Alarm Project

Part I Alarm Controller

Project objective

To create a home security monitor/alarm using elements of a pre-existing but redundant alarm system. The Alarm Controller should also be capable of triggering a separate security camera wirelessly. The camera is to be part II of this project.

Background

With the demise of old PSTN landline phone system, some older home security systems that relied on that PSTN network to access remote monitoring became redundant. There are several ways to address that situation, but for fun it seemed to me that it was a good candidate for some kind of IoT connected micro controller. Another reason you might go down this path is if you have an existing security system that had a free internet based monitoring, but that has now changed to a subscription model.

System requirements:

- Be powered entirely from the exiting alarm system power supply.
- Use a mobile phone for all control and monitoring from any where.
- Connect to an internet based IoT service for monitoring, control and communication with other IoT devices.
- Monitor up to four sensors and raise an alarm if a breach of security is detected.
- In the event of an alarm, respond in any or all of the following actions:
    - Sound an alarm
    - Flash a strobe light.
    - Send an alert email.
    - Send a push notification to a mobile phone.
- Be compliant with relevant regulations regarding limitations to duration of siren on time etc.
- Behave in a predictable and compliant way in the event that the internet connection is lost, or a dependent internet service fails.
- Have the ability to connect wirelessly with other IoT devices to add functionality.
- Be capable of receiving firmware updates via Wi-Fi, known as over the air (OTA).

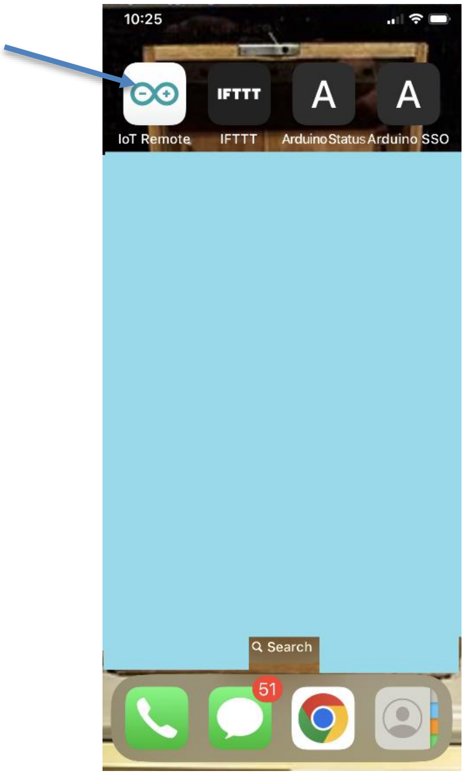
Finished project operation .

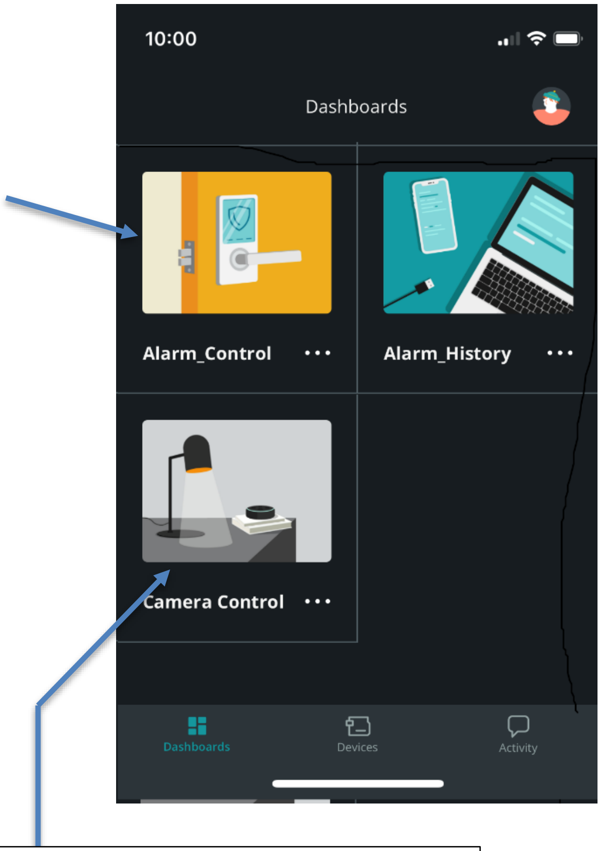
The alarm system is very simple to operate, it can be controlled and monitored with a mobile phone from anywhere as long as there is coverage and internet. There are only two user inputs and seven status indicators. No codes are required to access the app or the alarm panel.

Alarm system operation

Start by opening the Alarm control panel on your mobile phone.

Open the Iot Remote App , then select the Alarm_Control dashboard.

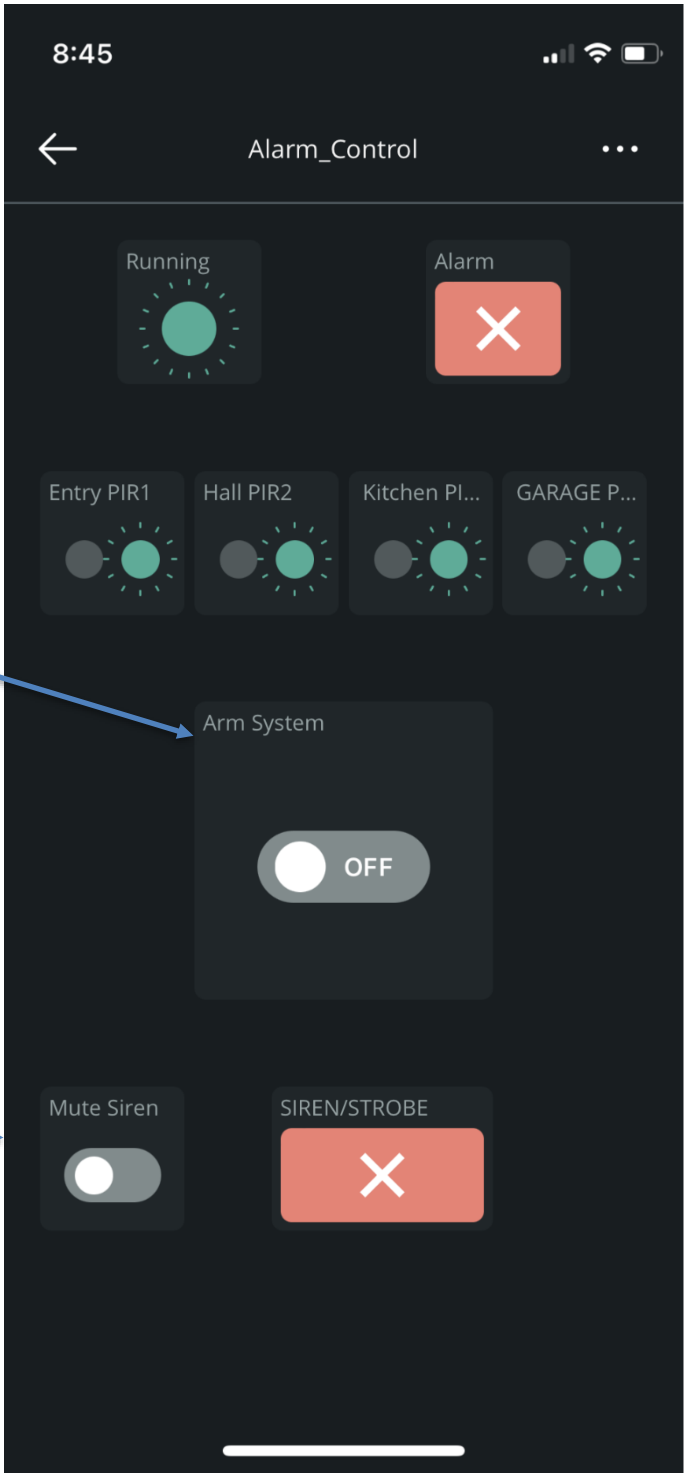




A separate but related project. I have built up a an ESP32-CAM video camera triggered wirelessly by this alarm system using a shared ArduinoCloud Variable. It uploads AVI's or stills to google drive. The part II is complete. Code and documentation available.

Alarm Panel controls

User control switches



Arm_System.
When on, puts the system into alarm monitoring mode, if an alarm is detected the Sirens will sound, the Strobe light will activate. Emails and mobile phone notifications will periodically be sent, alerting the owner. When off the system is idle.

Mute_Siren
Stops both sirens from sounding immediately. Other than that the system will still record Alarms send alerts etc if armed.

Status indicators

Running

Blinks green once per second, if its not blinking there is a problem. The alarm panel could be powered off or faulty, the local WiFi or internet or other critical service could be down where the alarm system is located.

Alarm

Shows as a red X when not in an Alarm state, shows a green tick when an alarm has been detected, alarm condition. Alarms will hold for 10 minutes assuming there are not further alarm triggers the Alarm state will be cleared the Alarm indicator will go back to a red X, an email will be sent indicating the alarm has cleared. If the Arm_System switch is turned of during an alarm state, the system will immediately. return to the idle state (Siren's and Strobe off, Alarm indicator to red X)

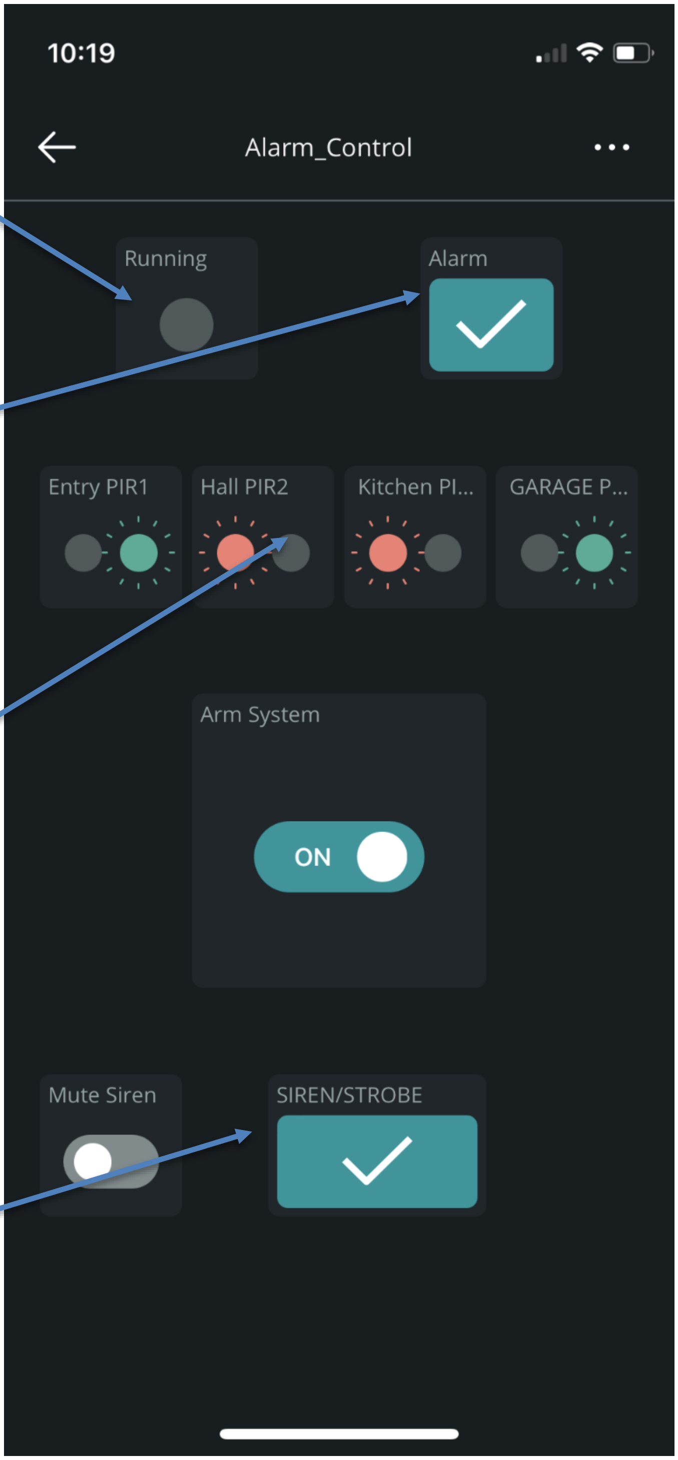
PIR's 1-4

When no movement is detected all four indicators will show as green, when movement is detected one or more of the indicators will turn red, if the system is armed this in turn will trigger an alarm state.

