Adafruit IO Basics: AirLift

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https://learn.adafruit.com/adafruit-io-basics-airlift

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Overview

Adafruit IO is the easiest way to stream, log, and interact with your data **(https://adafru.it/eIC).** It's built from the ground up to be easy to use - we do the hard stuff so you can focus on the fun stuff.

If you want to the best way of bringing your project online - **combine Adafruit IO and AirLift**! Our ESP32-based AirLift boards and breakouts are the newest way to connect your project to Adafruit IO, our internet-of-things service for everyone (https://adafru.it/eIC)!

Before you continue with this guide, you should run through the guide for your connecting specific board or breakout to the Internet. This guide assumes your AirLift hardware is set up, connected to the Internet, and ready to connect to Adafruit IO.

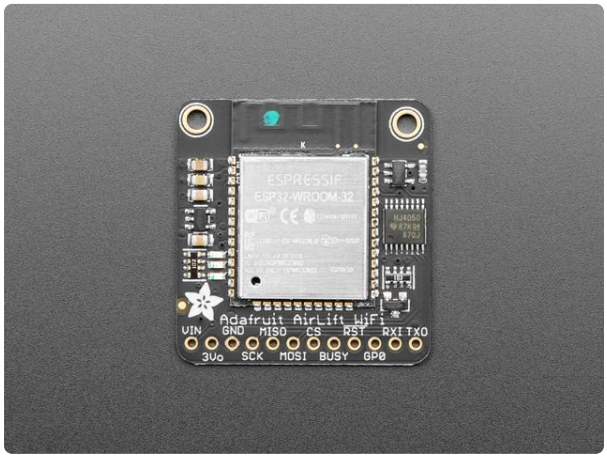
Why use AirLift?

Having WiFi managed by a separate chip means your code is simpler, you don't have to cache socket data, or compile in & debug an SSL library. With AirLift, you can send basic but powerful socket-based commands over 8MHz SPI for high speed data transfer. The ESP32 can handle all the heavy lifting of connecting to a WiFi network and transferring data from a site, even if its using the latest TLS/SSL encryption (it has root certificates pre-burned in).

The firmware on board is a slight variant of the Arduino WiFiNINA core, which works great, (https://adafru.it/E7O) and **our Adafruit IO Libraries for** CircuitPython **(https://adafru.it/Ean) and** Arduino **(https://adafru.it/fpd) support AirLift!**

External AirLift

If you already have a project which uses a popular microcontroller (like the ATMega328 or ATSAMD51), you can easily add WiFi by using an externally connected AirLift module.



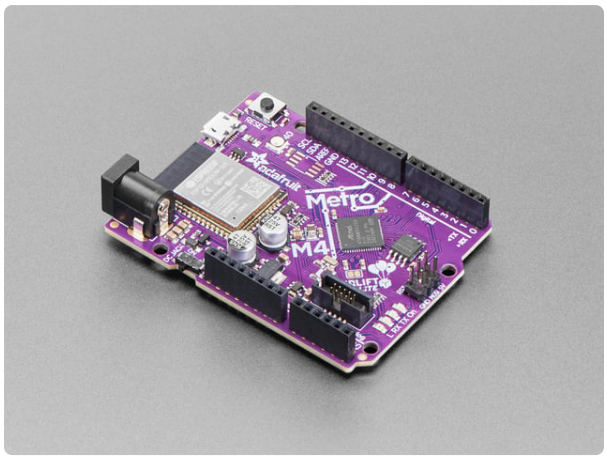
Adafruit AirLift – ESP32 WiFi Co-Processor Breakout Board

Give your plain ol' microcontroller project a lift with the Adafruit AirLift - a breakout board that lets you use the powerful ESP32 as a WiFi co-processor. You probably...

https://www.adafruit.com/product/4201

AirLift all-in-One Boards

Don't want to add extra hardware to your project? Consider grabbing a board which has an ESP32 WiFi co-processor built-in!



