CEC Continuing Education Center

DesignNews

IoT Device Prototyping with Microchip Curiosity Development Boards

Day 4:

AVR-IoT Cellular Mini Primer

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Webinar Logistics

- Turn on your system sound to hear the streaming presentation.
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- Participate in ‘Attendee Chat’ by maximizing the chat widget in your dock.

Fred Eady

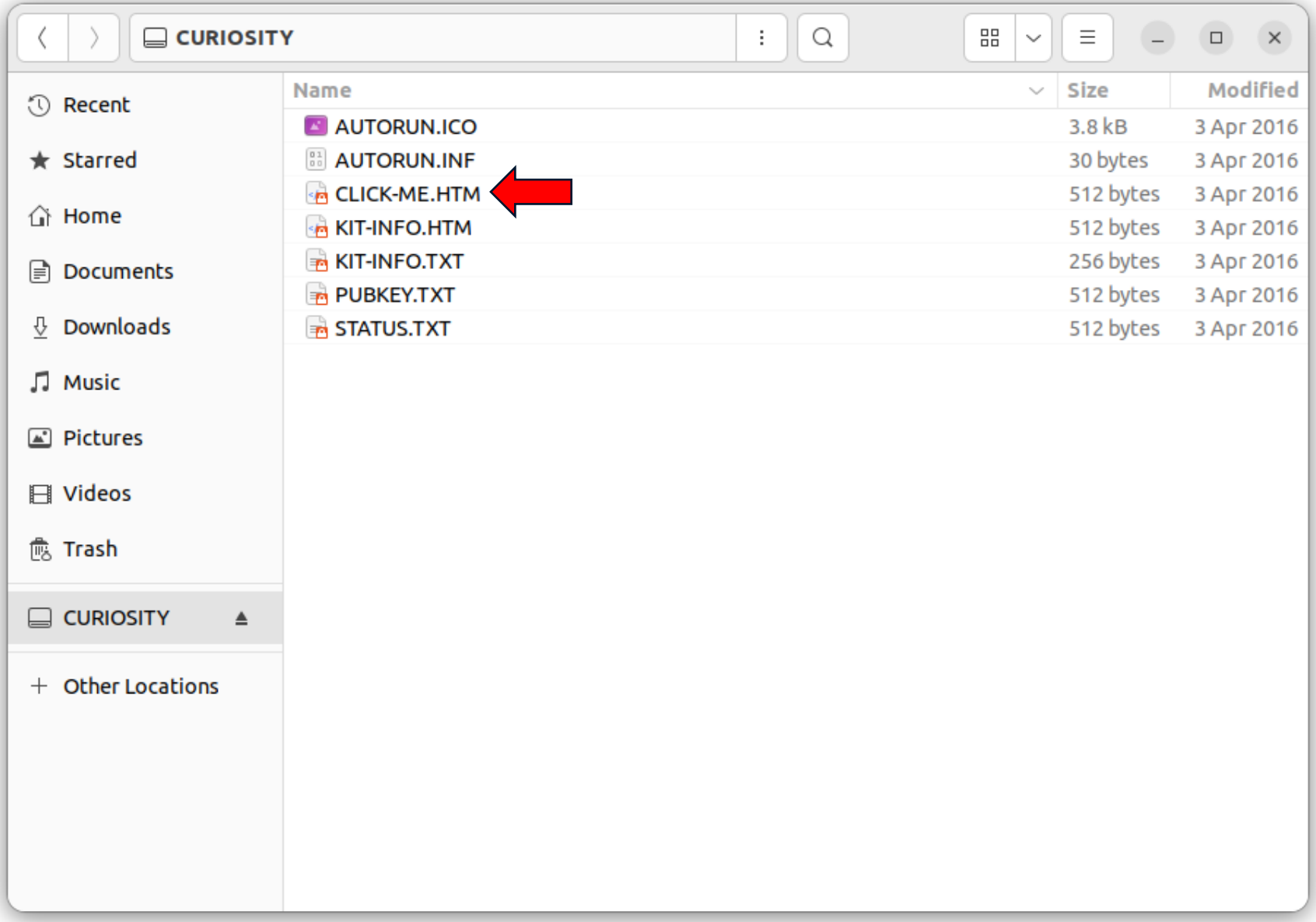
Visit ‘Lecturer Profile’ in your console for more details.

AGENDA

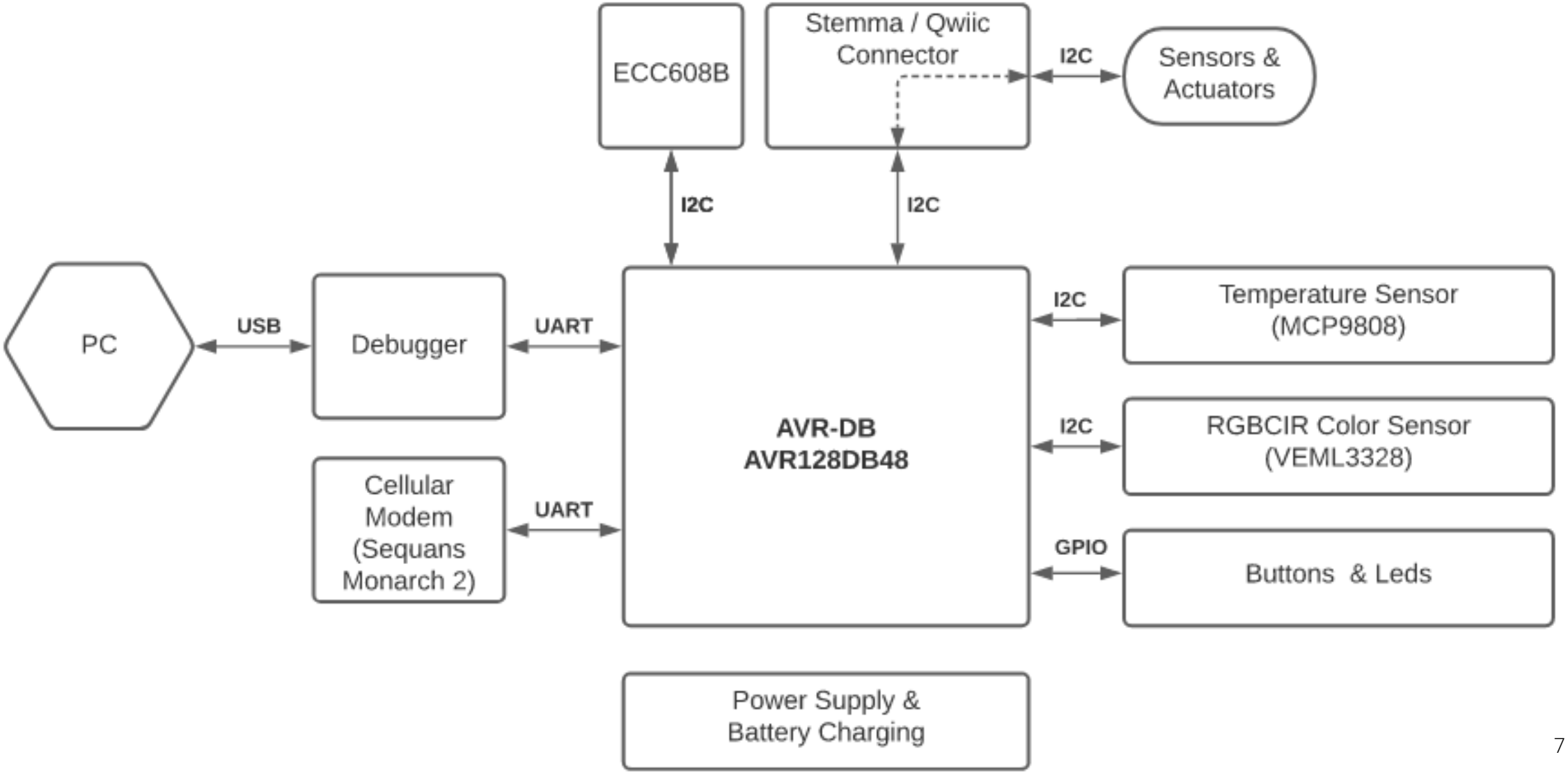
- Configure Visual Studio Code for Arduino Development
- Code an AWS MQTT Arduino Application