.

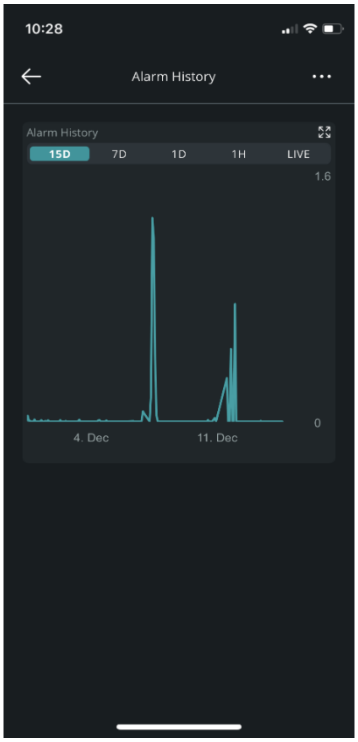
Siren/Strobe

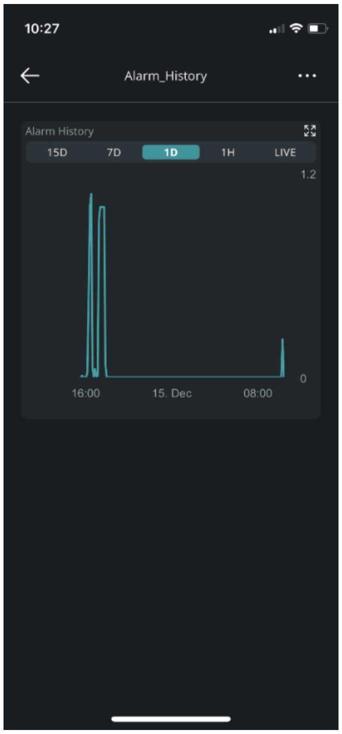
When showing a red X the Strobe and Siren's are off, if it's a green the Siren's the strobe are logically on, however if Mute_Siren is set to on, only the strobe will be active.

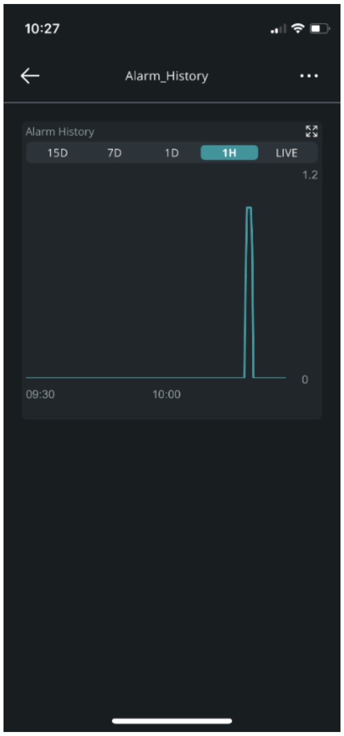


Alarm History

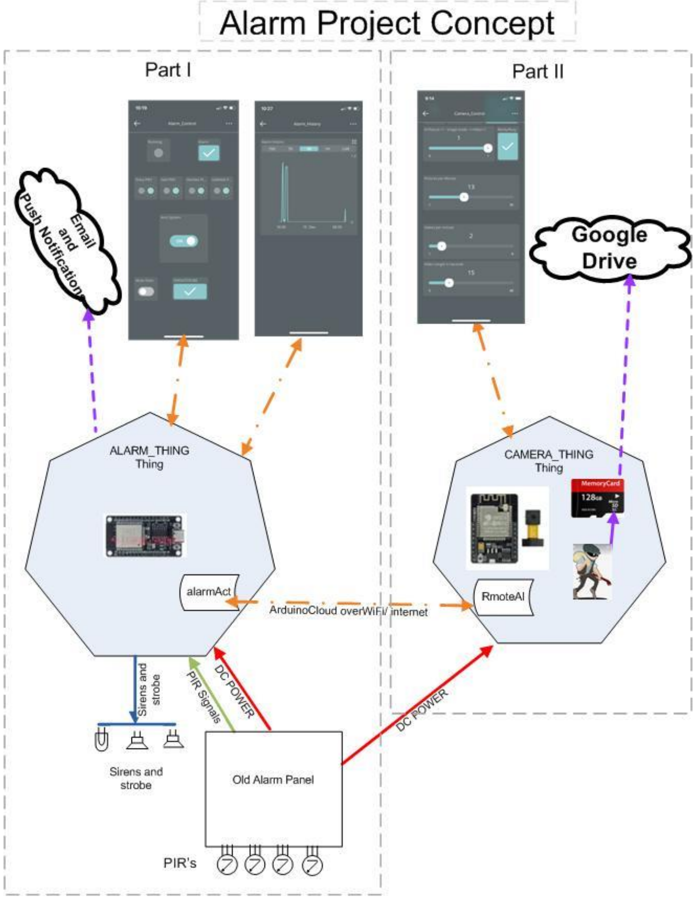
Alarm history is kept for 15 days and can be viewed over five different periods, Live, 1 Hour, 1, 7 or 15 Days. An alarm count is count is kept while the system is armed it the count resets to zero each time the alarm system is re-armed. To acces alarm history open the phone app and choose The Alarm_History dashboard.





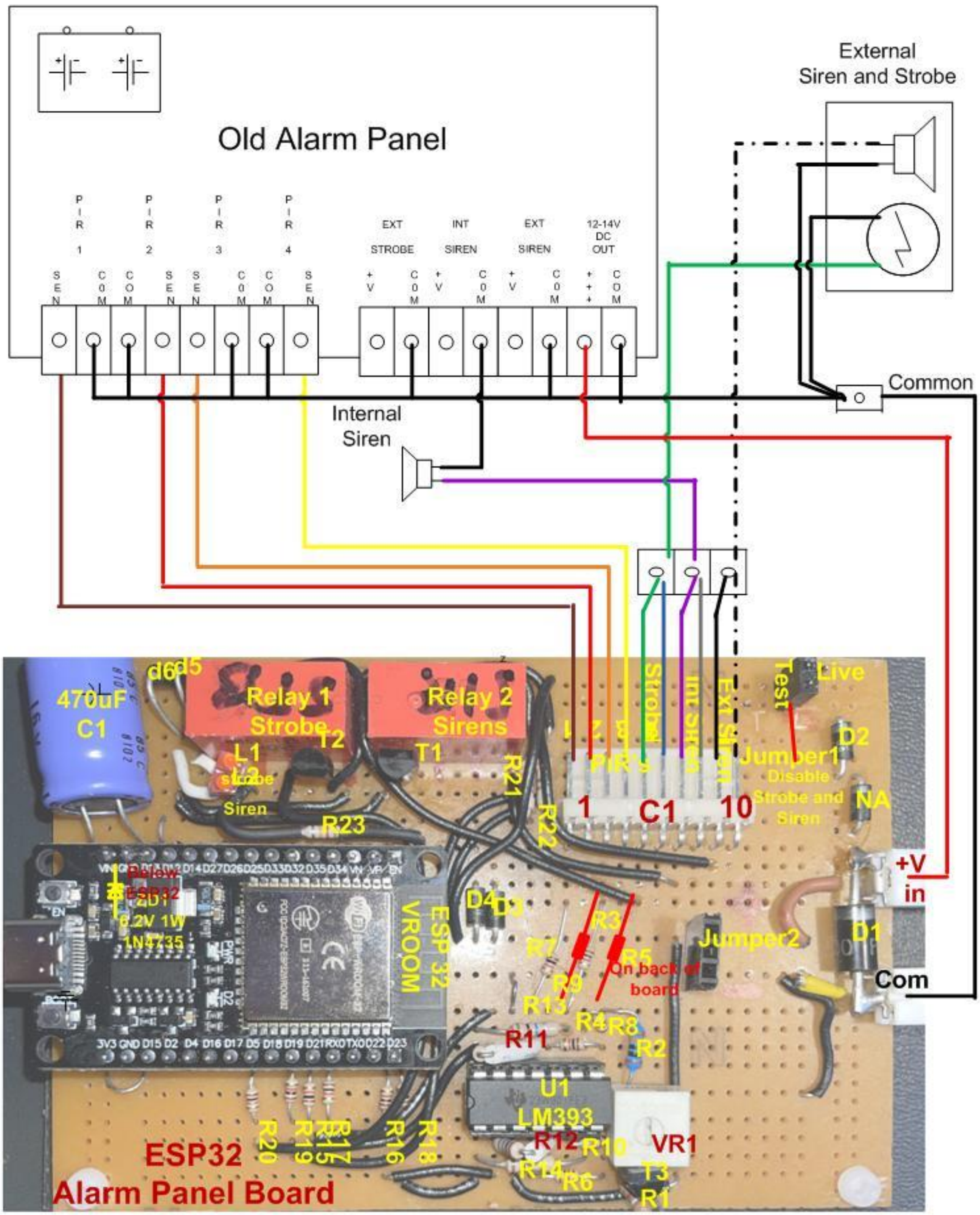


This diagram shows how the Camera connection (part II) of the project fits together.



Connecting up the system

Wiring diagram



Notes:

The PIR wiring can remain connected to the old panel terminals. The Alarm board PIR's inputs have a voltage threshold of approx 2.1v, inputs above that voltage are seen as high, below that low. The PIRs can be selected in firmware as logically Alarm high or Alarm low. The positive side of the siren's and the strobe need to be isolated from the old panel.

Construction and programming

Prerequisites

- An existing electronic alarm system that includes sensors (PIR's), siren, strobe light(optional), a battery backed up dc power supply.
- An internet connected Wi-Fi service accessible from the location of the new system.(probably the location of the existing system)
- A Windows 10 or later computer administrative user access.
- An Android or IOS mobile phone, with Arduino IOT remote app and IFTTT app.

Hardware

The size and shape requirement of the hardware will likely be different depending on the space available to fit it into an existing alarm panel box. My hardware is just a single board wired point to point on matrix prototype board. There are no hardware build details, just circuit diagram and layouts that I used, I expect if anyone decided to build this, they will do so in a form that suits them.

