



DesignNews

Arduino Pro Primer

Day 2:
Serious Sketching

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Webinar Logistics

- Turn on your system sound to hear the streaming presentation.
- If you have technical problems, click “Help” or submit a question asking for assistance.
- Participate in ‘Attendee Chat’ by maximizing the chat widget in your dock.

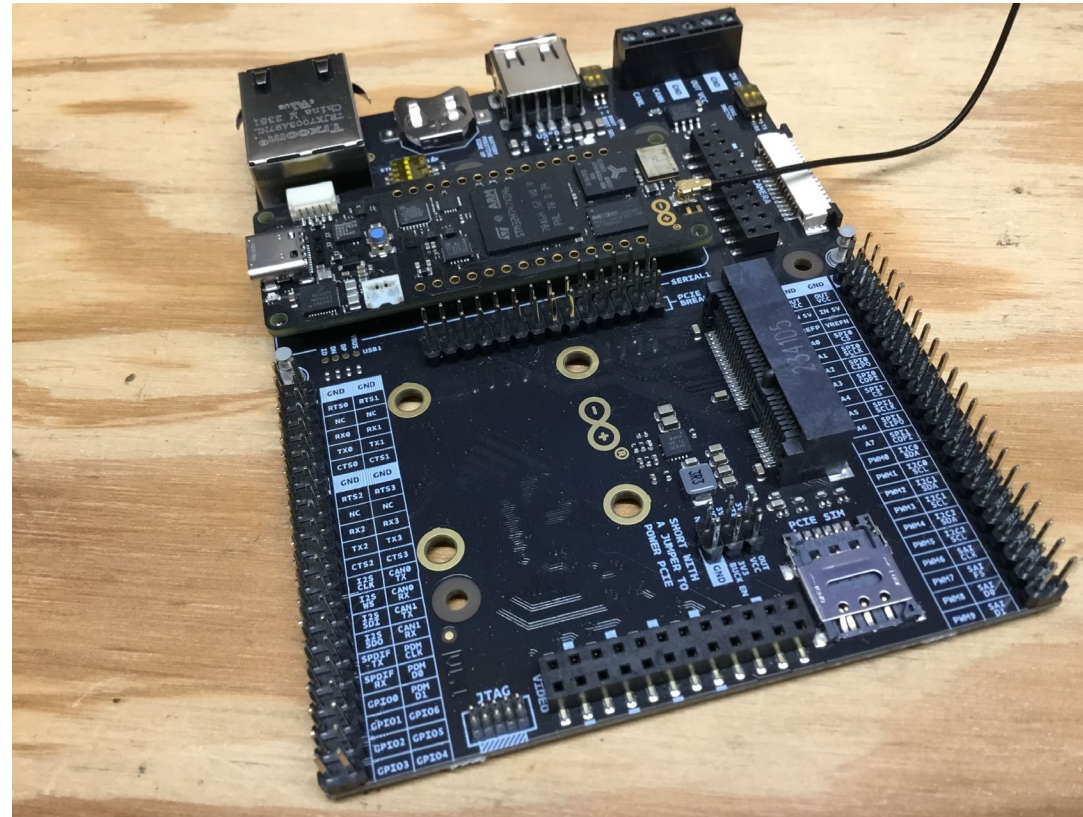


Fred Eady

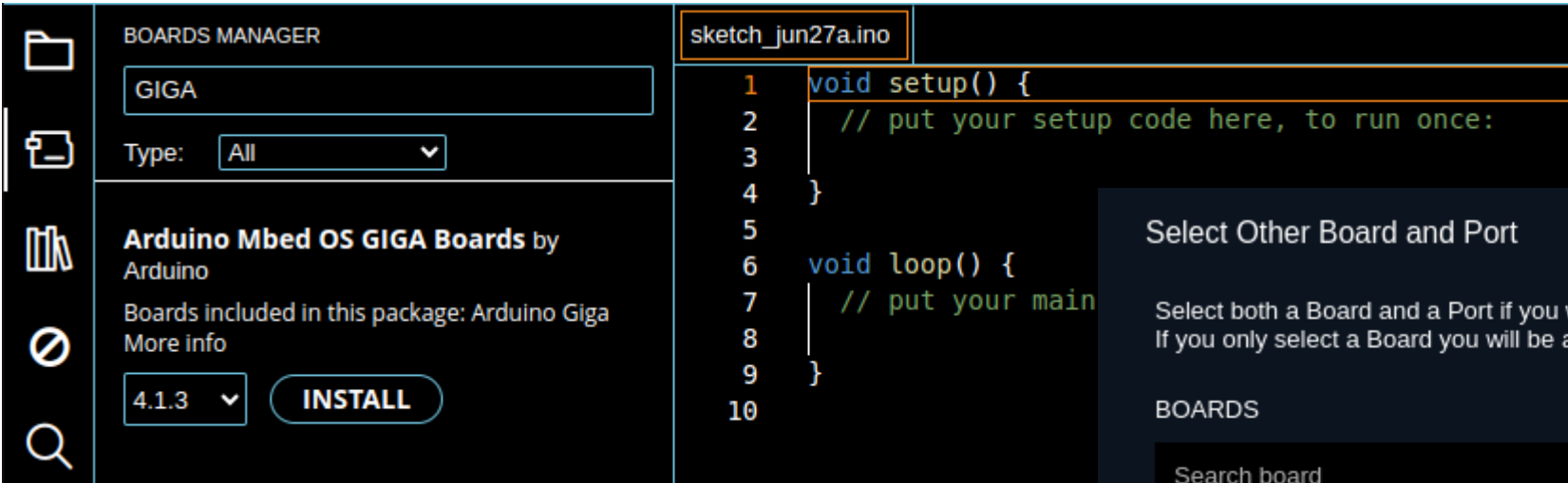
Visit 'Lecturer Profile' in your console for more details.

AGENDA

- **Installation**
 - **Arduino IDE 2.3.2**
 - **Arduino Cloud**
- **Driving a Stepper Motor from the Cloud**