Possible Gotcha

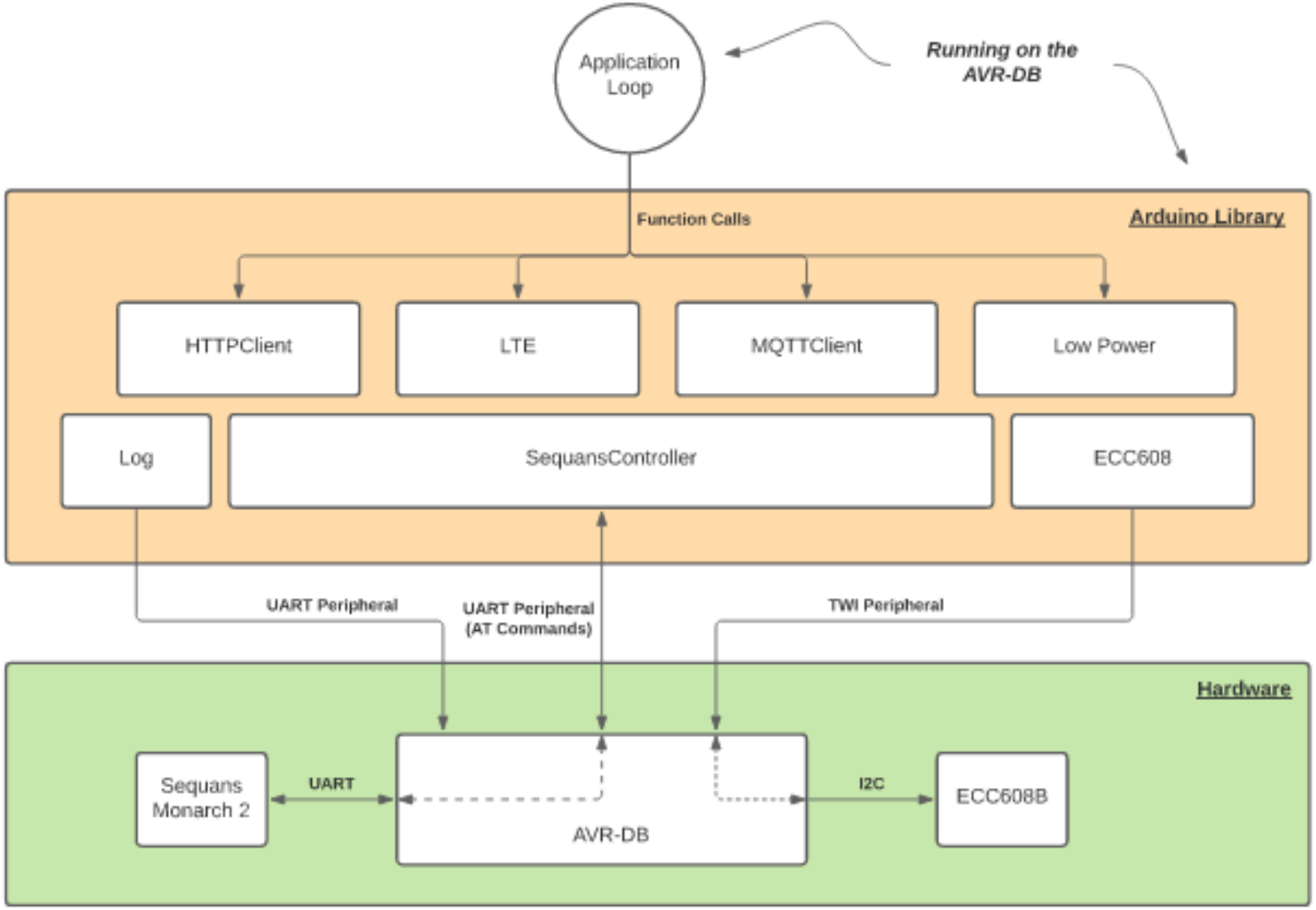
Reset Button



Hardware System Overview



Programmer's System Overview



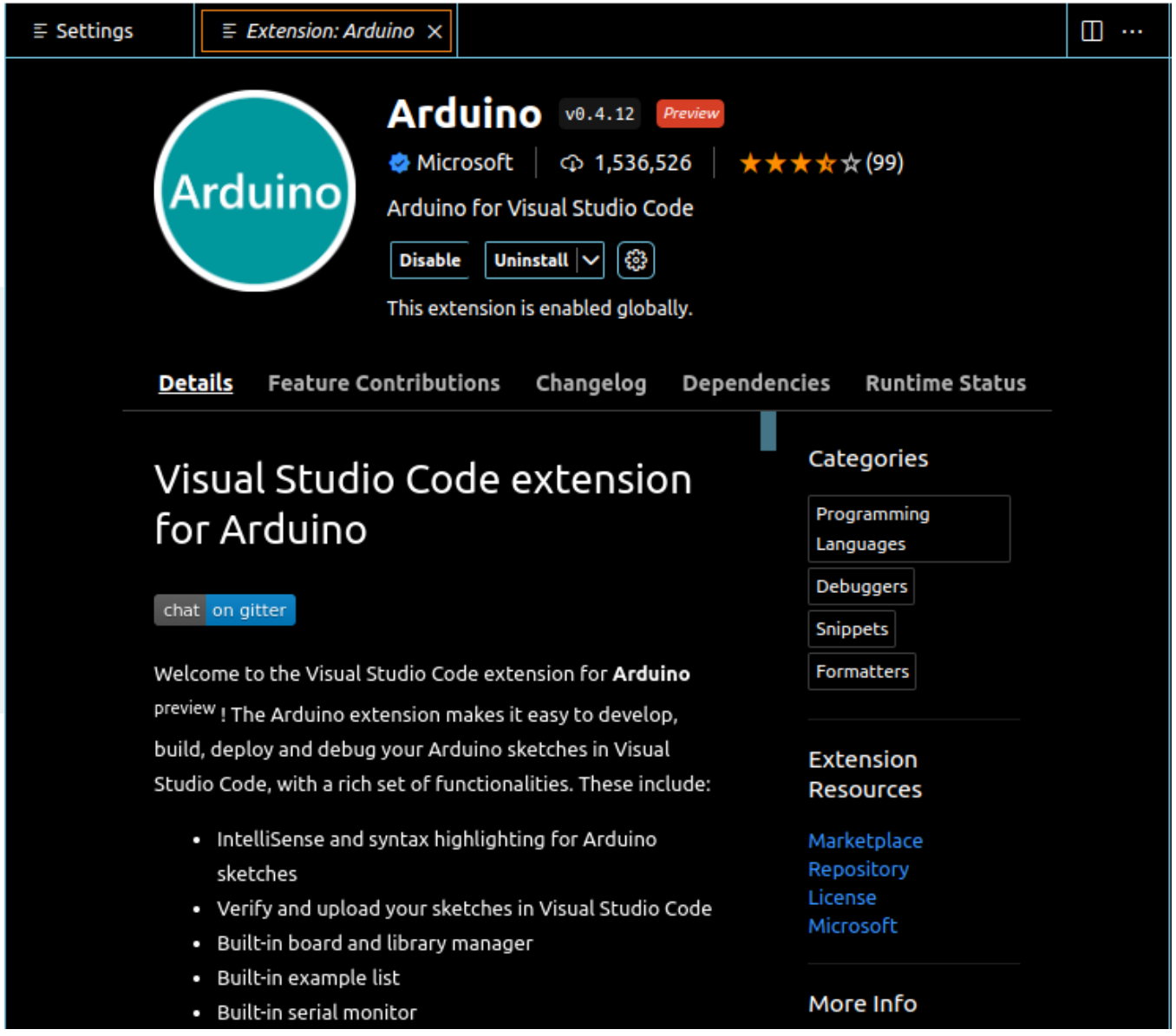
Install the Arduino Extension for Visual Studio Code

Legacy IDE (1.8.X)

Arduino IDE 1.8.19

The open-source Arduino Software (IDE) makes it easy to write and upload it to the board. This software can be used with any Arduino board.

Refer to the **Getting Started** page for Installation instructions.



