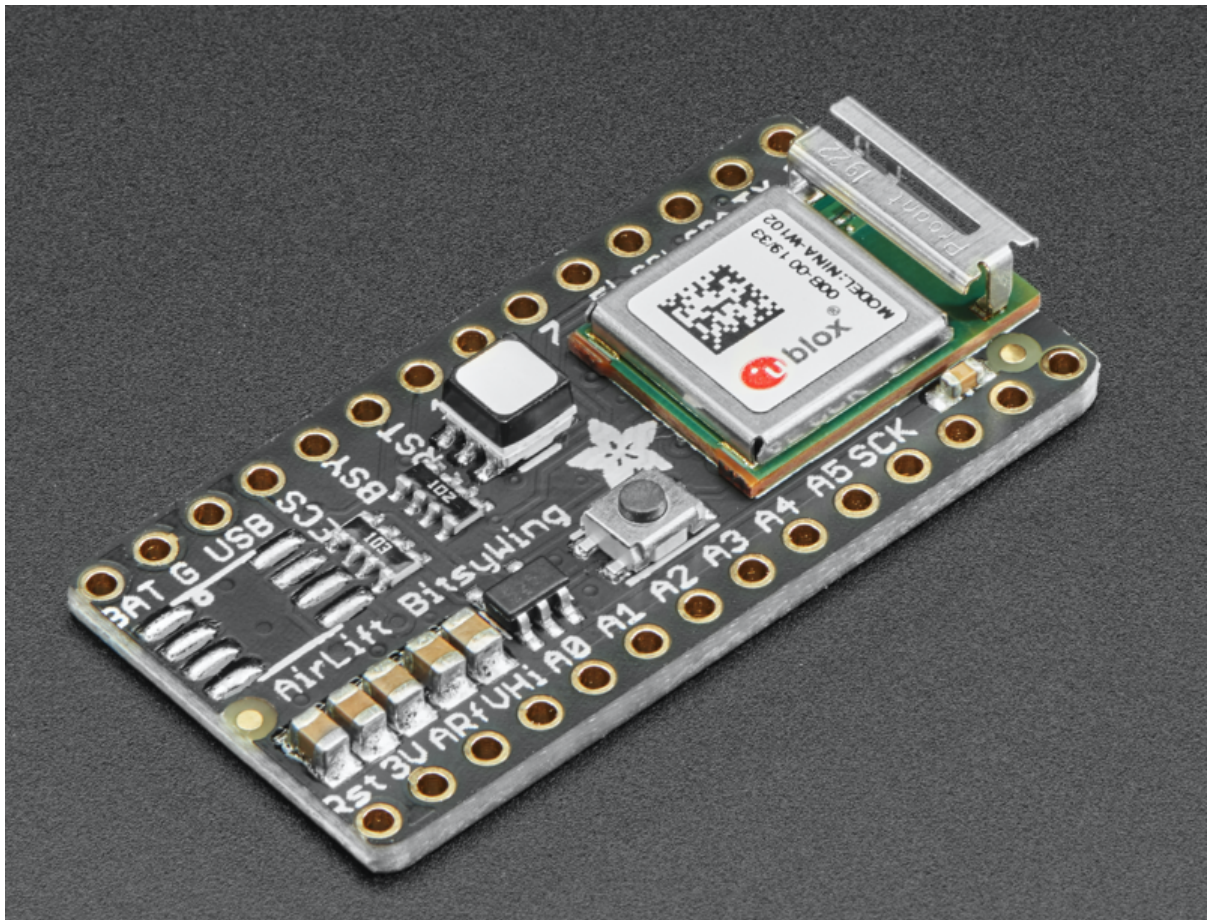




Adafruit Airlift Bitsy Add-On - ESP32 WiFi Co-Processor

Created by Bryan Siepert



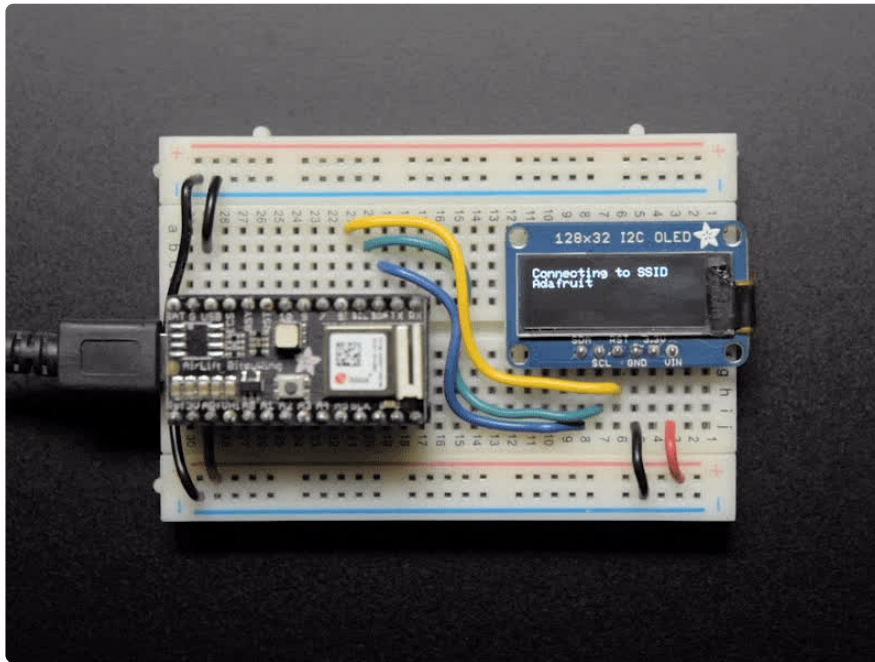
<https://learn.adafruit.com/adafruit-airlift-bitsy-add-on-esp32-wifi-co-processor>

Last updated on 2024-11-18 12:59:27 PM EST

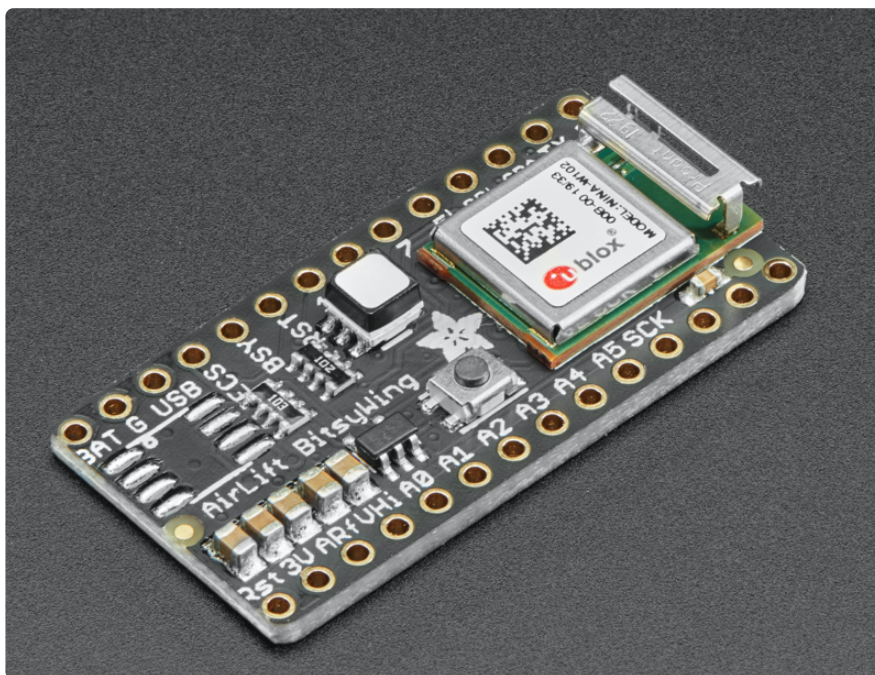
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Overview

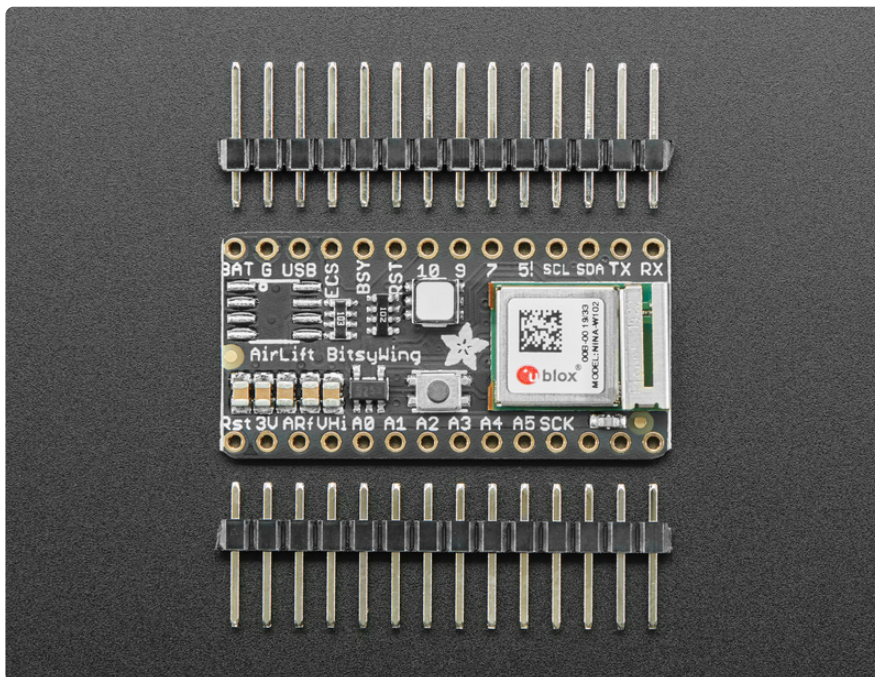


Give your ItsyBitsy project a lift with the Adafruit AirLift Bitsy Add-On! This sweet add-on for the ItsyBitsy lets you use the powerful ESP32 as a WiFi or BLE co-processor. You probably have your favorite ItsyBitsy ([like the ItsyBitsy M4 \(http://adafru.it/3800\)](http://adafru.it/3800)) that comes with its own set of awesome peripherals and lots of libraries. But it doesn't have WiFi built in! So let's give that chip a best friend, the ESP32. This chip 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).



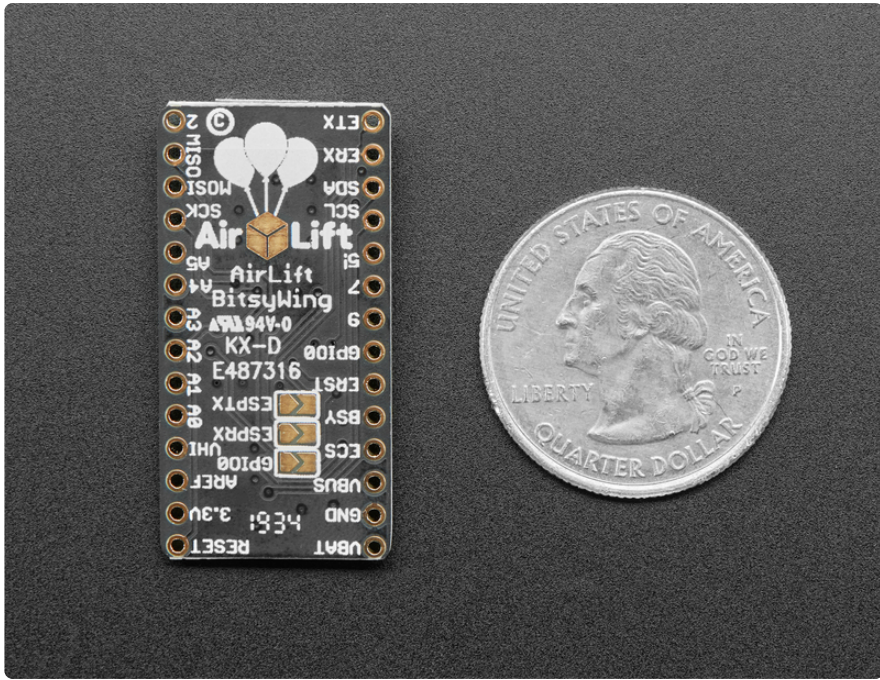
Having WiFi managed by a separate chip means your code is simpler, you don't have to cache socket data, or compile in & debug an SSL library. Instead the Airlift Add-On allows you to send basic but powerful socket-based commands over 8MHz SPI for high speed data transfer. You can use the 3V 32u4, M0, or M4 ItsyBitsy in Arduino although **the '32u4 will not be able to do very complex tasks or buffer a lot of data** because they do not have a lot of RAM. The add-on also works great with CircuitPython, though a SAMD51/Cortex M4 minimum required since we need a bunch of RAM. All you need is an SPI bus and 2 control pins plus a power supply that can provide up to 250mA during WiFi usage.

The ESP32 also supports BLE (Bluetooth Low Energy), though not simultaneously with WiFi. Many of our CircuitPython builds include native support for ESP32 BLE. Right now, we only support the ESP32 acting as a BLE peripheral, but that's sufficient to communicate with the ESP32 from a phone, tablet, host computer, or another BLE-capable board. You use a few control pins and the RX and TX pins to talk to the ESP32 when it's in BLE mode.

