

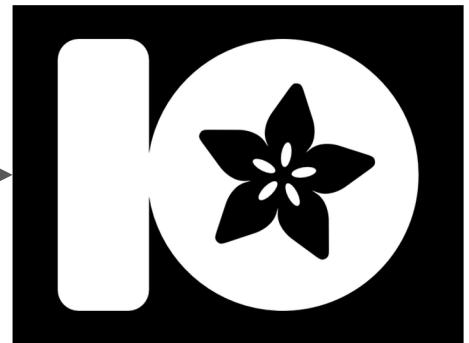
# End-to-End IoT

IFTTT + MQTT; Internet-RPi

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Innovation, Creativity, and Entrepreneurship  
(ICE) Incubator



*Objective: Tkinter notification triggered.*

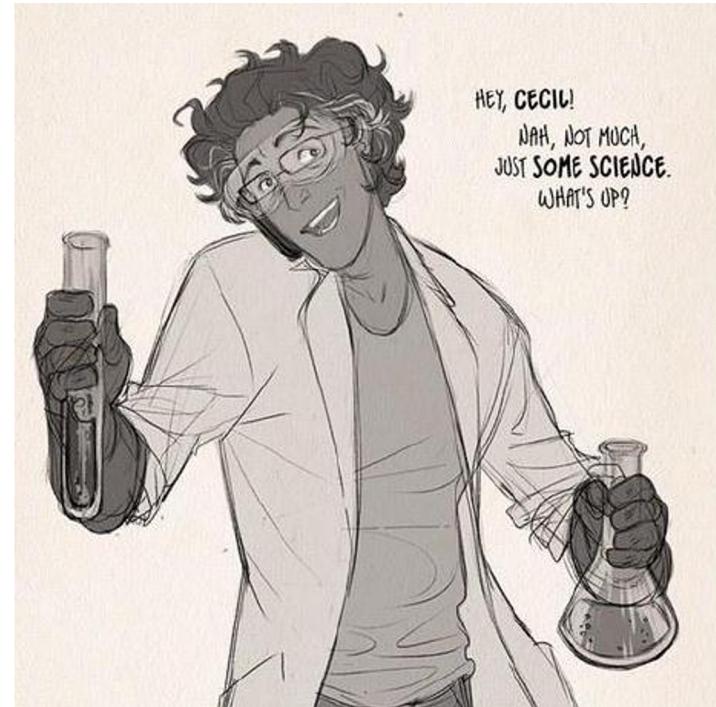
# Overview of Main Steps

1. Set up MQTT (Adafruit IO)
2. Set up IFTTT
3. Confirm RPi can poll MQTT server, get command from IFTTT
4. Make simple tkinter program that displays a dialog when triggered
5. Done!

# Information and Caveats

## Sources

- [github.com/knud/HackEDbeta2021Workshop](https://github.com/knud/HackEDbeta2021Workshop)
- [io.adafuit.com](https://io.adafuit.com) - MQTT
- [ifttt.com](https://ifttt.com) – If This Then That (IFTTT)



# Information and Cavets

- Should work at home. Some necessary networking protocols are blocked in places like the U of A
  - Zero-conf
  - Multicast DNS (mDNS)