Adafruit Metro M4 Express AirLift (WiFi) - Lite

Give your next project a lift with AirLift - our witty name for the ESP32 co-processor that graces this Metro M4. You already know about the Adafruit Metro...

https://www.adafruit.com/product/4000

Adafruit PyPortal - CircuitPython Powered Internet Display

PyPortal, our easy-to-use IoT device that allows you to create all the things for the “Internet of Things” in minutes. Make custom touch screen interface...
https://www.adafruit.com/product/4116

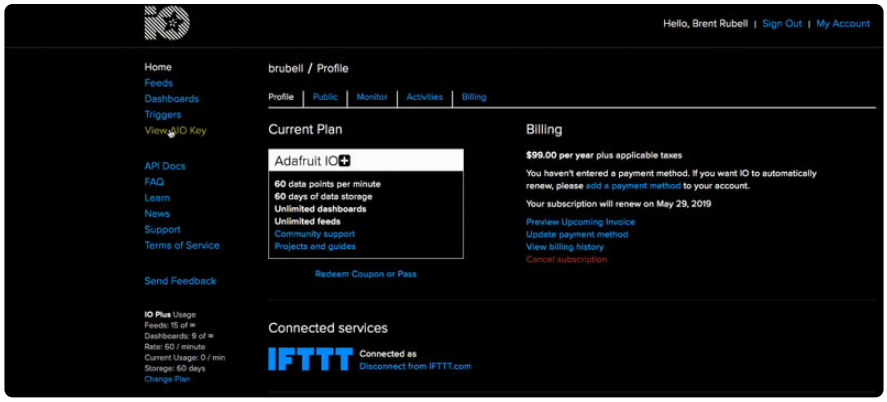
Adafruit IO Setup

If you have not already registered an Adafruit IO account, visit the registration page and sign up (https://adafru.it/dAQ).

Once you have registered an account, navigate to Adafruit IO and **log into your account** (https://adafru.it/eIC). You'll be directed to the Home page.

Click View AIO Key on the right-hand sidebar to r**etrieve your Adafruit IO Username and Active Key**.

Write these down somewhere safe - you'll need them later!



CircuitPython

To easily connect AirLift hardware to Adafruit IO using **CircuitPython**, we've written an Adafruit IO CircuitPython module (https://adafru.it/EFZ) to provide simple interaction with the Adafruit IO HTTP and MQTT APIs.

Install CircuitPython

Some of the CircuitPython compatible boards come with CircuitPython installed. Others are CircuitPython-ready, but need to have it installed. As well, you may want to update the version of CircuitPython already installed on your board. The steps are the same for installing and updating.

- To **install (or update) your CircuitPython board**, follow this page and come back here when you've successfully installed (or updated) CircuitPython. (https://adafru.it/Amd)

Internet Connect!

Once you have CircuitPython setup and libraries installed, you can get your project connected to the Internet.

To do this, you'll be editing CircuitPython code and will need an editor. We suggest using **Mu**, a lightweight text editor with support for CircuitPython built-in.

Click the button below to get instructions on how to install the Mu Editor.

Install Mu Editor

https://adafru.it/ANO

If you have not yet connected your board to the Internet, follow one of the guides below and come back when you've successfully connected to the internet:

- **If you have an AirLift All-in-One board** (like the Metro M4 WiFi or PyPortal), follow this page to connect to the internet (https://adafru.it/Eao).
- **If you have an externally connected AirLift**, follow this page to connect to the internet (https://adafru.it/EF-).

Secrets File Setup for Adafruit IO

While you created a secrets file and connected to the Internet in the previous step, you'll need to edit the **secrets** file to include your Adafruit IO **Username** and **Secret Key.**

Add the following code to your **secrets.py** file, **replacing `_your_adafruit_io_username` with your Adafruit IO username.**

Then, **replace `_your_big_huge_super_long_aio_key_` with your Adafruit IO Active Key**.

```
secrets = {
    'ssid' : '_your_wifi_ssid',
    'password' : '_your_wifi_password',
    'aio_username' : '_your_adafruit_io_username',
    'aio_key' : '_your_big_huge_super_long_aio_key_'
    }
```

Make sure you **save this file** before proceeding as **secrets.py** in the root directory of your board **CIRCUITPY** drive.

CircuitPython Library Installation

To interface your AirLift breakout/board with and the Internet - you'll need to install a few CircuitPython libraries on your board.

First make sure you are running the latest version of Adafruit CircuitPython (https://adafru.it/tBa) for your board.

Next you'll need to install the necessary libraries to use the hardware--carefully follow the steps to find and install these libraries from Adafruit's CircuitPython library bundle (https://adafru.it/zdx) matching your version of CircuitPython.

Before continuing - make sure your board's **lib** folder has the following files and folders copied over.

