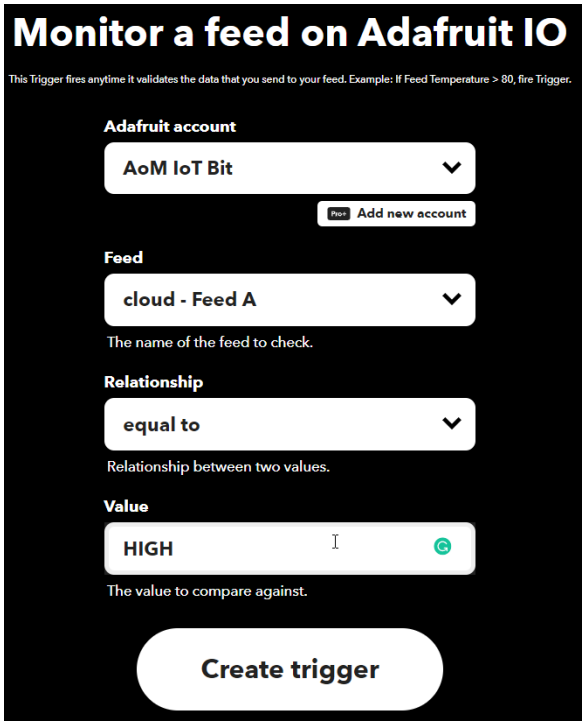


This will prompt you to create an "applet." In the "If this" field of the applet, select "Add" and select the Adafruit IO service, as shown:



Authorize the sign-in prompt on IFTTT and select “Monitor a feed on Adafruit IO” as your trigger. Add the AoM Cloud’s Adafruit IO account name (**AoM IoT Bit**,) AoM Cloud’s feed name (**cloud - Feed {X}**), set the relationship as “**equal to**,” and select “**HIGH**” as the value. This will trigger the “If this” portion of the widget any time the IoT bit uploads a HIGH value to Adafruit IO.





In the “Then That” field of the widget, select any web service that you want to interface to - it’s up to you! A simple “Hello World” test is the Google Tasks service, which allows you to create a task every time the Adafruit IO cloud receives a high value (i.e. ***IF*** Adafruit IO gets a high value, ***THEN*** create a Google Task.) But you’re only limited by your imagination - and the limits of the free IFTTT account, of course.