Parts List

Item	Description	QTY	Jaycar#	$Item	$Tot
1.	ESP32 Development Board TYPE-C USB CH340C WiFi+Bluetooth Ultra-Low Power Dual Core ESP32-DevKitC-32 ESP-WROOM-32 Expansion Board	1	AliExpress	$7.00	$7.00
2.	LM339 Quad comparator IC	1	ZL3339	$2.25	$2.25
3.	Relay DPDT 12V 2Amp NEC MR62-12SR (Jaycar Equiv listed)	2	SY4062	$6.00	$12.00
4.	Resistor 1K .5W	14		$0.15	$.2.10
5.	Resistor 10M .5W	4		$0.15	$0.60
6.	Resistor 330K .5W	2		$0.15	$0.30
7.	Resistor 100K .5W	1		$0.15	$0.15
8.	Resistor 3.9K .5W	1		$0.15.	$0.15
9.	Resistor 100K .5W	1		$0.15	$0.15
10.	Resistor 2.2K .5W	1		$0.15	$0.15
11.	Trimpot 10K 25t	1	RT4650	$2.95	$2.95
12.	Capacitor Electro 470uF 25v	1	RE6195	$0.75	$0.75
13.	Diode 1N4001	5	ZR1004	$0.25	$1.25
14.	Diode 1N5822 Schottky 40V 3A	1	ZR1048	$1.45	$0.15
15.	Zenner 6.2V 1W 1N4735	1	ZR1405	$0.95	$0.95
16.	10 way header socket	1	HM3410	$1.75	$1.75
17.	10 way header plug	1	HM3430	$1.45	$1.45
18.	spade connector male	2			$1.00
19.	spade connector female	2			$1.00
20.	Transistor FET 2N7000	2	ZT2400	$1.25	$2.50
21.	Transistor BC557	1	ZT2164	$1.95	$1.95
22.	ProtoType BOARD	1	HP9552	$8.95	$8.95
23.	IC Socket 30pin Make from 40 pin)	1	PI6508	$1.25	$1.25
24.	LED red 2mm	2	ZD0040	$075	$1.50
25.	Three position screw type terminal block (siren/strobe hook up)	1		$1.00	$1.00

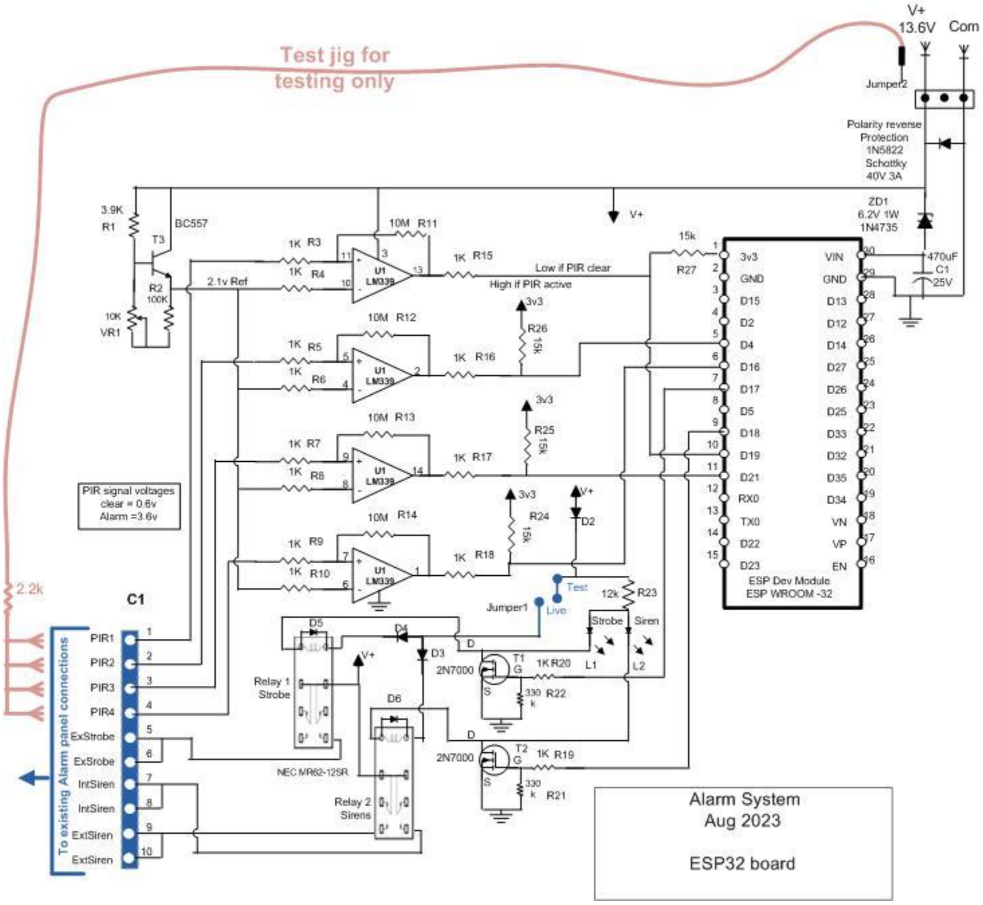
Where known I have included Jaycar stock numbers Total ~$46.5

Other: Sundry wire solder heat shrink etc
Tools: soldering iron, digital volt meter, wire cutters, screw drivers etc

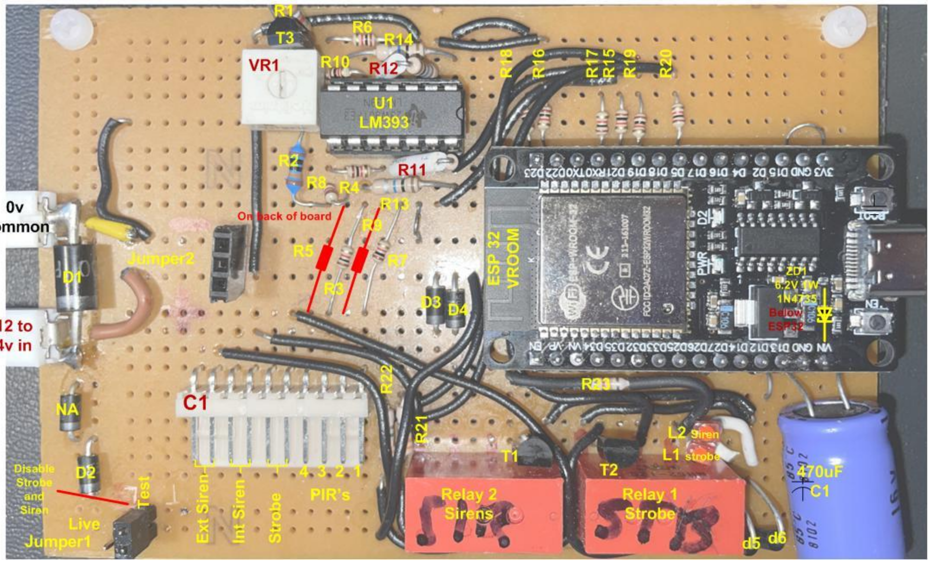
Circuit description

The ESP-32 uses 6 pins to control all the alarm sensors etc. Four input pins are connected to four PIR's. via am LM339 quad comparator IC which does the buffering and level shifting. The other two pins are outputs that connect to 2N7000 FETs that then drive two DPDT relays, one of which drives the internal and external sirens, the other the strobe light. Two on board LEDs indicate when siren's and or strobe is on. Jumper1 can be moved between the live and test positions to disable the sirens and strobe for test purposes. Jumper2 just exposes +V and Gnd for use with the test jig to simulate alarm/clear conditions during testing.

When choosing the matrix board size for the project you may want to make it a size and shape so that it will fit inside your existing alarm panel box.

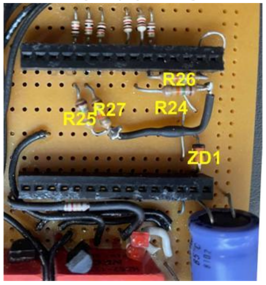


High res versions of the cct and layout are in the package



Board Dimensions 120mm x 78mm

Under ESP



Software

The file Pack1.Zip is included with this project includes all software source code files, templates for the IOT Thing and Dashboards, higher res circuit and layouts some more detailed set up guides for IFTTT etc. First thing to do if you are interested in building this is to create a folder in the root of the C drive C:\AlarmProject. (you may need to be granted elevated privileges to do this) Click Pack1.zip to download the file then extract it to into that folder.

The project is dependent on two services

ArduinoIotCloud (Provides dasboards and IoT communications)
You will need at least an Arduino base level subscription to implement this project, it currently costs about $20US per year. (that's the only ongoing cost for this project)

IFTTT (emails and mobile phone push notifications)
You will need a free subscription which gets you 30 emails/notifications a day, plenty. For sending alert emails and mobile phone notifications.

The source code is commented and its pretty straight forward, so will just give an overview here.
A flow chart on the next page give the words below some more context.
I am a very basic coder, so I am sure there is a lot of room for improvement by someone more skilled than I.

Overview

The system has two operating states armed and idle.

Features common idle or armed state.

- The dashboard is updated once every second if displays.
- A 'Running' Indicator that blinks every second. If this is not blinking the main unit is powered off or there is a hardware or dependent service fault.
- The status of the 4 PIR's, green normal red activated.
- 'Alarm' status a green tick indicates an alarm condition is active, a Red Cross means no alarm.
- 'Siren/Strobe' will show a green tick if activated if not a Red Cross
- The large 'Arm System' slider switch, when on Arms the system when off returns system to idle state.
- The small 'Mute Siren' slider switch when on inhibits siren sounding but otherwise the system is unaffected.

Armed state operation.

In the event a PIR’s enter an ‘alarm condition’:

- An alarm sequence will start and hold for the alarm hold time.
- The sirens sound (if not muted)
- The Strobe light will flash.
- An alert email and or a mobile phone push notification are sent.

When the alarm hold time expires and the ‘alarm condition’ has not been cleared:

- The sirens will keep sounding (if not muted) until the ‘alarm condition’ is cleared or the maximum siren time is expired, whichever is less,

If the ‘alarm condition’ is cleared:

- The sirens and strobe will turn off.
- The ‘alarm condition’ will be reset.
- An email is sent.

If the ‘Arm System’ switched off and an ‘alarm condition’ is active.

- The sirens. and strobes will turn off.
- An email will be sent.
- The ‘alarm condition’ will be reset.
- the system enter the ‘idle state’

‘alarm condition’ not active

- The system will enter the ‘idle state’

Idle State operation.

The ‘Arm System’ slider is turned on:

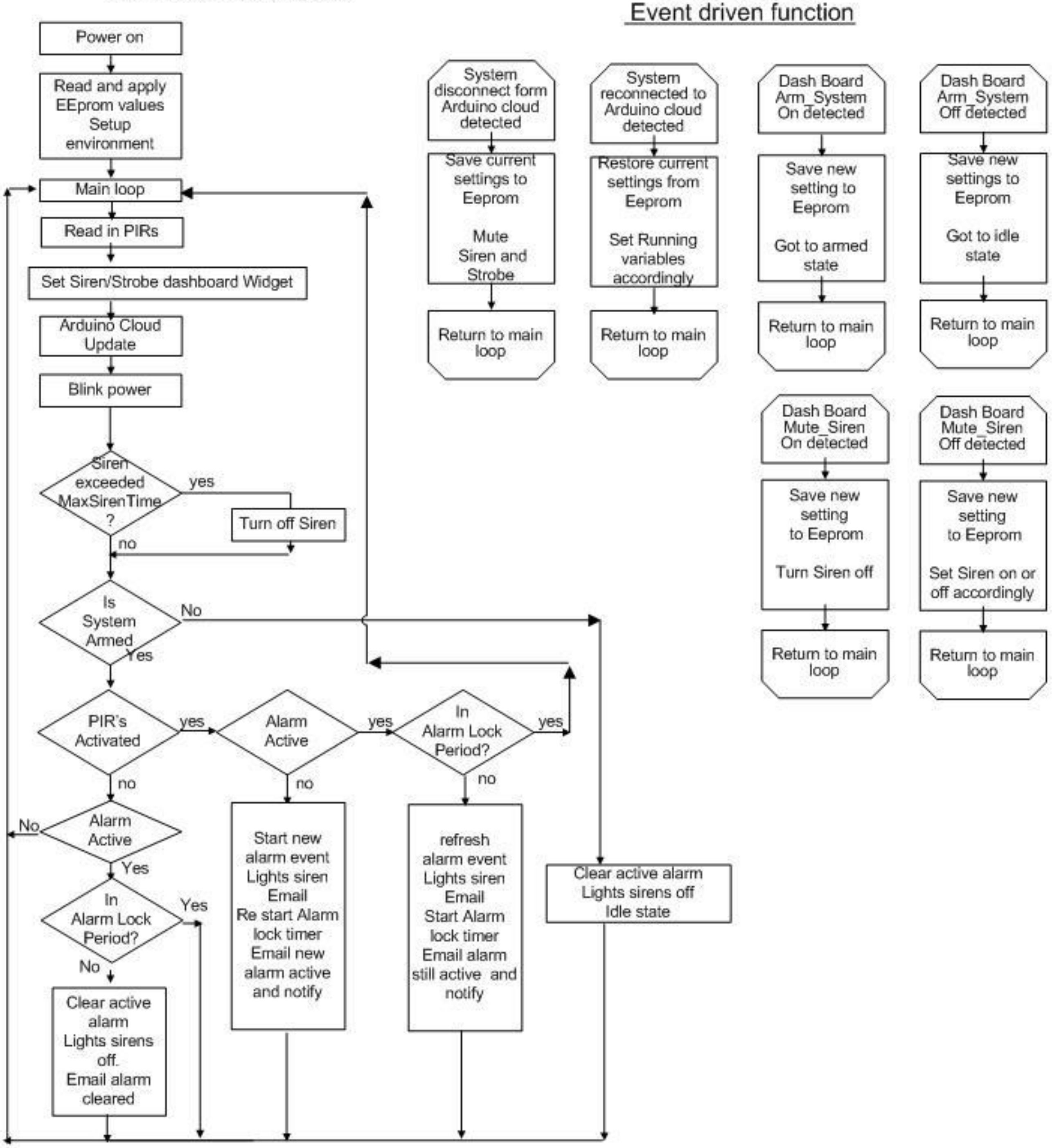
- The system enters the ‘Armed State’

The ‘Mute Siren’ slider is turned off:

- Siren muting is activated until turned off.