- **adafruit_io**
- **adafruit_esp32spi**
- **adafruit_bus_device**
- **adafruit_requests.mpy**
- **neopixel.mpy**

CircuitPython Usage

Copy the following code to your **code.py** file on your microcontroller:

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT
```

```
# adafruit_circuitpython_adafruitio usage with an esp32spi_socket
from random import randint
import board
import busio
from digitalio import DigitalInOut
import adafruit_connection_manager
from adafruit_esp32spi import adafruit_esp32spi
import adafruit_requests
from adafruit_io.adafruit_io import IO_HTTP, AdafruitIO_RequestError

# Add a secrets.py to your filesystem that has a dictionary called secrets with
"ssid" and
# "password" keys with your WiFi credentials. DO NOT share that file or commit it
into Git or other
# source control.
# pylint: disable=no-name-in-module,wrong-import-order
try:
    from secrets import secrets
except ImportError:
    print("WiFi secrets are kept in secrets.py, please add them there!")
    raise

# If you are using a board with pre-defined ESP32 Pins:
esp32_cs = DigitalInOut(board.ESP_CS)
esp32_ready = DigitalInOut(board.ESP_BUSY)
esp32_reset = DigitalInOut(board.ESP_RESET)

# If you have an externally connected ESP32:
# esp32_cs = DigitalInOut(board.D9)
# esp32_ready = DigitalInOut(board.D10)
# esp32_reset = DigitalInOut(board.D5)

spi = busio.SPI(board.SCK, board.MOSI, board.MISO)
esp = adafruit_esp32spi.ESP_SPIcontrol(spi, esp32_cs, esp32_ready, esp32_reset)

print("Connecting to AP...")
while not esp.is_connected:
    try:
        esp.connect_AP(secrets["ssid"], secrets["password"])
    except RuntimeError as e:
        print("could not connect to AP, retrying: ", e)
        continue
print("Connected to", str(esp.ssid, "utf-8"), "\tRSSI:", esp.rssi)

# Initialize a requests session
pool = adafruit_connection_manager.get_radio_socketpool(esp)
ssl_context = adafruit_connection_manager.get_radio_ssl_context(esp)
requests = adafruit_requests.Session(pool, ssl_context)

# Set your Adafruit IO Username and Key in secrets.py
# (visit io.adafruit.com if you need to create an account,
# or if you need your Adafruit IO key.)
aio_username = secrets["aio_username"]
aio_key = secrets["aio_key"]

# Initialize an Adafruit IO HTTP API object
io = IO_HTTP(aio_username, aio_key, requests)

try:
    # Get the 'temperature' feed from Adafruit IO
    temperature_feed = io.get_feed("temperature")
except AdafruitIO_RequestError:
    # If no 'temperature' feed exists, create one
    temperature_feed = io.create_new_feed("temperature")

# Send random integer values to the feed
random_value = randint(0, 50)
print("Sending {0} to temperature feed...".format(random_value))
```

```
io.send_data(temperature_feed["key"], random_value)
print("Data sent!")

# Retrieve data value from the feed
print("Retrieving data from temperature feed...")
received_data = io.receive_data(temperature_feed["key"])
print("Data from temperature feed: ", received_data["value"])
```

Connect to the serial monitor to see the output. It should look something like the following:

```
code.py output:
Sending 13 to temperature feed...
Data sent!
Retrieving data from temperature feed...
Data from temperature feed:  13
```

If the REPL outputs an `AttributeError` instead of running the code - you'll need to manually configure the AirLift module pin connections.

To do this, **edit the following lines of code** by replacing the pin values of `esp32_cs`, `esp32_ready`, and `esp32_reset` with the pinout from your AirLift module:

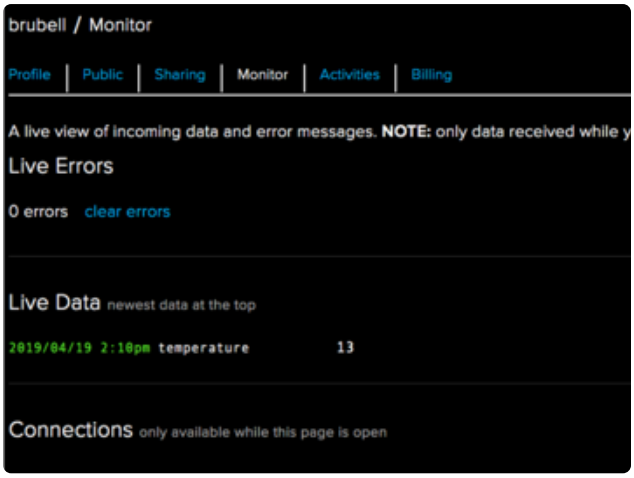
```
except AttributeError:
    esp32_cs = DigitalInOut(board.D9)
    esp32_ready = DigitalInOut(board.D10)
    esp32_reset = DigitalInOut(board.D5)
```

Congrats - you've sent a value to an Adafruit IO Feed, and retrieved it back!

Adafruit IO Usage

While you sent data to Adafruit IO, how do you know that Adafruit IO is receiving this data?

One of the most important places to check is the **Adafruit IO Monitor Page**. This page displays incoming data from your active feeds and any errors which might've occurred.



To do this, log into Adafruit IO and click here to navigate to the monitor page (https://adafru.it/DOK).

If everything worked correctly, **you should see a random value sent to the temperature feed when the code is run**.