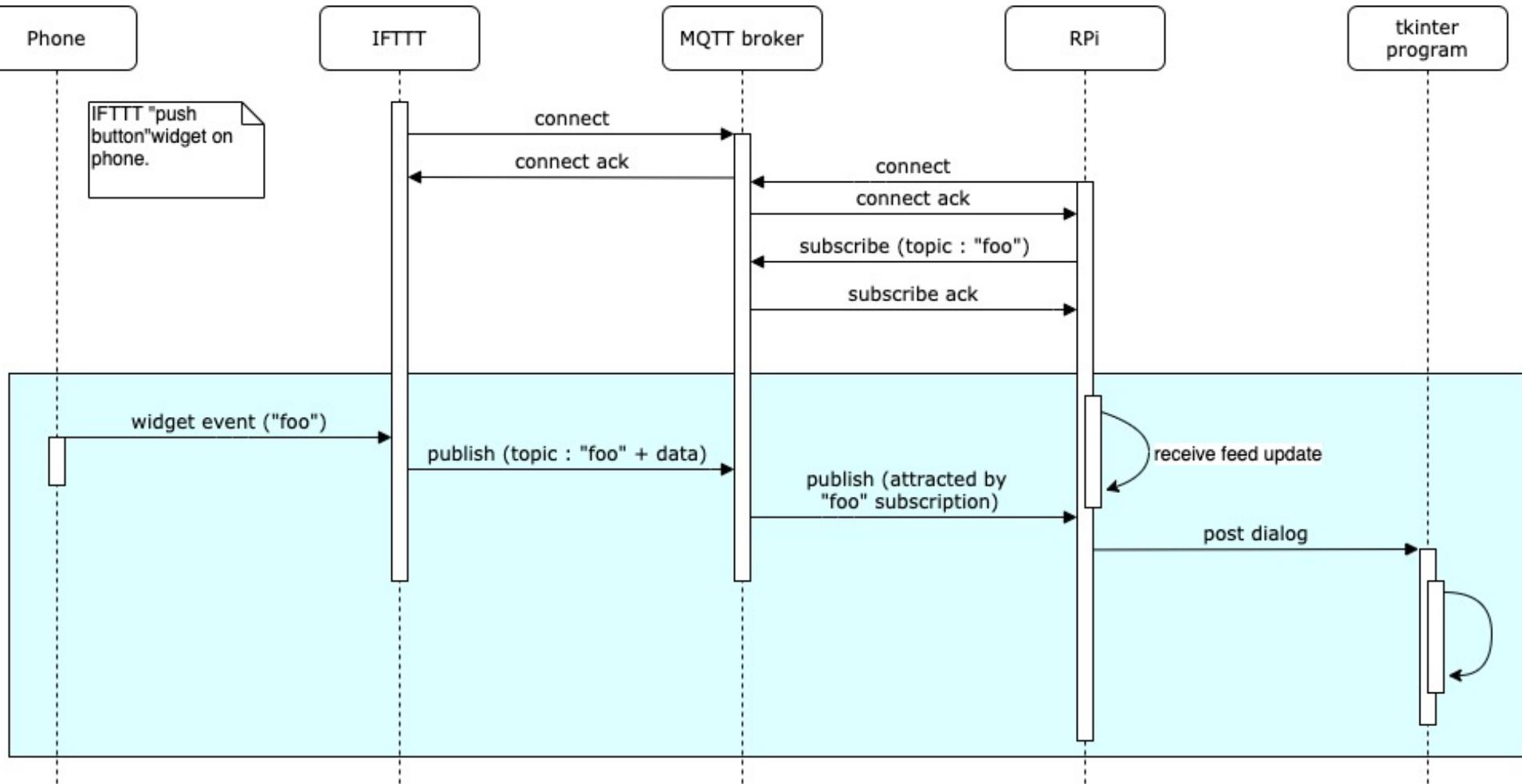


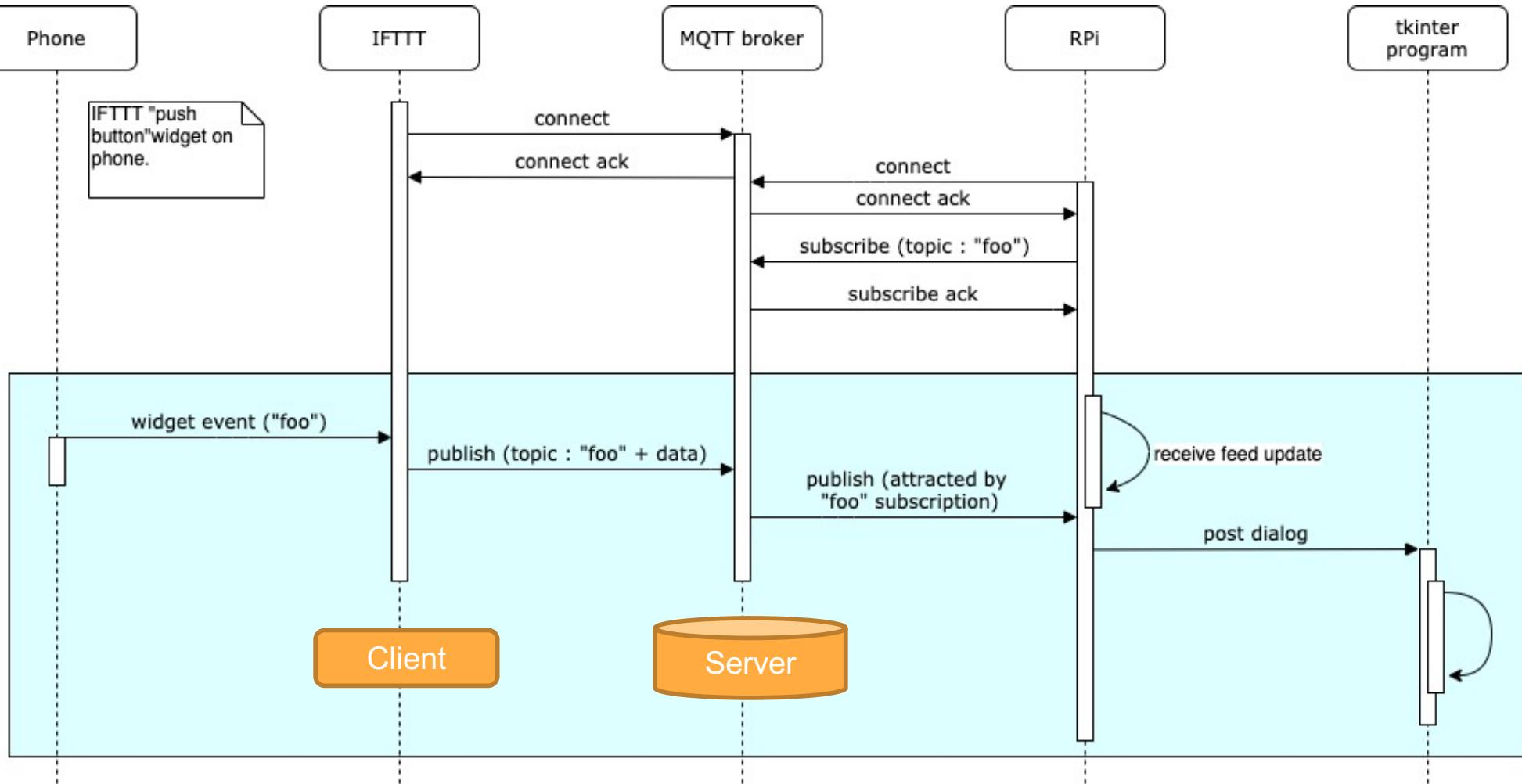
# MQTT — mqtt.org

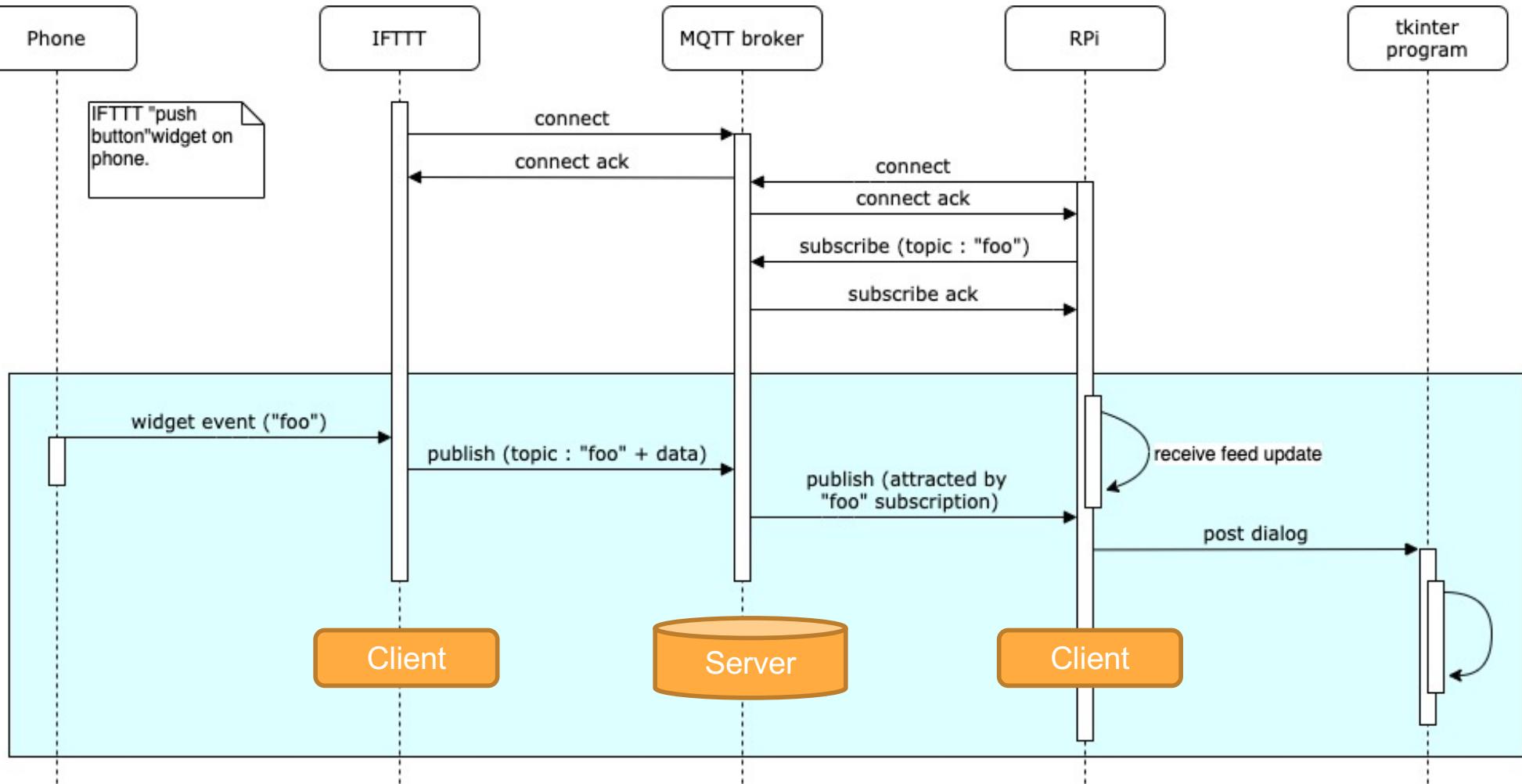
An extremely lightweight publish/subscribe messaging transport to support machine-to-machine (M2M), Internet of Things (IoT) interactions.