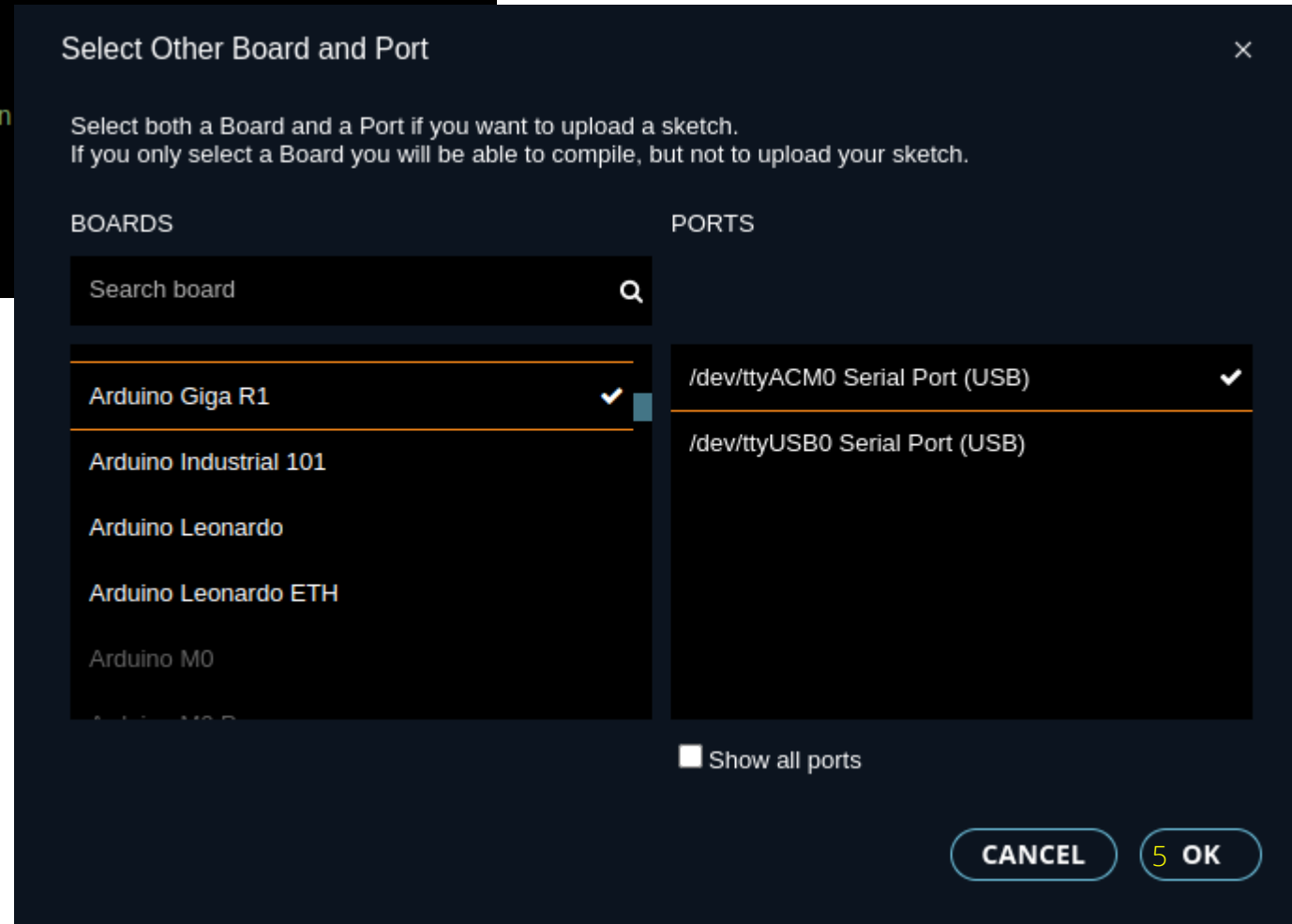


Install Arduino IDE and Add the Giga Boards Package



The screenshot shows the Arduino IDE interface. On the left, the 'BOARDS MANAGER' window displays the 'GIGA' package, which is highlighted. Below the package name, it shows 'Type: All' and 'Arduino Mbed OS GIGA Boards by Arduino'. A list of boards included in the package is shown, including 'Arduino Giga'. The version '4.1.3' is selected, and an 'INSTALL' button is visible. On the right, the code editor shows a sketch named 'sketch_jun27a.ino' with the following code:

```
1 void setup() {  
2     // put your setup code here, to run once:  
3  
4 }  
5  
6 void loop() {  
7     // put your main  
8  
9 }  
10
```



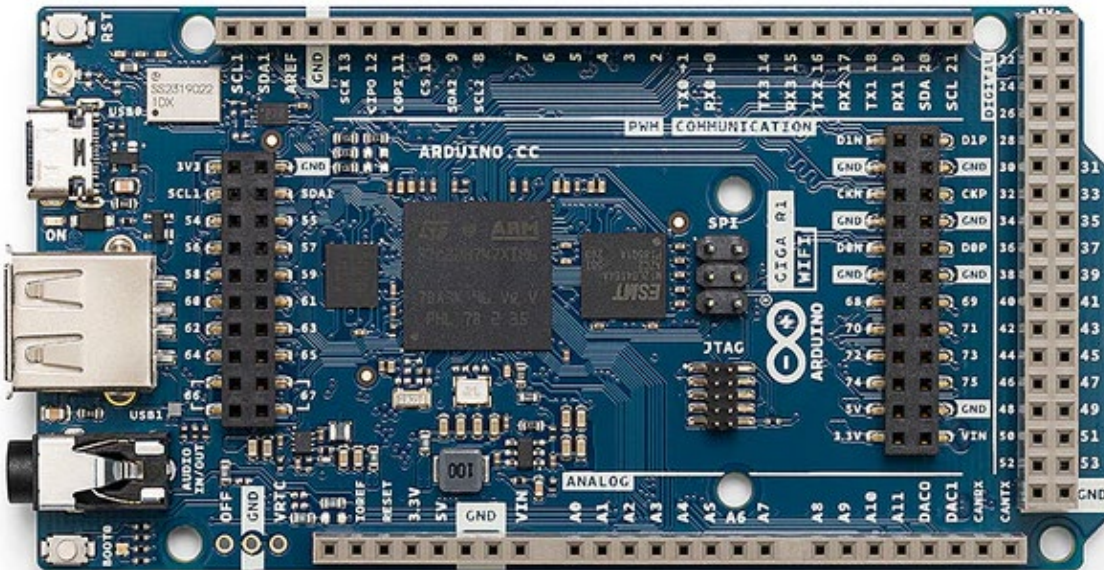
The screenshot shows the 'Select Other Board and Port' dialog box. It contains the following text:

Select both a Board and a Port if you want to upload a sketch.
If you only select a Board you will be able to compile, but not to upload your sketch.

The dialog has two columns: 'BOARDS' and 'PORTS'.

BOARDS	PORTS
Search board	
Arduino Giga R1 ✓	/dev/ttyACM0 Serial Port (USB) ✓
Arduino Industrial 101	/dev/ttyUSB0 Serial Port (USB)
Arduino Leonardo	
Arduino Leonardo ETH	
Arduino M0	

At the bottom right, there is a checkbox labeled 'Show all ports' which is currently unchecked. Below the dialog are 'CANCEL' and 'OK' buttons.



CANCEL

5 OK

Add the Portenta Board Package

BOARDS MANAGER

arduino mbed os portenta board

Type: All

Arduino Mbed OS Portenta Boards by...

Boards included in this package:
Arduino Portenta H7, Arduino Portenta X8
More info

4.1.3 **INSTALL**

```
1 void setup() {  
2   // put your setup code here, to run once:  
3  
4 }  
5  
6 void loop() {  
7   // put your main code here,  
8  
9 }  
10
```

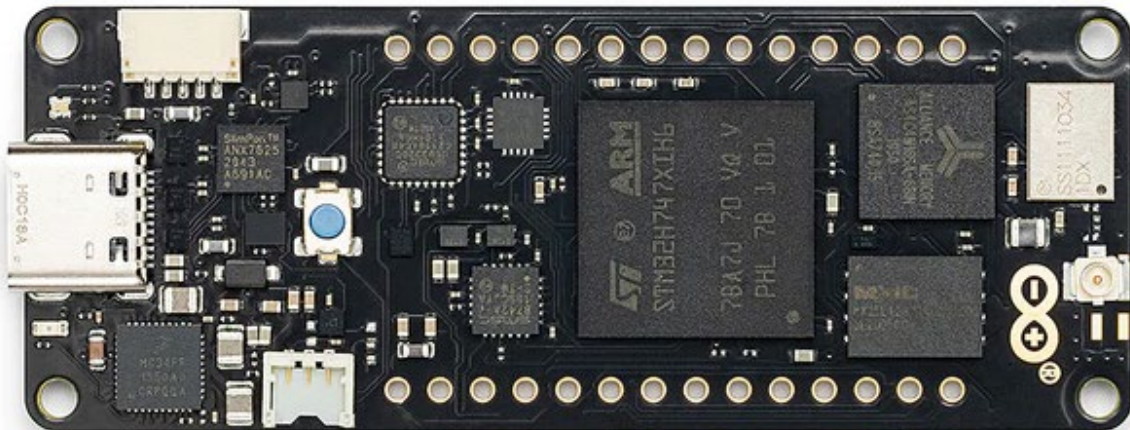
Select Other Board and Port

Select both a Board and a Port if you want to upload a sketch.
If you only select a Board you will be able to compile, but not to upload your sketch.