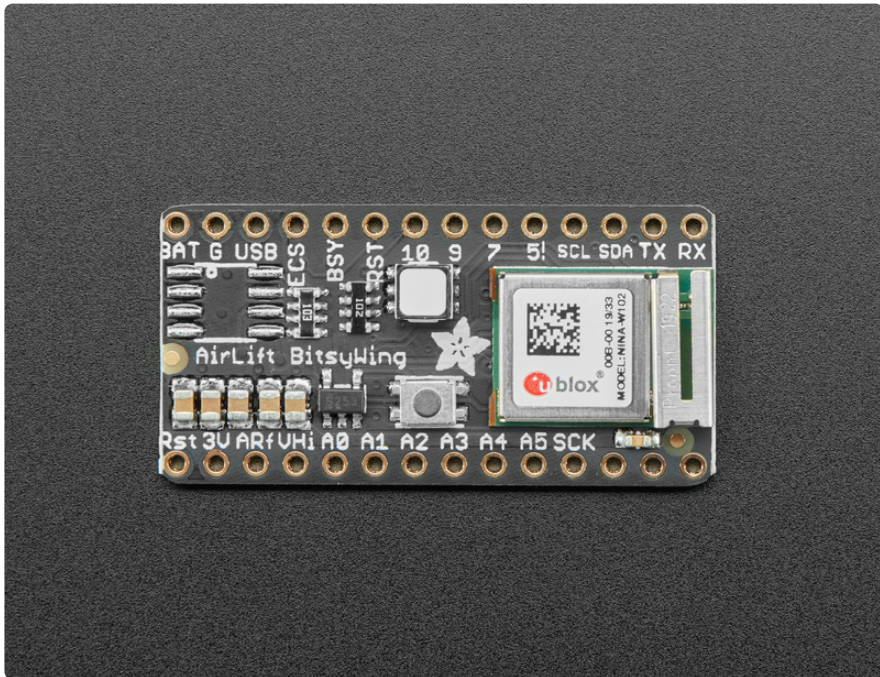


We placed an ESP32 module on a BitsyWing with a tri-state chip for MOSI so you can share the SPI bus. The add on comes fully assembled and tested, pre-programmed with ESP32 SPI WiFi co-processor firmware that [you can use in CircuitPython to use this into WiFi co-processor over SPI + 2 pins](https://adafru.it/EvI) (<https://adafru.it/EvI>). We also toss in some header so you can solder it in though **you'll need stacking headers for your ItsyBitsy to put the add-on on top.**

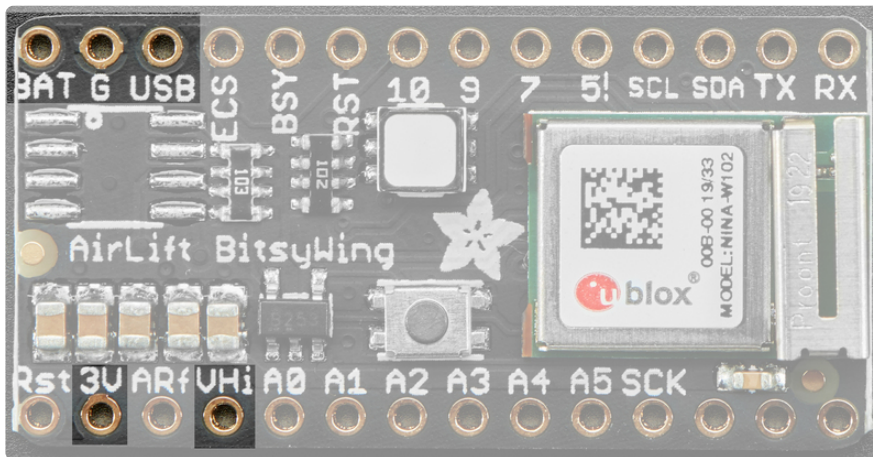
[The firmware on board is a slight variant of the Arduino Wi-Fi NINA core, which works great!](https://adafru.it/E7O) (<https://adafru.it/E7O>)



Pinouts



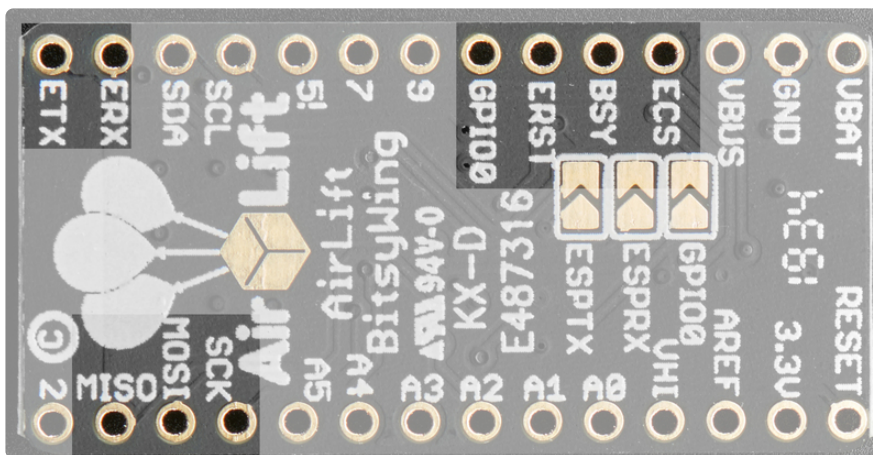
Power Pins



- **GND** - Common power/logic ground.
- **3.3V** - Power supply for the ublox WiFi module. You'll need up to 250mA to power the module. ItsyBitsy's tend to have a 500mA regulator so they should be OK, just make sure you're aware of your power budget

SPI and Control Pins

To keep transfers speedy, we use SPI not UART Serial. UART is too slow and hard to synchronize. This uses more pins but the experience is much better!



Classic SPI Pins:

- **SCK** - SPI Clock from your microcontroller, **logic level is 3.3V only**
- **MISO** - SPI Data from the AirLift to the microcontroller, **logic level is 3.3V only**. This is tri-stated when not selected, so you can share the SPI bus with other devices.
- **MOSI**- SPI Data to the AirLift from the microcontroller, **logic level is 3.3V only**.

- **ESPCS** - SPI Chip Select from the microcontroller to start sending commands to the AirLift, and to choose BLE mode on reset, **logic level is 3.3V only**

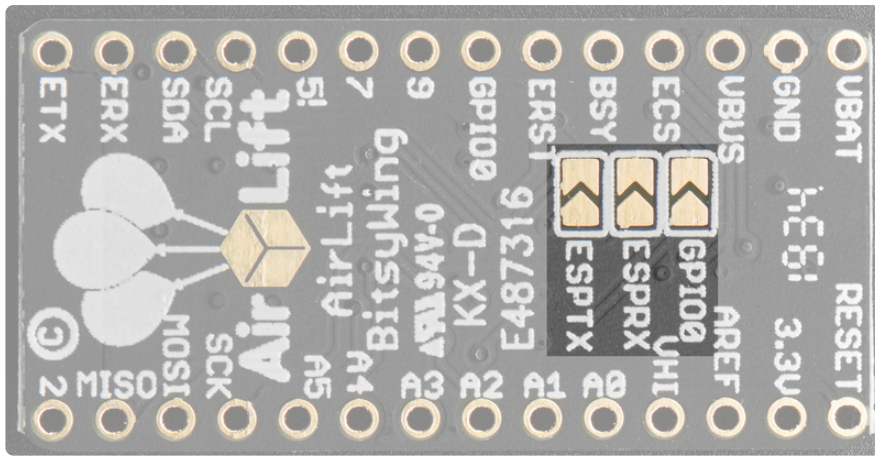
Required Control Pins:

- **ESPBUSY** - this pin is an input from the AirLift, it will let us know when its ready for more commands to be sent. **This is 3.3V logic out.** This pin must be connected.
- **ESPRST**- this pin is an output to the AirLift. Set low to put the AirLift into reset. You should use this pin, even though you might be able to run for a short while without it, it's essential to 'kick' the chip if it ever gets into a locked up state. **Logic level is 3.3V**

Warning! The initial batch has the silk screen labels for ESPBUSY and ESPRST swapped! The order should be ECS/RST/BSY not ECS/BSY/RST. The schematic, code, and fritzing object have been fixed. The silk will be corrected for the next run

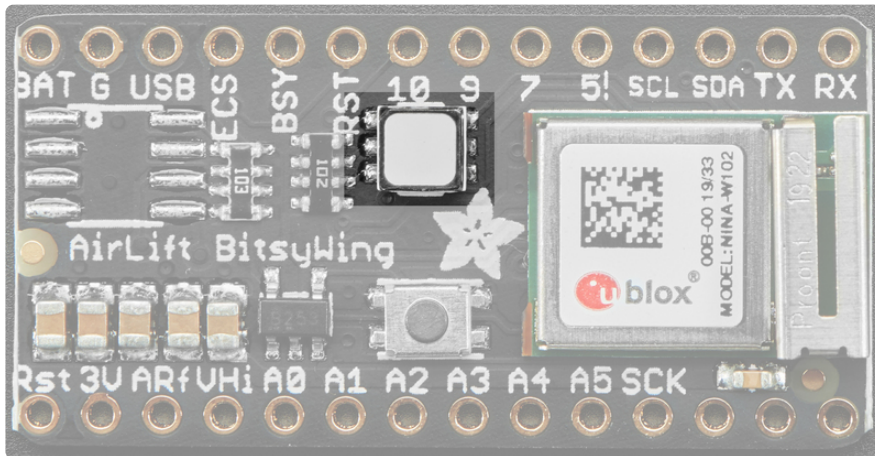
Optional Control Pins:

- **ESPGPIO0** - this is the ESP32 **GPIO0** pin, which is used to put the WiFi module it into bootloading mode if you want to update the firmware. It is also used if you like when the ESP32 is acting as a server, to let you know data is ready for reading. It's not required in WiFi mode, but you'll need to connect it for BLE mode. **You'll need to solder the pad on the bottom of the Bitsy Add-on to connect it.**
- **ESPRX & ESPTX** - Serial data in and Serial data out, used for bootloading new firmware, and for communication when in BLE mode. Leave disconnected if not using BLE or when not uploading new WiFi firmware to the AirLift (which is a rare occurrence). **You'll need to solder the two pads on the bottom of the Bitsy Add-on** to use these pins. Soldering the pads connects ESPTX to RX and ESPTX to RX, respectively.

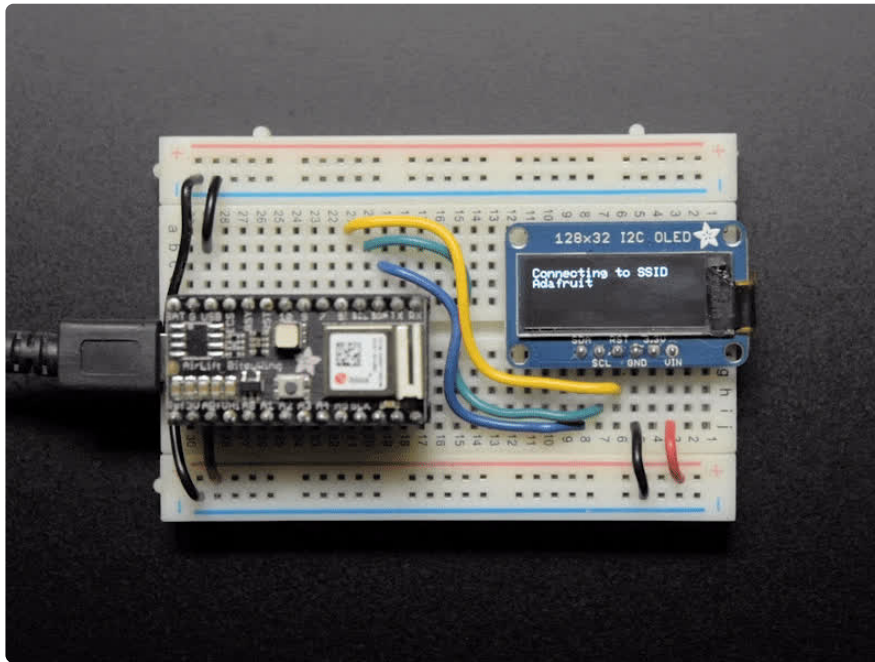


RGB LED

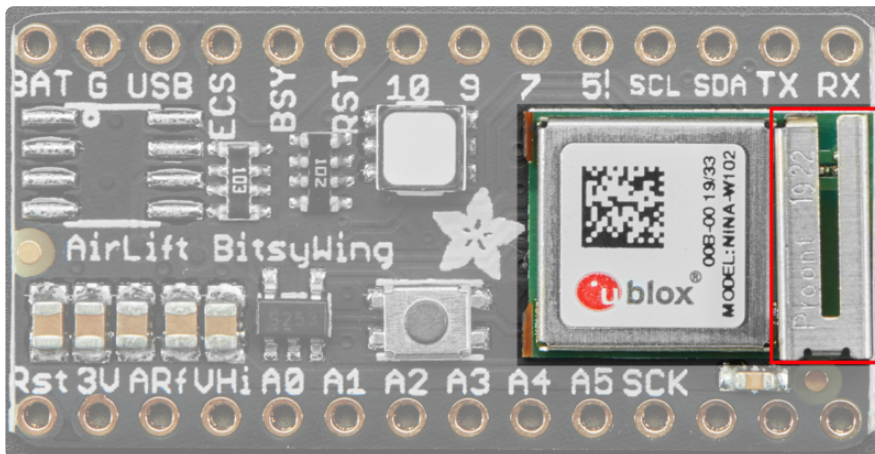
There is a small RGB LED to the left of the ESP32. These RGB LEDs are available in the Arduino and CircuitPython libraries if you'd like to PWM them for a visual alert. They're connected to the ESP32's pins 26 (Red), 25 (Green), and 27 (Blue).