Install the DxCore

DxCore by Spence Konde Version 1.4.10 **INSTALLED**

Boards included in this package:
AVR DA-series: AVR128DA28, AVR128DA32, AVR128DA48, AVR128DA64, AVR64DA28, AVR64DA32, AVR64DA48, AVR64DA64, AVR32DA28, AVR32DA32, AVR32DA48
 AVR DB-series: AVR128DB28, AVR128DB32, AVR128DB48, AVR128DB64, AVR64DB28, AVR64DB32, AVR64DB48, AVR64DB64, AVR32DB28, AVR32DB32, AVR32DB48
AVR DD-series support planned pending availability. Works with Microchip Curiosity Nano boards via the builtin USB port.
, 1.4.10: The latest critical bugfix for 1.4.x issues - this should finally make the new attachInterrupt implementation work.
 1.4.0: A HUGE update bringing the total rewrite of Wire.h with master+slave and dual mode support, major serial improvements (including half-duplex and RS485), and loads of additional features and fixes. See the documentation for the full list!, Supported UPDI programmers: SerialUPDI (serial adapter w/diode or resistor), jtag2updi, nEDBG, mEDBG, EDBG, SNAP, Atmel-ICE and PICkit4 - or use one of those to load Optiboot (included) for serial programming., DxCore 1.5.0 is not yet available, but upon release, it will be auge update adding support for the entire DD product line as well as a shedload of fixes.

More info

1.4.10 | Install | Remove

Settings

Search set

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- Application
- Security
- Extensions
  - .ipynb Support
  - .NET Install Tool
  - **Arduino configuration**

Arduino configuration

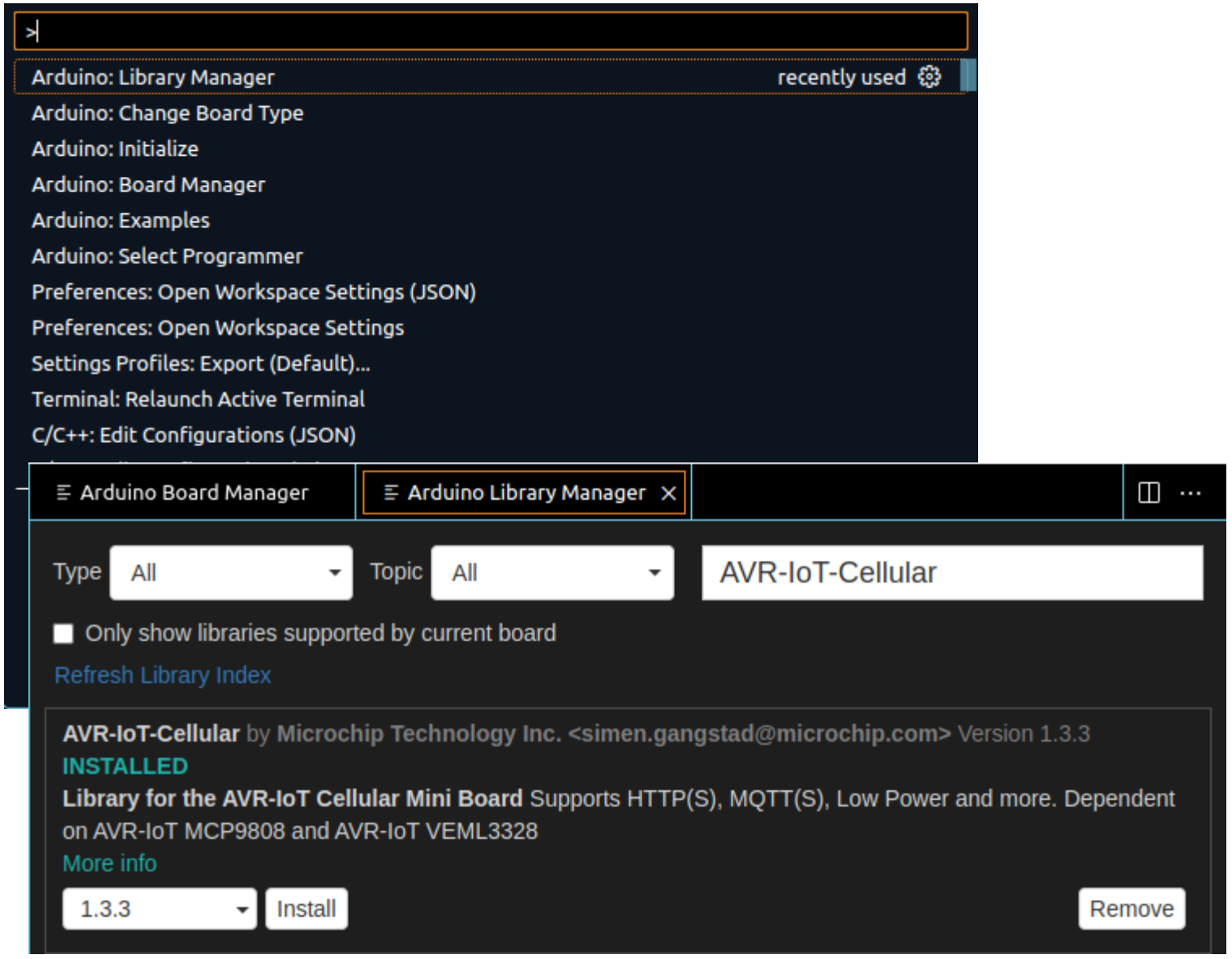
Arduino: Additional Urls

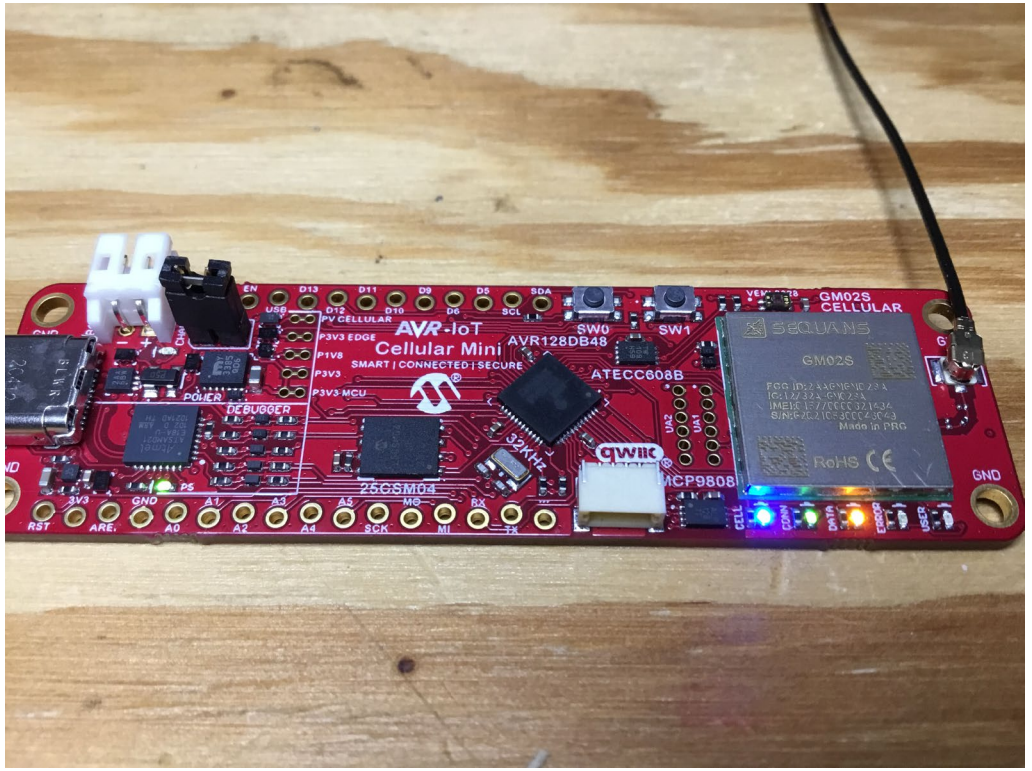
Additional URLs for 3rd party packages.

https://github.com/stm32duino/BoardManagerFiles/raw/main/package_stmicroelectronics_index.json
https://github.com/earlephilhower/arduino-pico/releases/download/global/package_rp2040_index.json
http://drazzy.com/package_drazzy.com_index.json