BOARDS	PORTS
<input type="text" value="Search board"/>	
Arduino Portenta C33	/dev/ttyACM0 Serial Port (USB) ✓
Arduino Portenta H7 - DEPRECATED	/dev/ttyUSB0 Serial Port (USB)
Arduino Portenta ... - Arduino Mbed OS Por... ✓	
Arduino Portenta X8 Arduino Portenta H7 - Arduino Mbed OS Portenta Boards	
Arduino Primo	
Arduino Primo Core	

Show all ports

CANCEL **6 OK**



Create an Arduino Cloud Account

Free

- ✓ 2 Things
- ✓ Unlimited dashboards
- ✓ 100 Mb to store sketches
- ✓ 1 day data retention
- ✓ 25/day compilations
- ✓ Machine Learning Tools

GET STARTED

Entry i

- ✓ 10 Things
- ✓ Unlimited dashboards
- ✓ Unlimited storage for sketches
- ✓ 15 days data retention
- ✓ Unlimited compilations
- ✓ Machine Learning Tools
- ✓ APIs
- ✓ Over the Air Updates

\$ 1.99/paid monthly
\$ 23.88 billed yearly

PURCHASE

Maker

BEST VALUE

- ✓ 25 Things
- ✓ Unlimited dashboards
- ✓ Unlimited storage for sketches
- ✓ 90 days data retention
- ✓ Unlimited compilations
- ✓ Machine Learning Tools
- ✓ APIs
- ✓ Over the Air Updates
- ✓ Dashboard sharing
- ✓ Cloud Triggers

\$ 5.99/paid monthly
\$ 71.88 billed yearly

PURCHASE

Maker plus

- ✓ 100 Things
- ✓ Unlimited dashboards
- ✓ Unlimited storage for sketches
- ✓ 1 year data retention
- ✓ Unlimited compilations
- ✓ Machine Learning Tools
- ✓ APIs
- ✓ Over the Air Updates
- ✓ Dashboard sharing
- ✓ Cloud Triggers

\$ 19.99/paid monthly
\$ 239.88 billed yearly

PURCHASE

Install the Arduino Cloud Agent


Install the Arduino Cloud Agent

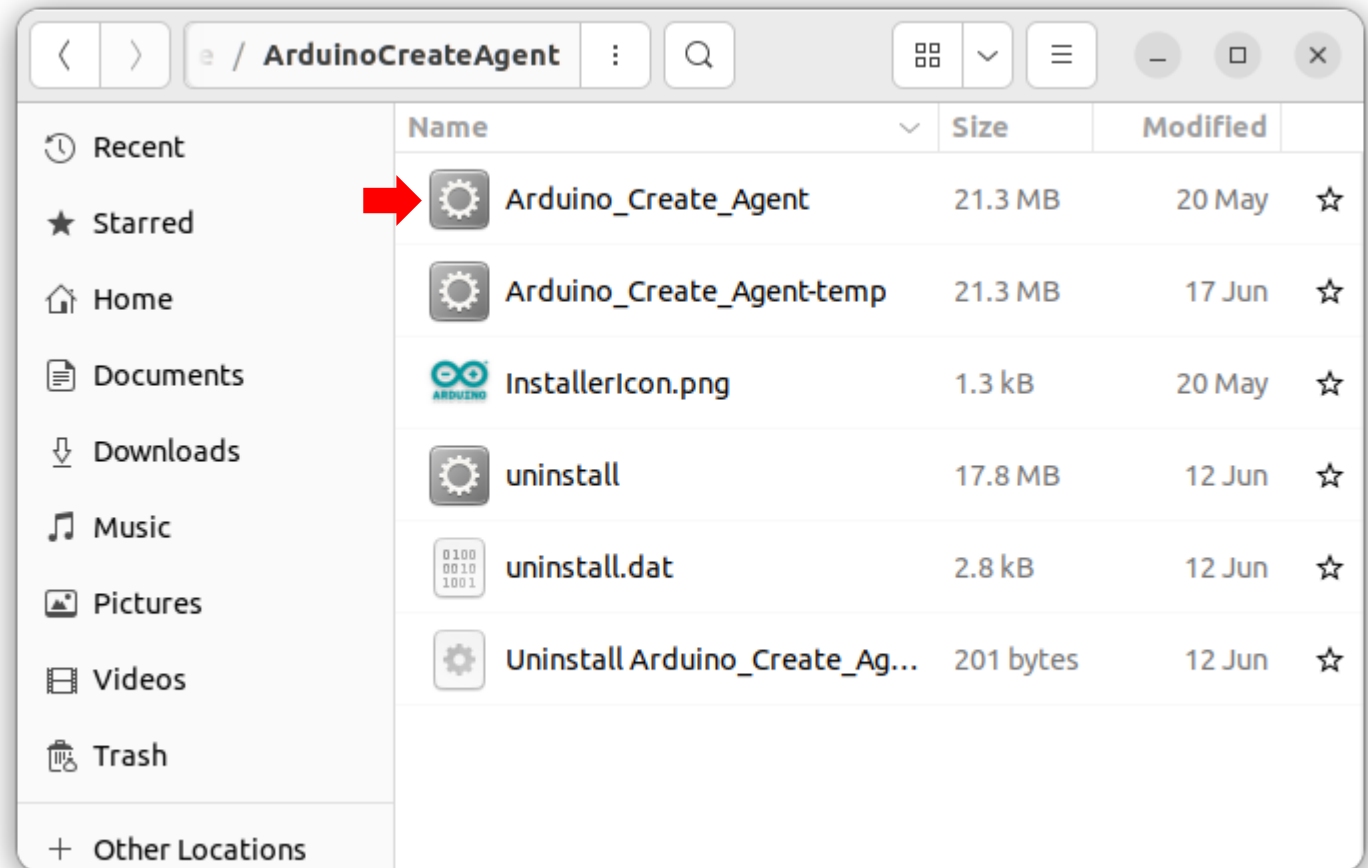
The Arduino Cloud Agent is a plugin that you install on your computer, that enables serial communication between your board and the Arduino Cloud.