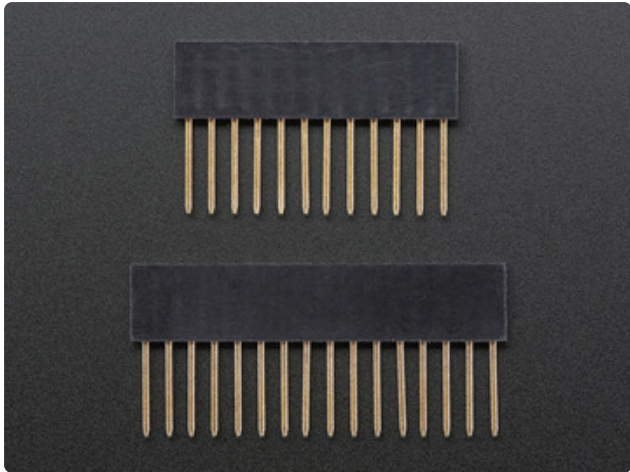


Assembly



The antenna on the new, smaller ESP32 module is very delicate! Avoid touching it and grab the add-on by the long sides to avoid smushing the antenna





To stack the Airlift Add-on on top of the ItsyBitsy, you'll need stacking headers for the ItsyBitsy. For now you'll need to cut down a set of [Feather Stacking Headers](http://adafru.it/2830) (<http://adafru.it/2830>) to fit the ItsyBitsy however we will have headers with the correctly length soon!

CircuitPython WiFi

It's easy to use the Adafruit AirLift breakout with CircuitPython and the [Adafruit CircuitPython ESP32SPI](https://adafru.it/DWV) (<https://adafru.it/DWV>) module. This module allows you to easily add WiFi to your project.

The ESP32SPI library requires a microcontroller with ~128KB of RAM or more. The SAMD21 will not work.

CircuitPython Microcontroller Pinout

Since all CircuitPython-running ItsyBitsies follow the same pinout, you do not need to change any of the pins listed below.

To use the ESP32's pins, copy the following lines into your code:

```
esp32_cs = DigitalInOut(board.D13)
esp32_reset = DigitalInOut(board.D12)
esp32_ready = DigitalInOut(board.D11)
```

Then, include the following code to use the pin:

```
esp32_gpio0 = DigitalInOut(board.D10)
```

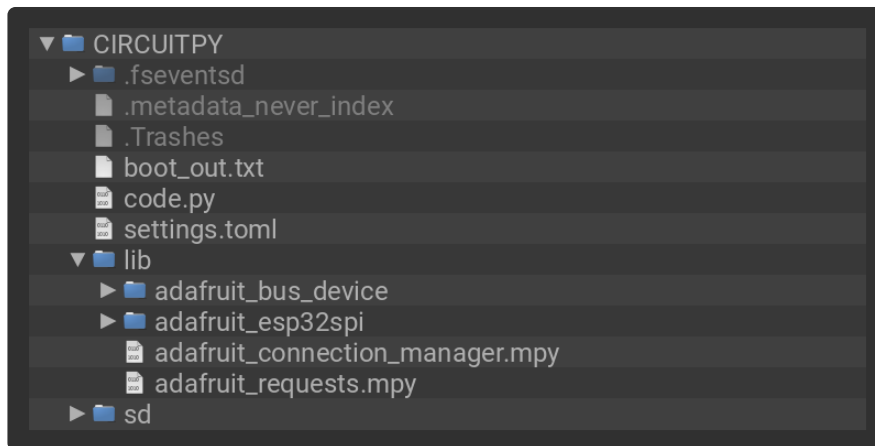
CircuitPython Setup

First make sure you are running the [latest version of Adafruit CircuitPython](https://adafru.it/Amd) (<https://adafru.it/Amd>) for your board.

Next you'll need to install the necessary libraries to use the hardware. Thankfully, we can do this in one go. In the example below, click the **Download Project Bundle** button below to download the necessary libraries and the `code.py` file in a zip file. Extract the contents of the zip file, and copy the **entire lib folder** and the `code.py` file to your **CIRCUITPY** drive.

Your **CIRCUITPY/lib** folder should contain the following folders and files:

- /adafruit_bus_device
- /adafruit_esp32spi
- adafruit_requests.mpy



CircuitPython Usage

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

```
import board
import busio
from digitalio import DigitalInOut

from adafruit_esp32spi import adafruit_esp32spi

print("ESP32 SPI hardware test")

esp32_cs = DigitalInOut(board.D13)
esp32_reset = DigitalInOut(board.D12)
esp32_ready = DigitalInOut(board.D11)

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

if esp.status == adafruit_esp32spi.WL_IDLE_STATUS:
    print("ESP32 found and in idle mode")
print("Firmware vers.", esp.firmware_version)
print("MAC addr:", [hex(i) for i in esp.MAC_address])

for ap in esp.scan_networks():
    print("\t%s\t\tRSSI: %d" % (str(ap['ssid'], 'utf-8'), ap['rssi']))

print("Done!")
```

[Connect to the serial console \(https://adafru.it/BIO\)](https://adafru.it/BIO) to see the output. It should look something like the following:

```
code.py output:
ESP32 SPI hardware test
ESP32 found and in idle mode
Firmware vers. bytearray(b'1.3.0\x00')
MAC addr: ['0xbd', '0xb0', '0xe', '0x33', '0x4f', '0xc4']
Get scan
  Adafruit          RSSI: -50
  Adafruit          RSSI: -57
  ESP_88EF6C       RSSI: -61
  consulatewireless RSSI: -70
  Adafruit          RSSI: -71
  Consulate Guest  RSSI: -71
  consulatewireless RSSI: -72
  Consulate Guest  RSSI: -73
  consulatewireless RSSI: -74
  ndm-studiopro2-hotspot RSSI: -74
Done!

Press any key to enter the REPL. Use CTRL-D to reload.
```

Make sure you see the same output! If you don't, check your wiring. Note that we've changed the pinout in the code example above to reflect the CircuitPython Microcontroller Pinout at the top of this page.

Once you've succeeded, continue onto the next page!

If you can read the Firmware and MAC address but fails on scanning SSIDs, check your power supply, you may be running out of juice to the ESP32 and it's resetting

Create Your settings.toml File

CircuitPython works with WiFi-capable boards to enable you to make projects that have network connectivity. This means working with various passwords and API keys. As of [CircuitPython 8 \(https://adafru.it/Em8\)](https://adafru.it/Em8), there is support for a **settings.toml** file. This is a file that is stored on your **CIRCUITPY** drive, that contains all of your secret network information, such as your SSID, SSID password and any API keys for IoT services. It is designed to separate your sensitive information from your **code.py** file so you are able to share your code without sharing your credentials.

CircuitPython previously used a **secrets.py** file for this purpose. The **settings.toml** file is quite similar.

Your settings.toml file should be stored in the main directory of your CIRCUITPY drive. It should not be in a folder.

CircuitPython settings.toml File

This section will provide a couple of examples of what your **settings.toml** file should look like, specifically for CircuitPython WiFi projects in general.

The most minimal **settings.toml** file must contain your WiFi SSID and password, as that is the minimum required to connect to WiFi. Copy this example, paste it into your **settings.toml**, and update:

- `your_wifi_ssid`
- `your_wifi_password`

```
CIRCUITPY_WIFI_SSID = "your_wifi_ssid"
CIRCUITPY_WIFI_PASSWORD = "your_wifi_password"
```

Many CircuitPython network-connected projects on the Adafruit Learn System involve using Adafruit IO. For these projects, you must also include your Adafruit IO username and key. Copy the following example, paste it into your settings.toml file, and update:

- `your_wifi_ssid`
- `your_wifi_password`
- `your_aio_username`
- `your_aio_key`

```
CIRCUITPY_WIFI_SSID = "your_wifi_ssid"
CIRCUITPY_WIFI_PASSWORD = "your_wifi_password"
ADAFRUIT_AIO_USERNAME = "your_aio_username"
ADAFRUIT_AIO_KEY = "your_aio_key"
```

Some projects use different variable names for the entries in the **settings.toml** file. For example, a project might use `ADAFRUIT_AIO_ID` in the place of `ADAFRUIT_AIO_USERNAME`. If you run into connectivity issues, one of the first things to check is that the names in the settings.toml file match the names in the code.

Not every project uses the same variable name for each entry in the settings.toml file! Always verify it matches the code.

settings.toml File Tips

Here is an example settings.toml file.

```
# Comments are supported
CIRCUITPY_WIFI_SSID = "guest wifi"
CIRCUITPY_WIFI_PASSWORD = "guessable"
CIRCUITPY_WEB_API_PORT = 80
CIRCUITPY_WEB_API_PASSWORD = "passw0rd"
test_variable = "this is a test"
thumbs_up = "\U0001f44d"
```

In a settings.toml file, it's important to keep these factors in mind:

- Strings are wrapped in double quotes; ex: "your-string-here"
- Integers are **not** quoted and may be written in decimal with optional sign (+1 , -1 , 1000) or hexadecimal (0xabcd).
 - Floats, octal (0o567) and binary (0b11011) are not supported.
- Use \u escapes for weird characters, \x and \ooo escapes are not available in .toml files
 - Example: \U0001f44d for (thumbs up emoji) and \u20ac for € (EUR sign)
- Unicode emoji, and non-ASCII characters, stand for themselves as long as you're careful to save in "UTF-8 without BOM" format

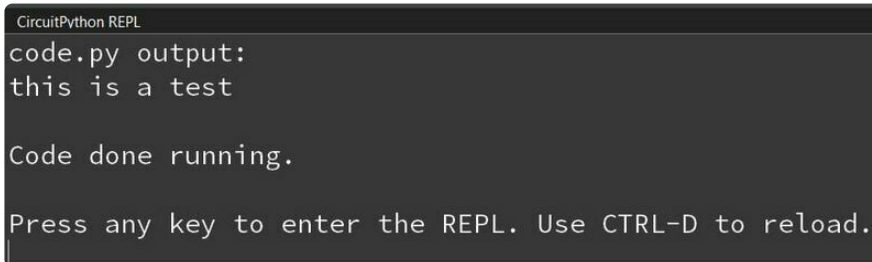


When your settings.toml file is ready, you can save it in your text editor with the .toml extension.

Accessing Your `settings.toml` Information in `code.py`

In your `code.py` file, you'll need to `import` the `os` library to access the `settings.toml` file. Your settings are accessed with the `os.getenv()` function. You'll pass your settings entry to the function to import it into the `code.py` file.

```
import os
print(os.getenv("test_variable"))
```



```
CircuitPython REPL
code.py output:
this is a test

Code done running.

Press any key to enter the REPL. Use CTRL-D to reload.
```

In the upcoming CircuitPython WiFi examples, you'll see how the `settings.toml` file is used for connecting to your SSID and accessing your API keys.

Internet Connect!

Connect to WiFi

OK, now that you have your `settings.toml` file set up - you can connect to the Internet.

To do this, you need to first install a few libraries, into the `lib` folder on your **CIRCUITPY** drive. Then you need to update `code.py` with the example script.

Thankfully, we can do this in one go. In the example below, click the **Download Project Bundle** button below to download the necessary libraries and the `code.py` file in a zip file. Extract the contents of the zip file, open the directory `examples/` and then click on the directory that matches the version of CircuitPython you're using and copy the contents of that directory to your **CIRCUITPY** drive.