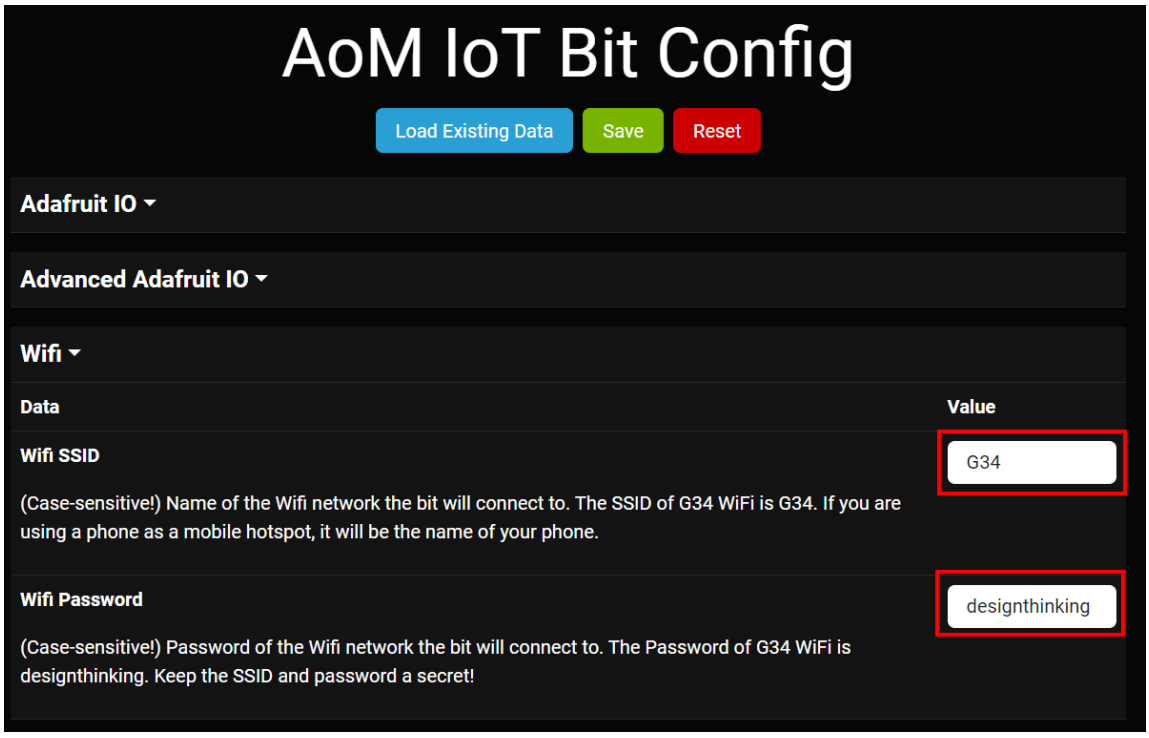
Changing WiFi Credentials

By default, IoT Bits connect to G34 WiFi. If you'd like to operate the IoT bit on a different WiFi network, you can configure which network the IoT Bit connects to. Keep in mind that you *cannot* connect to WIRELESS_PITTNET, so you'll have to use another network - mobile hotspots excel here.

Windows Users

Remove the MicroSD card from the IoT Bit and connect it to your computer (via an adapter, if necessary. If you do not have an adapter, ask a TA for one.) Run the aom-iot-bit-config.exe program and disregard any warning messages from your PC (it's safe - trust me.)

Select the Wifi dropdown and hit the Load Existing Data button. You'll be greeted with this screen:



Enter in your WiFi credentials, hit the Save button, and load the SD card back into the IoT Bit. When you boot it back up, the IoT bit will indicate a successful WiFi connection with a green illuminated LED.

Important: If you are using a mobile hotspot, be sure to turn on the "Maximize Compatibility" option in the hotspot configuration, or the IoT bit will not be able to connect. If you don't have a "Maximize Compatibility" option, ignore this warning.

If you are having trouble connecting to a mobile hotspot, make sure that your mobile hotspot screen is pulled up on your phone.

Mac Users

Remove the MicroSD card from the IoT Bit and connect it to your computer (via an adapter, if necessary. If you do not have an adapter, ask a TA for one.) When you open the secrets.txt file on the SD card, you'll see the contents of 7 variables, separated by semicolons. To change WiFi networks, you'll modify the ***WiFi SSID*** and ***WiFi password*** variables, which default to G34 WiFi credentials:

```
2;G34;designthinking;aom_cloud;cloud;feed-x;aio_AoMIoKeYsEcReT123
```

Here's what these variables mean:

WiFi SSID	The SSID of your WiFi network, i.e. the name. Defaults to **G34**. If you are using a phone as a mobile hotspot, it will be the name of your phone. Note that you cannot use WIRELESS_PITTNET as a WiFi network. If using a mobile hotspot, you may not have any special characters in the name of your device. For example, the apostrophe in "Samsher's iPhone" will cause an error; you'll have to change the name of your device.
WiFi Password	The password of your WiFi network/hotspot. Defaults to **designthinking**. Keep the SSID and password a secret!

Here's an example of what a secrets.txt file might look like with your data replacing the WiFi variable names:

2;Samsher_Phone;Samsher1234;aom_cloud;cloud;feed-a;AoMIoKeYsEcReT123

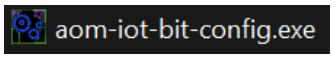
Careful - These variables are ***case sensitive!***

Important: If you are using a mobile hotspot, be sure to turn on the "Maximize Compatibility" option in the hotspot configuration, or the IoT bit will not be able to connect. If you don't have a "Maximize Compatibility" option, ignore this warning.