DOWNLOAD

How to install

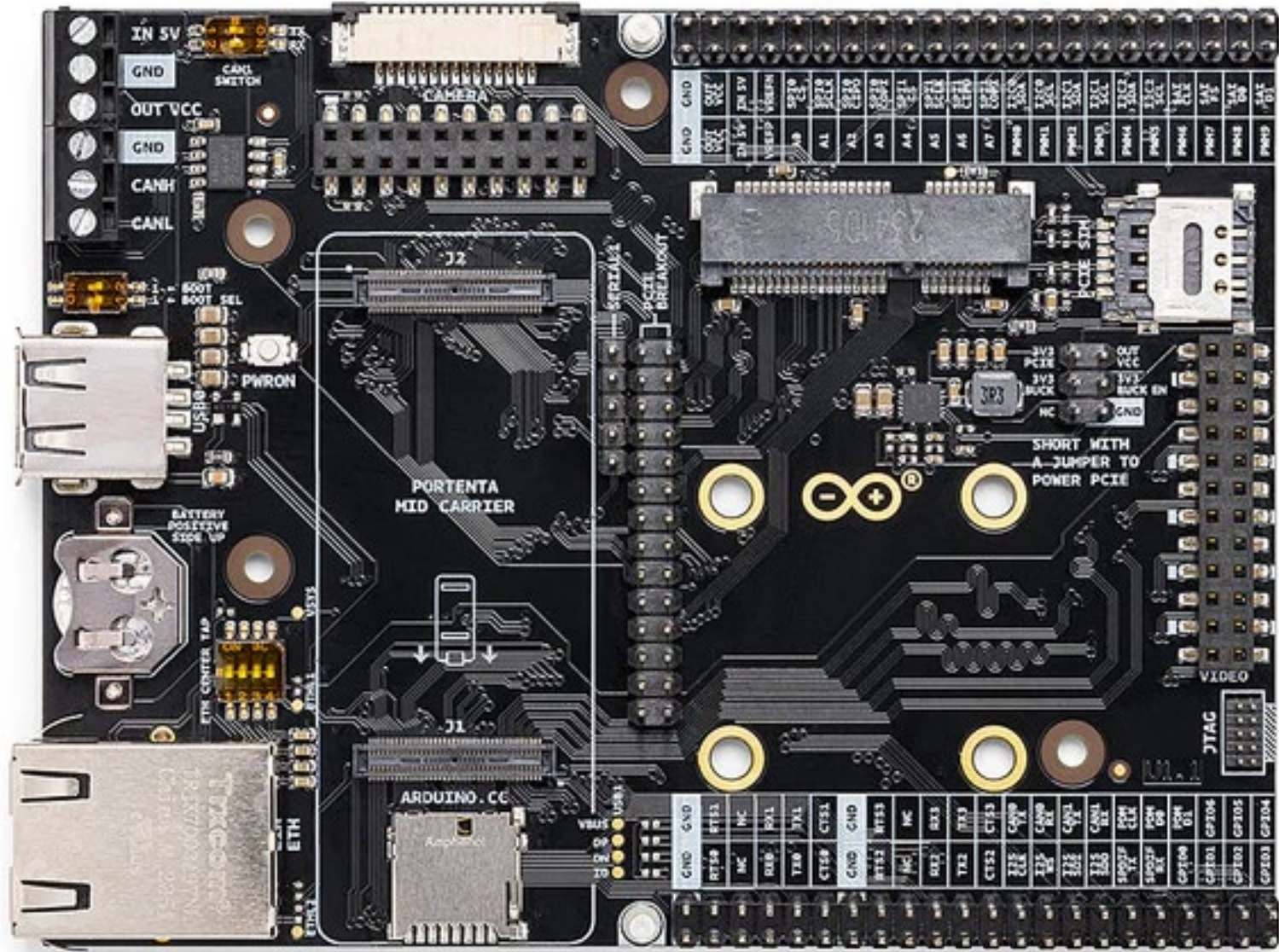
1. Open the downloaded file
2. Move the Agent to the Application folder
3. Open the Agent and check for system tray icon 



The Plan..

Frederick Eady
therealfreedy@gm...

- Home
- Sketches
- Devices
- Things
- Dashboards
- Triggers
- Resources
- Courses
- IoT Templates
- Integrations
- Plan Usage



Add Devices - Arduino Giga R1 WiFi

RECOMMENDED AUTOMATIC Auto-sketch generation, online editing, easy upload

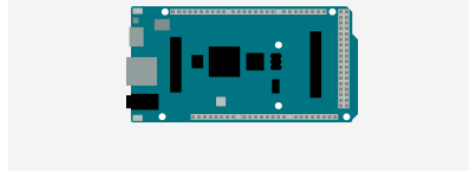
Arduino board ⓘ
↳ Arduino language (C++)

Third party device ⓘ
↳ Arduino language (C++)

MANUAL Manual programming and upload, offline editing

DIY

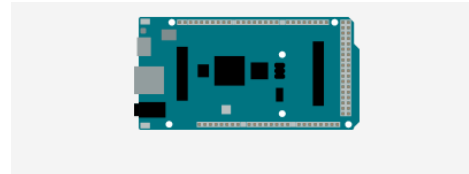
Any Device ⓘ
↳ Python, MicroPython, JavaScript (NodeJS)



Arduino Giga R1 found

An Arduino Giga R1 has been detected on port /dev/ttyACM0 and ready to be configured.

CONFIGURE



Give your device a name

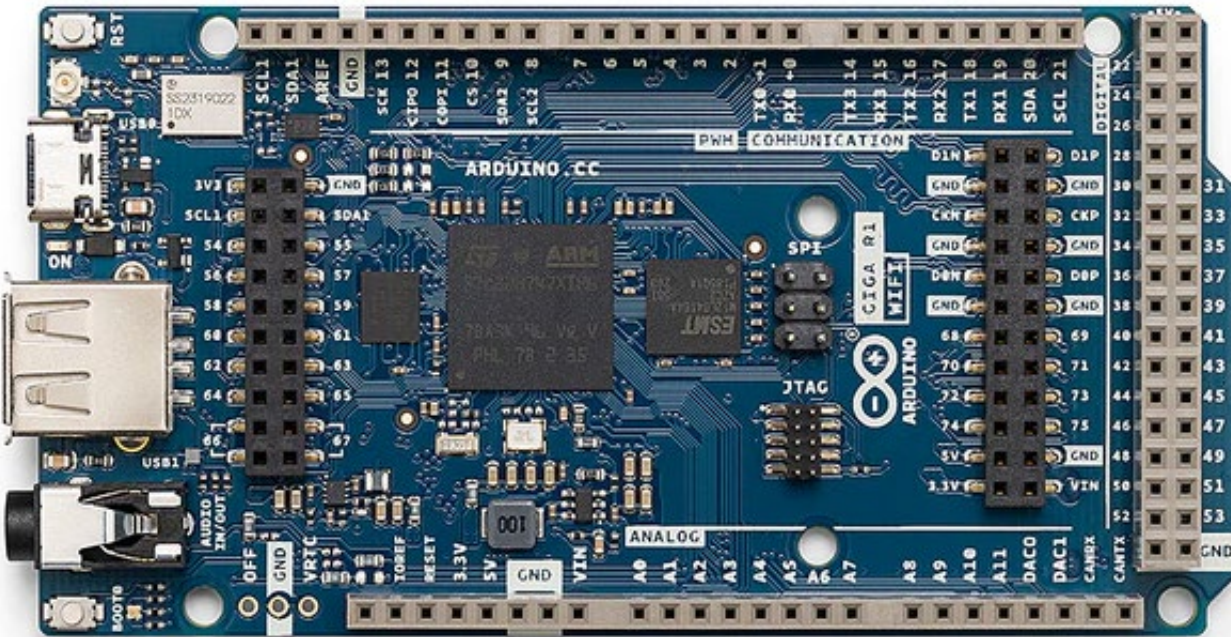
Name your device so you will be able to recognize it.

Device Name



Congratulations! You are all set

Your Arduino Giga R1 R1 has been successfully set up. You can now connect your device to sensors, actuators and other inputs or outputs!



Devices > R1 ▾

Arduino Giga R1 - Documentation ⓘ
● Offline

Last Activity

Added Jun 29, 2024, 11:24:54 AM

ID 393648d8-76aa-498b-9806-fedfac2dadbd2

FQBN arduino:mbed_giga:giga

Serial Number 001E003E3033511934393531

Associated Thing



No Thing associated with R1



Add Devices - Arduino Portenta H7

RECOMMENDED AUTOMATIC Auto-sketch generation, online editing, easy upload

Arduino board
 Arduino language (C++)

Third party device
 Arduino language (C++)

MANUAL Manual programming and upload, offline editing

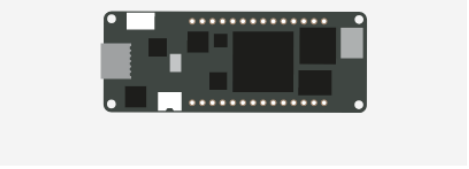
DIY **Any Device**
 Python, MicroPython, JavaScript (NodeJS)



Arduino Portenta H7 found

An Arduino Portenta H7 has been detected on port /dev/ttyACM0 and ready to be configured.