- Small; Windows executable is 1.4 MB

<https://en.wikipedia.org/wiki/MQTT>







# Set up MQTT

- Sign up with io.adafruit.com (aka AIO)
- Create new dashboard and open
- Create a new feed and block
- Set up / customize the block
- Record AIO key
  - Needed for IFTTT and RPi client

The screenshot shows the Adafruit IO web interface. At the top, there is a navigation bar with links for Shop, Learn, Blog, Forums, LIVE!, AdaBox, and IO. On the right side of the top bar, it says "Hi, Steven Knudsen | Account" and shows a shopping cart icon with "0". Below the top bar is a secondary navigation bar with links for Profile, Feeds, Dashboards, WipperSnapper, Triggers, Services, and My Key. The main content area shows the user's dashboards. A breadcrumb trail indicates the user is at "eeknud > Dashboards". There is a button labeled "+ New Dashboard" and a search bar. The main table lists three dashboards:

Name	Key	Created At	Action
HackED2020	hacked2020	January 13, 2020	🔒
HackEDbeta2021	hackedbeta2021	November 7, 2021	🔒
Welcome Dashboard	welcome-dashboard	October 31, 2017	🔒

At the bottom of the dashboard list, it says "Loaded in 0.14 seconds."

<https://io.adafruit.com/eeknud/dashboards>

The footer of the Adafruit IO website contains several links and social media icons. On the left, there are links for Get Help, Quick Guides, API Documentation, FAQ, Terms of Service, Privacy Policy, and Send Feedback. In the center, there are links for Learn, IO Plus, and News. On the right, there are icons for Instagram, Twitter, Facebook, YouTube, GitHub, and Discourse.

Get Help  
Quick Guides  
API Documentation  
FAQ  
Terms of Service  
Privacy Policy  
Send Feedback

Learn  
IO Plus  
News

Instagram Twitter Facebook YouTube GitHub Discourse

A Minority and Woman-owned Business Enterprise (M/WBE)

Name	Key	Created At
<a href="#">HackED2020</a>	hacked2020	January 13, 2020
<a href="#">HackEDbeta2021</a>	hackedbeta2021	November 7, 2021
<a href="#">Welcome Dashboard</a>	welcome-dashboard	October 31, 2017

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eeeknud > Dashboards > HackEDbeta2021



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eeknud > Dashboards > HackEDbeta2021



#### Dashboard Settings

[Edit Layout](#)

[Create New Block](#)

[View Fullscreen](#)

**Dark Mode** [on](#)

**Block Borders** [on](#)

**Dashboard Privacy** [off](#)

[Delete Dashboard](#)

Shop Learn Blog Forums **LIVE!** AdaBox **IO**

 Profile

eeknud > Dashboards > Hack

Create a new block X

Click on the block you would like to add to your dashboard. You can always come back and switch the block type later if you change your mind.

ON

RESET

0

0%

HELLO WORLD!

#00ACEC

Hello world! This is a different type of text block that works for larger quantities of data.

board Settings it Layout Create New Block New Fullscreen Mode ? Block Borders ? Dashboard Privacy Delete Dashboard

[Get Help](#) [Quick Guides](#) [API Documentation](#) [FAQ](#) [Terms of Service](#) [Privacy Policy](#) [Send Feedback](#)

Shop Learn Blog Forums LIVE! AdaBox IO

 Profile

eeknud > Dashboards > Hack

## Create a new block X

Click on the block you would like to add to your dashboard. You can always come back and switch the block type later if you change your mind.

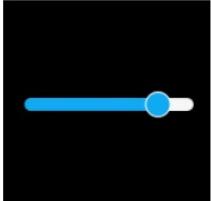
**Toggle**



**RESET**



**Slider**



**Gauge**



**HELLO WORLD!**



```
2015-09-11 15:55:39 - 94  
2015-09-11 15:55:37 - 53  
2015-09-11 15:55:36 - 98  
2015-09-11 15:55:35 - 58  
2015-09-11 15:55:34 - 28  
2015-09-11 15:55:33 - 60  
2015-09-11 15:55:32 - 37  
2015-09-11 15:55:31 - 37  
2015-09-11 15:55:30 - 79  
2015-09-11 15:55:29 - 44  
2015-09-11 15:55:28 - 50  
2015-09-11 15:55:26 - 19  
2015-09-11 15:55:25 - 69  
2015-09-11 15:55:24 - 53  
2015-09-11 15:55:23 - 61  
2015-09-11 15:55:22 - 27
```