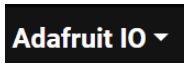
If you are having trouble connecting to a mobile hotspot, make sure that your mobile hotspot screen is pulled up on your phone. Be sure that your SSID (i.e., the name of your phone) does not have any apostrophes in it.

Changing an IoT Bit's Feed

Windows Users

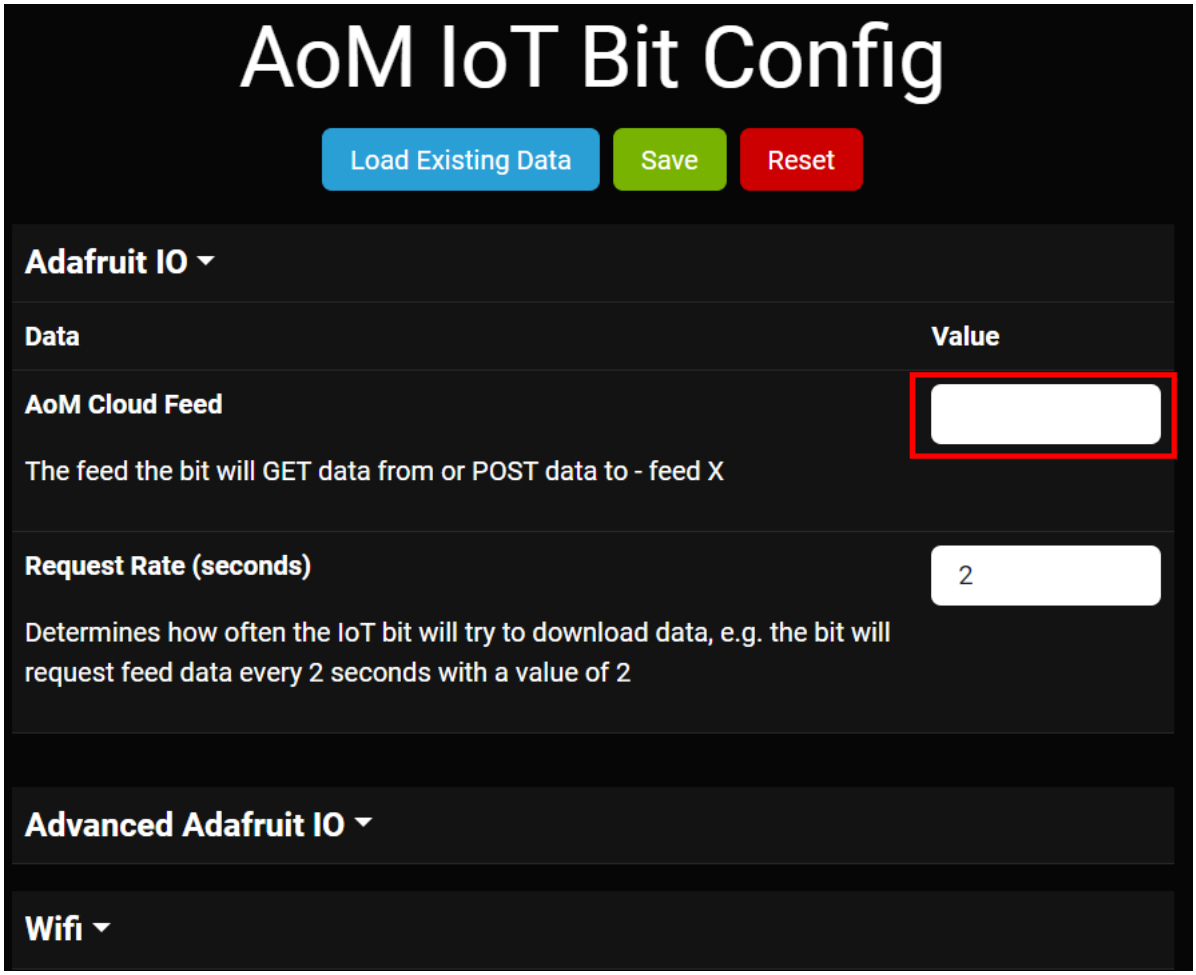
Remove the MicroSD card from the IoT Bit and connect it to your computer (via an adapter, if necessary. If you do not have an adapter, ask a TA for one.) Run the 

program and disregard any warning messages from your PC (it's safe - trust me.)