CONFIGURE



Give your device a name

Name your device so you will be able to recognize it.

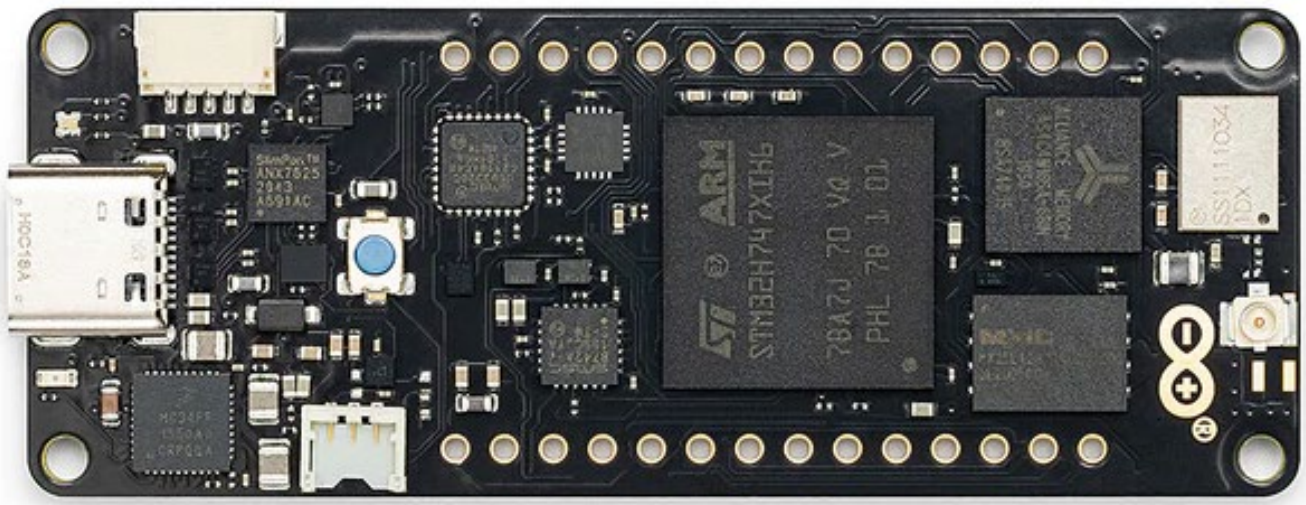
Device Name
 H7

Select the connection to use

With this device, you can use both the WiFi connection and the Ethernet networking. Select the connectivity you intend to use with your device.

WiFi
 Ethernet
 Cellular
 CatM1

! Remember that after the setup you won't be able to switch between them anymore.



Devices > H7

Arduino Portenta H7 - [Documentation](#)

● Offline

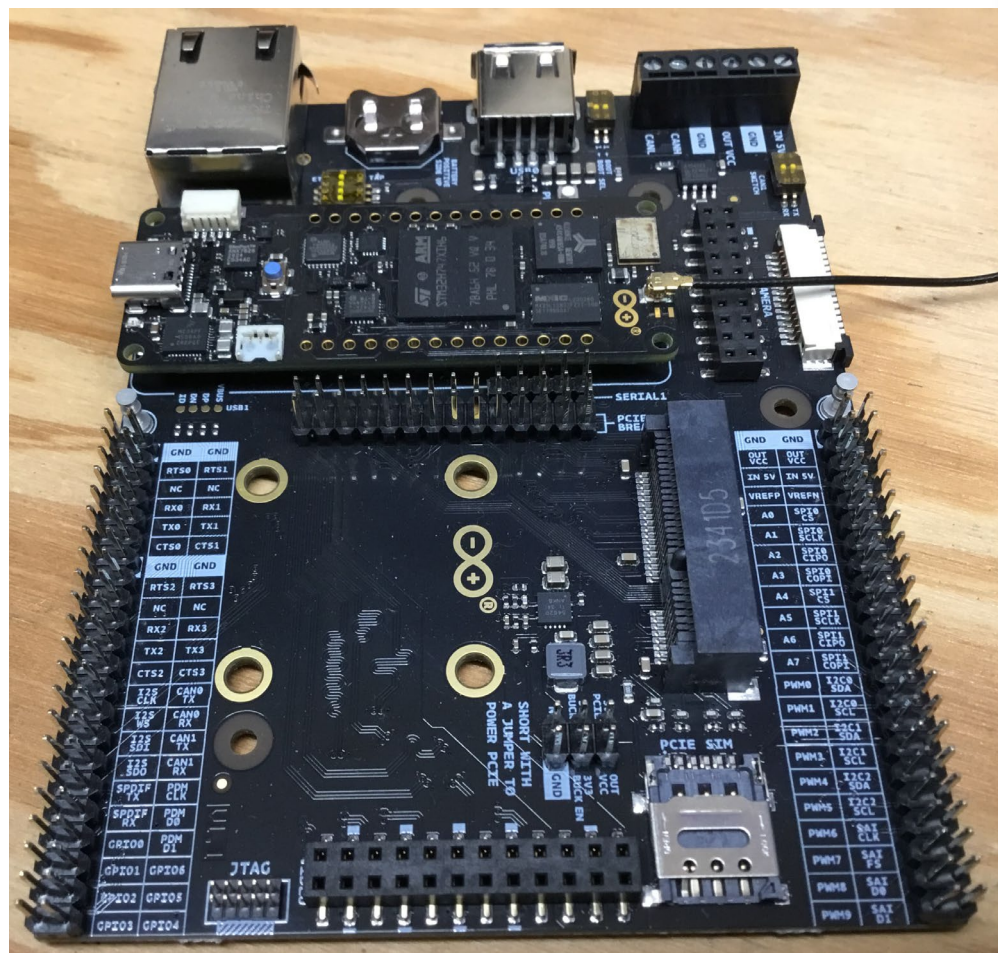
Last Activity	-
Added	Jun 29, 2024, 12:13:49 PM
ID	344458a5-da5e-4287-8998-a8f7348e05bf
FQBN	arduino:mbed_portenta:envie_m7
Serial Number	0048003C3130511236383730

Associated Thing

.....
.....

No Thing associated with H7

Create a Thing



The screenshot shows the Arduino Cloud interface for configuring a device. The browser address bar shows the URL: `https://app.arduino.cc/things/4d5aea8c-b085-44ec-8e5d-488bf6180963/setup`. The page title is "H7_thing Thing | Arduino".

Cloud Variables ADD

Variables are what you can monitor or control to make your Thing function. For example a temperature or a smart lamp. Once created, you can use them in your Sketch.

Associated Device

H7
ID: 344458a5-da5e-4287-8998-a8f7...
Type: Arduino Portenta H7
Status: Offline

Change Detach

Network

Wi-Fi Name: edtpnet2
Password:

Change

Smart Home integration

Configure your Thing to work with Amazon Alexa or Google Home

Configure

Data forwarding (Webhook)

Send data from your Thing to external services



Create Cloud Variables

Name
num_cw_steps

Name
num_ccw_steps

Sync with other Things ⓘ

Sync with other Things ⓘ

Integer Number eg. 1

Integer Number eg. 1

Declaration
`int num_cw_steps ;`

Declaration
`int num_ccw_steps ;`

Variable Permission ⓘ
 Read & Write Read Only

Variable Permission ⓘ
 Read & Write Read Only

Variable Update Policy ⓘ
 On change Periodically

Variable Update Policy ⓘ
 On change Periodically

Threshold
0

Threshold
0

H7_thing Thing | Arduino

https://app.arduino.cc/things/4d5aea8c-b085-44ec-8e5d-488bf6180963/setup

Things > H7_thing

Cloud Variables ADD

Name ↓	Last Value	Last Update
<input type="checkbox"/> num_ccw_steps <code>int num_ccw_steps;</code>	-	
<input type="checkbox"/> num_cw_steps <code>int num_cw_steps;</code>	-	

Associated Device

H7

ID: 344458a5-da5e-4287-8998-a8f7...