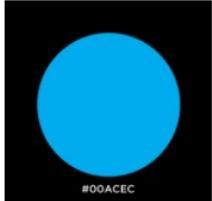
**Image**



**Line Graph**



**Color Circle**



#00ACEC

**Map**



**Control Panel**



**Cloud**



**Large Text**

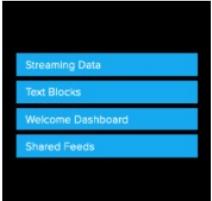


**Table**



Hello world! This is a different type of text block that works for larger quantities of data.

**Feed Block**



- Streaming Data
- Text Blocks
- Welcome Dashboard
- Shared Feeds



Profile

eeknud &gt; Dashboards &gt; Hack



## Connect a Feed



A toggle button is useful if you have an ON or OFF type of state. You can configure what values are sent on press and release.

Choose a single feed you would like to connect to this toggle. You can also create a new feed within a group.

### Default

Feed Name	Last value	Recorded	
<input type="checkbox"/> MomButton	ON	about 1 hour	
<input type="checkbox"/> Motor Control	OFF	about 18 hours	
<input type="checkbox"/> Welcome Feed		almost 3 years	

[Create](#)**0 of 1 feeds selected**[Previous step](#)[Next step](#)



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## Connect a Feed



A toggle button is useful if you have an ON or OFF type of state. You can configure what values are sent on press and release.

Choose a single feed you would like to connect to this toggle. You can also create a new feed within a group.

### Default

Feed Name	Last value	Recorded	
<input checked="" type="checkbox"/> HackEDbeta Toggle		less than a min...	
<input type="checkbox"/> MomButton	ON	10 minutes	
<input type="checkbox"/> Motor Control	OFF	about 18 hours	
<input type="checkbox"/> Welcome Feed		almost 3 years	

**Create****1 of 1 feeds selected****◀ Previous step****Next step ➤**

Shop Learn Blog Forums LIVE! AdaBox IO

Account 

 Profile

eeknud > Dashboards > HackEDbeta

**Block settings**

In this final step, you can give your block a title and see a preview of how it will look. Customize the look and feel of your block with the remaining settings. When you are ready, click the "Create Block" button to send it to your dashboard.

Block Title (optional)

Block Preview  
**HackEDbeta Toggle**  


Button On Text

Button On Value (uses On Text if blank)

Button Off Text

Button Off Value (uses Off Text if blank)

**Toggle** A toggle button is useful if you have an ON or OFF type of state. You can configure what values are sent on press and release.

Test Value

Published Value  
  
0 bytes

[Previous step](#) [Create block](#)



Get Help  
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Profile

Feeds

eeknud &gt; Dashboards &gt; HackEDbeta



My Block

On

## YOUR ADAFRUIT IO KEY



Your Adafruit IO Key should be kept in a safe place and treated with the same care as your Adafruit username and password. People who have access to your Adafruit IO Key can view all of your data, create new feeds for your account, and manipulate your active feeds.



If you need to regenerate a new Adafruit IO Key, all of your existing programs and scripts will need to be manually changed to the new key.

**Username**

eeknud

**Active Key**

aio\_ZDNg0402bakwCOSKPZ96eLE5Ixey

REGENERATE KEY

[Hide Code Samples](#)**Arduino**

```
#define IO_USERNAME "eeknud"  
#define IO_KEY "aio_ZDNg0402bakwCOSKPZ96eLE5Ixey"
```