Software flow diagram

Asynchronous Event driven function


Power on
Read and apply EEprom values Setup environment
Main loop
Read in PIRs
Set Siren/Strobe dashboard Widget
Arduino Cloud Update
Blink power
Siren exceeded MaxSirenTime ?
yes
Turn off Siren
no
Is System Armed
No
Yes
PIR's Activated
yes
no
Alarm Active
yes
no
In Alarm Lock Period?
yes
no
Start new alarm event Lights siren Email Re start Alarm lock timer Email new alarm active and notify
refresh alarm event Lights siren Email Start Alarm lock timer Email alarm still active and notify
Clear active alarm Lights sirens off Idle state
No
Alarm Active
Yes
In Alarm Lock Period?
Yes
No
Clear active alarm Lights sirens off. Email alarm cleared
System disconnect form Arduino cloud detected
Save current settings to Eeprom
Mute Siren and Strobe
Return to main loop
System reconnected to Arduino cloud detected
Restore current settings from Eeprom
Set Running variables accordingly
Return to main loop
Dash Board Arm_System On detected
Save new setting to Eeprom
Got to armed state
Return to main loop
Dash Board Arm_System Off detected
Save new settings to Eeprom
Got to idle state
Return to main loop
Dash Board Mute_Siren On detected
Save new setting to Eeprom
Turn Siren off
Return to main loop
Dash Board Mute_Siren Off detected
Save new setting to Eeprom
Set Siren on or off accordingly
Return to main loop

Operation

There are effectively three inputs to the alarm system
1. Dash board System_Aarm switch, that switches alarm from the idle state to the armed state
2. Dash board Mute_Siren when on disables the siren. Logical state of the siren is not effected.
3. The sensor input (PIRs) these are logically just one input, If the system is in the armed state and any Sensor comes on an alarm will be triggered.

There are several built in software timers that determine system behaviour the durations are controlled by variables in the software at compile time.

1. When an alarm is triggered at timer starts that holds the system in the 'Alarmed State' until the timer expires or the system is disarmed. Variable AE_Hold sets the duration on the hold period. (default 10 minutes)
2. The duration the siren can sound is limited, for each alarm even, for regulatory and common sense reasons The MaxSireTime sets the duration.(default 180000ms) 3 minutes
3. In addition to timer 2 above there is a lock out period after the siren has stopped sounding until it can sound again. Variable Siren_Lockout sets the duration. (default 900000ms) 15 minutes.

Source code configuration options that set default behavior and timings in AlarmProject.ini

Compile time options

```
// Comment these  out to allow emails and notifications respectively.
#define StopSendEmail
#define StopSendNotify

//Comment this out to aset time out to live system mode rather  than TEST
#define ALARMTEST

// comment out the line below to turn off most serial printing
#define DEBUG

// comment out this line for alarm active low PIRS else Active High
#define AlarmHigh
```

Timming control variables

AE_Hold default 10 minutes minimium alarm state hold time
This also determines how often alarm status emails are sent out

MaxSirenTime default 180000ms 3 minutes Maximium time the Siren can continuously sound

SirenLockout default 900000ms 15 minimum duration of lockout after siren has timed out(MaxSirenT expired

Software setup

Summary steps

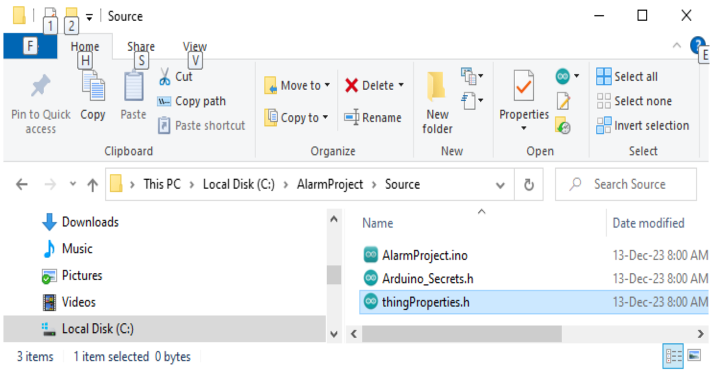
- Copy the project package to your computer.
- Setup Arduino Cloud account (if required)
- Manually add the esp32 dev module to your cloud environment
- Download and setup Arduino cloud CLI (if required)
- Use CLI templates to create the ALARM_THING and two dashboards.
- Link device ALARM_DEV to thing ALARM_THING
- Set up an ifttt account (if required) and create two applets.
- Configure software user specific items like Wi-Fi etc.
- Configure Mobile Phone apps

Detail

#### Copy the project package to your computer.

1. Create a folder C:\AlarmProject that you have full Read write change access to.
   (Elevated permission may be required)
2. Extract AlarmProject.zip to C:\AlarmProject.
3. You should see Source and Templates folders Along with other files and folders

   (it is important to use the exact folder name and Location as the rest of this guide uses links to that Folder)

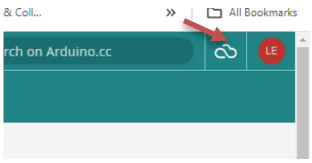


Name	Date modified
AlarmProject.ino	13-Dec-23 8:00 AM
Arduino_Secrets.h	13-Dec-23 8:00 AM
thingProperties.h	13-Dec-23 8:00 AM

You may want to add C:\AlarmProject to Qick Access

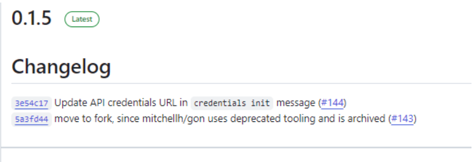
#### Setup Arduino Cloud account (if required)

4. Setup Arduino cloud account if you don't have one already
   Ref https://support.arduino.cc/hc/en-us/articles/360016416280-Sign-up-for-an-Arduino-Cloud-plan
   Choose at least 'Entry' plan currently $US1.99 per month



5. Ctrl Click Arduino cloud and Login if you are not already.
   Click the cloud button (top right) to go to the home page

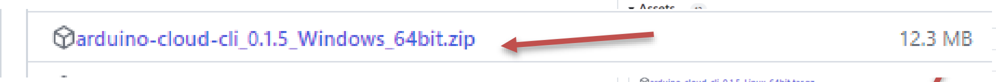
6. Download the ArduinoCloudCLI executable if you don't have it already
   Click on this link https://github.com/arduino/arduino-cloud-cli/releases
   to download the zip file and extract directly into
   C:\AlarmProject\templates. (Assuming
We are usings windows 10 or 11)



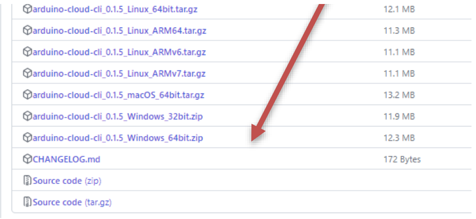
0.1.5 Latest

Changelog

3e54c17 Update API credentials URL in `credentials init` message (#144)
5a3fd44 move to fork, since mitchellh/gon uses deprecated tooling and is archived (#143)



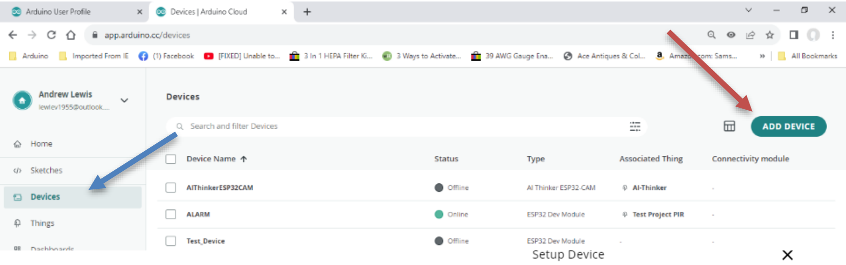
arduino-cloud-cli_0.1.5_Windows_64bit.zip 12.3 MB



	870 Bytes
	11.6 MB
arduino-cloud-cli_0.1.5_Linux_64bit.tar.gz	12.1 MB
arduino-cloud-cli_0.1.5_Linux_ARM64.tar.gz	11.3 MB
arduino-cloud-cli_0.1.5_Linux_ARMv6.tar.gz	11.1 MB
arduino-cloud-cli_0.1.5_Linux_ARMv7.tar.gz	11.1 MB
arduino-cloud-cli_0.1.5_macOS_64bit.tar.gz	13.2 MB
arduino-cloud-cli_0.1.5_Windows_32bit.zip	11.9 MB
arduino-cloud-cli_0.1.5_Windows_64bit.zip	12.3 MB
CHANGELOG.md	172 Bytes
Source code (zip)	
Source code (tar.gz)	

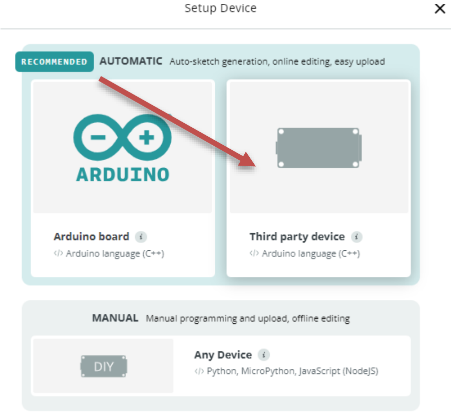
####   Manually add the esp32 dev module to your cloud environment

7. Add the ESP32 as a device into Arduino CLoud
   - Select Devices in the left side pane.
   - Select ADD DEVICE

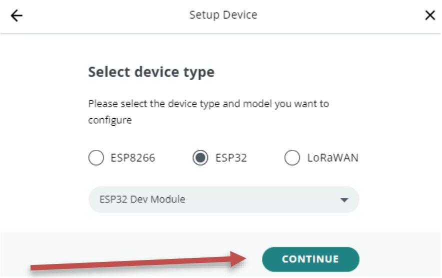


Device Name	Status	Type	Associated Thing	Connectivity module
AIThinkerESP32CAM	Offline	AI Thinker ESP32-CAM	AI-Thinker	-
ALARM	Online	ESP32 Dev Module	Test Project PIR	-
Test_Device	Offline	ESP32 Dev Module	-	-

   - Choose third party device.