Your **CIRCUITPY** drive should now look similar to the following image:



If you are using CircuitPython 9.0.x on a board with frozen libraries, such as the Matrix Portal M4, use this version of the "Internet Connect" program. If you are using CircuitPython 9.1.0 or later, use the second version below.

```
# SPDX-FileCopyrightText: 2019 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

from os import getenv
import board
import busio
from digitalio import DigitalInOut
import adafruit_connection_manager
import adafruit_requests
from adafruit_esp32spi import adafruit_esp32spi

# Get wifi details and more from a settings.toml file
# tokens used by this Demo: CIRCUITPY_WIFI_SSID, CIRCUITPY_WIFI_PASSWORD
secrets = {
    "ssid": getenv("CIRCUITPY_WIFI_SSID"),
    "password": getenv("CIRCUITPY_WIFI_PASSWORD"),
}
if secrets == {"ssid": None, "password": None}:
    try:
        # Fallback on secrets.py until depreciation is over and option is removed
        from secrets import secrets
    except ImportError:
        print("WiFi secrets are kept in settings.toml, please add them there!")
        raise

print("ESP32 SPI webclient test")

TEXT_URL = "http://wifitest.adafruit.com/testwifi/index.html"
JSON_URL = "http://api.coindesk.com/v1/bpi/currentprice/USD.json"

# 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 AirLift Shield:
# esp32_cs = DigitalInOut(board.D10)
```

```

# esp32_ready = DigitalInOut(board.D7)
# esp32_reset = DigitalInOut(board.D5)

# If you have an AirLift Featherwing or ItsyBitsy Airlift:
# esp32_cs = DigitalInOut(board.D13)
# esp32_ready = DigitalInOut(board.D11)
# esp32_reset = DigitalInOut(board.D12)

# If you have an externally connected ESP32:
# NOTE: You may need to change the pins to reflect your wiring
# esp32_cs = DigitalInOut(board.D9)
# esp32_ready = DigitalInOut(board.D10)
# esp32_reset = DigitalInOut(board.D5)

# Secondary (SCK1) SPI used to connect to WiFi board on Arduino Nano Connect RP2040
if "SCK1" in dir(board):
    spi = busio.SPI(board.SCK1, board.MOSI1, board.MISO1)
else:
    spi = busio.SPI(board.SCK, board.MOSI, board.MISO)
esp = adafruit_esp32spi.ESP_SPIcontrol(spi, esp32_cs, esp32_ready, esp32_reset)

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)

if esp.status == adafruit_esp32spi.WL_IDLE_STATUS:
    print("ESP32 found and in idle mode")
print("Firmware vers.", esp.firmware_version.decode("utf-8"))
print("MAC addr:", ":".join("%02X" % byte for byte in esp.MAC_address))

for ap in esp.scan_networks():
    print("\t%-23s RSSI: %d" % (str(ap["ssid"], "utf-8"), ap["rssi"]))

print("Connecting to AP...")
while not esp.is_connected:
    try:
        esp.connect_AP(secrets["ssid"], secrets["password"])
    except OSError as e:
        print("could not connect to AP, retrying: ", e)
        continue
print("Connected to", str(esp.ssid, "utf-8"), "\tRSSI:", esp.rssi)
print("My IP address is", esp.pretty_ip(esp.ip_address))
print(
    "IP lookup adafruit.com: %s" %
    esp.pretty_ip(esp.get_host_by_name("adafruit.com"))
)
print("Ping google.com: %d ms" % esp.ping("google.com"))

# esp._debug = True
print("Fetching text from", TEXT_URL)
r = requests.get(TEXT_URL)
print("-" * 40)
print(r.text)
print("-" * 40)
r.close()

print()
print("Fetching json from", JSON_URL)
r = requests.get(JSON_URL)
print("-" * 40)
print(r.json())
print("-" * 40)
r.close()

print("Done!")

```

If you are using CircuitPython 9.1.0, or using the latest version of the ESP32SPI library, using the version below. If you are using CircuitPython 9.0.x on a board with frozen libraries, such as the Matrix Portal M4, use the first version above.

```
# SPDX-FileCopyrightText: 2019 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

from os import getenv
import board
import busio
from digitalio import DigitalInOut
import adafruit_connection_manager
import adafruit_requests
from adafruit_esp32spi import adafruit_esp32spi

# Get wifi details and more from a settings.toml file
# tokens used by this Demo: CIRCUITPY_WIFI_SSID, CIRCUITPY_WIFI_PASSWORD
secrets = {
    "ssid": getenv("CIRCUITPY_WIFI_SSID"),
    "password": getenv("CIRCUITPY_WIFI_PASSWORD"),
}
if secrets == {"ssid": None, "password": None}:
    try:
        # Fallback on secrets.py until depreciation is over and option is removed
        from secrets import secrets
    except ImportError:
        print("WiFi secrets are kept in settings.toml, please add them there!")
        raise

print("ESP32 SPI webclient test")

TEXT_URL = "http://wifitest.adafruit.com/testwifi/index.html"
JSON_URL = "http://api.coindesk.com/v1/bpi/currentprice/USD.json"

# 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 AirLift Shield:
# esp32_cs = DigitalInOut(board.D10)
# esp32_ready = DigitalInOut(board.D7)
# esp32_reset = DigitalInOut(board.D5)

# If you have an AirLift Featherwing or ItsyBitsy AirLift:
# esp32_cs = DigitalInOut(board.D13)
# esp32_ready = DigitalInOut(board.D11)
# esp32_reset = DigitalInOut(board.D12)

# If you have an externally connected ESP32:
# NOTE: You may need to change the pins to reflect your wiring
# esp32_cs = DigitalInOut(board.D9)
# esp32_ready = DigitalInOut(board.D10)
# esp32_reset = DigitalInOut(board.D5)

# Secondary (SCK1) SPI used to connect to WiFi board on Arduino Nano Connect RP2040
if "SCK1" in dir(board):
    spi = busio.SPI(board.SCK1, board.MOSI1, board.MISO1)
else:
    spi = busio.SPI(board.SCK, board.MOSI, board.MISO)
esp = adafruit_esp32spi.ESP_SPIcontrol(spi, esp32_cs, esp32_ready, esp32_reset)
```

```

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)

if esp.status == adafruit_esp32spi.WL_IDLE_STATUS:
    print("ESP32 found and in idle mode")
print("Firmware vers.", esp.firmware_version)
print("MAC addr:", ":".join("%02X" % byte for byte in esp.MAC_address))

for ap in esp.scan_networks():
    print("\t%-23s RSSI: %d" % (ap.ssid, ap.rssi))

print("Connecting to AP...")
while not esp.is_connected:
    try:
        esp.connect_AP(secrets["ssid"], secrets["password"])
    except OSError as e:
        print("could not connect to AP, retrying: ", e)
        continue
print("Connected to", esp.ap_info.ssid, "\tRSSI:", esp.ap_info.rssi)
print("My IP address is", esp.ipv4_address)
print(
    "IP lookup adafruit.com: %s" %
    esp.pretty_ip(esp.get_host_by_name("adafruit.com"))
)
print("Ping google.com: %d ms" % esp.ping("google.com"))

# esp._debug = True
print("Fetching text from", TEXT_URL)
r = requests.get(TEXT_URL)
print("-" * 40)
print(r.text)
print("-" * 40)
r.close()

print()
print("Fetching json from", JSON_URL)
r = requests.get(JSON_URL)
print("-" * 40)
print(r.json())
print("-" * 40)
r.close()

print("Done!")

```

And save it to your board, with the name **code.py**.

Don't forget you'll also need to create the **settings.toml** file as seen above, with your WiFi ssid and password.

In a serial console, you should see something like the following. For more information about connecting with a serial console, view the guide [Connecting to the Serial Console \(https://adafru.it/Bec\)](https://adafru.it/Bec).

```
COM61 - PuTTY
ESP32 SPI webclient test
ESP32 found and in idle mode
Firmware vers. bytearray(b'1.2.2\x00')
MAC addr: ['0x1', '0x5c', '0xd', '0x33', '0x4f', '0xc4']
MicroPython-d45f8a          RSSI: -44
adafruit_tw                 RSSI: -63
FIOS-QOGLB                  RSSI: -63
adafruit                    RSSI: -71
AP819                       RSSI: -73
FIOS-K57GI                  RSSI: -74
AP819                       RSSI: -77
linksys_SES_2868            RSSI: -79
linksys_SES_2868            RSSI: -79
FIOS-K57GI                  RSSI: -83
Connecting to AP...
Connected to adafruit        RSSI: -65
My IP address is 10.0.1.54
IP lookup adafruit.com: 104.20.38.240
Ping google.com: 30 ms
Fetching text from http://wifitest.adafruit.com/testwifi/index.html
-----
This is a test of the CC3000 module!
If you can read this, its working :)
-----
Fetching json from http://api.coindesk.com/v1/bpi/currentprice/USD.json
-----
{'time': {'updated': 'Feb 27, 2019 03:11:00 UTC', 'updatedISO': '2019-02-27T03:11:00+00:00', 'updateduk': 'Feb 27, 2019 at 03:11 GMT'}, 'disclaimer': 'This data was produced from the CoinDesk Bitcoin Price Index (USD). Non-USD currency data converted using hourly conversion rate from openexchangerates.org', 'bpi': {'USD': {'code': 'USD', 'description': 'United States Dollar', 'rate_float': 3832.74, 'rate': '3,832.7417'}}}
-----
Done!
```

In order, the example code...

Initializes the ESP32 over SPI using the SPI port and 3 control pins:

```
esp32_cs = DigitalInOut(board.ESP_CS)
esp32_ready = DigitalInOut(board.ESP_BUSY)
esp32_reset = DigitalInOut(board.ESP_RESET)

#...

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

Gets the socket pool and the SSL context, and then tells the `adafruit_requests` library about them.

```
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)
```

Verifies an ESP32 is found, checks the firmware and MAC address

```
if esp.status == adafruit_esp32spi.WL_IDLE_STATUS:
    print("ESP32 found and in idle mode")
    print("Firmware vers.", esp.firmware_version)
    print("MAC addr:", [hex(i) for i in esp.MAC_address])
```

Performs a scan of all access points it can see and prints out the name and signal strength:

```
for ap in esp.scan_networks():
    print("\t%s\t\tRSSI: %d" % (str(ap['ssid'], 'utf-8'), ap['rssi']))
```

Connects to the AP we've defined here, then prints out the local IP address, attempts to do a domain name lookup and ping google.com to check network connectivity (note sometimes the ping fails or takes a while, this isn't a big deal)

```
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)
print("My IP address is", esp.pretty_ip(esp.ip_address))
print(
    "IP lookup adafruit.com: %s" %
    esp.pretty_ip(esp.get_host_by_name("adafruit.com"))
```

OK now we're getting to the really interesting part. With a SAMD51 or other large-RAM (well, over 32 KB) device, we can do a lot of neat tricks. Like for example we can implement an interface a lot like [requests](https://adafru.it/E9o) (<https://adafru.it/E9o>) - which makes getting data really really easy

To read in all the text from a web URL call `requests.get` - you can pass in `https` URLs for SSL connectivity

```
TEXT_URL = "http://wifitest.adafruit.com/testwifi/index.html"
print("Fetching text from", TEXT_URL)
r = requests.get(TEXT_URL)
print('- '*40)
print(r.text)
print('- '*40)
r.close()
```

Or, if the data is in structured JSON, you can get the json pre-parsed into a Python dictionary that can be easily queried or traversed. (Again, only for nRF52840, M4 and other high-RAM boards)

```
JSON_URL = "http://api.coindesk.com/v1/bpi/currentprice/USD.json"
print("Fetching json from", JSON_URL)
r = requests.get(JSON_URL)
print('- '*40)
print(r.json())
print('- '*40)
r.close()
```

Requests

We've written a [requests-like \(https://adafru.it/Kpa\)](https://adafru.it/Kpa) library for web interfacing named [Adafruit_CircuitPython_Requests \(https://adafru.it/FpW\)](https://adafru.it/FpW). This library allows you to send HTTP/1.1 requests without "crafting" them and provides helpful methods for parsing the response from the server.

To use with CircuitPython, you need to first install a few libraries, into the lib folder on your **CIRCUITPY** drive. Then you need to update **code.py** with the example script.

Thankfully, we can do this in one go. In the example below, click the **Download Project Bundle** button below to download the necessary libraries and the **code.py** file in a zip file. Extract the contents of the zip file, open the directory **examples/** and then click on the directory that matches the version of CircuitPython you're using and copy the contents of that directory to your **CIRCUITPY** drive.

Your **CIRCUITPY** drive should now look similar to the following image:

CIRCUITPY

Temporarily unable to load content:

The code first sets up the ESP32SPI interface. Then, it initializes a **request** object using an ESP32 **socket** and the **esp** object.

```
import board
import busio
from digitalio import DigitalInOut
import adafruit_esp32spi.adafruit_esp32spi_socket as socket
from adafruit_esp32spi import adafruit_esp32spi
import adafruit_connection_manager
import adafruit_requests as requests

# 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(b'MY_SSID_NAME', b'MY_SSID_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)
```

```
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)
```

HTTP GET with Requests

The code makes a HTTP GET request to Adafruit's WiFi testing website - <http://wifitest.adafruit.com/testwifi/index.html> (<https://adafru.it/Fp->).

To do this, we'll pass the URL into `requests.get()`. We're also going to save the response from the server into a variable named `response`.

Having requested data from the server, we'd now like to see what the server responded with. Since we already saved the server's `response`, we can read it back. Luckily for us, **requests automatically decodes the server's response into human-readable text**, you can read it back by calling `response.text`.

Lastly, we'll perform a bit of cleanup by calling `response.close()`. This closes, deletes, and collect's the response's data.

```
print("Fetching text from %s"%TEXT_URL)
response = requests.get(TEXT_URL)
print('- '*40)

print("Text Response: ", response.text)
print('- '*40)
response.close()
```

While some servers respond with text, some respond with json-formatted data consisting of attribute–value pairs.

CircuitPython_Requests can convert a **JSON**-formatted response from a server into a CPython `dict` object.

We can also fetch and parse **json** data. We'll send a HTTP get to a url we know returns a json-formatted response (instead of text data).

Then, the code calls `response.json()` to convert the response to a CPython `dict`.

```
print("Fetching JSON data from %s"%JSON_GET_URL)
response = requests.get(JSON_GET_URL)
print('- '*40)

print("JSON Response: ", response.json())
print('- '*40)
response.close()
```

HTTP POST with Requests

Requests can also **POST** data to a server by calling the `requests.post` method, passing it a `data` value.