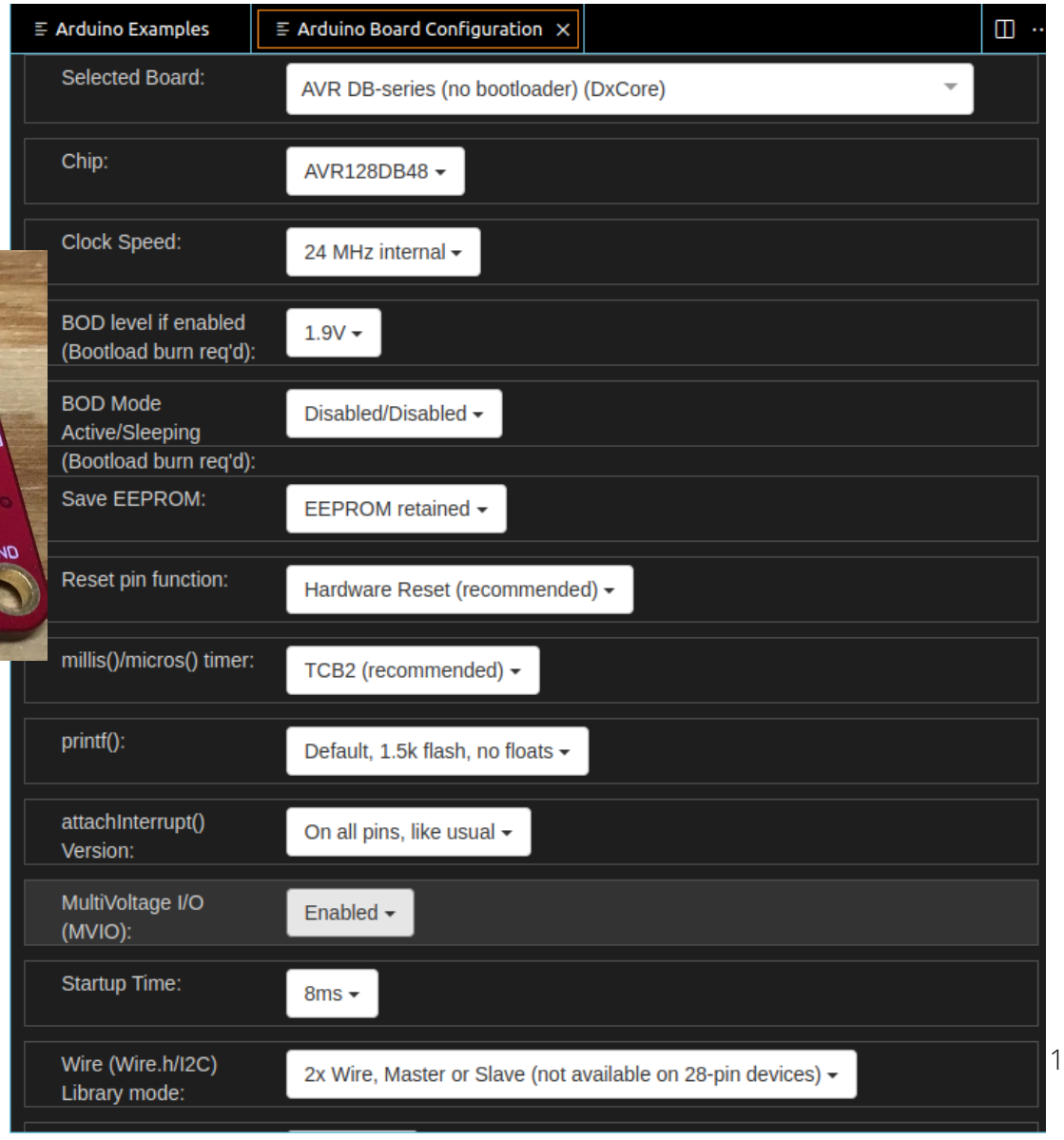
Add Item

Install the AVR-IoT Cellular Library

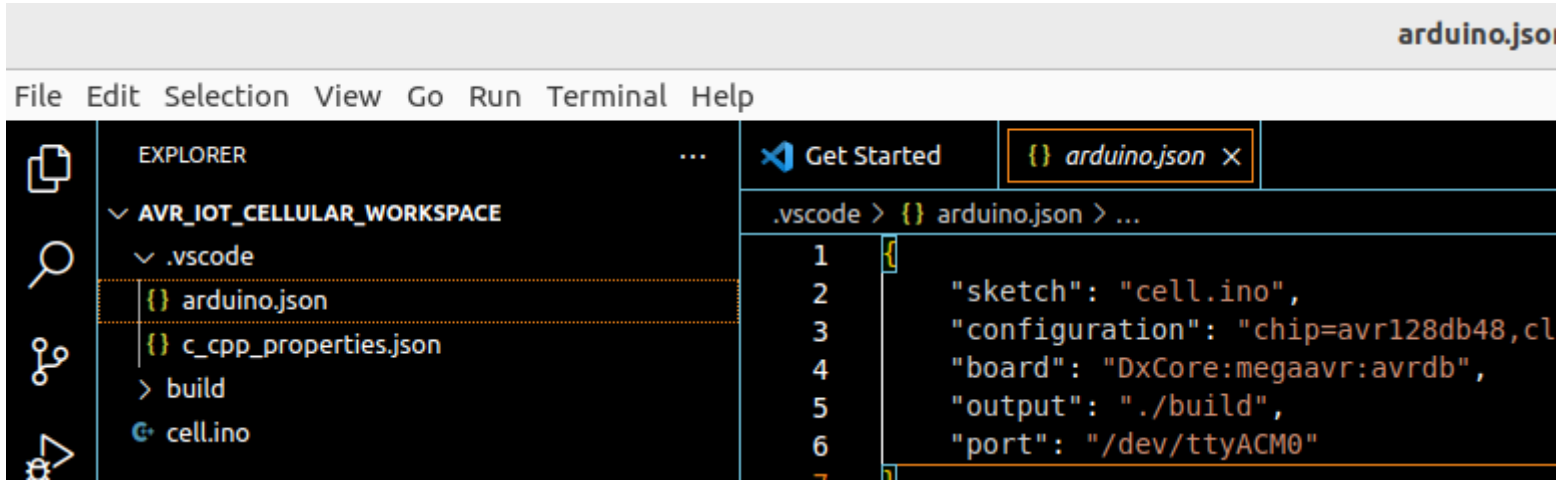


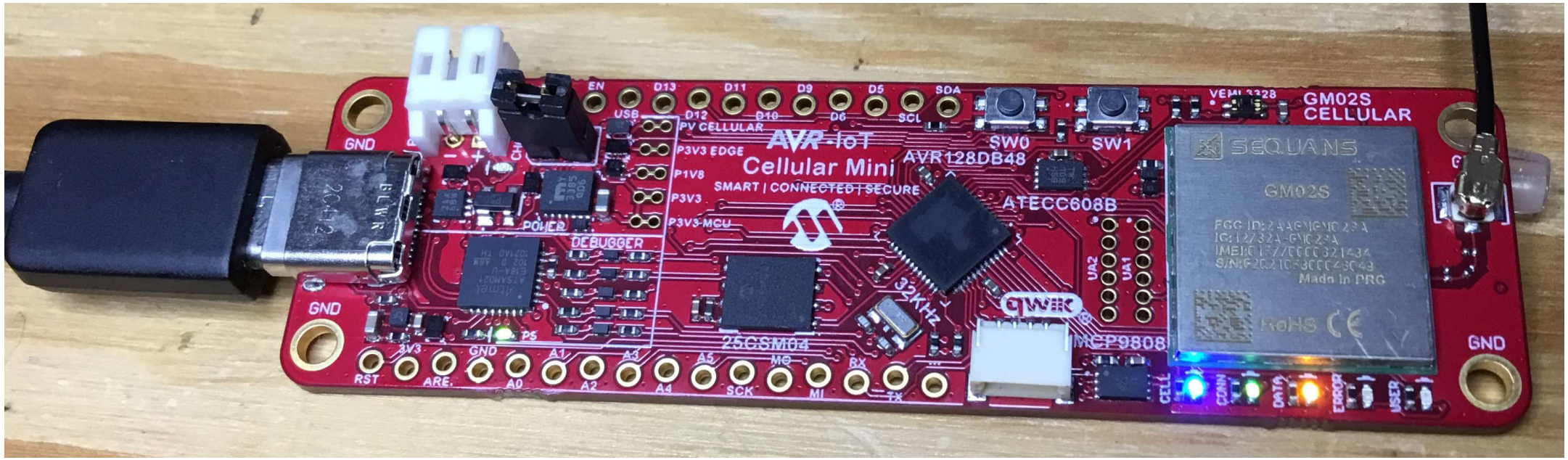


Configure the Arduino Development Target

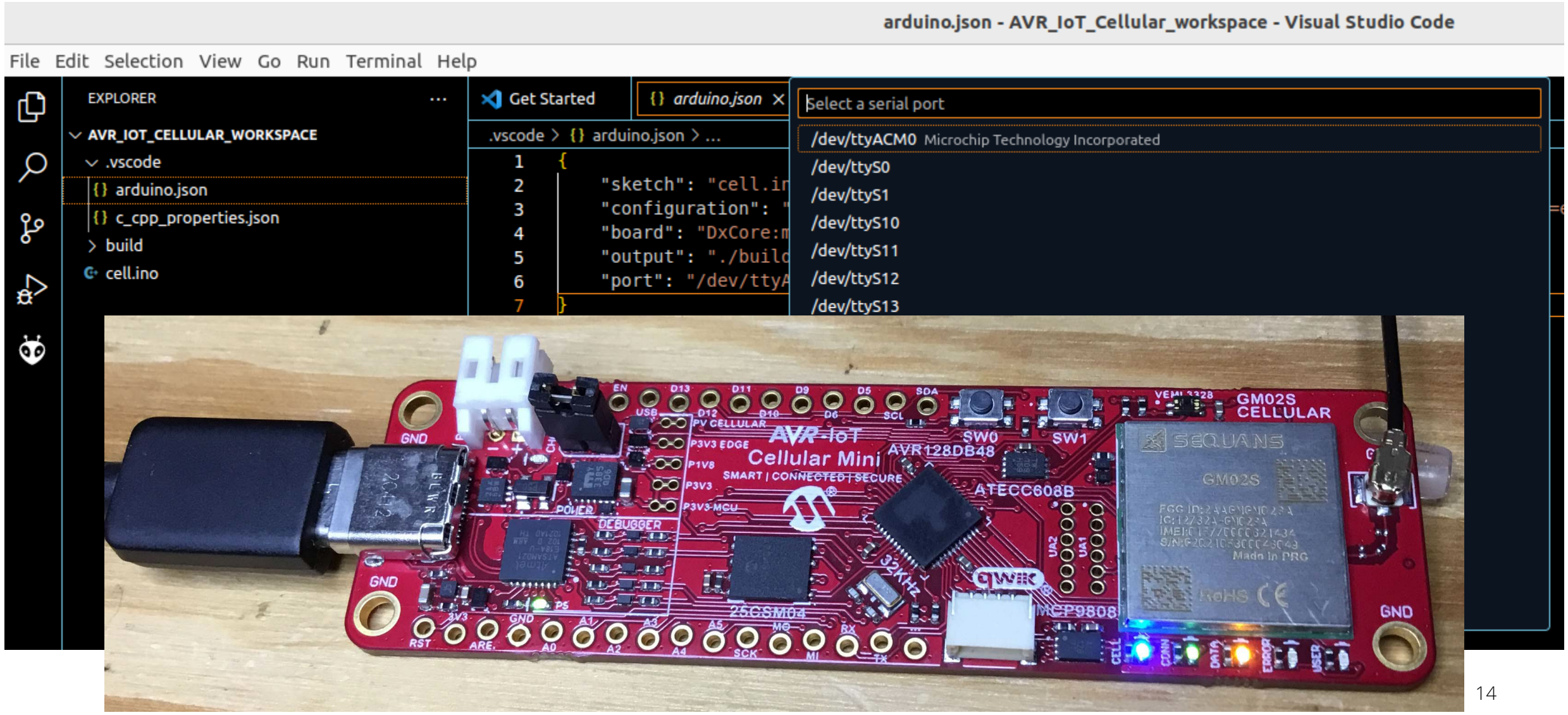


Create a build Directory





Identity the USB Port



Includes – Variables - Definitions

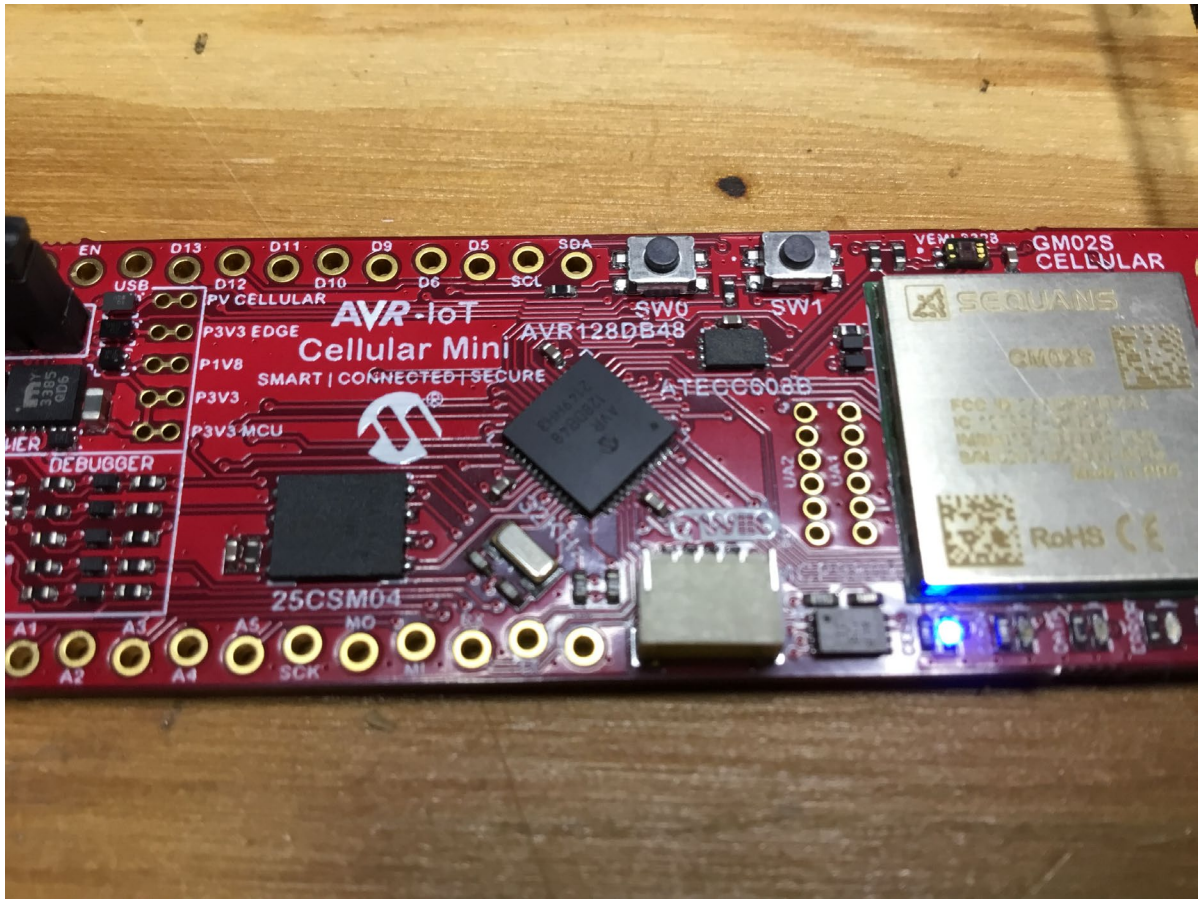
```
1  //*****************************************************************
2  //* AVR-IoT Cellular Mini Driver
3  //* Written by Fred Eady for CEC December 2022
4  //* Rev 1.00 A
5  //* Last Update 11/17/2022
6  //*****************************************************************
7
8  #include <Arduino.h>
9  #include <ecc608.h>
10 #include <led_ctrl.h>
11 #include <log.h>
12 #include <lte.h>
13 #include <mqtt_client.h>
14 #include <mcp9808.h>
15 // AWS topic format
16 #define MQTT_SUB_TOPIC_FMT "%s/sensors"
17 #define MQTT_PUB_TOPIC_FMT "%s/sensors"
18 // Temperature Variables
19 int8_t temF = 0;
20 uint16_t res = 0; //resolution
21 // SUB-PUB Buffers
22 char mqtt_sub_topic[128];
23 char mqtt_pub_topic[128];
24 char temMsg[16]; // MCP9808 message buffer
```