Next Steps

You've successfully connected your CircuitPython board to Adafruit IO, now what?

Would you like to add a sensor to your project? What about displaying your data on a graph? Control a motor from the Internet? Set the colors of a RGB LED from the Internet? Monitor the temperature and humidity of a room from across the world?

To continue your educational journey with Adafruit IO, click here to visit the Adafruit IO Basics series for guides about the topics listed and more! (https://adafru.it/iDX)

Need some inspiration for your next project? We have lots of Adafruit IO-specific guides on the Adafruit Learning System. Click here to view more projects and guides for Adafruit IO (https://adafru.it/iRB).

Arduino IO Library

Adafruit IO Arduino is NOT compatible with AVR boards like the Metro 328p

If you're using a non-SAMD board (such as an Adafruit Metro or Arduino Uno) with an AirLift Co-Processor, **you will not be able to use Adafruit IO Arduino with an AirLift Breakout/Shield/FeatherWing** (it's a large library and will not fit on these boards).

For using these boards securely with Adafruit IO, we suggest the Adafruit MQTT Library **(https://adafru.it/fp6)** instead of Adafruit IO Arduino. We've added a usage example for AirLift Co-Processors here (https://adafru.it/ENc).

Installation

Installing Adafruit IO on Arduino requires **four** libraries: **Adafruit's WiFiNINA**, **Adafruit IO**, **Adafruit MQTT**, and **ArduinoHttpClient**.

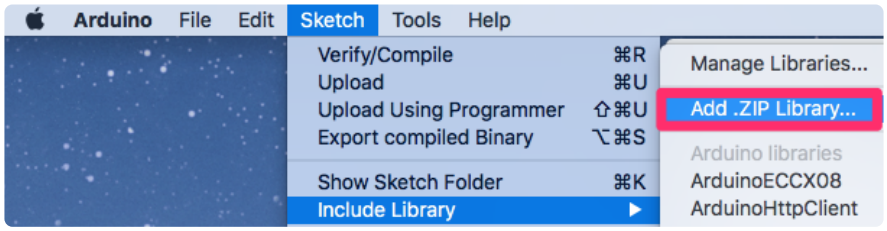
If you have these libraries already installed - you will need to update them to the versions listed on this page for use with AirLift.

To install the **Adafruit WiFiNINA** library, click the link below to download the library as a zip file:

Download Adafruit WiFiNINA ZIP

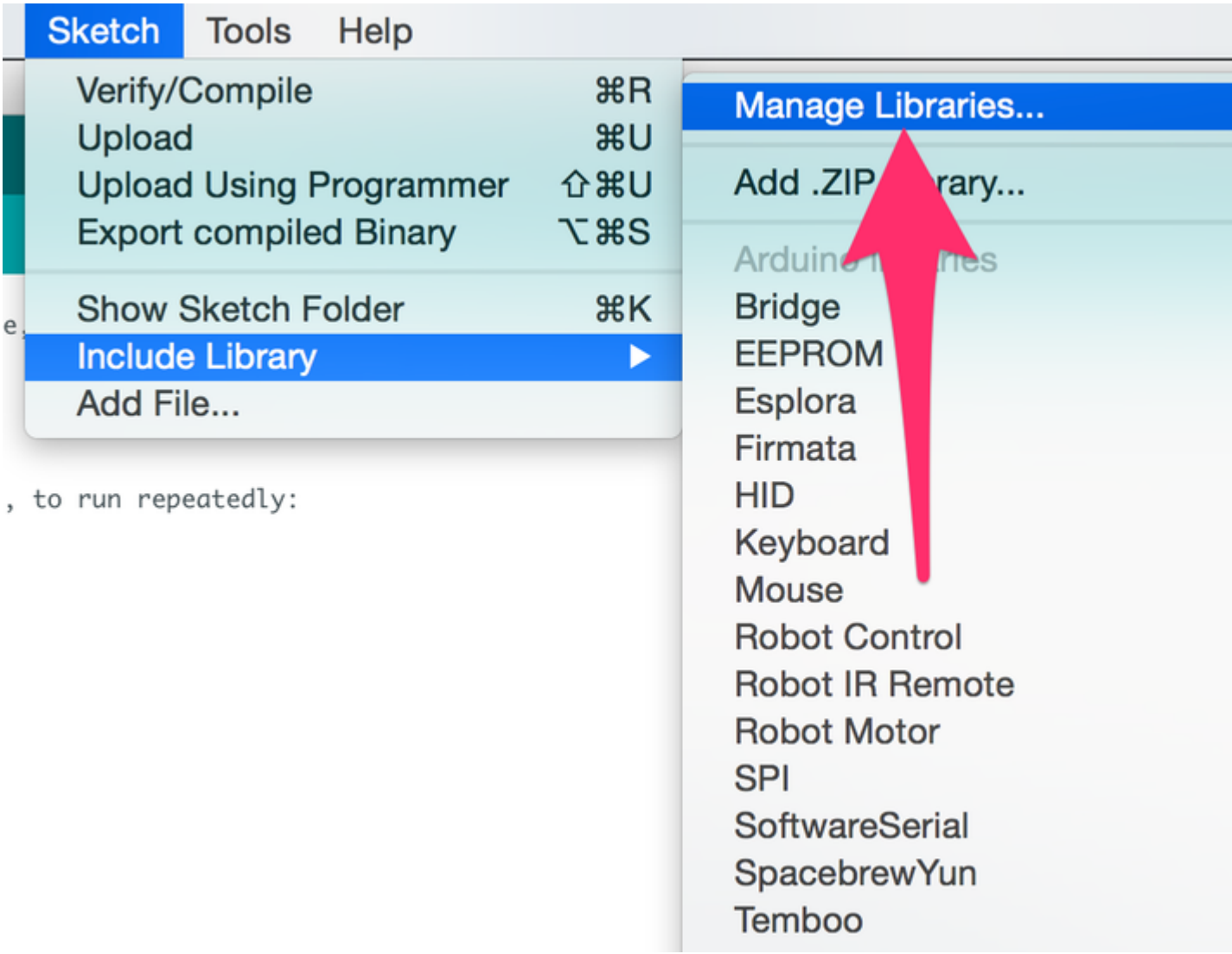
https://adafru.it/Evm

To install this library, **navigate to the Add .ZIP Library option** in the **Sketch -> Include Library** menu and select the zip file from the file browser.



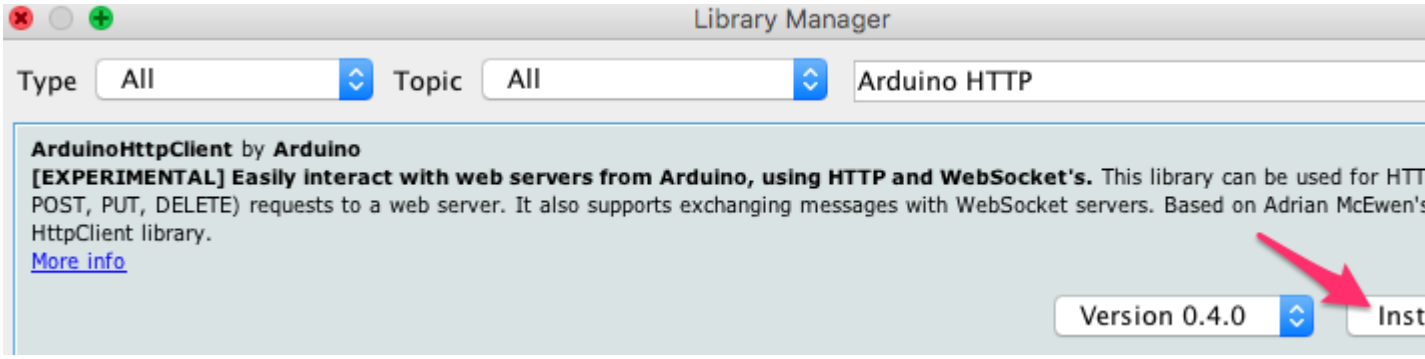
Enter **Arduino HTTP** into the search box, and click **Install** on the **ArduinoHttpClient** library option to **install version 0.4.0 or higher**.

You are going to install the next few libraries using the Arduino **Library Manager**. Navigate to the **Manage Libraries...** option in the **Sketch -> Include Library** menu.