```
data = '31F'
print("POSTing data to {0}: {1}".format(JSON_POST_URL, data))
response = requests.post(JSON_POST_URL, data=data)
print('-'*40)

json_resp = response.json()
# Parse out the 'data' key from json_resp dict.
print("Data received from server:", json_resp['data'])
print('-'*40)
response.close()
```

You can also post json-formatted data to a server by passing `json_data` into the `requests.post` method.

```
json_data = {"Date" : "July 25, 2019"}
print("POSTing data to {0}: {1}".format(JSON_POST_URL, json_data))
response = requests.post(JSON_POST_URL, json=json_data)
print('-'*40)

json_resp = response.json()
# Parse out the 'json' key from json_resp dict.
print("JSON Data received from server:", json_resp['json'])
print('-'*40)
response.close()
```

Advanced Requests Usage

Want to send custom HTTP headers, parse the response as raw bytes, or handle a response's http status code in your CircuitPython code?

We've written an example to show advanced usage of the requests module below.

To use with CircuitPython, you need to first install a few libraries, into the lib folder on your **CIRCUITPY** drive. Then you need to update `code.py` with the example script.

Thankfully, we can do this in one go. In the example below, click the **Download Project Bundle** button below to download the necessary libraries and the `code.py` file in a zip file. Extract the contents of the zip file, open the directory `examples/` and then click on the directory that matches the version of CircuitPython you're using and copy the contents of that directory to your **CIRCUITPY** drive.

Your **CIRCUITPY** drive should now look similar to the following image:

CIRCUITPY

Temporarily unable to load content:

WiFi Manager

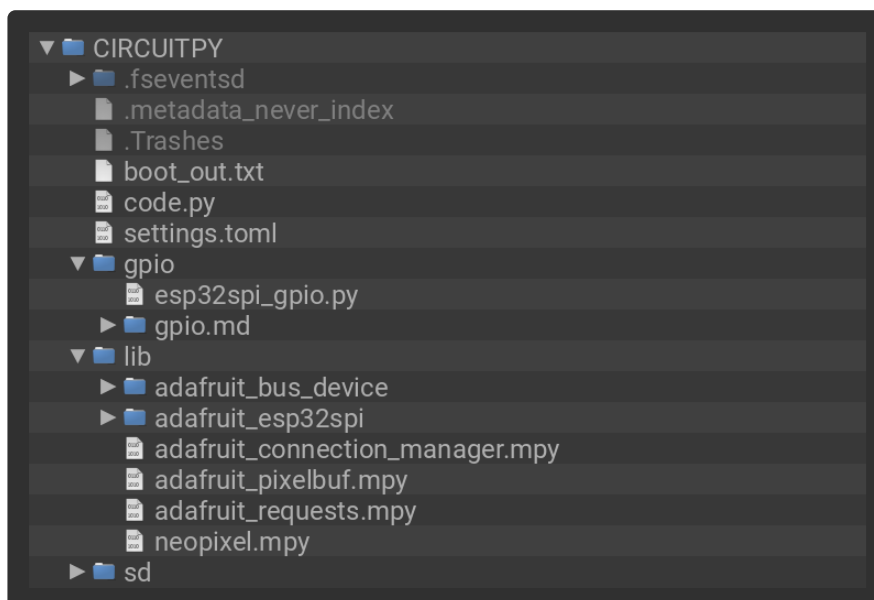
That simplest example works but it's a little finicky - you need to constantly check WiFi status and have many loops to manage connections and disconnections. For more advanced uses, we recommend using the WiFiManager object. It will wrap the connection/status/requests loop for you - reconnecting if WiFi drops, resetting the ESP32 if it gets into a bad state, etc.

Here's a more advanced example that shows the WiFi manager and also how to POST data with some extra headers:

To use with CircuitPython, you need to first install a few libraries, into the lib folder on your **CIRCUITPY** drive. Then you need to update **code.py** with the example script.

Thankfully, we can do this in one go. In the example below, click the **Download Project Bundle** button below to download the necessary libraries and the **code.py** file in a zip file. Extract the contents of the zip file, open the directory **examples/** and then click on the directory that matches the version of CircuitPython you're using and copy the contents of that directory to your **CIRCUITPY** drive.

Your **CIRCUITPY** drive should now look similar to the following image:



```
# SPDX-FileCopyrightText: 2019 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

import time
from os import getenv
import board
import busio
from digitalio import DigitalInOut
```

```

import neopixel
from adafruit_esp32spi import adafruit_esp32spi
from adafruit_esp32spi import adafruit_esp32spi_wifimanager

print("ESP32 SPI webclient test")

# Get wifi details and more from a settings.toml file
# tokens used by this Demo: CIRCUITPY_WIFI_SSID, CIRCUITPY_WIFI_PASSWORD
#                               CIRCUITPY_AIO_USERNAME, CIRCUITPY_AIO_KEY
secrets = {}
for token in ["ssid", "password"]:
    if getenv("CIRCUITPY_WIFI_" + token.upper()):
        secrets[token] = getenv("CIRCUITPY_WIFI_" + token.upper())
for token in ["aio_username", "aio_key"]:
    if getenv("CIRCUITPY_" + token.upper()):
        secrets[token] = getenv("CIRCUITPY_" + token.upper())

if not secrets:
    try:
        # Fallback on secrets.py until depreciation is over and option is removed
        # from secrets import secrets
    except ImportError:
        print("WiFi secrets are kept in settings.toml, 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)

# Secondary (SCK1) SPI used to connect to WiFi board on Arduino Nano Connect RP2040
if "SCK1" in dir(board):
    spi = busio.SPI(board.SCK1, board.MOSI1, board.MISO1)
else:
    spi = busio.SPI(board.SCK, board.MOSI, board.MISO)
esp = adafruit_esp32spi.ESP_SPIcontrol(spi, esp32_cs, esp32_ready, esp32_reset)
"""Use below for Most Boards"""
status_light = neopixel.NeoPixel(board.NEOPIXEL, 1, brightness=0.2)
"""Uncomment below for ItsyBitsy M4"""
# status_light = dotstar.DotStar(board.APA102_SCK, board.APA102_MOSI, 1,
# brightness=0.2)
"""Uncomment below for an externally defined RGB LED (including Arduino Nano
Connect)"""
# import adafruit_rgbled
# from adafruit_esp32spi import PWMOut
# RED_LED = PWMOut.PWMOut(esp, 26)
# GREEN_LED = PWMOut.PWMOut(esp, 27)
# BLUE_LED = PWMOut.PWMOut(esp, 25)
# status_light = adafruit_rgbled.RGBLED(RED_LED, BLUE_LED, GREEN_LED)

wifi = adafruit_esp32spi_wifimanager.ESPSPI_WiFiManager(esp, secrets, status_light)

counter = 0

while True:
    try:
        print("Posting data...", end="")
        data = counter
        feed = "test"
        payload = {"value": data}
        response = wifi.post(
            "https://io.adafruit.com/api/v2/"
            + secrets["aio_username"]
            + "/feeds/"

```

```

        + feed
        + "/data",
        json=payload,
        headers={"X-AIO-KEY": secrets["aio_key"]},
    )
    print(response.json())
    response.close()
    counter = counter + 1
    print("OK")
except OSError as e:
    print("Failed to get data, retrying\n", e)
    wifi.reset()
    continue
response = None
time.sleep(15)

```

You'll note here we use a secrets.py file to manage our SSID info. The wifimanager is given the ESP32 object, secrets and a neopixel for status indication.

Note, you'll need to add a some additional information to your secrets file so that the code can query the Adafruit IO API:

- `aio_username`
- `aio_key`

You can go to your adafruit.io View AIO Key link to get those two values and add them to the secrets file, which will now look something like this:

```

# This file is where you keep secret settings, passwords, and tokens!
# If you put them in the code you risk committing that info or sharing it

secrets = {
    'ssid' : '_your_ssid_',
    'password' : '_your_wifi_password_',
    'timezone' : "America/Los_Angeles", # http://worldtimeapi.org/timezones
    'aio_username' : '_your_aio_username_',
    'aio_key' : '_your_aio_key_',
}

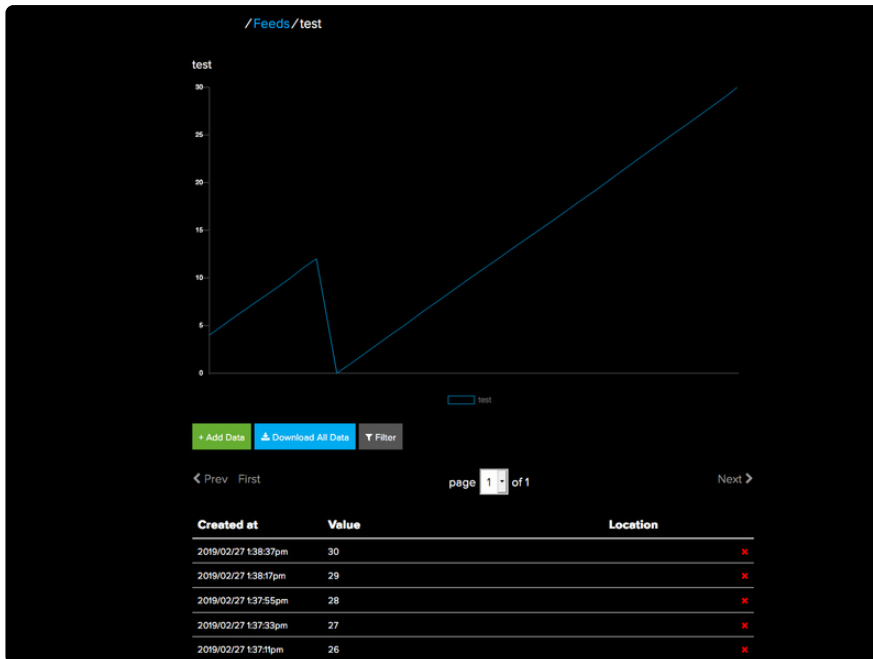
```

Next, set up an Adafruit IO feed named `test`

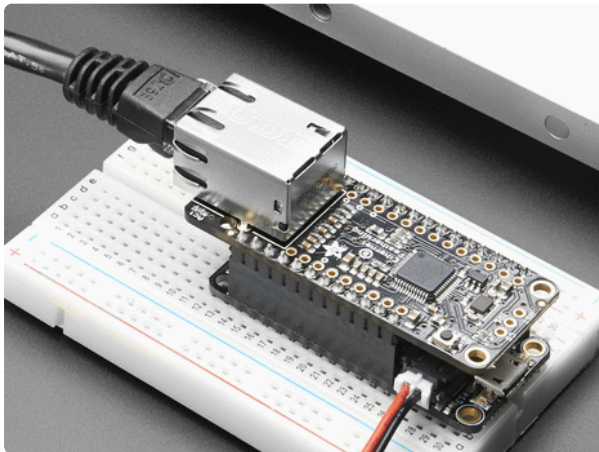
- If you do not know how to set up a feed, [follow this page and come back when you've set up a feed named `test`](https://adafru.it/f5k). (<https://adafru.it/f5k>)

We can then have a simple loop for posting data to Adafruit IO without having to deal with connecting or initializing the hardware!

Take a look at your `test` feed on Adafruit.io and you'll see the value increase each time the CircuitPython board posts data to it!



For more information on the basics of doing networking in CircuitPython, see this guide:



Networking in CircuitPython

By Anne Barela

<https://learn.adafruit.com/networking-in-circuitpython>

OLD - CircuitPython WiFi

It's easy to use the Adafruit AirLift breakout with CircuitPython and the [Adafruit CircuitPython ESP32SPI \(https://adafru.it/DWV\)](https://adafru.it/DWV) module. This module allows you to easily add WiFi to your project.

You need plenty of RAM for CircuitPython/requests/json, so the ItsyBitsy M0 will not work! Please use an Itsy with at least 100KB of RAM, like the ItsyBitsy M4!

CircuitPython Microcontroller Pinout

Since all CircuitPython-running ItsyBitsies follow the same pinout, you do not need to change any of the pins listed below.

To use the ESP32's pins, copy the following lines into your code:

```
esp32_cs = DigitalInOut(board.D13)
esp32_reset = DigitalInOut(board.D12)
esp32_ready = DigitalInOut(board.D11)
```

Then, include the following code to use the pin:

```
esp32_gpio0 = DigitalInOut(board.D10)
```

CircuitPython Installation of ESP32SPI Library

You'll need to install the [Adafruit CircuitPython ESP32SPI \(https://adafru.it/DWV\)](https://adafru.it/DWV) library on your CircuitPython board.

First make sure you are running the [latest version of Adafruit CircuitPython \(https://adafru.it/Amd\)](https://adafru.it/Amd) 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 \(https://adafru.it/uap\)](https://adafru.it/uap). Our CircuitPython starter guide has [a great page on how to install the library bundle \(https://adafru.it/ABU\)](https://adafru.it/ABU).

You can manually install the necessary libraries from the bundle:

- `adafruit_esp32spi`
- `adafruit_bus_device`

Before continuing make sure your board's lib folder or root filesystem has the `adafruit_esp32spi` and `adafruit_bus_device` folders copied over.

Next [make sure you are set up to connect to the serial console \(https://adafru.it/Bec\)](https://adafru.it/Bec)

CircuitPython Usage

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