Setup Device
RECOMMENDED
AUTOMATIC Auto-sketch generation, online editing, easy upload
ARDUINO
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)

   - Select device type and model
   - **ESP32   ESP32 DEV MODULE**
   - Click on Continue.



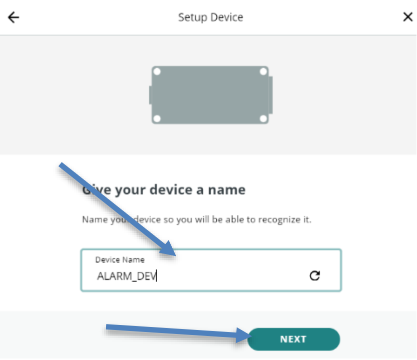
Please select the device type and model you want to configure

○ ESP8266 ● ESP32 ○ LoRaWAN

ESP32 Dev Module

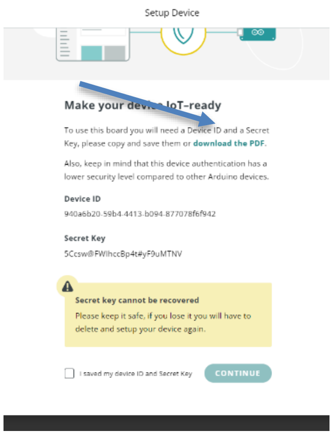
   - Type in **ALARM_DEV** as the Device Name
   - Click Next

   - A dialogue will come up with the device ID and Secret Key
   - Click 'Download the PDF'
   - Click the downloads button in the top right of the browser
   - Then hover over the file and click on the folder button



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

Device Name: ALARM_DEV



Make your device IoT–ready

To use this board you will need a Device ID and a Secret Key, please copy and save them or **download the PDF**.

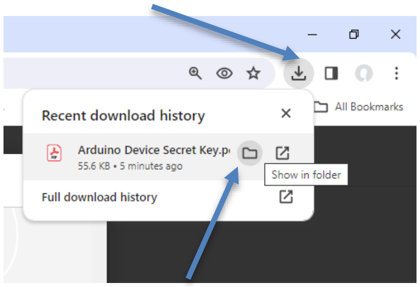
Also, keep in mind that this device authentication has a lower security level compared to other Arduino devices.

Device ID
940a6b20-59b4-4413-b094-877078f6f942

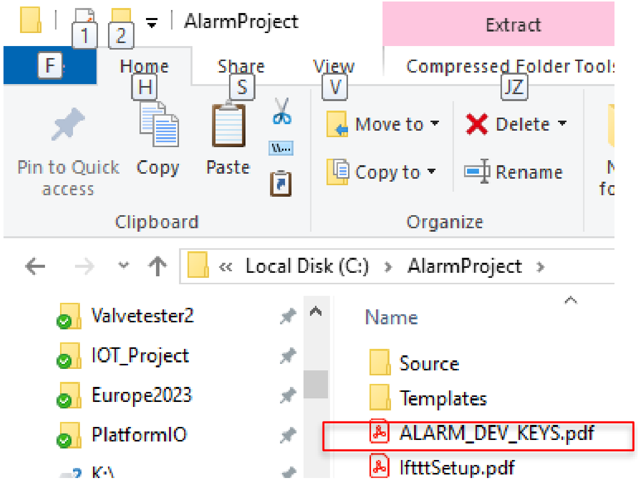
Secret Key
5Ccsw@FWlhccBp4t#yF9uMTNV

Secret key cannot be recovered
Please keep it safe, if you lose it you will have to delete and setup your device again.

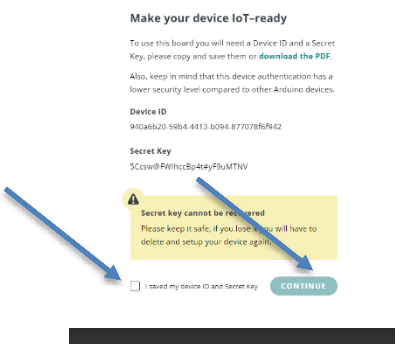
□ I saved my device ID and Secret Key



- Right click on the pdf file and rename it
- ALARM_DEV_KEYS.pdf
- Copy and paste to the project folder
  Save it in the project folder [C:\AlarmProject](C:\AlarmProject)



- Back in the browser
- Click on the ‘I saved my Device ID and Secret’ check box then Continue and done.



Make your device IoT–ready

To use this board you will need a Device ID and a Secret Key, please copy and save them or **download the PDF**.

Also, keep in mind that this device authentication has a lower security level compared to other Arduino devices.

Device ID

940a6b20-59b4-4413-b094-877078f6f942

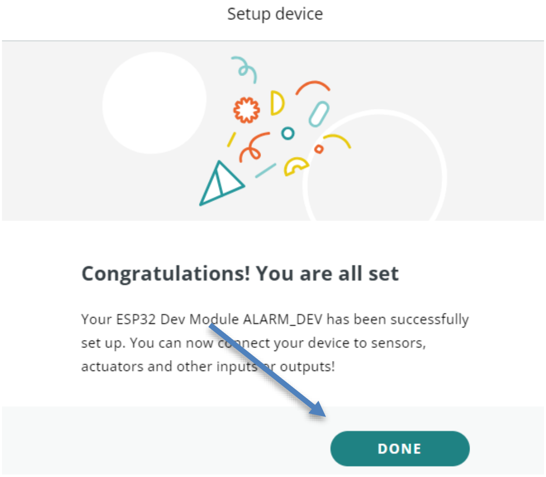
Secret Key

5Ccsw@FWlhccBp4t#yF9uMTNV

Secret key cannot be recovered

Please keep it safe, if you lose it you will have to delete and setup your device again.

□ I saved my device ID and Secret Key CONTINUE



Setup device

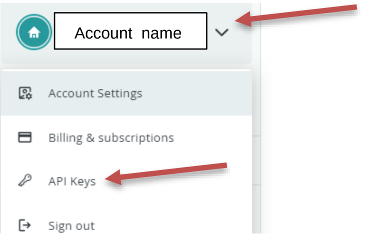
Congratulations! You are all set

Your ESP32 Dev Module ALARM_DEV has been successfully set up. You can now connect your device to sensors, actuators and other inputs or outputs!

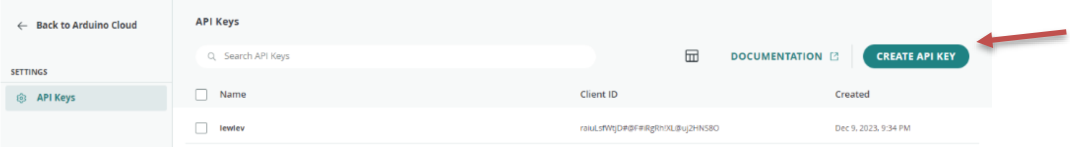
DONE

####   Setup Arduino cloud CLI (if required)

8. The task involves using the ArduinoCloud CLI if you have not used this before it needs to be authenticated with your Arduino Cloud Account if you have already done that skip to step 11.
   - Go to your Adruino Cloud home page
   - In the top left corner, you will find your account name



   - Click on the down arrow beside your name select API Keys

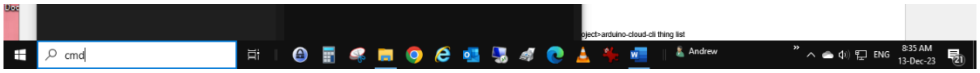


API Keys

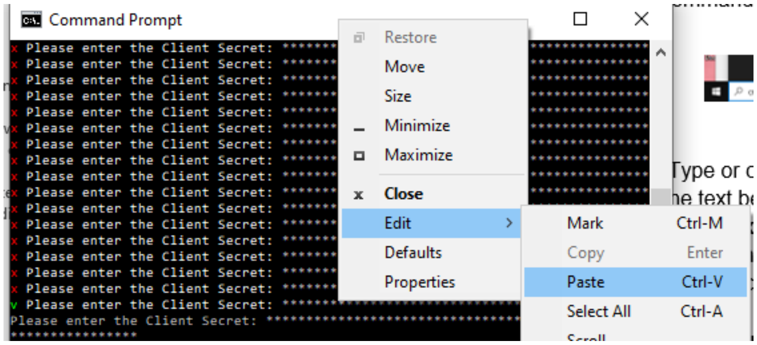
□ Name	Client ID	Created
□ lewlev	raiuLsfWtjD#@F#iRgRh!XL@uj2HNS8O	Dec 9, 2023, 9:34 PM

   - Click on the Create API Key button
   - A new key will be created.
   - You will be prompted to save a pdf file with the,new keys details.
   - Save it to [*C:\AlarmProject\*](C:\AlarmProject\) *say call it CloudCLI_API_Keys.pdf*

9. Open a command window by typing ‘cmd’ into the windows search bar.



- Type or copy and past the text below shown in **”bold text“** at theCommand prompt.
(don’t include the “”)
Note to paste right click on the white Bar at top cmd window the edit Paste Ctrl V does not seem to work.



```
Please enter the Client Secret: *******
Please enter the Client Secret: *******
Please enter the Client Secret: *******
Please enter the Client Secret: *******
Please enter the Client Secret: *******
Please enter the Client Secret: *******
Please enter the Client Secret: *******
Please enter the Client Secret: *******
Please enter the Client Secret: *******
Please enter the Client Secret: *******
Please enter the Client Secret: *******
Please enter the Client Secret: *******
Please enter the Client Secret: *******
Please enter the Client Secret: *******
Please enter the Client Secret: *******
Please enter the Client Secret: *******
Please enter the Client Secret: *******
Please enter the Client Secret: ******************************
***************
```

- **“cd\AlarmProject\Templates”**

  Enter the command below, when prompted enter the ClientID and Client Secret Obtained in step 7.

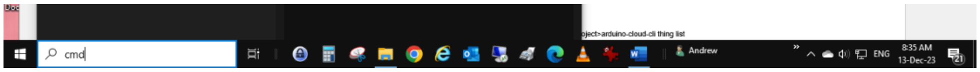
- **“arduino-cloud-cli credentials init”**

  To obtain your API credentials visit https://create.arduino.cc/iot/integrations
  Please enter the Client ID^^&%YUYUIYT&*&^*&*&^*(^*(&^*
  Please enter the Client Secret:
  ****
  v Please enter the Organization ID - if any - Leave empty otherwise:
  Credentials file successfully initialized at:
  D:\Users\User\AppData\Local\Arduino15\arduino-cloud-credentials.yaml

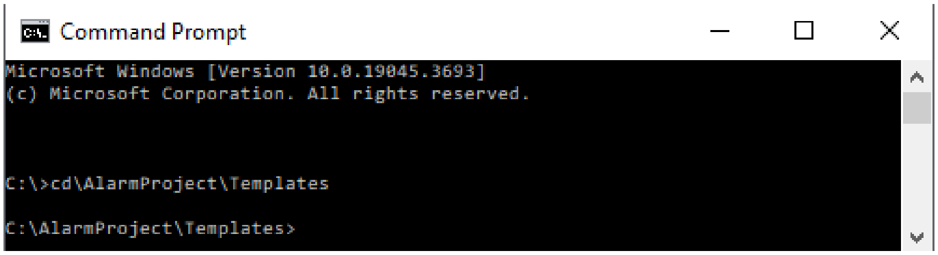
- If successful you should a response like the one above.