Select the 

and hit the 

button. You'll be greeted with this screen:



Enter in the feed that you'd like to connect your IoT Bit to (A-F), hit the 

button, and load the SD card back into the IoT Bit.

Mac Users

Remove the MicroSD card from the IoT Bit and connect it to your computer (via an adapter, if necessary. If you do not have an adapter, ask a TA for one.) When you open the secrets.txt file on the SD card, you'll see the contents of 7 variables, separated by semicolons. To change feeds, you'll modify the ***feed name*** credential.

```
2;G34;designthinking;aom_cloud;cloud;feed-a;aio_IcBf80xk6xCixEHC24RZh3BmkHHc
```

Here's an example of what a secrets.txt file might look like after changing from feed **A** to feed **B**.

2;G34;designthinking;aom_cloud;cloud;feed-b;AoMIoKeYsEcReT123

Careful - These variables are ***case sensitive.*** Even though the feeds are named with capital letters, the name should be entered as a lowercase

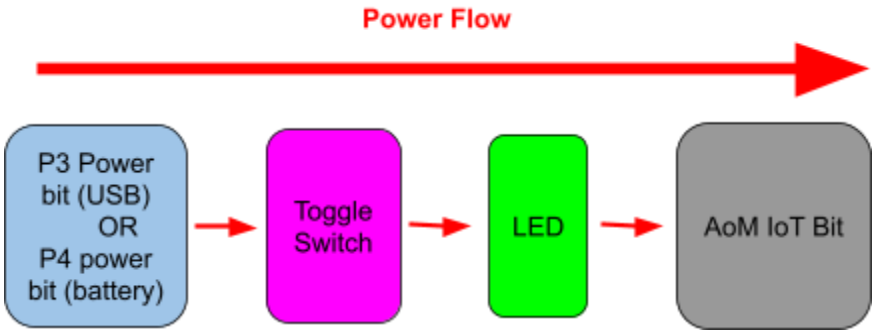
“Hello, World” Applications

1. Post to IO

You will need:

- Littlebits p4 power bit (1)
- Littlebits toggle switch, flipped to the off position (1)
- Littlebits LED (1)
- AoM IoT Bit (1)

a. Build the circuit as shown below:



Scrub your Littlebits connections with a microfiber cloth to ensure a sound electrical connection and use littleBits magnetic shoes or mounting boards to keep the circuit from breaking connection and resetting.

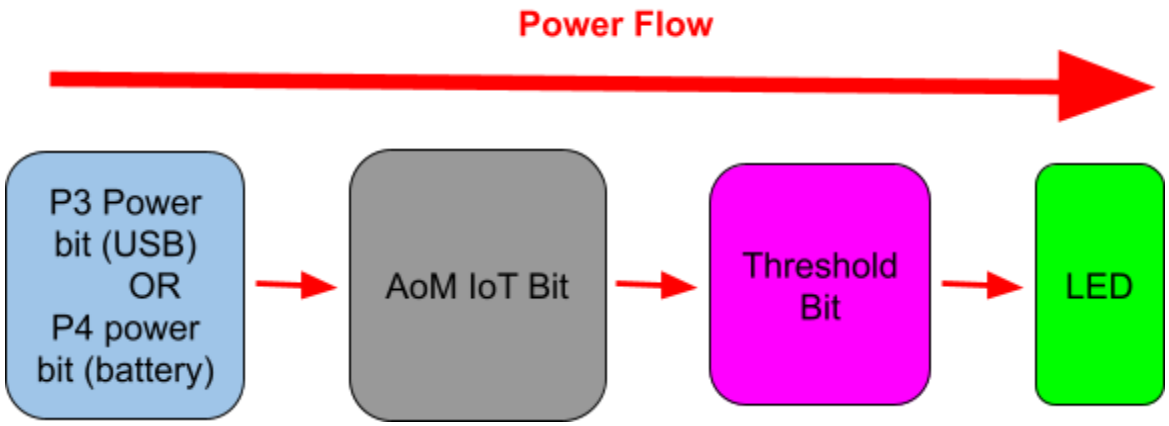
b. Once the IoT Bit is powered and the green LED on the IoT Bit illuminates to indicate a WiFi connection, flip the “post” switch from left to right to the “ON” position.
c. Flip the Littlebits toggle switch state from off to on. The littlebits LED should illuminate, and the post LED will pulse to indicate a successful upload. Check the data stream on your Adafruit IO feed - you should see a new “HIGH” value uploaded to the feed. The IoT Bit will upload the IoT bit’s input signal to the cloud every time that input signal changes from LOW to HIGH or HIGH to LOW.
d. Alright! Now you can send data to the AoM cloud. Flip the “post” switch back to “OFF” before proceeding to “Hello, World” application 2.