**Linux Shell**

```
export IO_USERNAME="eeknud"  
export IO_KEY="aio_ZDNg0402bakwCOSKPZ96eLE5Ixey"
```

**Scripting**

```
ADAFRUIT_IO_USERNAME = "eeknud"  
ADAFRUIT_IO_KEY = "aio_ZDNg0402bakwCOSKPZ96eLE5Ixey"
```

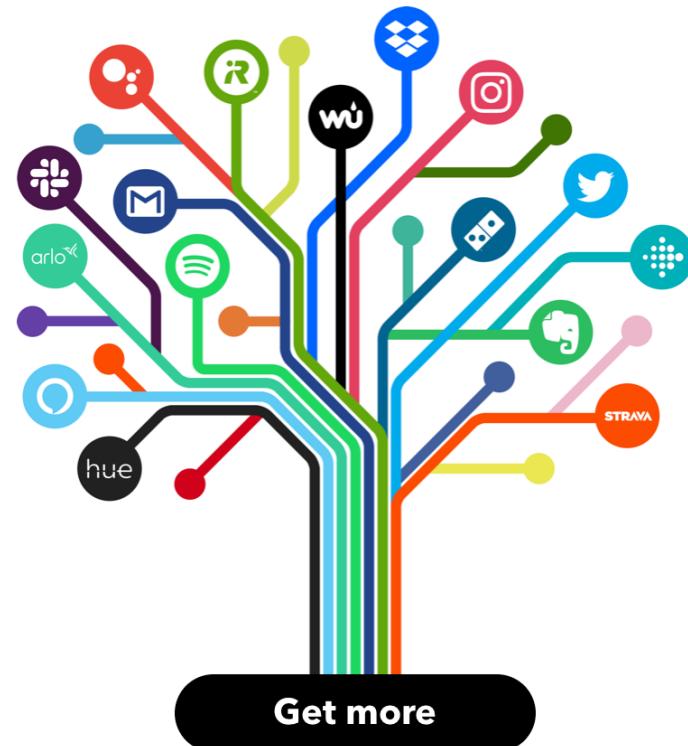
# Next, set up IFTTT

- Create a new widget
- Select an action (“This”)
  - Button
- Select a service (“That”)
  - Choose Adafruit service

We'll make one button to toggle something ON, and another to toggle it OFF



## Start connecting your world.



# Create your own

---

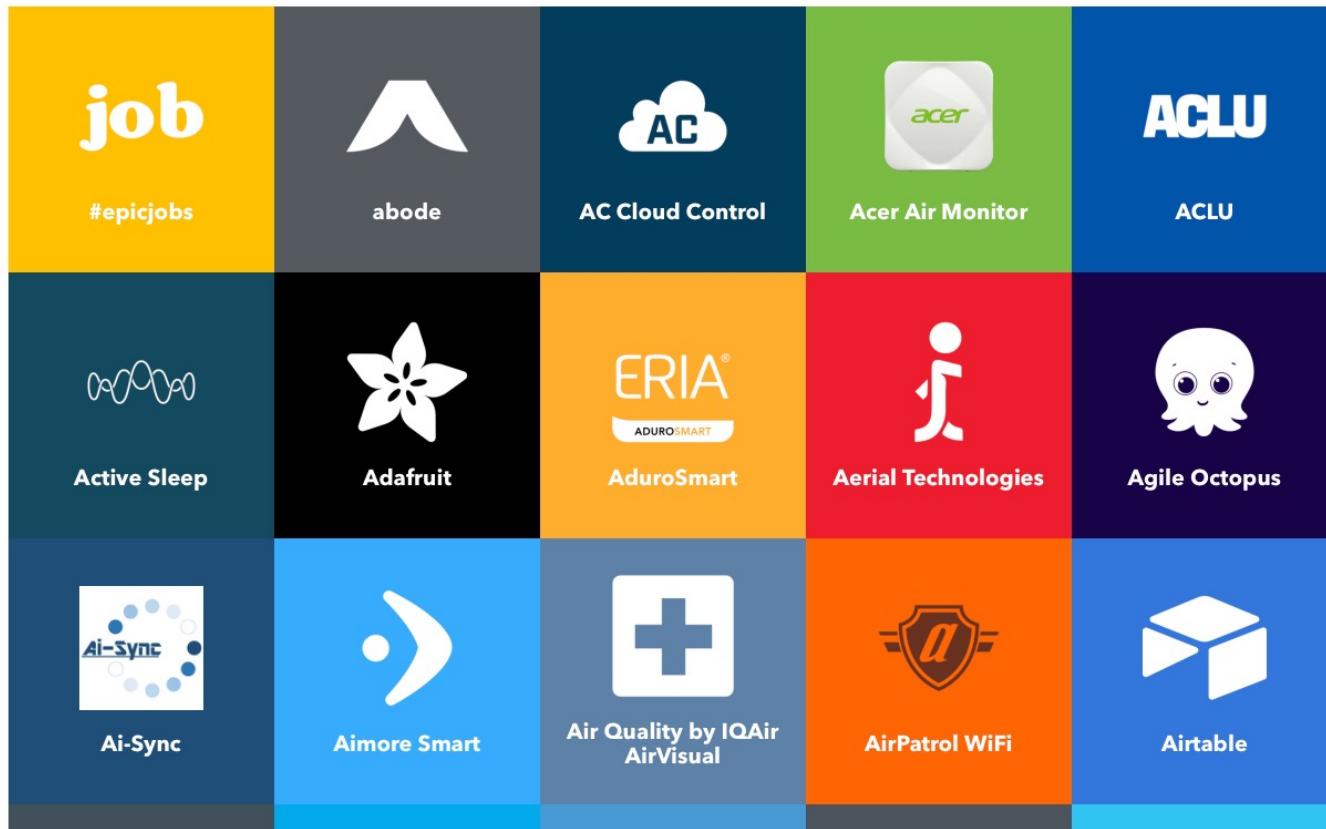
If This

Add

Then That

# Choose a service

 Search services



# Choose a service

Q **button**



Button widget

# Choose a trigger



## Button widget

### Button press

This trigger fires every time you press the button.