Type: Arduino Portenta H7

Status: Offline

Change Detach

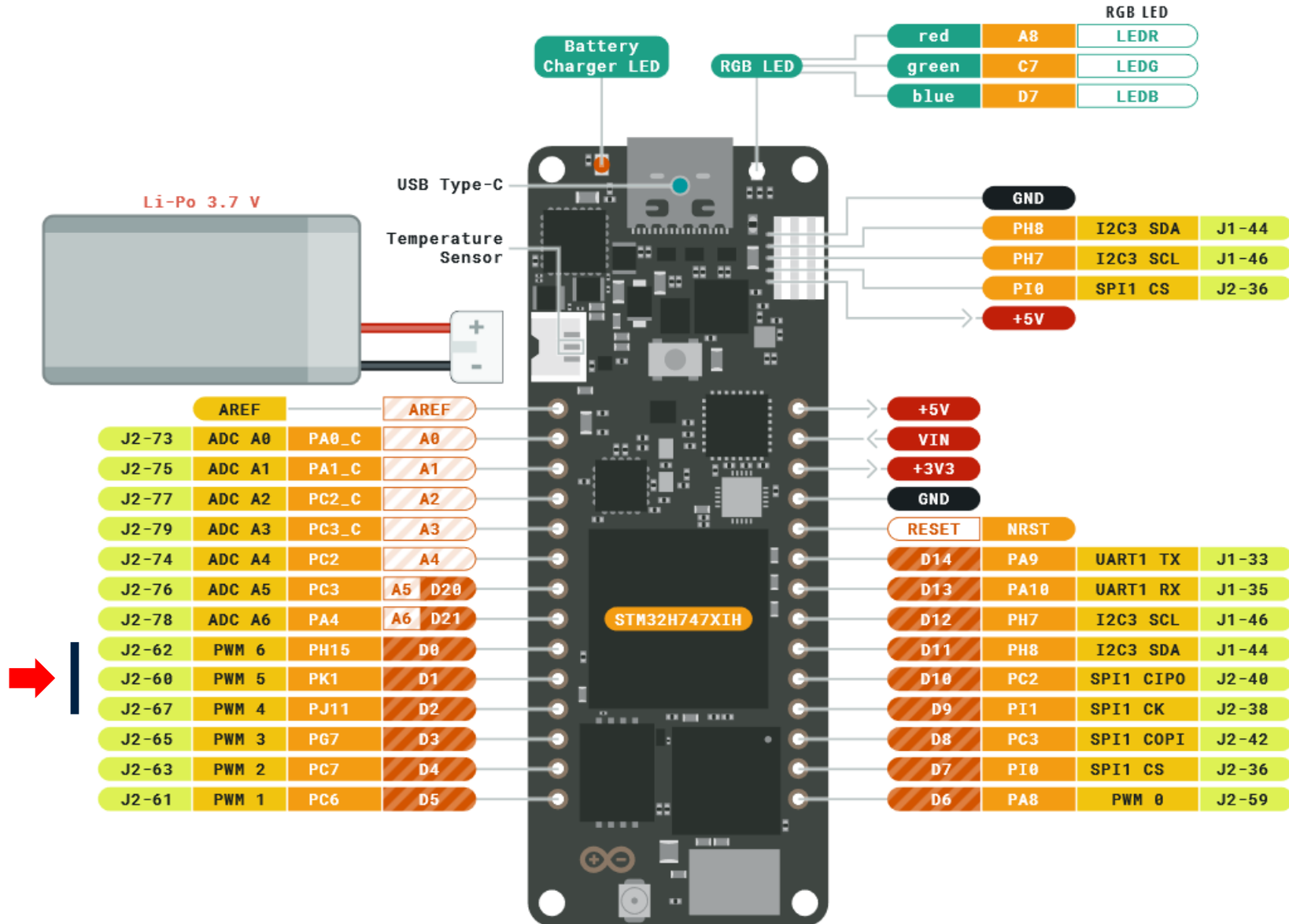
Network

Wi-Fi Name: edtpnet2

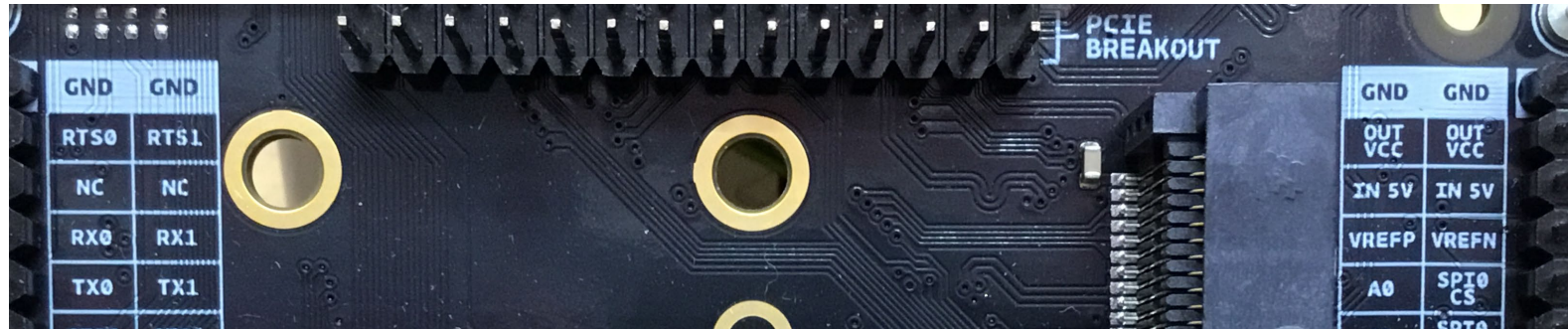
Password:

Change

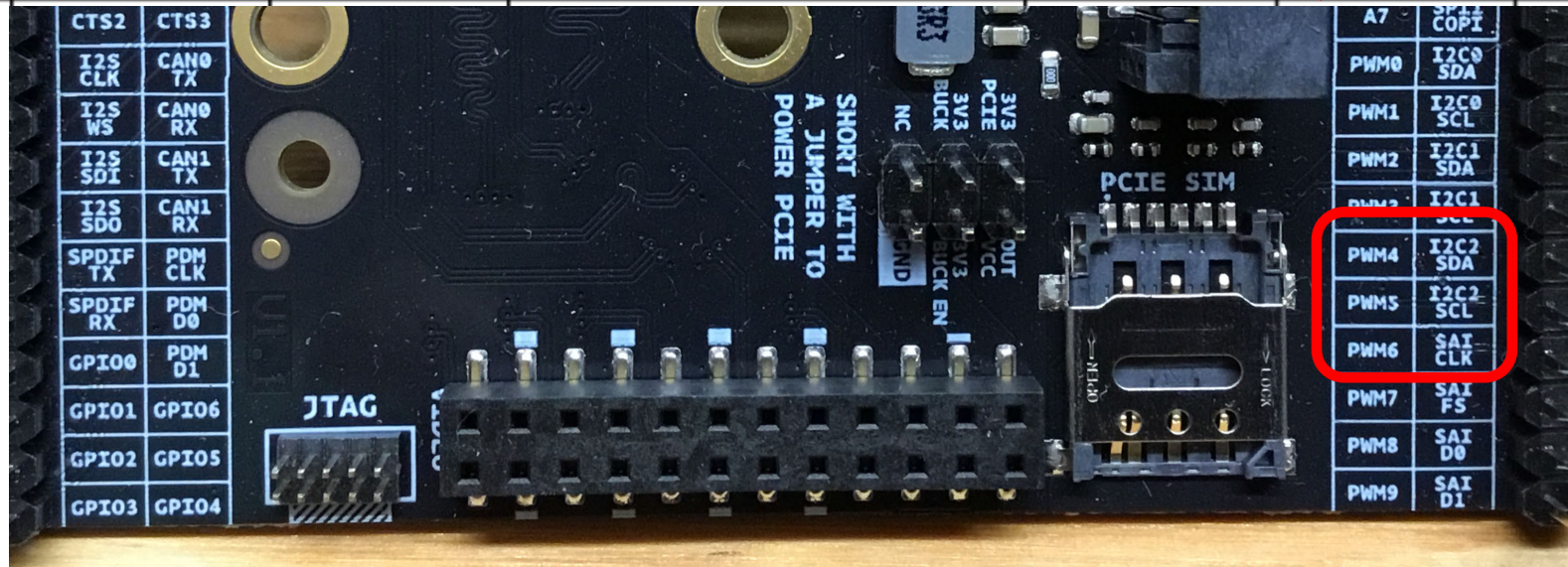
Define Sketch GPIO



Define Sketch GPIO



33	PWM4	187	77 / - / 187 / PWM4	-	➔ PJ_11	4
34	I2C2 SDA	149	78 / - / 149 / I2C2_SDA	-	PH_12	39
35	PWM5	188	79 / - / 188 / PWM5	-	➔ PK_1	5
36	I2C2 SCL	148	80 / - / 148 / I2C2_SCL	-	PH_11	40
37	PWM6	189	81 / - / 189 / PWM6	-	➔ PH_15	6




Initialize the Sketch GPIO

```

7   The following variables are automatically generated and updated when changes are made to the Thing
8
9   int num_ccw_steps;
10  int num_cw_steps;
11
12  Variables which are marked as READ/WRITE in the Cloud Thing will also have functions
13  which are called when their values are changed from the Dashboard.
14  These functions are generated with the Thing and added at the end of this sketch.
15  */
16
17  #include "thingProperties.h"
18  // START MANUALLY ADDED CODE
19  #define pinStep D0 //PWM6 PH15
20  #define pinDir  D1 //PWM5 PK1
21  #define pinEna  D2 //PWM4 PJ11
22  #define MOTION_ENABLED 0
23  #define MOTION_DISABLED 1
24  #define CW 1
25  #define CCW 0
26  // END MANUALLY ADDED CODE
27  void setup() {
28    // Initialize serial and wait for port to open:
29    Serial.begin(9600);
30    // This delay gives the chance to wait for a Serial Monitor without blocking if none is found
31    delay(1500);
32    // START MANUALLY ADDED CODE
33    pinMode(pinStep,OUTPUT);
34    pinMode(pinDir,OUTPUT);
35    pinMode(pinEna,OUTPUT);
36
37    digitalWrite(pinStep,LOW);
38    digitalWrite(pinDir,CW);
39    digitalWrite(pinEna,MOTION_DISABLED);
40    // END MANUALLY ADDED CODE

```



J2-62	PWM 6	PH15	D0
J2-60	PWM 5	PK1	D1
J2-67	PWM 4	PJ11	D2

Populate the Cloud Variable Callbacks

```
68  /*
69   Since NumCwSteps is READ_WRITE variable, onNumCwStepsChange() is
70   executed every time a new value is received from IoT Cloud.
71  */
72  void onNumCwStepsChange() {
73   // Add your code here to act upon NumCwSteps change
74   digitalWrite(pinEna, MOTION_ENABLED);
75   digitalWrite(pinDir, CW);
76
77   for(int i=0; i<num_cw_steps; i++)
78   {
79     digitalWrite(pinStep, HIGH);
80     delayMicroseconds(50);
81     digitalWrite(pinStep, LOW);
82     delayMicroseconds(50);
83   }
84   digitalWrite(pinEna, MOTION_DISABLED);
85 }
```

```
87  /*
88   Since NumCcwSteps is READ_WRITE variable, onNumCcwStepsChange() is
89   executed every time a new value is received from IoT Cloud.
90  */
91  void onNumCcwStepsChange() {
92   // Add your code here to act upon NumCcwSteps change
93   digitalWrite(pinEna, MOTION_ENABLED);
94   digitalWrite(pinDir, CCW);
95
96   for(int i=0; i<num_ccw_steps; i++)
97   {
98     digitalWrite(pinStep, HIGH);
99     delayMicroseconds(50);
100    digitalWrite(pinStep, LOW);
101    delayMicroseconds(50);
102   }
103   digitalWrite(pinEna, MOTION_DISABLED);
104 }
```


Create a DASHBOARD and Add Widgets

Dashboards

<input type="checkbox"/> Name ↑	Last modified	Sharing with
<input type="checkbox"/> H7_dashboard	Jun 30, 2024, 12:14 PM	Frederick Eady

WIDGETS

All Interaction Visualisation Annotation

	Messenger		Color
	Dimmed light		Colored light
	Time Picker		Scheduler
	Value		Value Selector

Value

Supported variables types: Character String, Int, Float and all Specialized types based on these 3 types

Display or send a numeric or a text value to your device.

Configure the Widgets

Widget Settings

Name
CW STEPS

Hide widget frame

Linked Variable ⓘ

This widget is displaying example data. Select a source variable to display its value.



Link Variable

Decimal digits ⓘ

Digits
0



Truncate



Round

Widget Settings

Name
CCW STEPS

Hide widget frame

Linked Variable ⓘ

This widget is displaying example data. Select a source variable to display its value.



Link Variable

Decimal digits ⓘ

Digits
0



Truncate



Round

Link the Widgets to Cloud Variables



Link Variable to CW STEPS

Things

H7_thing
H7 - Arduino Portenta H7

Variables

num_ccw_steps
Int

num_cw_steps
Int

num_cw_steps

Thing H7_thing
Type Int
Last Value 6
Permission Read/Write
Update Policy On change - Threshold 0
Last Update 30 Jun 2024 10:47:23

LINK VARIABLE

Dashboards > **H7_dashboard**

ADD

CCW STEPS

0

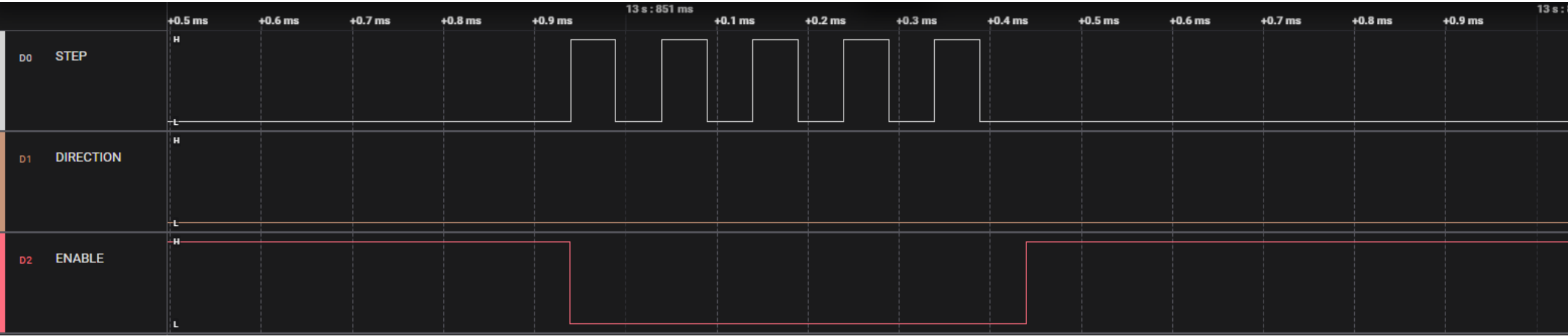
CW STEPS

0

Stepper Motor Simulator



Stepper Motor Simulator - CCW



```
87  /*
88   Since NumCcwSteps is READ_WRITE variable, onNumCcwStepsChange() is
89   executed every time a new value is received from IoT Cloud.
90  */
91  void onNumCcwStepsChange() {
92    // Add your code here to act upon NumCcwSteps change
93    digitalWrite(pinEna, MOTION_ENABLED);
94    digitalWrite(pinDir, CCW);
95
96    for(int i=0; i<num_ccw_steps; i++)
97    {
98      digitalWrite(pinStep, HIGH);
99      delayMicroseconds(50);
100     digitalWrite(pinStep, LOW);
101     delayMicroseconds(50);
102    }
103    digitalWrite(pinEna, MOTION_DISABLED);
104  }
```