10. Open ArduinoCloud CLI on your computer
(If you just added a new set of keys skip to step 11)
(computer must be running Windows 10 at a minimum)
the CLI executable will be in the C:\AlarmProject \Templates folder.
Ref Cli guide docs https://docs.arduino.cc/arduino-cloud/arduino-cloud-cli/getting-started

- If you don’t have one open, open a command window by typing ‘cmd’ into the windows search bar



- Type or copy and past the text below shown in **”bold text“** to the Command prompt.
(don’t include the “”)
followed by the Enter key



```
Microsoft Windows [Version 10.0.19045.3693]
(c) Microsoft Corporation. All rights reserved.


C:\>cd\AlarmProject\Templates

C:\AlarmProject\Templates>
```

“cd\AlarmProject\Templates”

C:\AlarmProject\Templates>

#### Use CLI templates to create the ALARM_THING and two dasboards ####

11. Create the **ALARM_THING** thing from template.
    - Type or copy and paste the text below shown in **”bold text“** to the Command prompt. (don’t include the “”) followed by the Enter key
    - **“arduino-cloud-cli thing create --name ALARM_THING --template ALARM_THING_Temp.yaml name: ALARM_THING”**

```
name: ALARM_THING
id: c5713bfc-00ad-4a9b-b75a-6564d207606b
device_id:
variables: AlarmHist, AlarmAct, ARMED, BlinkPower, MUTESIREN, PIR1, PIR2,
PIR3, PIR4, SIRENsTROBEWidget
```

If you get a response like the one above the new ALARM_THING was created OK. The ID (Yellow highlight) will of course be different and unique to the new thing.

Take note of the thing id above it is needed to create the dashboards via the CLI in next steps. (tip, to copy txt from the command prompt, right click the top white command prompt bar, select edit select mark, use the mouse to select txt, it will highlight in white, hit the return key. The text can now pasted any where with cntrl P)

12. Create the **Alarm_Control** dashboard from template
    - Please copy just the ID in yellow and past it into the command window. Don’t hit return or any other key except the left arrow to move the cursor back to the beginning of command prompt, like this
      C:\AlarmProject\Templates >| *c5713bfc-00ad-4a9b-b75a-6564d207606b*
    - Now type or copy and paste the section of the command below in bold (don’t copy the quotes) followed by the Enter key
    - **“arduino-cloud-cli dashboard create --name Alarm_Control --template Alarm_Control_Temp.yaml --override ALARM_THING=”** *c5713bfc-00ad-4a9b-b75a-6564d207606b*

```
name: Alarm_Control
id: d5355171-c4fe-4818-841f-42df411738cc
updated_at: 2023-12-13 00:25:20.7042 +0000 UTC
widgets: Hall PIR2, SIREN/STROBE, Alarm, Mute Siren, Entry PIR1,  GARAGE
PIR4,  Kitchen PIR3, Running, Arm System
```

13. Create the **Alarm_History** dashboard from template

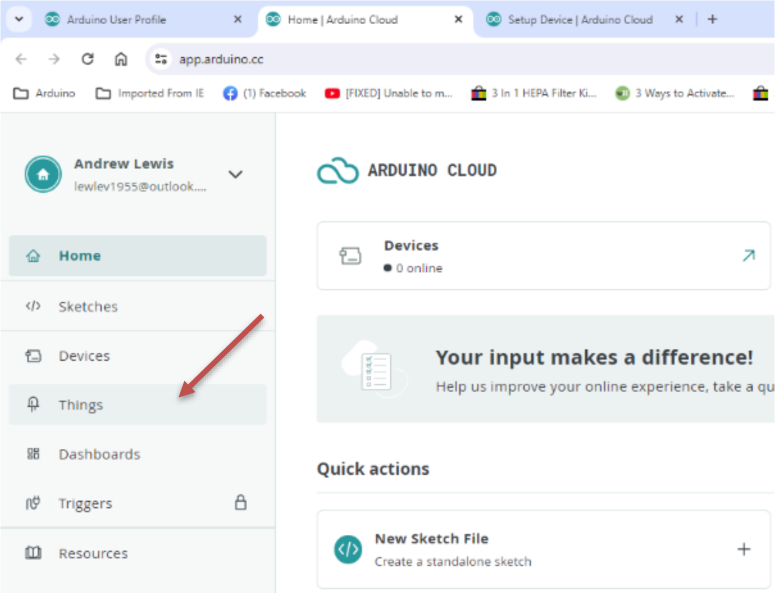
Repeat step 11 again for the Alarm_History Dashboard

"arduino-cloud-cli dashboard create --name Alarm_History --template Alarm_History_Temp.yaml --override ALARM_THING=" *c5713bfc-00ad-4a9b-b75a-6564d207606b*

```
name: Alarm_History
id: f3bab9f9-3b6d-42b2-9540-1eabdb7a4e54
updated_at: 2023-12-13 03:06:18.990525 +0000 UTC
widgets: Alarm History
```

14. Associate ALARM_DEV and ALARM thing

From the Arduino Cloud home page choose Things

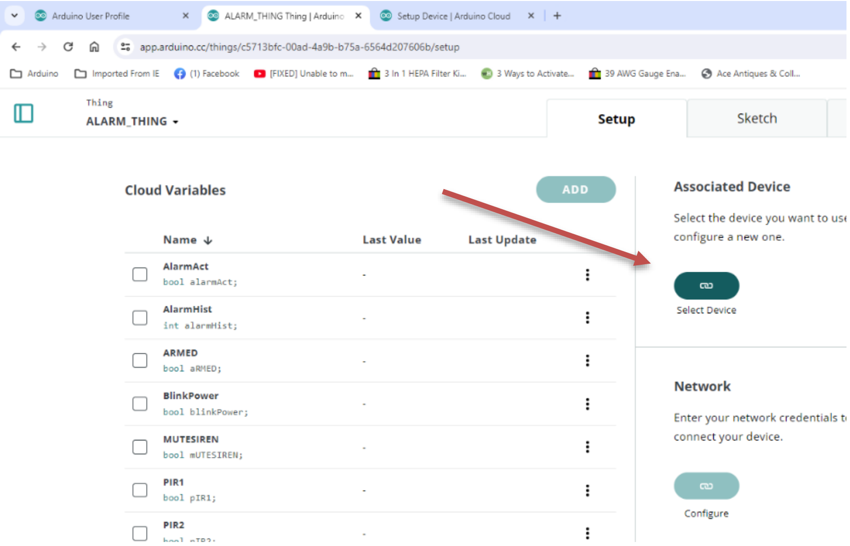


Your input makes a difference!

Help us improve your online experience, take a qu

Then choose ALARM_THING

Then click on 'Select Device'



app.arduino.cc/things/c5713bfc-00ad-4a9b-b75a-6564d207606b/setup

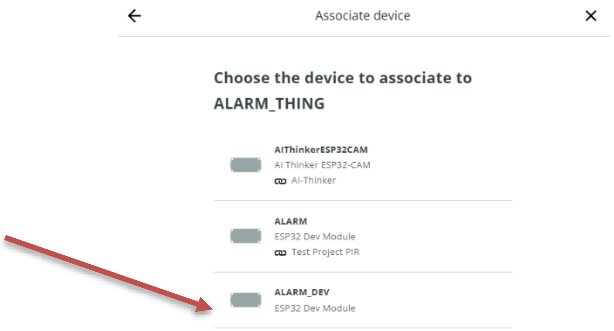
Cloud Variables

Name ↓	Last Value	Last Update
AlarmAct bool alarmAct;	-	
AlarmHist int alarmHist;	-	
ARMED bool aRMED;	-	
BlinkPower bool blinkPower;	-	
MUTESIREN bool mUTESIREN;	-	
PIR1 bool pIR1;	-	
PIR2	-	

Select the device you want to use configure a new one.

Enter your network credentials t connect your device.

Then choose ALARM_DEVICE



Associate device

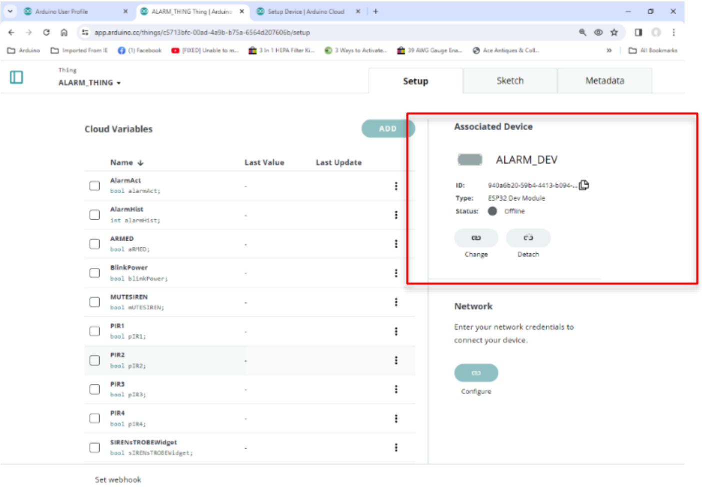
Choose the device to associate to ALARM_THING

AIThinkerESP32CAM
AI Thinker ESP32-CAM
AI-Thinker

ALARM
ESP32 Dev Module
Test Project PIR

ALARM_DEV
ESP32 Dev Module

Done



Thing
ALARM_THING

Setup | Sketch | Metadata

Cloud Variables

ADD

Name	Last Value	Last Update
AlarmAct `bool alarmAct;`	-	
AlarmHist `int alarmHist;`	-	
ARMED `bool aRMED;`	-	
BlinkPower `bool blinkPower;`	-	
MUTESIREN `bool mUTESIREN;`	-	
PIR1 `bool pIR1;`	-	
PIR2 `bool pIR2;`	-	
PIR3 `bool pIR3;`	-	
PIR4 `bool pIR4;`	-	
SIRENsTROBEWidget `bool sIRENsTROBEWidget;`	-	

Associated Device

ALARM_DEV
ID: 940a6b20-59b4-4413-b094-...
Type: ESP32 Dev Module
Status: ● Offline

Change Detach

Network

Enter your network credentials to connect your device.

Configure

Set webhook

That completes all the Arduino Cloud items needed

**####	Set up an ifttt account (if required) and create two applets. #####**

15. Set up ifttt service to generate email and mobile phone push notifications.

Open a browser and got https://ifttt.com/
Set up a free account using the email address that Alarm notification emails are to go to
Create two applets as detailed below
Retrieve connection key
A detailed set of screen shots to guide you through the steps required is in the project folder C:\AlarmProject\IftttSetup.pdf if needed.

Setting	Applet 1	Applet 2
Name	Alarm_Event	Alarm_Nofification
If This Service	Webhooks	Webhooks
Trigger	Web requ with json load	Web requ with json load
Then that Service	Email	Notifications
Action	Send an Email	Send notification from the IFTTT app.
Target	Your ifttt account email	mobile phone # entered during create.

16. Test the applets by pasting the URLs below (with your connection key) into a browser
An email and a mobile phone notification should be generated.

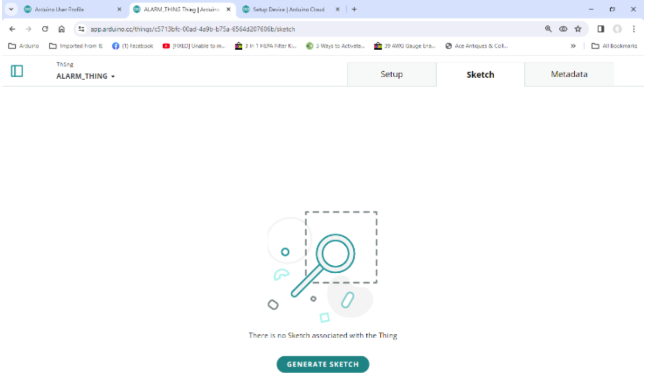
```
https://maker.ifttt.com/trigger/Alarm_Event/with/key/your_key
```

`https://maker.ifttt.com/trigger/Alarm_Notification/with/key/`

####   Configure software user specific items like Wi-Fi etc.   ####

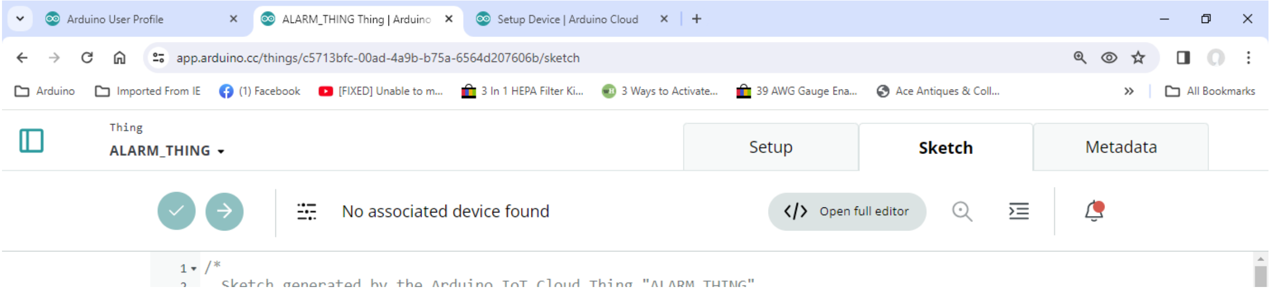
17. Load the source files into your cloud environment, there is a little bit of file manipulation to do Here because of the project and file name conventions work.