# Create your own

---



# Choose a service



Search services

 (more:trees)	 abode	 AC Cloud Control	 Adafruit	 ERIA ADUROSMART AduroSmart
 Ai-Sync	 AICO	 Aimore Smart	 AirPatrol WiFi	 Airtable

# Choose an action



**Adafruit**

## Send data to Adafruit IO

This Action will send data  
to a feed in your Adafruit  
IO account.

# Complete action fields



## Send data to Adafruit IO

This Action will send data to a feed in your Adafruit IO account.

### Feed name

HackEDbeta Toggle



The name of the feed to save data to.

### Data to save

ON

The data to be saved to your feed.

Add ingredient

Create action

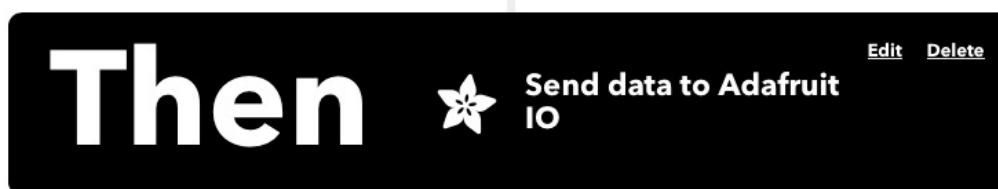
---

# Create your own

---



+



+

Continue

# Review and finish



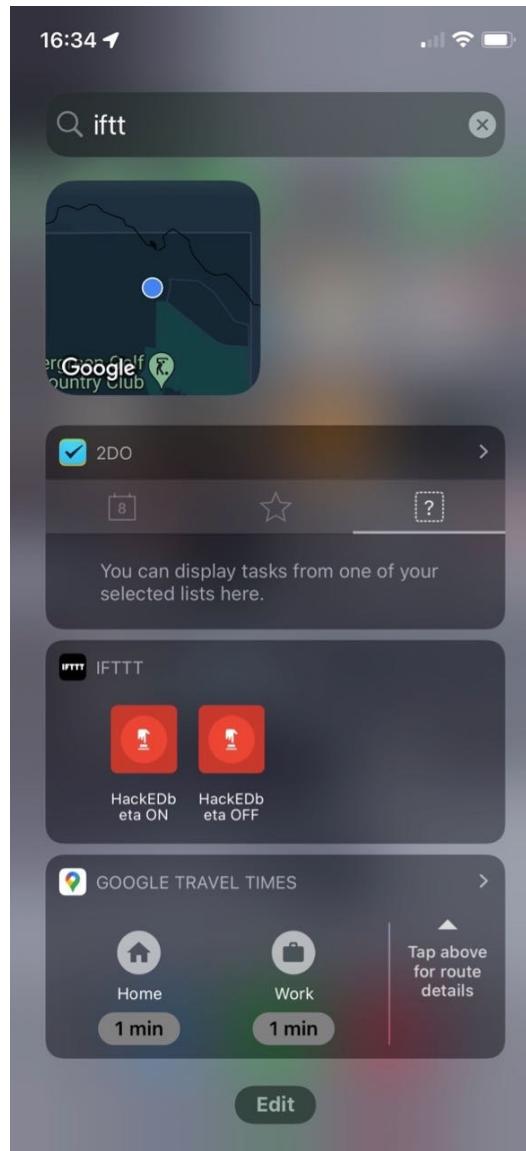
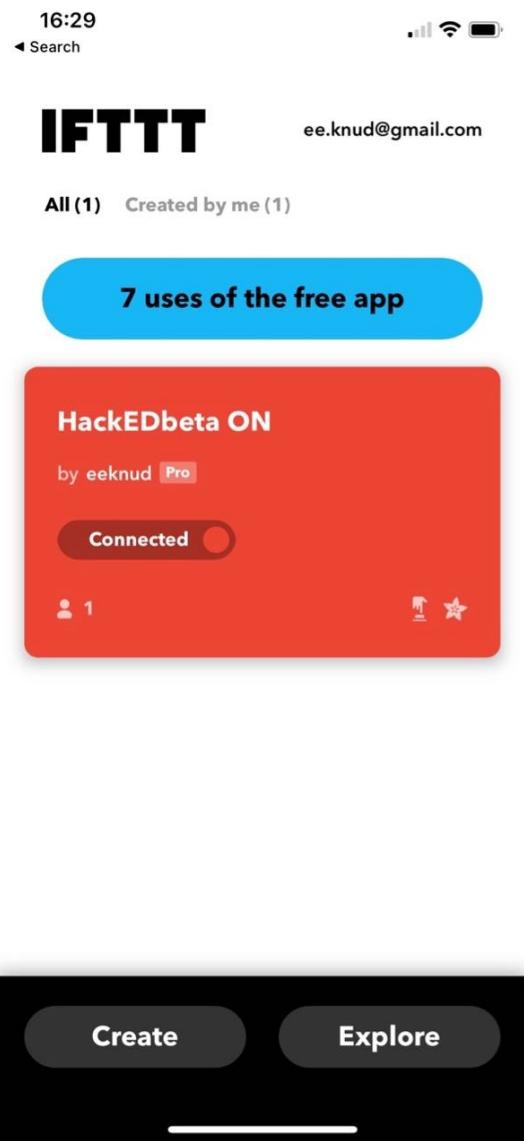
Applet Title