```
import board
import busio
from digitalio import DigitalInOut

from adafruit_esp32spi import adafruit_esp32spi

print("ESP32 SPI hardware test")

esp32_cs = DigitalInOut(board.D13)
esp32_reset = DigitalInOut(board.D12)
```

```

esp32_ready = DigitalInOut(board.D11)

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

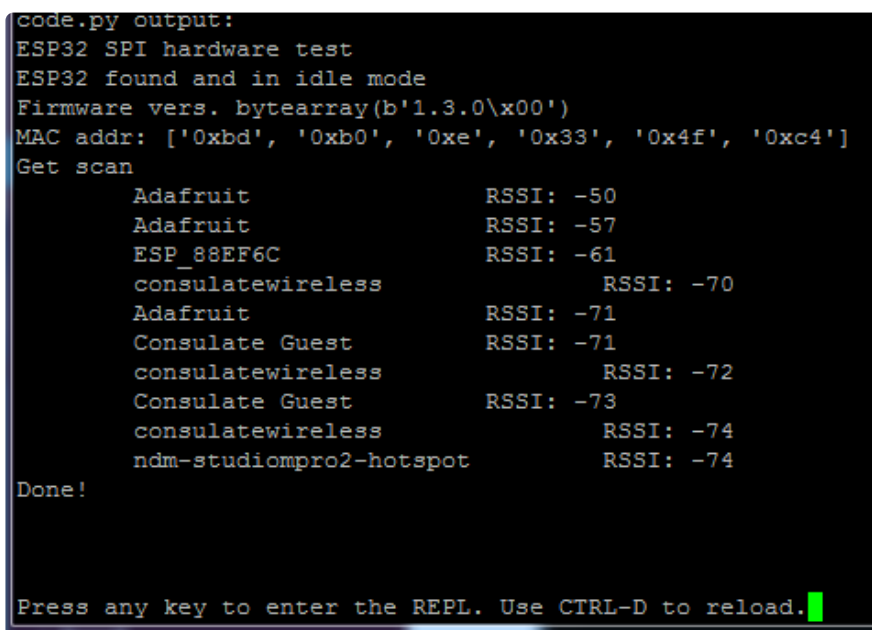
if esp.status == adafruit_esp32spi.WL_IDLE_STATUS:
    print("ESP32 found and in idle mode")
print("Firmware vers.", esp.firmware_version)
print("MAC addr:", [hex(i) for i in esp.MAC_address])

for ap in esp.scan_networks():
    print("\t%s\t\tRSSI: %d" % (str(ap['ssid'], 'utf-8'), ap['rssi']))

print("Done!")

```

[Connect to the serial console \(https://adafru.it/BIO\)](https://adafru.it/BIO) to see the output. It should look something like the following:



```

code.py output:
ESP32 SPI hardware test
ESP32 found and in idle mode
Firmware vers. bytearray(b'1.3.0\x00')
MAC addr: ['0xbd', '0xb0', '0xe', '0x33', '0x4f', '0xc4']
Get scan
  Adafruit          RSSI: -50
  Adafruit          RSSI: -57
  ESP_88EF6C        RSSI: -61
  consulatewireless RSSI: -70
  Adafruit          RSSI: -71
  Consulate Guest   RSSI: -71
  consulatewireless RSSI: -72
  Consulate Guest   RSSI: -73
  consulatewireless RSSI: -74
  ndm-studiopro2-hotspot RSSI: -74
Done!
Press any key to enter the REPL. Use CTRL-D to reload.

```

Make sure you see the same output! If you don't, check your wiring. Note that we've changed the pinout in the code example above to reflect the CircuitPython Microcontroller Pinout at the top of this page.

Once you've succeeded, continue onto the next page!

If you can read the Firmware and MAC address but fails on scanning SSIDs, check your power supply, you may be running out of juice to the ESP32 and it's resetting

CircuitPython BLE

CircuitPython BLE UART Example

It's easy to use Adafruit AirLift ESP32 co-processor boards for Bluetooth Low Energy (BLE) with CircuitPython. When you reset the ESP32, you can put it in WiFi mode (the default), or in BLE mode; you cannot use both modes simultaneously.

Here's a simple example of using BLE to connect CircuitPython with the Bluefruit Connect app. Use CircuitPython 6.0.0 or later.

Note: Don't confuse the **ESP32** with the **ESP32-S2**, which is a different module with a similar name. The ESP32-S2 does not support BLE.

Currently, AirLift BLE support is not currently available on boards with Espressif chips. If the Espressif board provides `_bleio`, it is for native BLE support (e.g. ESP32-S3), not AirLift.

Currently the AirLift support for CircuitPython only provides BLE peripheral support. BLE central is under development. So you cannot connect to BLE devices like Heart Rate monitors, etc., but you can act as a BLE peripheral yourself.

Adafruit Airlift Bitsy ESP32 Add-On Wiring

If you have an **Adafruit Airlift Bitsy ESP32 Add-On**, you will need to solder three jumpers closed on the bottom side of the board to enable BLE. The rest of the ESP32 pins you need are already jumpered to certain ItsyBitsy pins.

Update the AirLift Firmware

You will need to update the AirLift's firmware to at least version 1.7.1. **Previous versions of the AirLift firmware do not support BLE.**

Follow the instructions in the guide below, and come back to this page when you've upgraded the AirLift's firmware:

**Upgrade External ESP32 AirLift
Firmware**

<https://adafru.it/RdC>

Ensure the AirLift firmware is version 1.7.1 or higher for BLE to work.

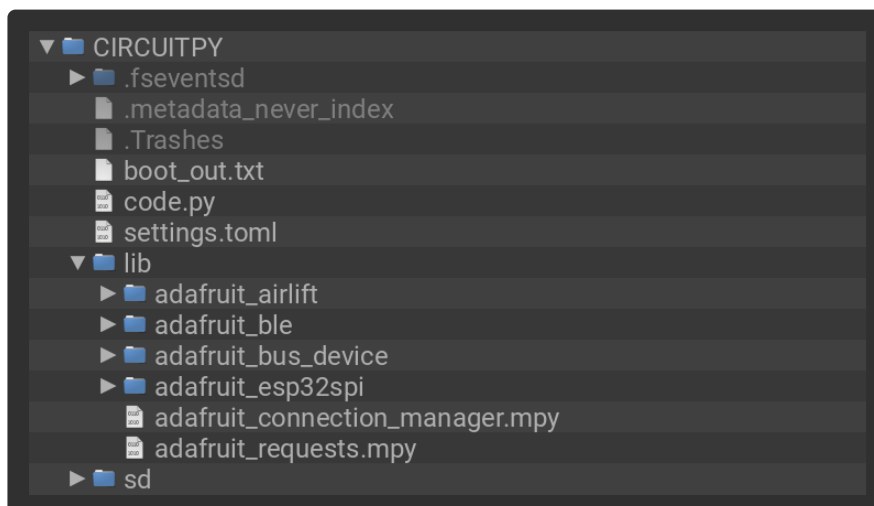
Install CircuitPython Libraries

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

Next you'll need to install the necessary libraries to use the hardware. Thankfully, we can do this in one go. In the example below, click the **Download Project Bundle** button below to download the necessary libraries and the **code.py** file in a zip file. Extract the contents of the zip file, and copy the **entire lib folder** and the **code.py** file to your **CIRCUITPY** drive.

Your **CIRCUITPY/lib** folder should contain the following folders and files:

- /adafruit_airlift
- /adafruit_ble
- /adafruit_bus_device
- /adafruit_esp32spi
- adafruit_requests.mpy



Install the Adafruit Bluefruit LE Connect App

The Adafruit Bluefruit LE Connect iOS and Android apps allow you to connect to BLE peripherals that provide a over-the-air "UART" service. Follow the instructions in the [Bluefruit LE Connect Guide \(https://adafru.it/Eg5\)](https://adafru.it/Eg5) to download and install the app on your phone or tablet.

BLE Example

TAKE NOTE: Adjust the program as needed to suit the AirLift board you have. Comment and uncomment lines 19-55 below as necessary.

```
# SPDX-FileCopyrightText: 2020 Dan Halbert, written for Adafruit Industries
#
# SPDX-License-Identifier: Unlicense

# pylint: disable=unused-import
import board
import busio
from digitalio import DigitalInOut
from adafruit_ble import BLERadio
from adafruit_ble.advertising.standard import ProvideServicesAdvertisement
from adafruit_ble.services.nordic import UARTService
from adafruit_esp32spi import adafruit_esp32spi
from adafruit_airlift.esp32 import ESP32

# If you are using a Metro M4 Airlift Lite, PyPortal,
# or MatrixPortal, you can use the default pin settings.
# Leave this DEFAULT line uncommented.
# If you are using a board with pre-defined ESP32 Pins:
esp32 = ESP32()

# If you are using a Metro M7 **OR**
# if you are using CircuitPython 6.0.0 or earlier,
# on PyPortal and PyPortal Titano only, use the pin settings
# below. Comment out the DEFAULT line above and uncomment
# the line below. For CircuitPython 6.1.0, the pin names
# have changed for these boards, and the DEFAULT line
# above is correct.
# esp32 = ESP32(tx=board.TX, rx=board.RX)

# If you are using an AirLift FeatherWing or AirLift Bitsy Add-On,
# use the pin settings below. Comment out the DEFAULT line above
# and uncomment the lines below.
# If you are using an AirLift Breakout, check that these
# choices match the wiring to your microcontroller board,
# or change them as appropriate.
# esp32 = ESP32(
#     reset=board.D12,
#     gpio0=board.D10,
#     busy=board.D11,
#     chip_select=board.D13,
#     tx=board.TX,
#     rx=board.RX,
# )

# If you are using an AirLift Shield,
# use the pin settings below. Comment out the DEFAULT line above
# and uncomment the lines below.
# esp32 = ESP32(
#     reset=board.D5,
#     gpio0=board.D6,
#     busy=board.D7,
#     chip_select=board.D10,
#     tx=board.TX,
#     rx=board.RX,
# )
```

```

adapter = esp32.start_bluetooth()

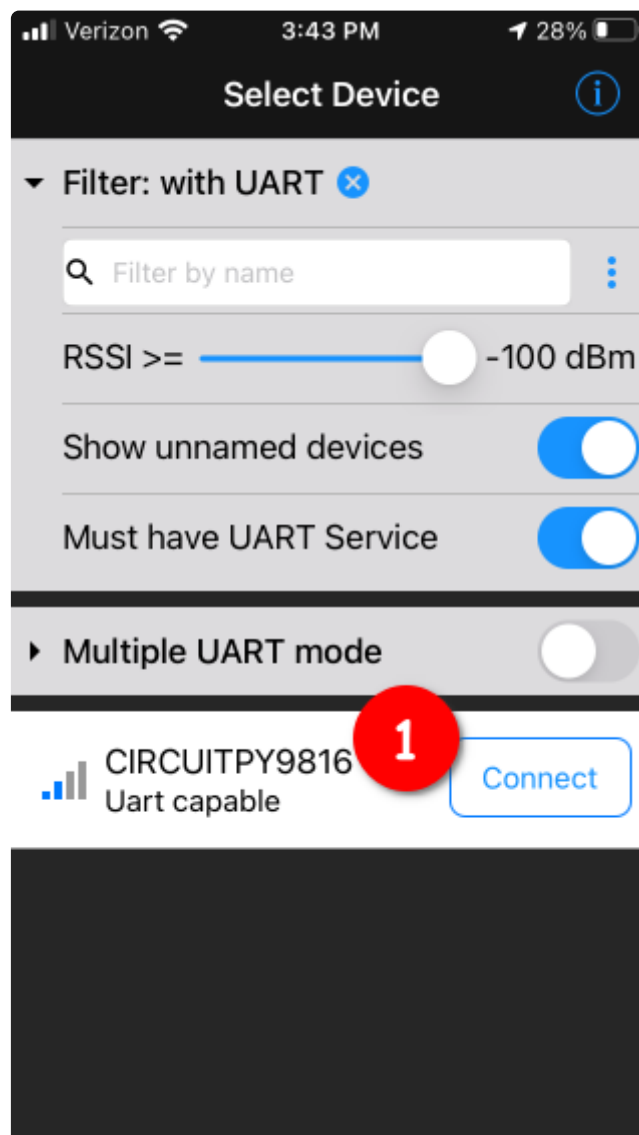
ble = BLERadio(adapter)
uart = UARTService()
advertisement = ProvideServicesAdvertisement(uart)

while True:
    ble.start_advertising(advertisement)
    print("waiting to connect")
    while not ble.connected:
        pass
    print("connected: trying to read input")
    while ble.connected:
        # Returns b'' if nothing was read.
        one_byte = uart.read(1)
        if one_byte:
            print(one_byte)
            uart.write(one_byte)