- Open [Arduino Cloud](#) home page login if required,
- Open Things
- Open thing ALARM_THING then click on the sketch tab
- You should see the dialogue below click on “Generate Sketch”


Arduino User Profile
ALARM_THING Thing | Arduino
Setup Device | Arduino Cloud
app.arduino.cc/things/c5713bfc-00ad-4a9b-b75a-6564d207606b/sketch
Thing
ALARM_THING
Setup
Sketch
Metadata
GENERATE SKETCH

There is no Sketch associated with the Thing

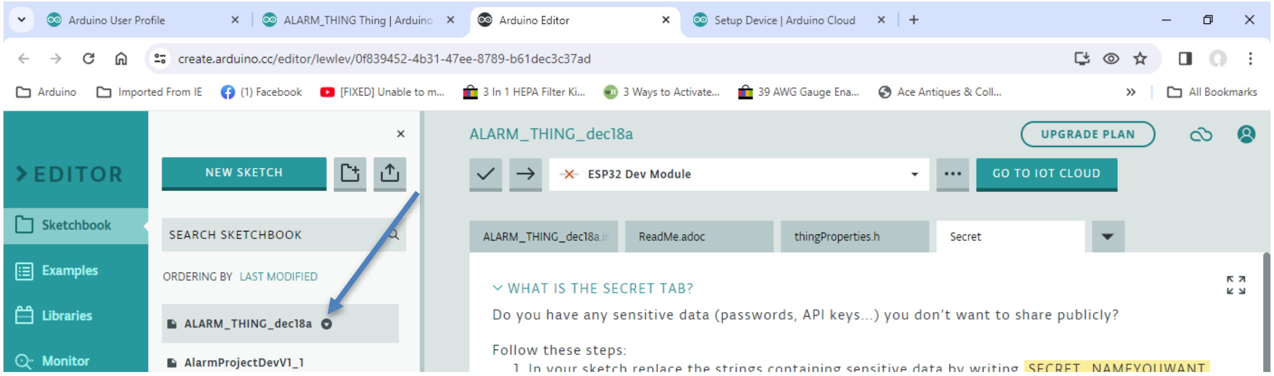
- The sketch will open in the basic editor



No associated device found

```
/*
  Sketch generated by the Arduino IoT Cloud Thing "ALARM_THING"
```

- Click on Open full editor
  The web editor will open with 4 tabs
  ALARM_THINGxxxx.ino, ReadMe,thingProperties.h and Secret
  We will effectively replace ALARM_THINGxxxx.ino, with the AlarmProject code.

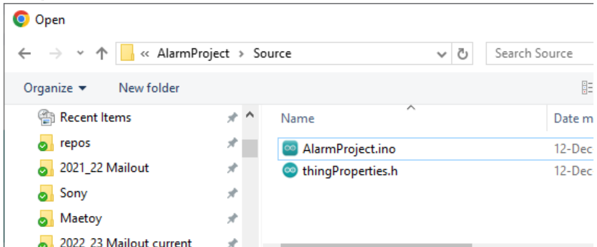


Do you have any sensitive data (passwords, API keys...) you don't want to share publicly?

Follow these steps:

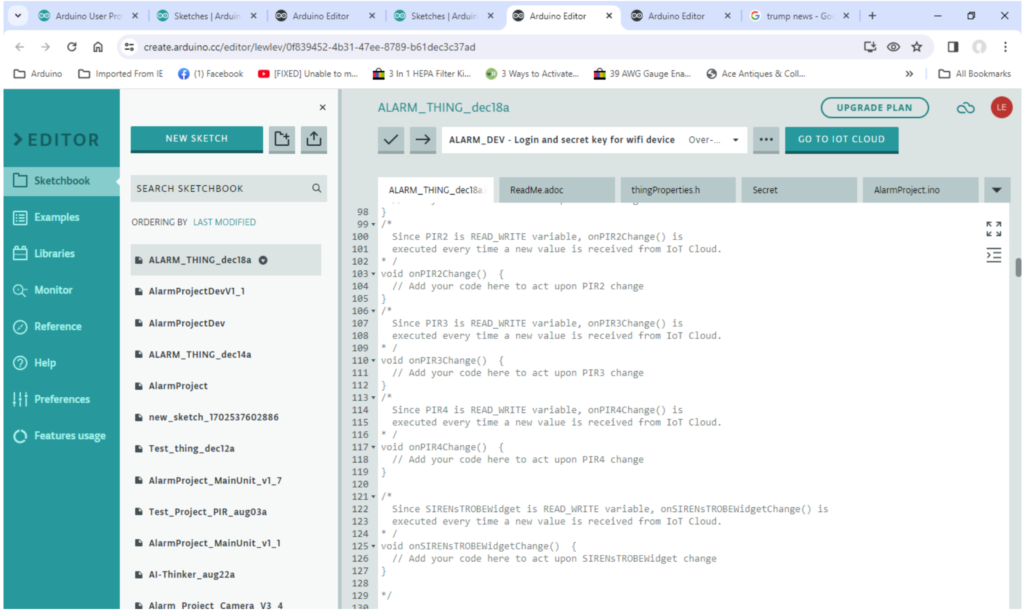
1. In your sketch replace the strings containing sensitive data by writing SECRET_NAMEYOUWANT

- The Web editor will have ALARM_THINGxxxx.ino at the top of the sketch list in the left pane.
- Click on the down arrow and choose
- ‘Import File into Sketch’



Name	Date m
AlarmProject.ino	12-Dec
thingProperties.h	12-Dec

- Browse to the project folder and
- open the Source folder C\AlarmProject\Source
- Select AlarmProject.ino and click open
- You should now have five file tabs file tabs with AlarmProject.ino added
- Open ALARM_THINGxxxx.ino tab in the web editor, right click and choose ‘Find and Replace’
- Type */   into the find box and   * / into the replace box click on the ALL button
- Move the cursor past the last of the text type in */   to close the last comment.
  This will effectively comment out the auto generated section of code that will be replaced by the incoming .ino file



```
}
/*
  Since PIR2 is READ_WRITE variable, onPIR2Change() is
  executed every time a new value is received from IoT Cloud.
* /
void onPIR2Change()  {
  // Add your code here to act upon PIR2 change
}
/*
  Since PIR3 is READ_WRITE variable, onPIR3Change() is
  executed every time a new value is received from IoT Cloud.
* /
void onPIR3Change()  {
  // Add your code here to act upon PIR3 change
}
/*
  Since PIR4 is READ_WRITE variable, onPIR4Change() is
  executed every time a new value is received from IoT Cloud.
* /
void onPIR4Change()  {
  // Add your code here to act upon PIR4 change
}

/*
  Since SIRENsTROBEWidget is READ_WRITE variable, onSIRENsTROBEWidgetChange() is
  executed every time a new value is received from IoT Cloud.
* /
void onSIRENsTROBEWidgetChange()  {
  // Add your code here to act upon SIRENsTROBEWidget change
}

*/
```

- Open the AlarmProject.ino tab in the web editor, right click and choose ‘Select All’ right click again and choose ‘Copy’
- Open the ALARM_THINGxxxx.ino tab and place the cursor at the very bottom of the file after the last line of text in the file. Right click and choose ‘Paste’

- Now you should have the code from AlarmProject.ino in ALARM_THINGxxxx.ino.
- Select the AlarmProject.ino tab then click on the little down arrow tab and select delete AlarmProject.ino.

18. We now need to match the template sketch and Thing security keys etc to your environment.

click on the cloud button (top right) click on Sketches.

Secrets.h
Open the Secrets tab and enter your Wi-Fi SSID and password and the **Secret Key** from the **ALARM_DEV**, it will be in the pdf file **ALARM_DEV_KEYS.pdf**   file saved earlier the project folder.
Note this will populate WiFi credential and Secret ID in ALARM_THING as well.

AlarmProject.ino
Search for “// ##################### Enter ifttt key here #################
On the next line enter or paste between the ”” your ifttt key from the account setup earlier

- const char *key = "Your ifttt key";

#### **Configure Mobile Phone apps. ####**

19. Goto the app store

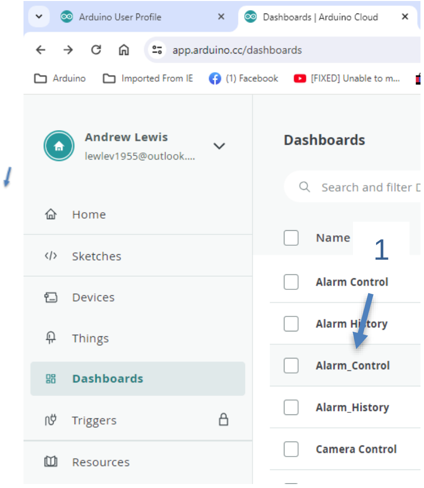
- Install the Arduino IOT remote app use the Arduino Cloud Account credentials.

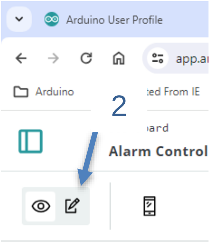
- Install the IFTTT app use your IFTTT account credentials.

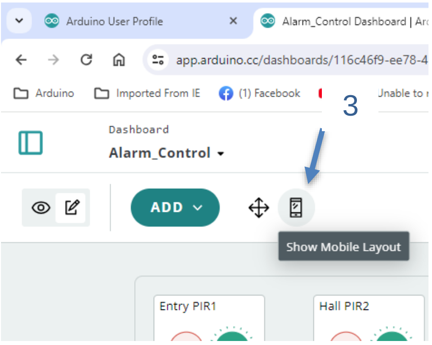
A brief guide is included in the pack C:\AlarmProject\Alarm_Project_Mobile App installs.pdf if required.