2. Get from IO

You will need:

- Littlebits p4 power bit (1)
- Littlebits LED (1)
- AoM IoT Bit (1)

a. Build the circuit as shown below:



Dust your Littlebits connections with a microfiber cloth to ensure a sound electrical connection and use LittleBits magnetic shoes to keep the circuit from breaking connection and resetting.

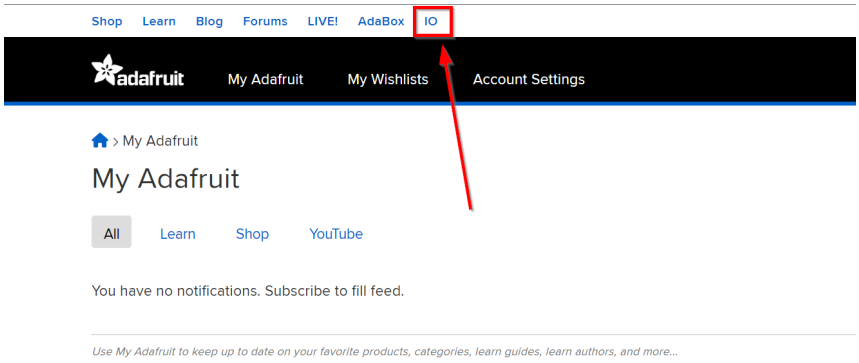
b. Once the IoT Bit is powered, flip the “get ” switch from left to right to the “ON” position. Turn the threshold bit knob to about ⅔ of maxed out.
c. Once the green LED on the IoT Bit illuminates to indicate a WiFi connection, the GET LED will begin to pulse, indicating that the output of the IoT bit is reflecting the data in the cloud - i.e. if the most recent data point in the cloud is HIGH, the IoT bit will output a HIGH signal. If the most recent data point in the cloud is LOW, the IoT bit will output a LOW signal. This behavior will dictate the state of the LittleBits LED.

Advanced Settings

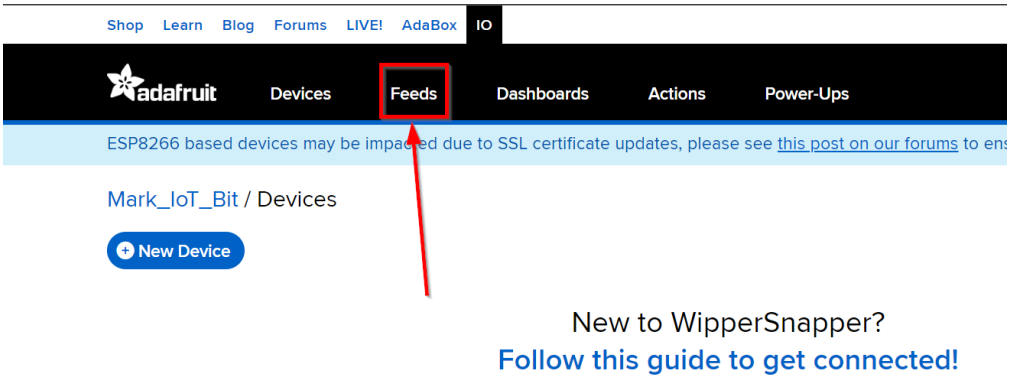
Using a different Adafruit IO+ account

You may want to use your own cloud instead of the AoM IoT Bit Cloud. To do this, create an account on Adafruit IO, which is a **web-based cloud service** where the IoT bit will upload and download data from.