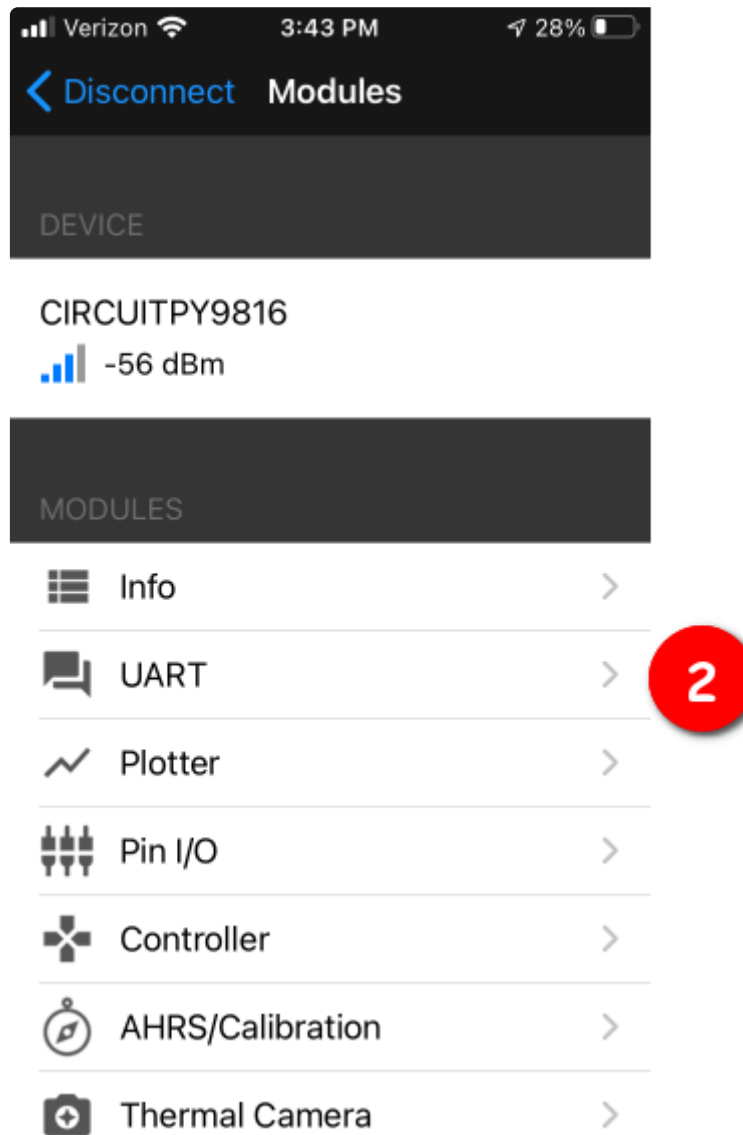
```

Talk to the AirLift via the Bluefruit LE Connect App

Start the Bluefruit LE Connect App on your phone or tablet. You should see a CIRCUITPY device available to connect to. Tap the Connect button (1):



You'll then see a list of Bluefruit Connect functions ("modules"). Choose the UART module (2):



On the UART module page, you can type a string and press Send (3). You'll see that string entered, and then see it echoed back (echoing is in gray).



Arduino WiFi

You can use the AirLift with Arduino. Unlike CircuitPython, it work work with most of the Arduino compatible ItsyBitsies, even the **3V** ItsyBitsy 32u4. However, if you want to use libraries like ArduinoJSON or add sensors and SD card, you'll really want an ATSAM21 (Cortex M0) or ATSAM51 (Cortex M4), both of which have plenty or RAM

Library Install

We're using a variant of the Arduino WiFinINA library, which is amazing and written by the Arduino team! **The official WiFi101 library won't work because it doesn't support the ability to change the pins.**

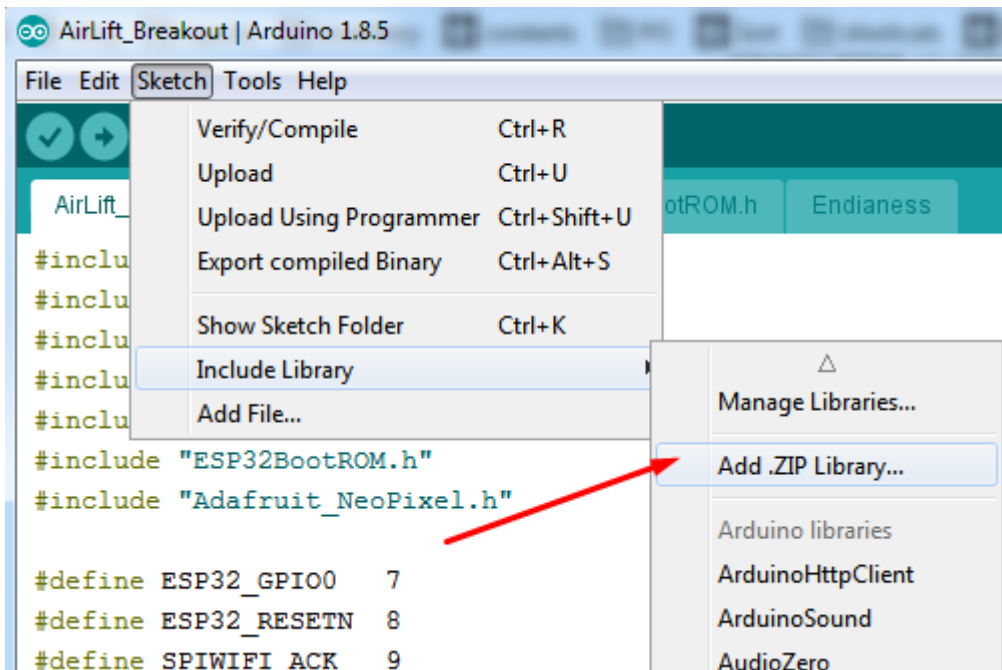
So! We made a fork that you can install.

Click here to download the library:

Download Adafruit's version of WiFiNINA

<https://adafru.it/Evm>

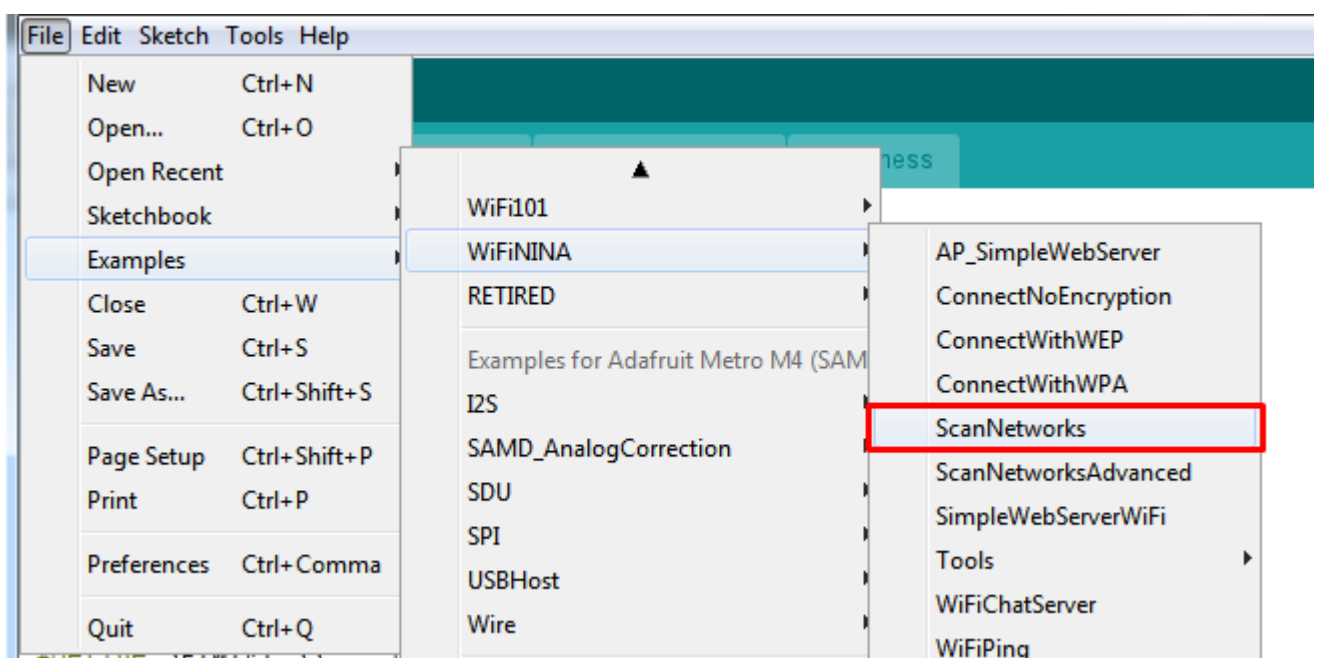
Within the Arduino IDE, select **Install library from ZIP...**



First Test

OK now you have it wired and library installed, time to test it out!

Lets start by scanning the local networks. Load up the **ScanNetworks** example



adafru.it/EVU

(<https://>

At the top you'll see a section where the GPIO pins are defined

```
// Configure the pins used for the ESP32 connection
#define SPIWIFI      SPI    // The SPI port
#define SPIWIFI_SS   10    // Chip select pin
#define SPIWIFI_ACK   7    // a.k.a BUSY or READY pin
#define ESP32_RESETN 5     // Reset pin
#define ESP32_GPIO0  -1    // Not connected
```

(<https://adafru.it/EVv>)

If you don't see this, you may have the wrong WiFiNINA library installed. Uninstall it and re-install the Adafruit one as above.

Compile and upload to your board wired up to the AirLift

```
WiFi Scanning test
MAC: C4:4F:33:0E:B0:BD
Scanning available networks...
** Scan Networks **
number of available networks:10
0) Adafruit      Signal: -56 dBm Encryption: WPA2
1) Consulate Guest  Signal: -59 dBm Encryption: WPA2
2) consulatewireless  Signal: -60 dBm Encryption: WPA2
3) Adafruit      Signal: -66 dBm Encryption: WPA2
4) consulatewireless  Signal: -67 dBm Encryption: WPA2
5) Consulate Guest  Signal: -69 dBm Encryption: WPA2
6) Adafruit      Signal: -69 dBm Encryption: WPA2
7) Consulate Guest  Signal: -71 dBm Encryption: WPA2
8) consulatewireless  Signal: -72 dBm Encryption: WPA2
9) ESP_88EF6C     Signal: -75 dBm Encryption: None
```

(<https://>

adafru.it/EVw)

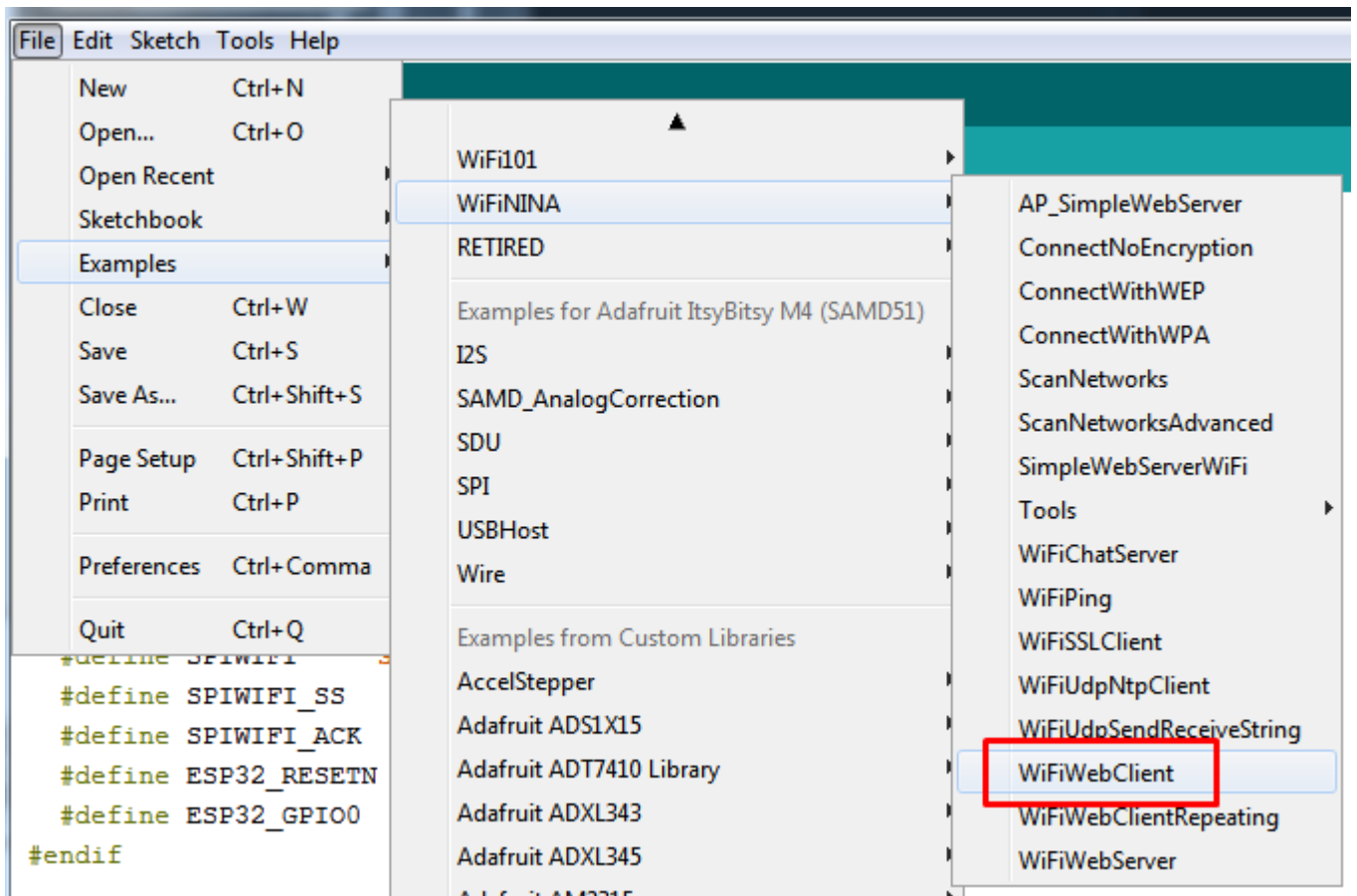
If you don't even get the MAC address printed out, check your wiring.

If you get the MAC address but cannot scan any networks, check your power supply. You need a solid 3.3V into **Vin** in order for the ESP32 not to brown out.

WiFi Connection Test

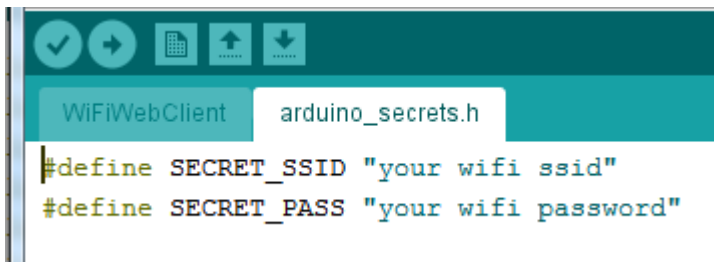
Now that you have your wiring checked, time to connect to the Internet!

Open up the **WiFiWebClient** example



adafru.it/EVx

Open up the secondary tab, `arduino_secrets.h`. This is where you will store private data like the SSID/password to your network.



<https://adafru.it/EVy>

You must change these string values before updating to your board!

After you've set it correctly, upload and check the serial monitor. You should see the following. If not, go back, check wiring, power and your SSID/password