20. Fix dashboard widget layout

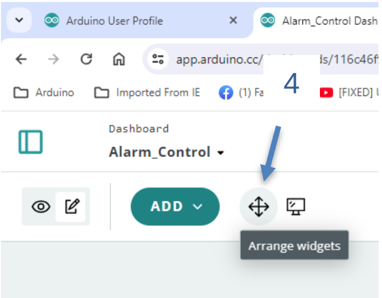
Note for reasons unknown to me, the Dashboards created through the CLI, don’t automatically layout the widgets correctly in the Mobile view. So it is necessary to adjust Mobile layout. Open ArduinoCloud follow the steps below to edit the layout

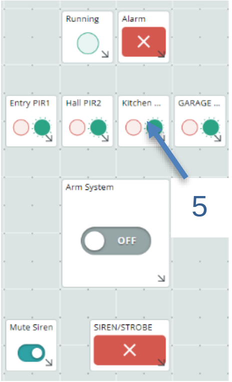


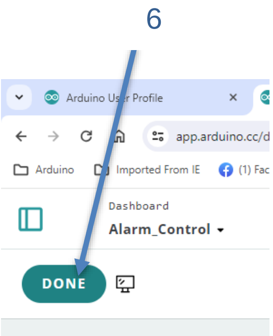




Move Widgets as desired



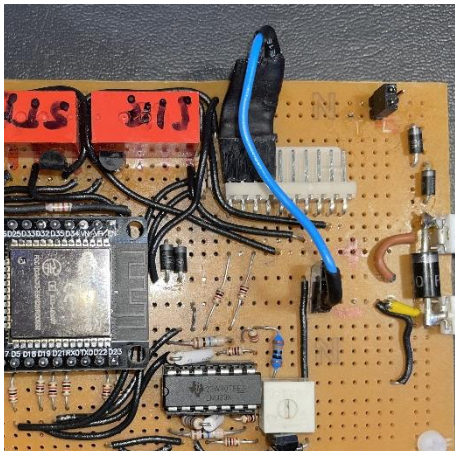




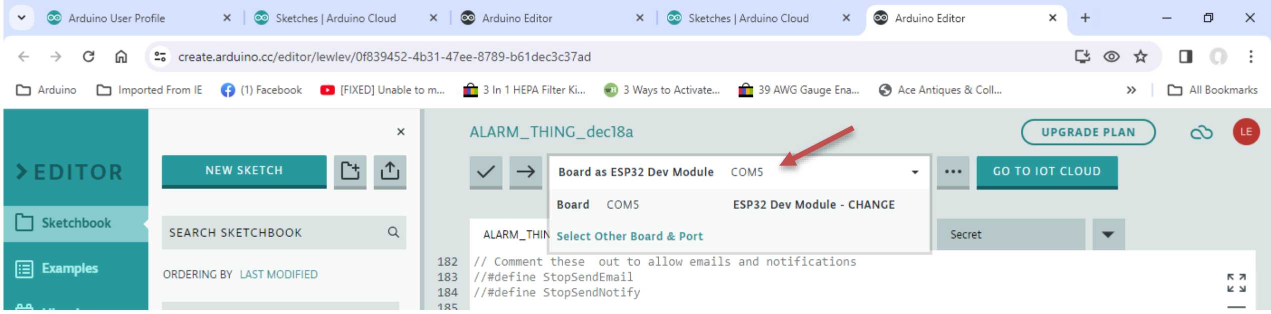
21. Thats it.

22. Bench Testing

- You may like to make up a test jig see the circuit diagram for details just a resistor a 4 pin piece of header socket and some wire with a pin to connect to +v or ground to simulate alarm on/off PIR conditions. The blue wire in the picture is part the jig.



- Connect your board to a 12v power supply and the ESP32 to your PC via USB conditions.
- Open the Arduino Cloud Web Editor then the ALARM_THINGxxxx.ino file
- Uncomment the Debug definition in the ino file so we get some definition serial monitoring
- Check /set the device connection to Board COMx ESP32 Dev Module



create.arduino.cc/editor/lewlev/0f839452-4b31-47ee-8789-b61dec3c37ad

ALARM_THING_decl8a

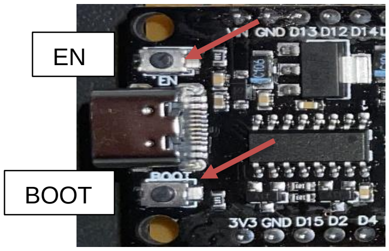
Board as ESP32 Dev Module COM5

Board COM5 ESP32 Dev Module - CHANGE

Select Other Board & Port

```
// Comment these  out to allow emails and notifications
//#define StopSendEmail
//#define StopSendNotify
```

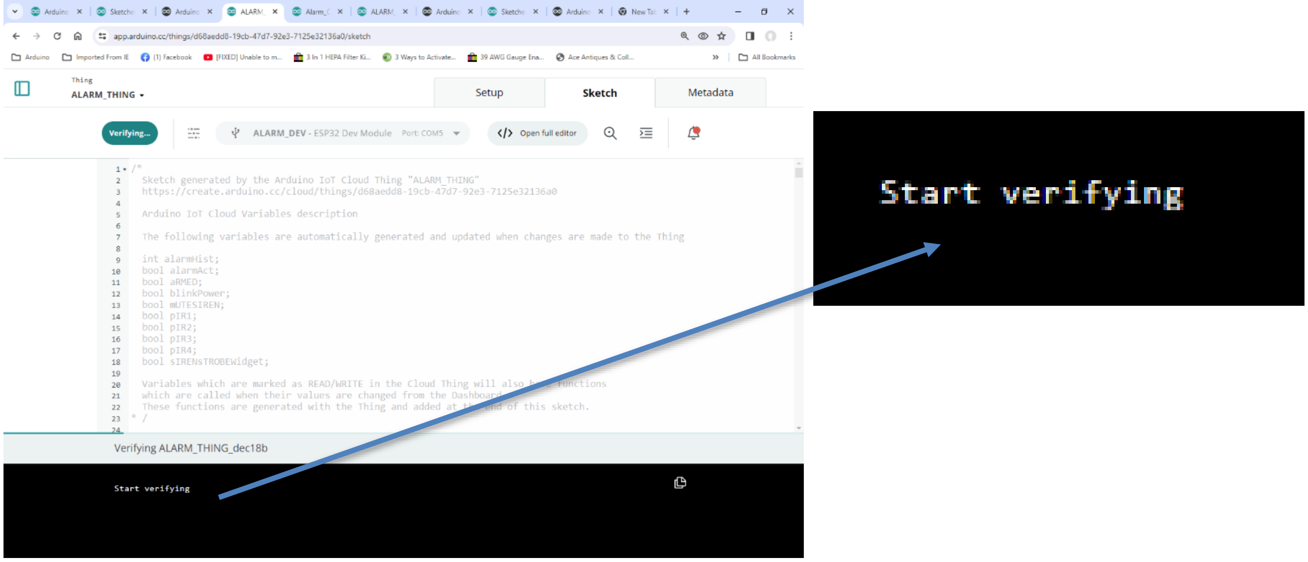
- Open the serial monitor (@115200 baud.



- Put the ESP32 into upload mode Pres and hold BOOT button briefly press EN button, release BOOT button, you should see 'waiting for download' in the monitor.

- Compile and upload.
- you should see the ESP go through setup and connect to WiFi and then Arduino Cloud
- If not there is some trouble shooting to do
- Open the Arduino Remote App you should have at least the Alarm_Control and Alarm_History Dashboard to pick for., if not see previous dot point.
- Open Alarm_Control you should be able get all the PIR's to swap between red to green by connecting the test jig to +v and ground. If not you know the drill.
- Arm the system using the Arm_System Slider switch ensure the Mute_Siren Slider is off. Simulate an alarm with the jig you should see both the LED's on the board light up the alarm and Siren/Strobe indicators should change from red to green ticks. Slide the Arm_System switch off. The two LED's should go off the indicators should go back to red X's. If not sorry!
- Time for a light refreshment or other indulgence of your choice.

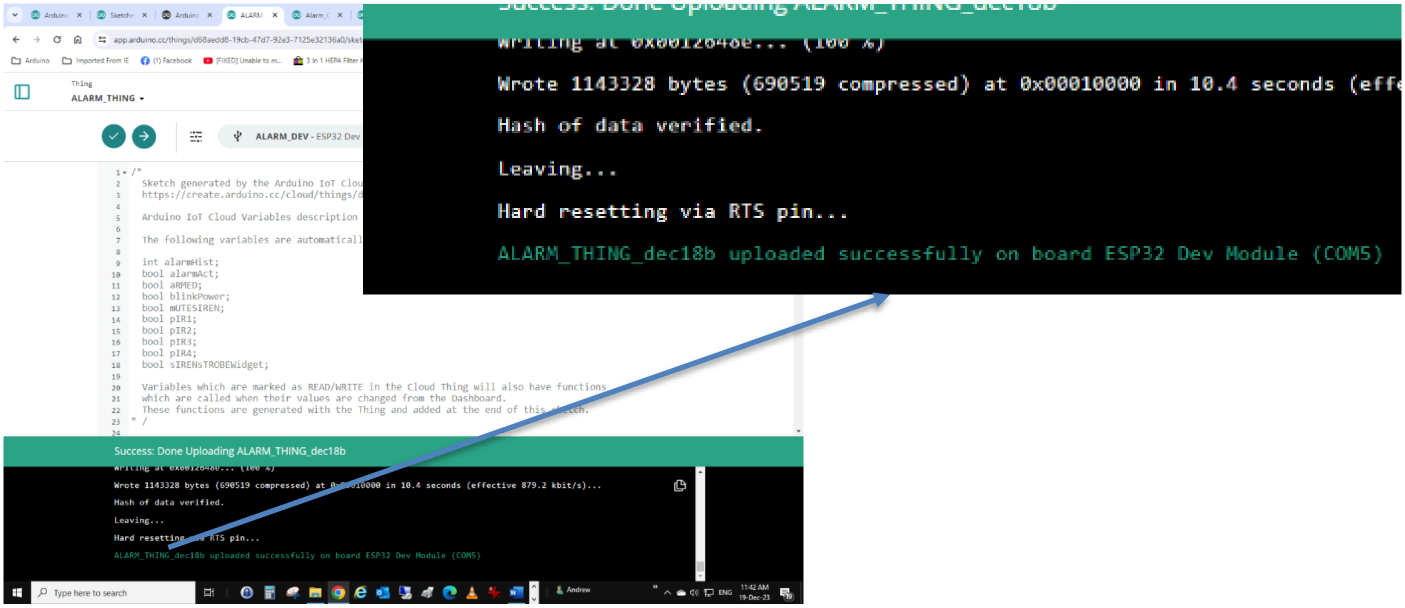
23. Tested OTA upload works fine but it must be done from the thing page rather than the full editor.



```
/*
  Sketch generated by the Arduino IoT Cloud Thing "ALARM_THING"
  https://create.arduino.cc/cloud/things/d68aedd8-19cb-47d7-92e3-7125e32136a0

  Arduino IoT Cloud Variables description

  The following variables are automatically generated and updated when changes are made to the Thing

  int alarmHist;
  bool alarmAct;
  bool aRMED;
  bool blinkPower;
  bool mUTESIREN;
  bool pIR1;
  bool pIR2;
  bool pIR3;
  bool pIR4;
  bool sIRENsTROBEWidget;

  Variables which are marked as READ/WRITE in the Cloud Thing will also have functions
  which are called when their values are changed from the Dashboard.
  These functions are generated with the Thing and added at the end of this sketch.
* /
```

Verifying ALARM_THING_dec18b

```
Start verifying
```



Success: Done Uploading ALARM_THING_dec18b

```
Writing at 0x0012048e... (100 %)
Wrote 1143328 bytes (690519 compressed) at 0x00010000 in 10.4 seconds (effective 879.2 kbit/s)...
Hash of data verified.
Leaving...
Hard resetting via RTS pin...
ALARM_THING_dec18b uploaded successfully on board ESP32 Dev Module (COM5)
```

24. Alarm board PI sensor reference voltage adjustment refer to: C:\AlarmProject\AlarmProject_Setting_PIR_Voltage_ref.pdf

Connecting Up

25. Connecting up the to the existing panel is going to be different depending on what the old panel is. Refer to the wiring diagram for guidance on connection,

    In my case I wanted the ESP board to fit into the old alarm box so I made sure the matrix board the project is built on would be able to squeeze in. As mentioned, I just left the PIR's wired into the old system terminal block and connected the ESP board sensor connections into the active side of the PIR's. Siren's and Strobe are connected directly to the ESP board, which switches the positive side. The common side can remain connected to the old panel.