Initialize MQTT Topics Function

```
26  bool initMQTTTopics()
27  {
28      ECC608.begin();
29
30      // Find the thing ID and set the publish and subscription topics
31      uint8_t thingName[128];
32      uint8_t thingNameLen = sizeof(thingName);
33
34      // -- Get the thingname
35      uint8_t err = ECC608.getThingName(thingName, &thingNameLen);
36      if (err != ECC608.ERR_OK)
37      {
38          Log.error("Could not retrieve thingname from the ECC");
39          return false;
40      }
41
42      sprintf(mqtt_sub_topic, MQTT_SUB_TOPIC_FMT, thingName);
43      sprintf(mqtt_pub_topic, MQTT_PUB_TOPIC_FMT, thingName);
44      return true;
45  }
```

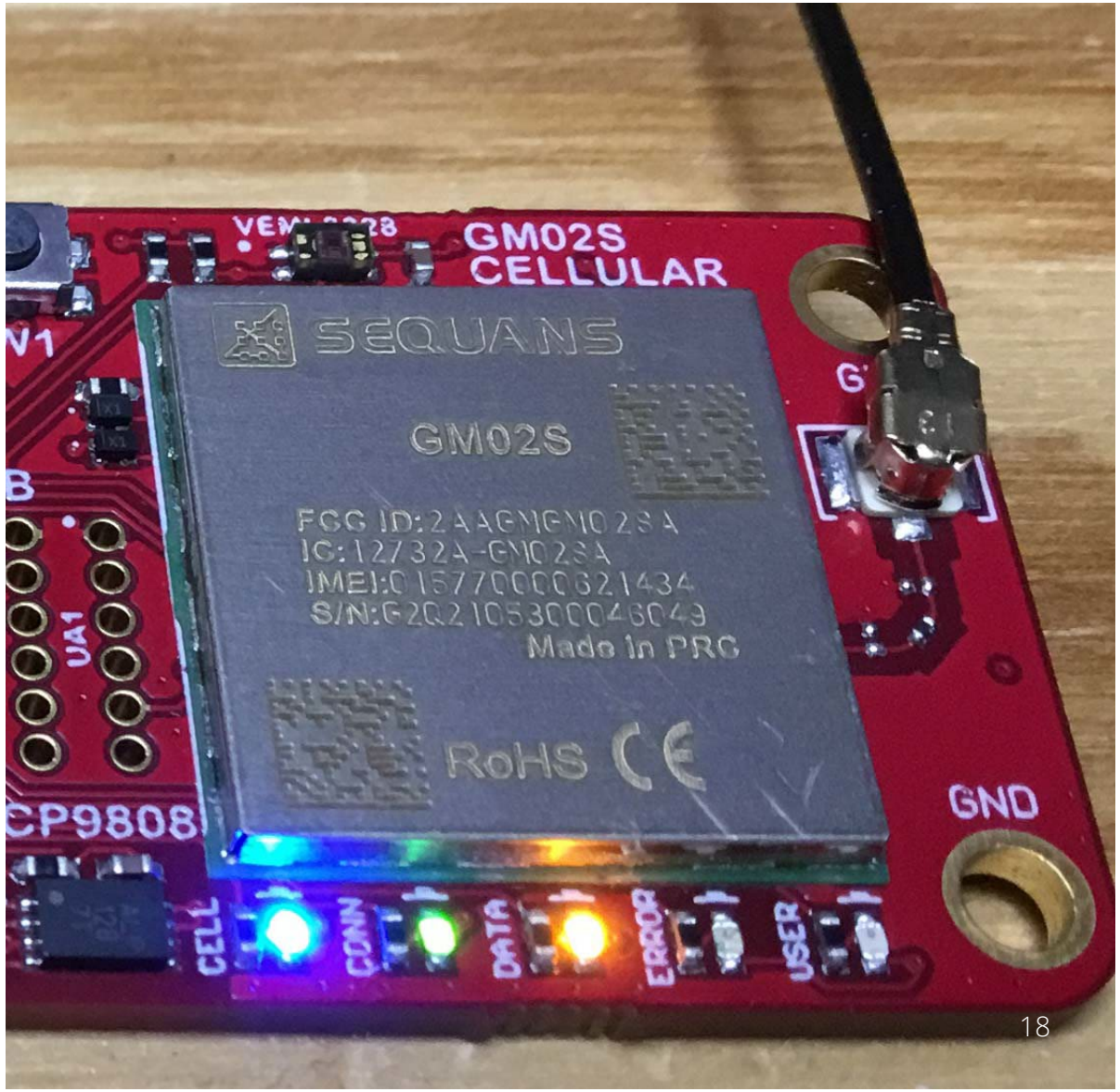
Connect to the Network

```
47  void setup()
48  {
49      Log.begin(115200);
50      LedCtrl.begin();
51      LedCtrl.startupCycle();
52      Mcp9808.begin();
53
54      Log.info("Starting MQTT Temperature App for AWS\r\n");
55
56      if (initMQTTTopics() == false)
57      {
58          Log.error("Unable to initialize the MQTT topics. Stopping...");
59          while (1) {}
60      }
61
62      if (!Lte.begin())
63      {
64          Log.error("Failed to connect to operator");
65
66          // Halt here
67          while (1) {}
68      }
```



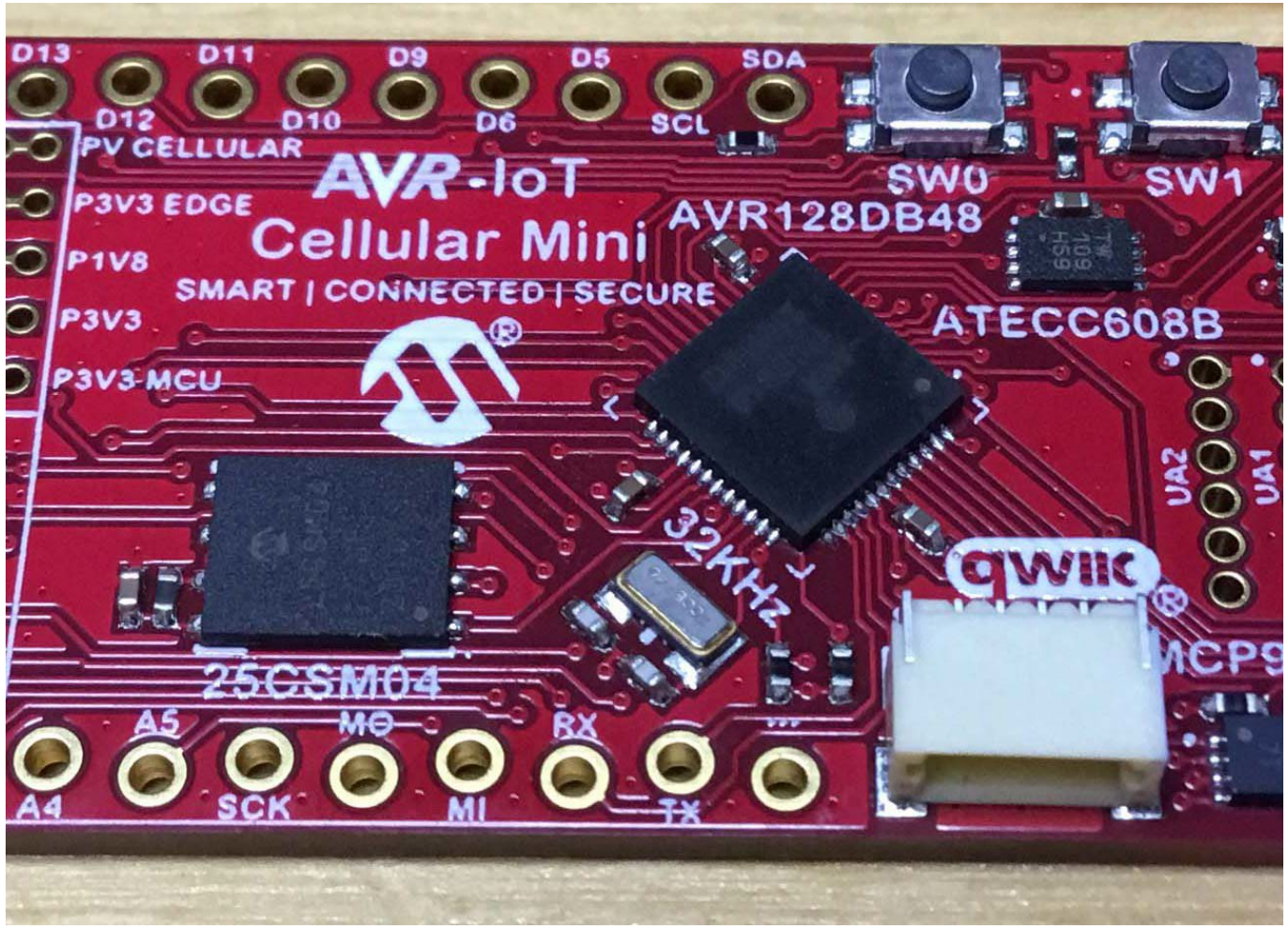
Connect to the MQTT Broker

```
70      // Attempt to connect to the broker
71      if (MqttClient.beginAWS())
72      {
73          Log.infof("Connecting to broker");
74
75          while (!MqttClient.isConnected())
76          {
77              Log.rawf(".");
78              delay(500);
79          }
80
81          Log.rawf(" OK!\r\n");
82
83          // Subscribe to the topic
84          MqttClient.subscribe(mqtt_sub_topic);
85      }
86      else
87      {
88          Log.rawf("\r\n");
89          Log.error("Failed to connect to broker");
90
91          // Halt here
92          while (1) {}
93      }
```