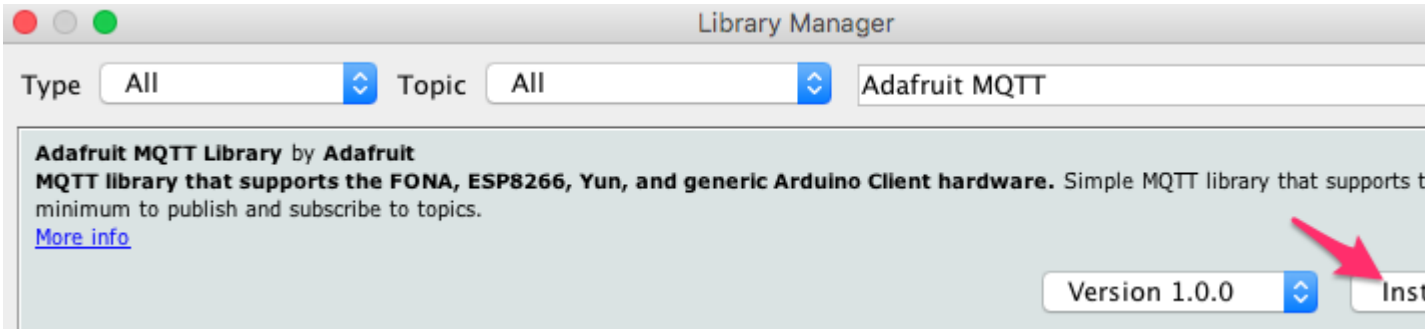
adafru.it/EG1)

Enter **Arduino HTTP** into the search box, and click **Install** on the **ArduinoHttpClient** library option to **install version 0.4.0 or higher**.



adafru.it/EG2)

Enter **Adafruit MQTT** into the search box, and click **Install** on the **Adafruit MQTT** library option to **install version 1.0.0 or higher**.



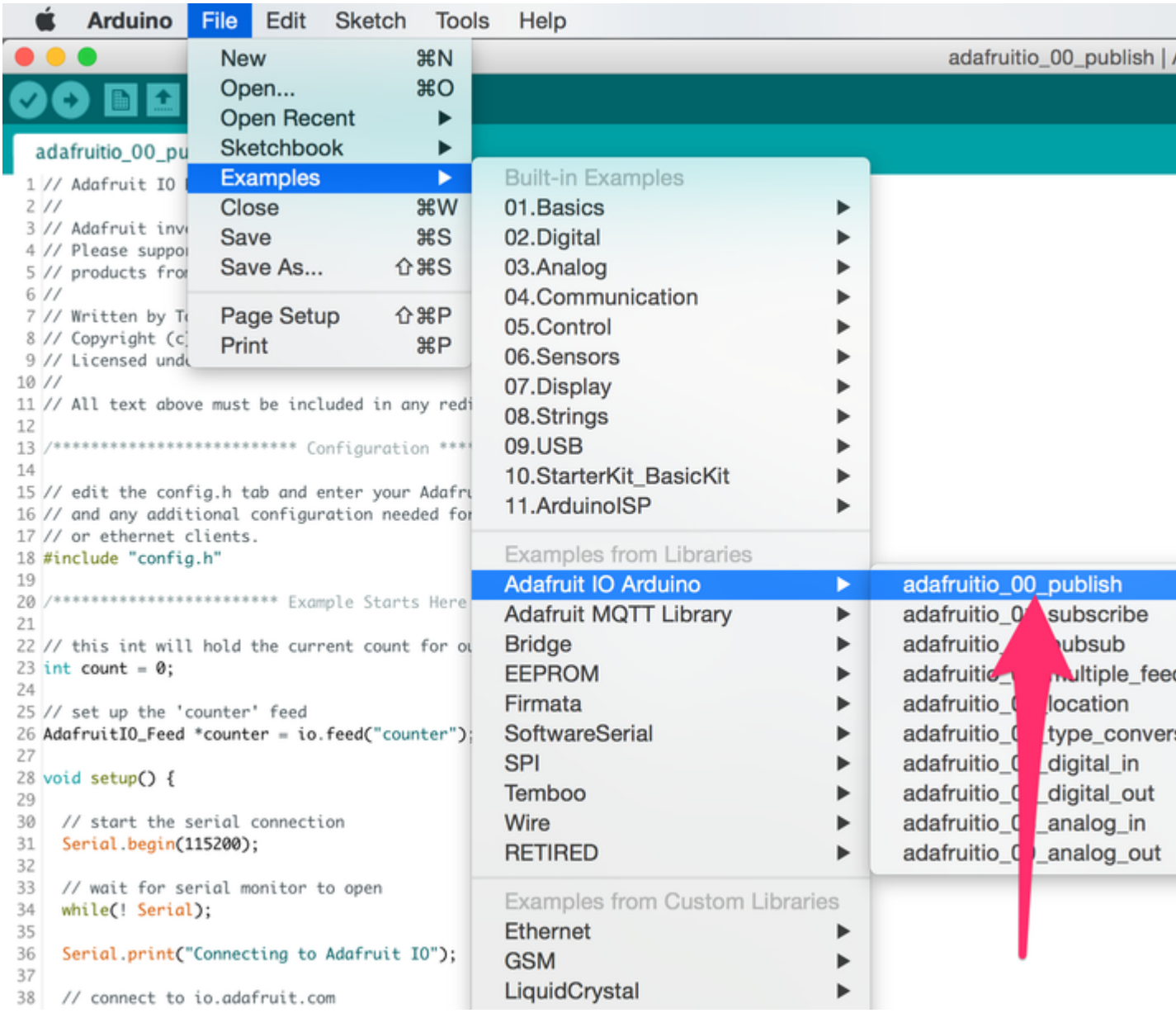
adafru.it/EG3)

Enter **Adafruit IO Arduino** into the search box, and click **Install** on the **Adafruit IO Arduino** library option to **install version 3.1.0 or higher**.

Usage

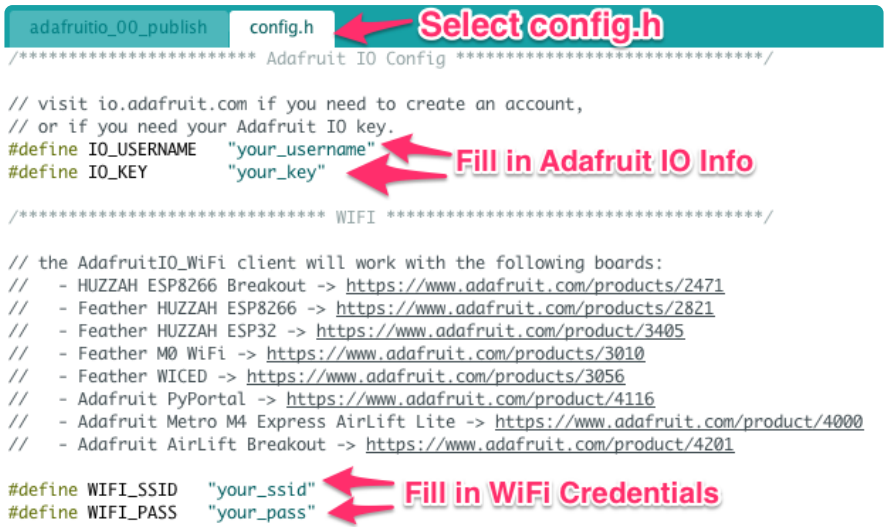
Now that we have installed all of the dependencies, we can try to run one of the Adafruit IO example sketches.

Navigate to the `adafruitio_00_publish` sketch by **opening the File -> Examples -> Adafruit IO Arduino menu**.



adafru.it/EG0)

Click on the **`config.h`** tab, and **replace the placeholders with your Adafruit IO info and WiFi connection credentials.**

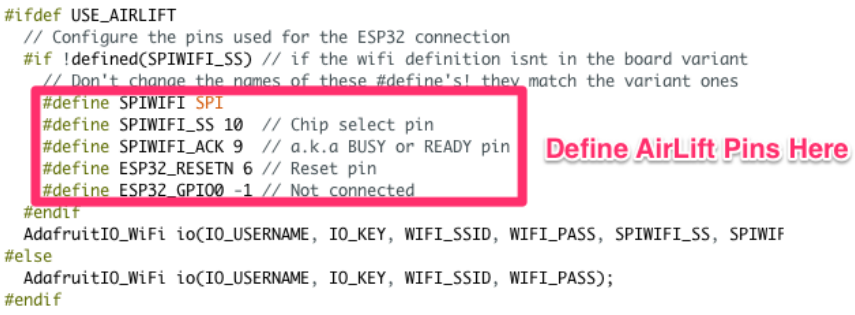


Since we are using AirLift with Adafruit IO Arduino, **make sure to uncomment the line `#define USE_AIRLIFT` line in the sketch** so it looks like the following:

```
// uncomment the following line if you are using airlift
#define USE_AIRLIFT
```

If you do not see this line, **upgrade** the Adafruit IO Arduino Library to the latest version.

If you're using an externally connected AirLift module (such as a breakout), you'll need to configure your ESP32's pins in the section of `config.h` where the ESP32 pins are defined:



If you're using an AirLift All-in-One board, you don't need to perform pin configuration - Adafruit IO does this for you automatically based on the board's ESP pin definitions.

Then, **compile and upload the sketch to your board.**

Usage

Once the sketch is uploaded, you can now **click the serial monitor icon to view the output of the sketch.**

If everything goes as expected, you should see counter values being sent to Adafruit IO.

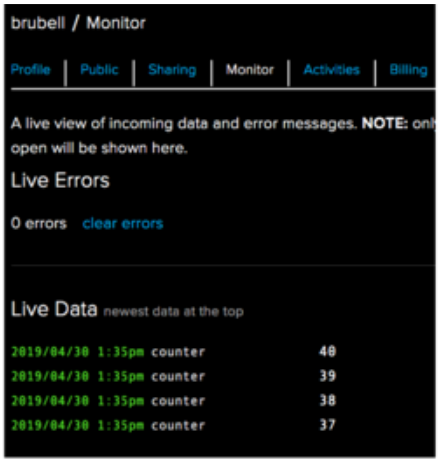
If you are not connecting to Adafruit IO, check your WiFi and Adafruit IO credentials in **config.h** and try uploading your sketch again using the process above.

Congrats - you've sent a value to an Adafruit IO Feed!

Adafruit IO Usage

While you sent data to Adafruit IO, how do you know that Adafruit IO is receiving this data?

One of the most important places to check is the **Adafruit IO Monitor Page**. This page displays incoming data from your active feeds and any errors which might've occurred.



To do this, log into Adafruit IO and navigate to the monitor page. (https://adafru.it/DOK)

If everything worked correctly, **you should see an incrementing value sent to the counter feed while the code is running**.

Next Steps

You've successfully connected your Arduino board to Adafruit IO - so, now what?

Would you like to add a sensor to your project? What about displaying your data on a graph? Control a motor from the internet? Set the colors of a RGB LED from the internet? Monitor the temperature and humidity of a room from across the world?

To continue your educational journey with Adafruit IO, click here to visit the Adafruit IO Basics series for guides about the topics listed and more! (https://adafru.it/iDX)

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Adafruit IO FAQ

My data isn't displaying, is Adafruit IO's {service/MQTT/API} down?

Possibly - you can check IO status on the Adafruit Status page (https://adafru.it/Oc0).

I have a problem with billing and Adafruit IO+

Visit https://io.adafruit.com/support (https://adafru.it/Sgb) and click "**Contact Adafruit IO Support**"

There is an issue with Adafruit IO. Something is broken!

Visit https://io.adafruit.com/support (https://adafru.it/Sgb) and click "**Contact Adafruit IO Support**"

There is an issue with WipperSnapper. Something is broken!

First, check if the issue you're having already exists on the GitHub repository for Adafruit IO WipperSnapper by visiting the "Issues" page (https://adafru.it/19Em).

If it does not exist, please file a new bug report on the GitHub repository for Adafruit IO WipperSnapper. (https://adafru.it/19En)

Is my data being sent properly? Am I sending too much data?

There's a monitor page built-into Adafruit IO (https://adafru.it/DOK) which provides a live view of incoming data and error messages. Keep this page open while you send data to your Adafruit IO devices to monitor data and errors.

Can I build my own Client Library for Adafruit IO?

Absolutely - the same API that drives our user interface is available to you. We provide documentation so you can build a library in your favorite language to talk to IO (https://adafru.it/uff)

What about the data that my project generates? Where does it go? What happens to it? Are you going to sell it?

The data your store with IO is yours to manage and control. You can download it all anytime and we will never sell or give it away to another company. We feel strongly enough about this that we put it in our IoT Bill of Rights (https://adafru.it/Bll).

I don't see my question listed.

If you have any questions or issues with Adafruit IO, post up in the Adafruit IO Forums (https://adafru.it/pIC) or chat with Adafruit staff and community members in real-time on the adafruit-io channel on the Adafruit Discord server (https://adafru.it/BmL).