Once you create an account, navigate to the "**IO**" tab.



Next, navigate to the "**Feeds**" tab in IO.

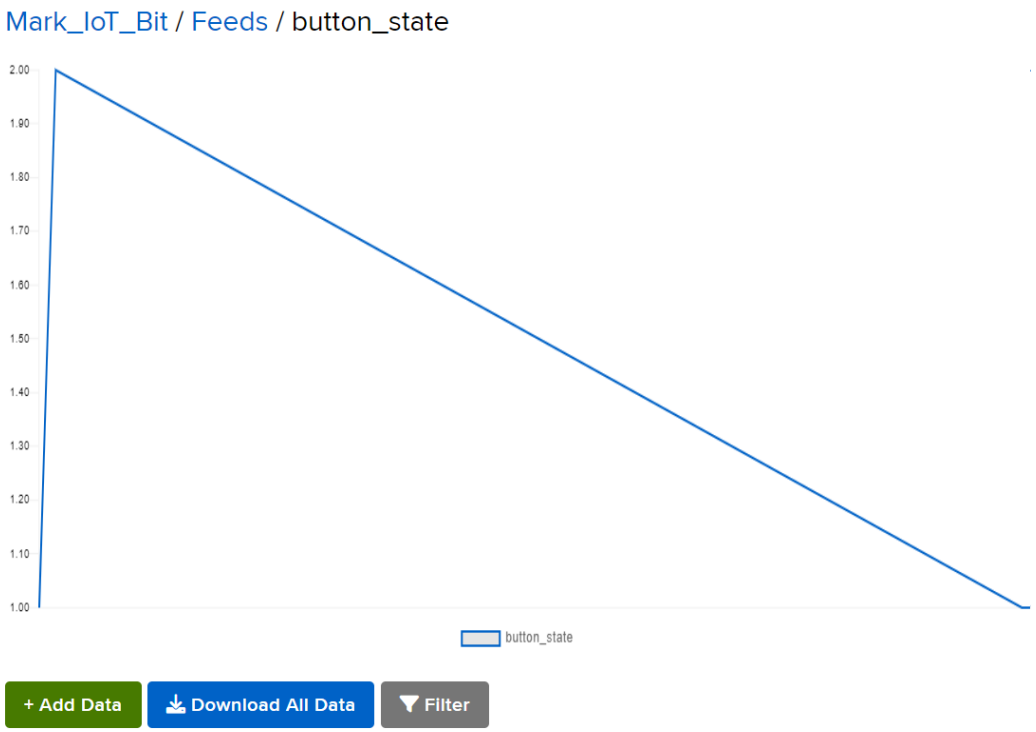


Next, Create a New feed by selecting the 

button. "Feeds" are specific places that the IoT Bit can send data to. Make sure to name your feed so that it corresponds to the data that you'll be sending it. For example, if the feed will be

receiving data about whether a button is on or off, you might name the feed "button_state."

The feed will be empty because the IoT bit hasn't uploaded any data to it yet. To get the "ball rolling," you can manually add data by pressing the + Add Data button. This isn't very useful to you right now, but it will be soon when we begin to construct circuits. You'll also notice that the feed has a graph to show the history of values in the feed.



You've (hopefully) mastered the very basics of the proprietary AoM IoT bit. If you'd like, be sure to copy and remove your credentials from the SD card before returning the IoT bit to the Littlebits wall. Congratulations - the control of an infinite number of objects is now possible with the flip of a switch, from **anywhere** that can connect to WiFi. Don't let the power get to your head - but go out and make incredible devices. However, I simply must emphasize this once more:

This was created with design thinking and is a work in progress. The technology is snazzy and fancy, and that is all well and good, but what is most important is your experience. Which means that you should give us (honest!) user feedback - what works? What doesn't? What's awful? DON'T hesitate to reach out to me!