```
Found firmware 1.3.0
Attempting to connect to SSID: Adafruit
Connected to wifi
SSID: Adafruit
IP Address: 10.0.1.179
signal strength (RSSI):-44 dBm

Starting connection to server...
connected to server
HTTP/1.1 200 OK
Server: nginx/1.10.3 (Ubuntu)
Date: Wed, 10 Apr 2019 20:55:51 GMT
Content-Type: text/html
Content-Length: 73
Last-Modified: Thu, 16 Feb 2017 17:42:29 GMT
Connection: close
ETag: "58a5e485-49"
Accept-Ranges: bytes

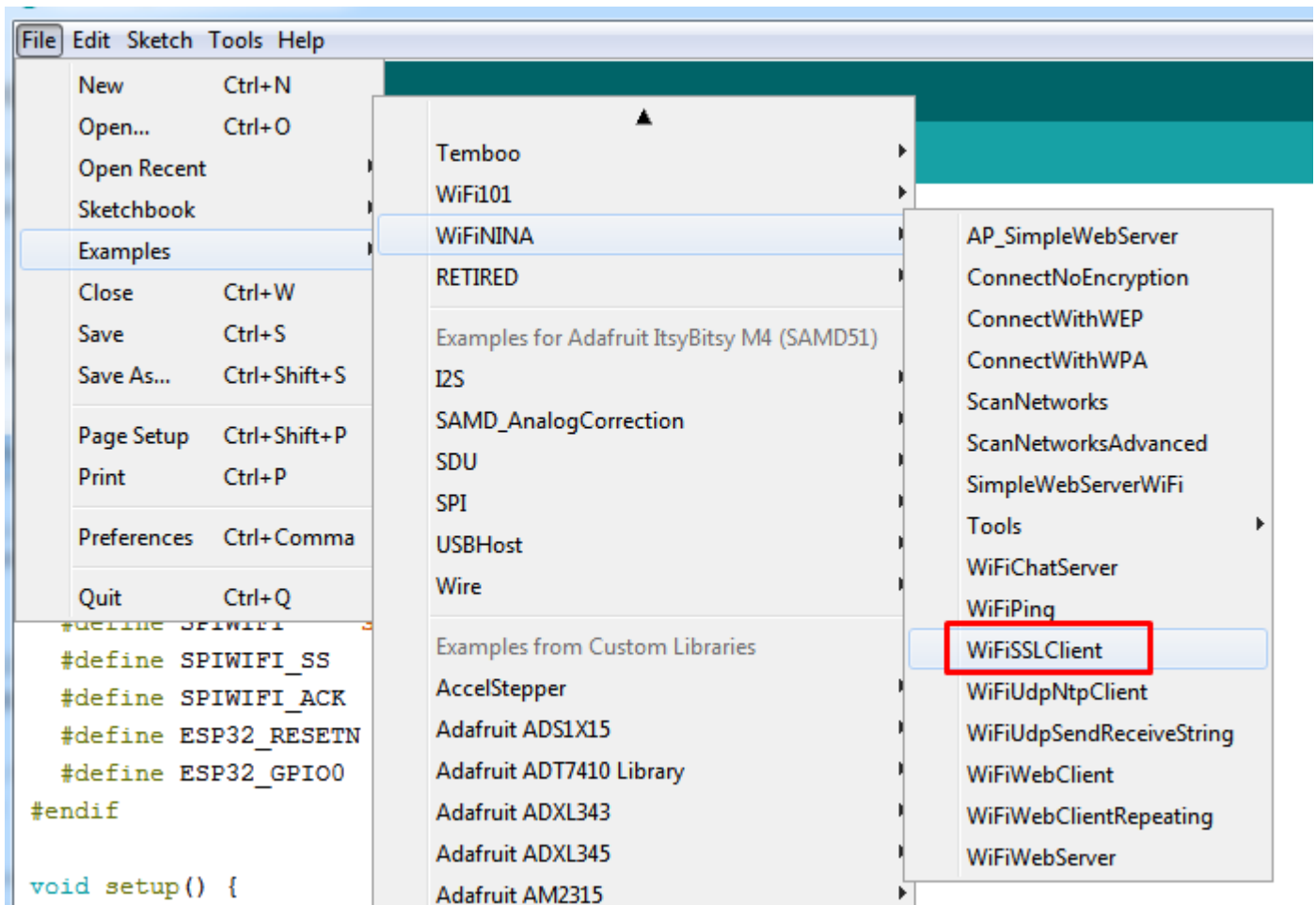
This is a test of the CC3000 module!
If you can read this, its working :)
disconnecting from server.
```

[\(https://adafru.it/](https://adafru.it/)

[EVz\)](#)

Secure Connection Example

Many servers today do not allow non-SSL connectivity. Lucky for you the ESP32 has a great TLS/SSL stack so you can have that all taken care of for you. Here's an example of a secure WiFi connection:



adafru.it/EVA

Note we use `WiFiSSLClient client;` instead of `WiFiClient client;` to require an SSL connection!

```
COM161 (Adafruit ItsyBitsy M4 (SAMD51))

Attempting to connect to SSID: Adafruit
Connected to wifi
SSID: Adafruit
IP Address: 10.0.1.179
signal strength (RSSI):-52 dBm

Starting connection to server...
connected to server
HTTP/1.1 200 OK
cache-control: must-revalidate, max-age=600
content-disposition: attachment; filename=json.json
content-type: application/json;charset=utf-8
expires: Wed, 10 Apr 2019 21:17:24 GMT
last-modified: Wed, 10 Apr 2019 21:07:24 GMT
strict-transport-security: max-age=631138519
timing-Allow-Origin: *
x-connection-hash: ab527136393fa0f3bb7779f53c657fae
x-content-type-options: nosniff
x-frame-options: SAMEORIGIN
x-response-time: 12
x-xss-protection: 1; mode=block; report=https://twitter.com/i/xss_report
Content-Length: 197
Accept-Ranges: bytes
Date: Wed, 10 Apr 2019 21:07:24 GMT
Via: 1.1 varnish
Age: 0
Connection: close
X-Served-By: cache-bwi5023-BWI
X-Cache: MISS
X-Timer: S1554930445.534696,VS0,VE25
Vary: Accept-Encoding

[{"following":false,"id":"20731304","screen_name":"adafruit","name":"adafruit industries
disconnecting from server.
Read 959 bytes
```

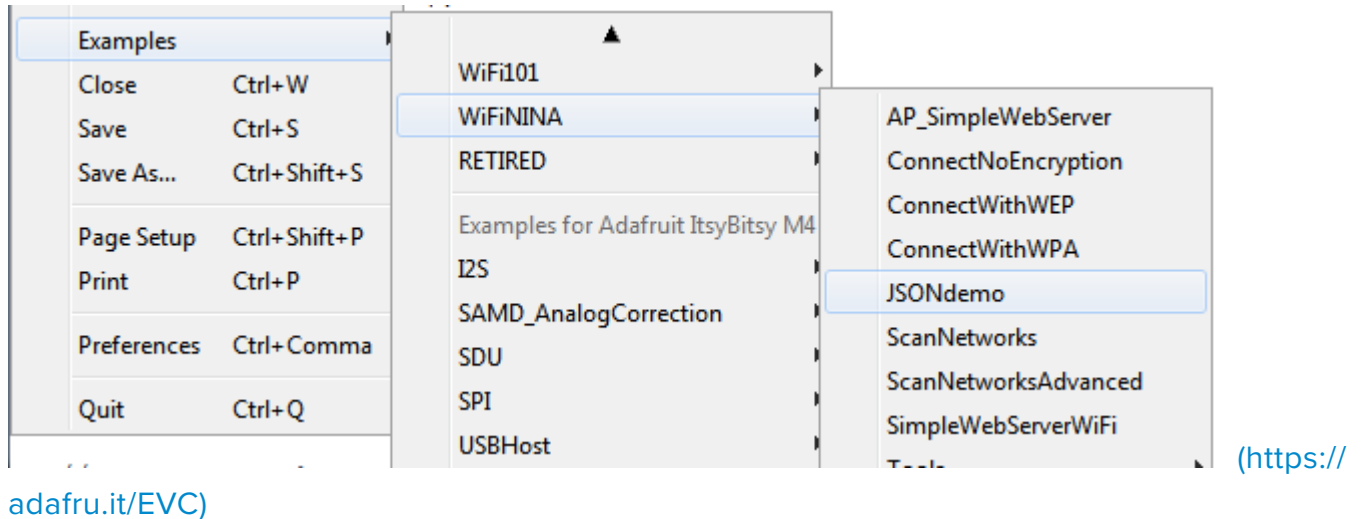
adafru.it/EVB)

JSON Parsing Demo

This example is a little more advanced - many sites will have API's that give you JSON data. We'll use [ArduinoJSON](https://adafru.it/Evn) (https://adafru.it/Evn) to convert that to a format we can use and then display that data on the serial port (which can then be re-directed to a display of some sort)

First up, [use the Library manager to install ArduinoJSON](https://adafru.it/Evo) (https://adafru.it/Evo).

Then load the example **JSONdemo**



By default it will connect to the Twitter banner image API, parse the username and followers and display them.

```
Attempting to connect to SSID: Adafruit
Connected to wifi
SSID: Adafruit
IP Address: 10.0.1.179
signal strength (RSSI):-51 dBm

Starting connection to server...
connected to server
Response:
Twitter username: adafruit
Twitter followers: 159265
```

(https://adafru.it/EVD)

Adapting Other Examples

Once you've got it connecting to the Internet you can check out the other examples. Most of the sketches included with the Adafruit fork of the WiFiNINA library above will have the pin mapping done for the ItsyBitsies. For other examples the only change you'll want to make is at the **top** of the sketches, add:

```
#define SPIWIFI      SPI // The SPI port
#define SPIWIFI_SS  13  // Chip select pin
#define ESP32_RESETN 12  // Reset pin
#define SPIWIFI_ACK  11  // a.k.a BUSY or READY pin
#define ESP32_GPI00 -1
```

Note: These pin definitions leave the the ESP32's **GPI00** pin undefined (-1). If you wish to use this pin - **solder the pad on the bottom of the Bitsy Add-on** and set **#define ESP32_GPI00** to the correct pin for your microcontroller. For the **ItsyBitsies** it will be **D10/10**

And then **before** you check the `status()` of the module, call the function `WiFi.setPins(SPIWIFI_SS, SPIWIFI_ACK, ESP32_RESETN, ESP32_GPI00, &SPIWIFI);`

```
// check for the WiFi module:
WiFi.setPins(SPIWIFI_SS, SPIWIFI_ACK, ESP32_RESETN, ESP32_GPI00, &SPIWIFI);
while (WiFi.status() == WL_NO_MODULE) {
  Serial.println("Communication with WiFi module failed!");
  // don't continue
  delay(1000);
}
```

Downloads

Files

- [NINA-W102 ESP32 Module Datasheet \(https://adafru.it/19kA\)](https://adafru.it/19kA)
- [EagleCAD files on GitHub \(https://adafru.it/FJZ\)](https://adafru.it/FJZ)
- [Fritzing object in Adafruit Fritzing Library \(https://adafru.it/FJ-\)](https://adafru.it/FJ-)

Schematic