**HackEDbeta ON**

by **eeknud**

13/140

**Finish**





Profile

Feeds

Dashboards

WipperSnapper

Triggers

Services

My Key

eeknud > Dashboards > HackEDbeta2021



HackEDbeta Toggle



November 8th 2021, 4:36:06PM

[Profile](#)[Feeds](#)[Dashboards](#)[WipperSnapper](#)[Triggers](#)[Services](#)[My Key](#)[eeknud](#) > [Dashboards](#) > [HackEDbeta2021](#)**HackEDbeta Toggle**

November 8th 2021, 4:37:02PM

## So far...

- At this point the IFTTT ON and OFF widgets should activate and be available on your phone
  - BTW, you need an IFTTT account and their app
- Activating the widget sends the data you specified to the Adafruit feed
- The Adafruit MQTT broker makes note of it for any subscribers

But we need a subscriber...

# Raspberry Pi

- Need to be sure that `requests`, and `adafruit-io` are installed.
  - `sudo pip3 install requests`
  - `sudo pip3 install adafruit-io`
- Need `MQTTRelay.py` from  
[github.com/knud/HackEDbeta2021Workshop](https://github.com/knud/HackEDbeta2021Workshop)
- `MQTTRelay`
  - Connects to Adafruit.io MQTT server
  - Looks for changes to the last posted message (ON or OFF)
  - Notifies the user via the command line and a simple Tkinter window

```
1 #!/usr/bin/env python
2 # -*- coding: utf-8 -*-
3
4 from time import sleep
5 from Adafruit_IO import Client, RequestError
6 from tkinter import *
7 from tkinter import messagebox
8 import time
9
10 #
11 # Set up the window and a canvas
12 #
13 ws = Tk()
14 ws.title('HackEDbeta 2021')
15 ws.geometry('496x187+100+100')
16 ws.config(bg='#345')
17
18 hebimage = PhotoImage(file='doc/HackEDbeta2021_496_187.png')
19 my_canvas = Canvas(ws, width=496, height=187)
20 my_canvas.pack(fill="both", expand=True)
21 my_canvas.create_image(0, 0, image=hebimage, anchor=("nw"))
```

```
23 #
24 # Connect to the Adafruit MQTT server
25 #
26 ADAFRUIT_IO_KEY = 'aio_ZDNg0402bakwC0SKPZ96eLE5Ixey'
27 ADAFRUIT_IO_USERNAME = 'eeknud'
28
29 aio = Client(ADAFRUIT_IO_USERNAME, ADAFRUIT_IO_KEY)
30
31 #
32 # Let's get the last state of the button
33 #
34 try:
35     hackEDbetaButtonFeed = aio.feeds('hackedbeta-toggle')
36 except RequestError:
37     print("feed error")
38 sleep(0.1)
39 hackEDbetaButtonState = aio.receive(hackEDbetaButtonFeed.key)
40 buttonState = hackEDbetaButtonState.value
41 print("Initial HackEDbeta button state : %s" % (buttonState) )
42
```

```
43 on_off_label = Label(my_canvas, font=("Helvetica", 20))
44 on_off_label.place(x = 180, y = 82)
45 if buttonState == 'OFF':
46     on_off_label.config(bg = '#FFF000000', text = "OFF")
47 else:
48     on_off_label.config(bg = '#000FFF000', text = " ON")
49
50 # check the MQTT feed for an update
51 def checkFeed():
52     global buttonState
53     print(time.asctime()+' checking feed...')
54     hackEDbetaButtonState = aio.receive(hackEDbetaButtonFeed.key)
55     if hackEDbetaButtonState.value != buttonState:
56         print("HackEDbeta button state changed to: %s" % (hackEDbetaButtonState.value) )
57         buttonState = hackEDbetaButtonState.value
58         if buttonState == 'ON':
59             on_off_label.config(bg = '#000FFF000', text = " ON")
60         else:
61             on_off_label.config(bg = '#FFF000000', text = "OFF")
62     ws.after(1000, checkFeed)
63
64 ws.after(1000, checkFeed)
65 ws.mainloop()
66
```