Dashboards > H7_dashboard ▾



CCW STEPS

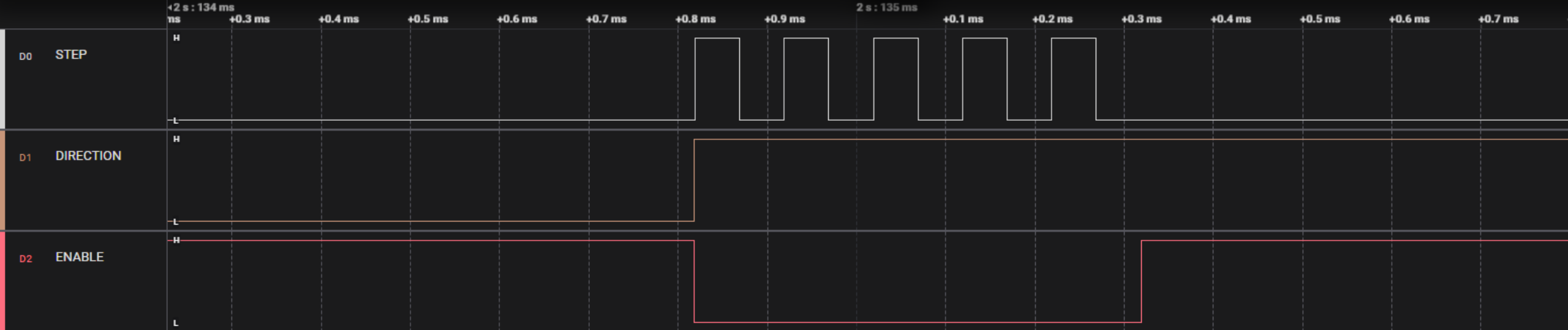
5

CW STEPS

0

22

Stepper Motor Simulator – CW



```
68  /*
69   Since NumCwSteps is READ_WRITE variable, onNumCwStepsChange() is
70   executed every time a new value is received from IoT Cloud.
71  */
72  void onNumCwStepsChange() {
73    // Add your code here to act upon NumCwSteps change
74    digitalWrite(pinEna, MOTION_ENABLED);
75    digitalWrite(pinDir, CW);
76
77    for(int i=0; i<num_cw_steps; i++)
78    {
79      digitalWrite(pinStep, HIGH);
80      delayMicroseconds(50);
81      digitalWrite(pinStep, LOW);
82      delayMicroseconds(50);
83    }
84    digitalWrite(pinEna, MOTION_DISABLED);
85  }
```



Dashboards > H7_dashboard ▾



CCW STEPS

5

CW STEPS

5

23

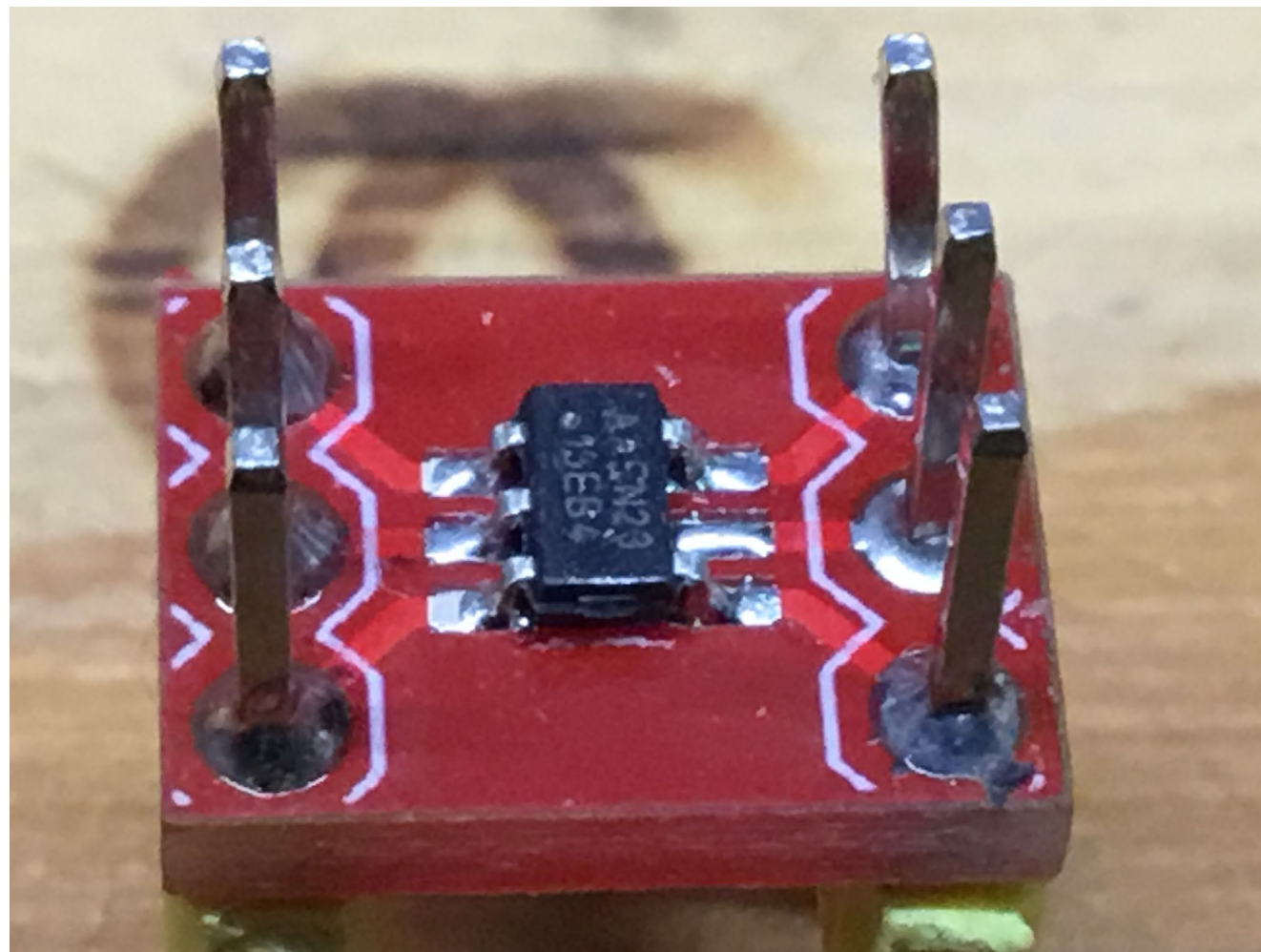
Next Time...

MORE TO COME..

Thank you for attending!!!

Please consider the resources below:

- [Today's Download Package](#)
- arduino.cc





Thank You

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