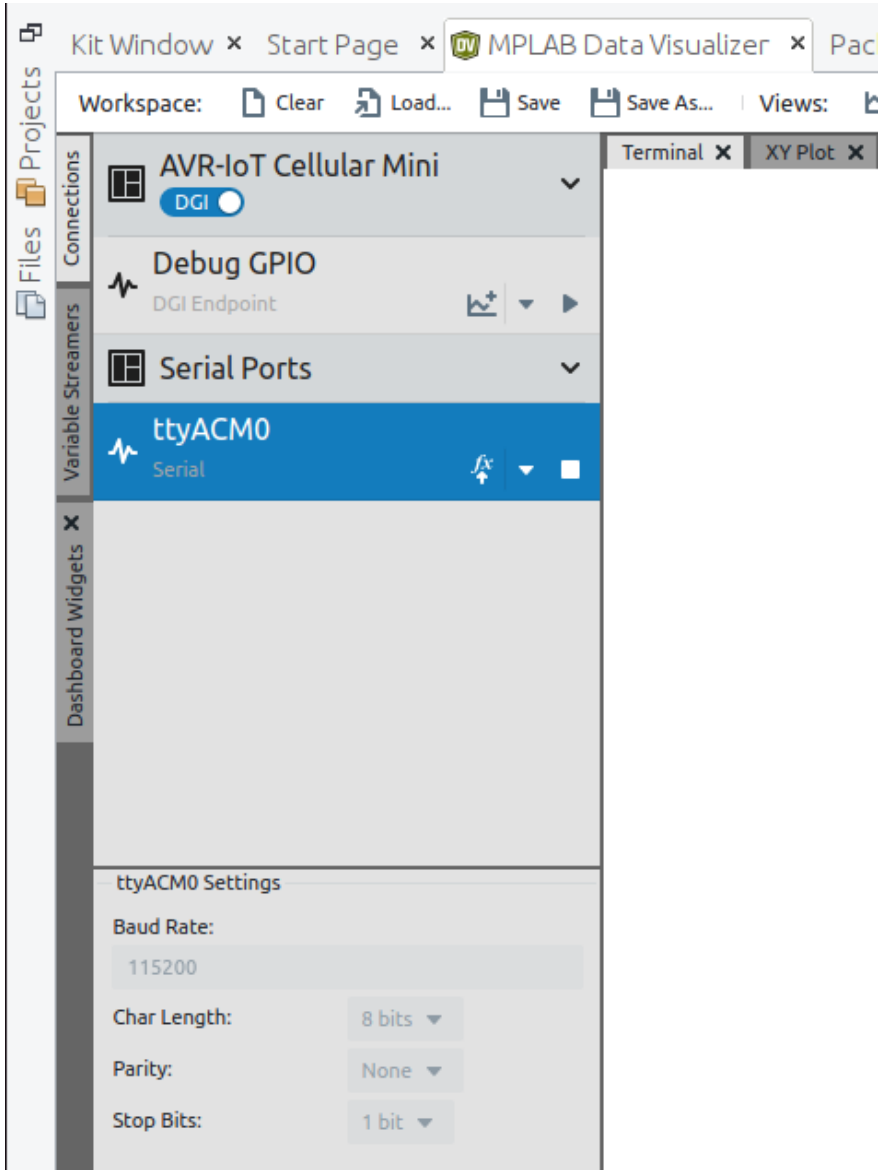


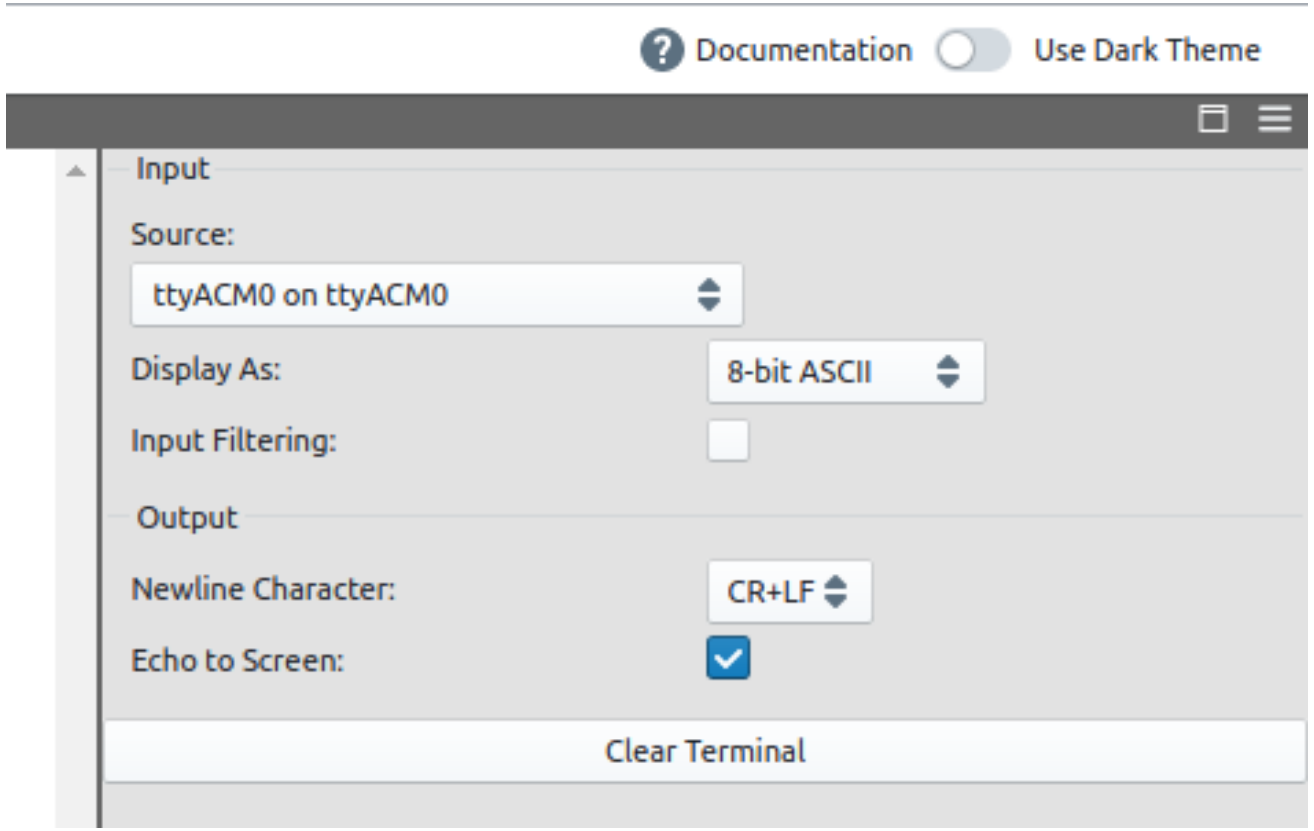
MQTT Publish and Receive

```
95      // MQTT publish and receive
96      for (uint8_t i = 0; i < 1; i++)
97          {
98          temF = (int)Mcp9808.readTempF();
99          sprintf(temMsg, "Temp (*F): %d", temF);
100
101         bool published_successfully =
102             MqttClient.publish(mqtt_pub_topic, temMsg);
103
104         if (published_successfully)
105         {
106             Log.info("Published message");
107         }
108         else
109         {
110             Log.error("Failed to publish\r\n");
111         }
112
113         delay(2000);
114
115         String message = MqttClient.readMessage(mqtt_sub_topic);
116
117         // Read message will return an empty string if there were no new
118         // messages, so anything other than that means that there were a
119         // new message
120         if (message != "")
121         {
122             Log.infof("Got new message: %s\r\n", message.c_str());
123         }
124
125         delay(2000);
126     }
127
128     Log.info("Closing MQTT connection");
129     MqttClient.end();
130 }
```

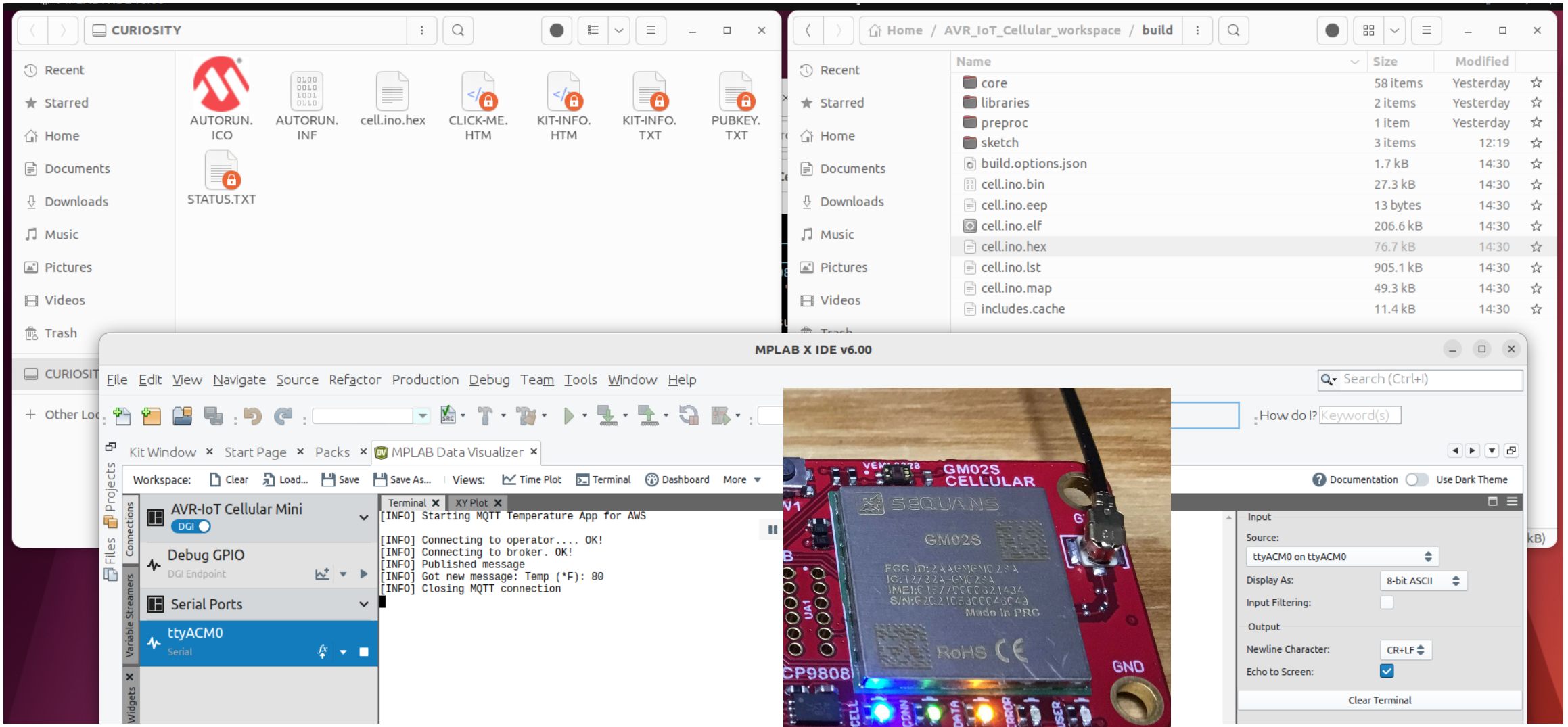


Setup MPLAB Data Visualizer





Execute the Arduino MQTT Temperature Application

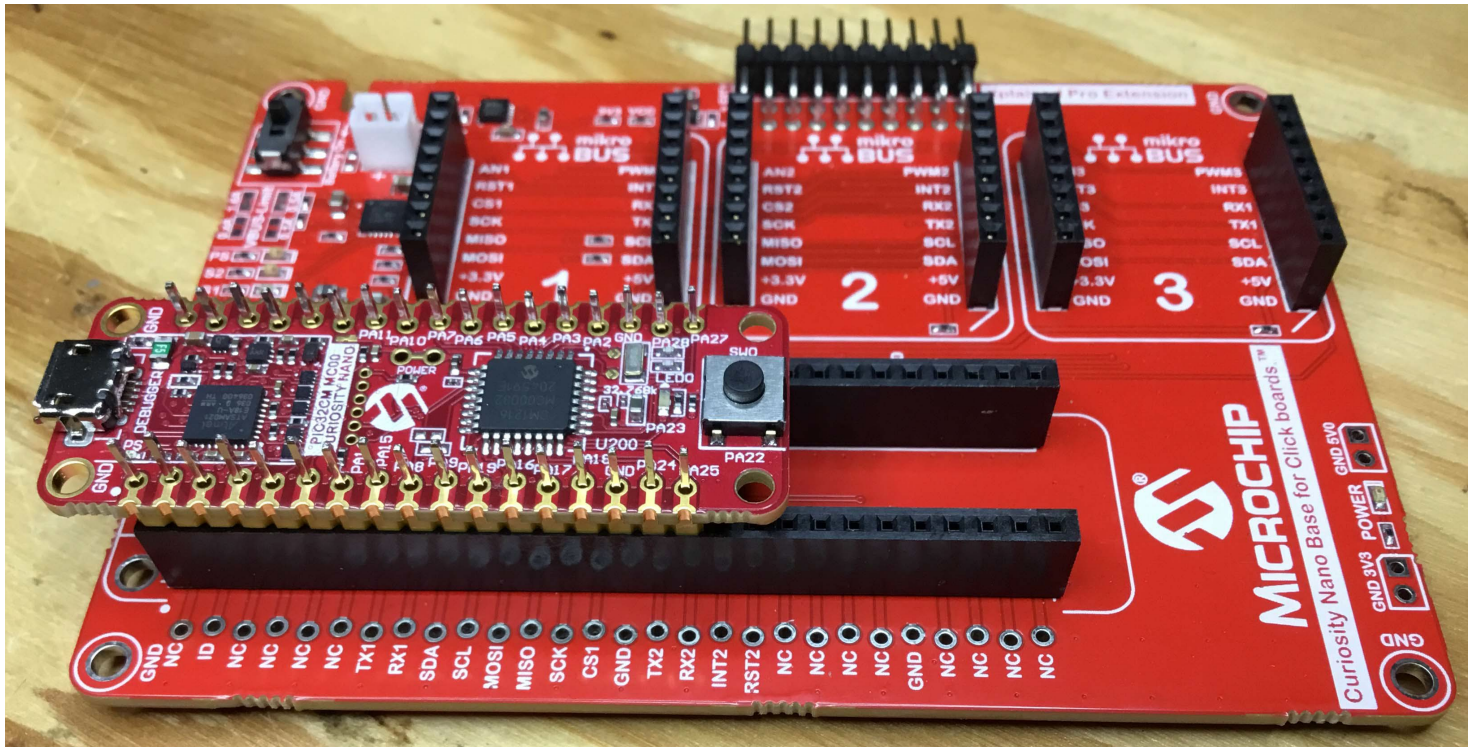


MORE TO COME..

Thank you for attending!!!

Please consider the resources below:

- microchip.com
- MPLAB Data Visualizer User Guide
- AVR-IoT Cellular Mini User Guide
- Visual Studio Code Extensions



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