Empowering People To Build An Internet of Things They Trust

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About Me

- Tony DiCola
- Engineer for Adafruit, tdicola@adafruit.com
- Check out projects: http://learn.adafruit.com/users/tdicola
About Me

- Have a cat that loves boxes.
About Adafruit

- Help makers, artists, students, engineers — anyone — learn about electronics.
About Adafruit

- Built on open source hardware and software.
- Recently shipped 800,000 th order.
- Manufacturing Arduino.cc boards in the US soon.
What’s the talk about?

- How Adafruit thinks about the Internet of Things
- Introduce Adafruit IO
Let’s talk about the Internet of Things.
What is the Internet of Things?
What Is The Internet of Things?

The truth is we don’t really know yet!

“Computers in the future may weigh no more than 1.5 tons.”

―Popular Mechanics, 1949
How Adafruit Thinks About IoT

The New York Times

A Bill of Rights for the Internet of Things

Limor Fried is the founder and engineer of Adafruit Industries.

I spend most of my workday writing code and designing electronics, many of which are intended to connect to the Internet. These Internet of Things devices hold a lot of potential and promise for makers. This is where all devices are headed. Whether you want a gadget to give you weather forecasts or relay sensor data to a network, it's crucial that it be able to "talk" and report automatically and reliably. But that doesn't necessarily lead to "1984." In fact, businesses and consumers can avoid that path easily.

adafruit.com/iotbor
Internet of Things Bill of Rights

- Open is better than closed.
- Consumers own their data.
- Public data remains in the public.
Open Is Better Than Closed

- Open standards & protocols.
- Open data.
- Open source hardware and software.
Example: Open Transit Data
Example: Open Transit Data

- General Feed Transit Specification (GTFS).
- Public transport agencies publish route data in an open CSV format.
- Grew from an idea two people had in 2005 to over 900 public transport agencies across the globe sharing their data today.
Example: Open Transit Data

- Everyone benefits from open transit data.
- You can even build a project on top of it!

NextBus Transit Clock Project for Raspberry Pi by Phillip Burgess on learn.adafruit.com
Consumers Own Their Data

- Consumers control how their data is shared.
- Consumers can choose to delete their data.
Example: Loyalty Cards

Photo credit: Joe Loong, CC BY-SA 2.0 License
Example: Loyalty Cards

- Do you know who else has access to your loyalty card purchase data?
- August 2004: Tacoma, WA, man charged with arson based on his loyalty card data. Luckily charges dropped once someone else came forward and confessed!
Example: Loyalty Cards

- Even if intentions are good, what if the data owner changes?
- May 20th: Bankruptcy Judge Approves Sale of RadioShack Name and Data [emphasis added]
- Everyone can benefit from the data collected on them.
- People should know what data is being collected on them, even in aggregate.
Example: Public Data Uses

- Consumers and businesses benefit from public data:
  - LinkedIn, Zillow, Kayak, FourSquare, CarFax, Cattlefax, AccuWeather, Zoc Doc, and many more.
See: www.data.gov/impact
Let’s talk about Adafruit IO
What is Adafruit IO?

- Free sandbox to use and learn about the Internet of Things.
- Made for makers, artists, students, engineers who use and learn from Adafruit’s kits and tutorials.
Demo Adafruit.IO Dashboard
Why Adafruit IO?

Adafruit helps you create things without being a master of the hardware & electronics domain.
Why Adafruit IO?
- Adafruit IO helps you create internet things without being a master of the hardware & internet service domains.
Who is Adafruit IO?

- Credit to Tyler Cooper & Justin Cooper of Adafruit.
- They’ve brought us hits like learn.adafruit.com and other infrastructure.
- Thanks to many other folks behind the scenes!
Warning: Beta!

- Adafruit IO is currently in beta.
- You can sign up to gain access at [http://io.adafruit.com](http://io.adafruit.com)
- Be aware there can be bugs and some features still in development.
Features

- Web-based dashboards with live updates.
- Graphs and gauges to view data.
- Buttons & switches to interact with devices.
- Triggers to notify of data changes.
- Share dashboards publicly or keep private.
- Export feeds as CSV, Excel, JSON, XML.
## Data Model

### Feed
- Name
- Key & ID
- Description
- License

- **Data[]**
  - Value
  - Timestamps
  - Geo Location
Data Model Continued

**Feed**
- Name
- Key & ID
- Description
- License

- **Data[]**
  - Value
  - Timestamps
  - Geo Location

**Group**
- Name
- Key & ID
- Description

  **Feed**

  ...
## APIs

<table>
<thead>
<tr>
<th>REST API</th>
<th>MQTT</th>
</tr>
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<tbody>
<tr>
<td>- Simple append &amp; read last data.</td>
<td>- MQTT 3/3.1 broker.</td>
</tr>
<tr>
<td>- Full CRUD for Feeds, Data, and Groups.</td>
<td>- Subscribe and publish data on feed topics.</td>
</tr>
<tr>
<td>- JSON or text data.</td>
<td>- JSON or text data.</td>
</tr>
</tbody>
</table>
Client Libraries

REST API
- **Python**: io-client-python
- **Ruby**: io-client-ruby
- **Node**: io-client-node
- **Arduino**: Adafruit_IO_Arduino
  - CC3000
  - Generic client/ESP8266
  - FONA

MQTT
- **Python**: io-client-python
- **Arduino**: Adafruit_MQTT_Library
  - CC3000
  - Generic client/ESP8266
  - FONA

All available from:
http://github.com/adafruit
Sharing

- Dashboards and feeds can be public or private.

- Control license for feed data.
Security

- Authorization with revocable user API key to access REST and MQTT APIs.
  - Support for fine-grained feed-level keys planned.
- SSL on platforms that support it.
Limits

- Rate limits: ~2 requests / second for a user
- Data limits: 50k items per feed, APIs limit to retrieving last 1000 items
- Expect to iterate on limits based on beta usage.
What can you do with Adafruit IO?
Example: Sensor Logging

Switch
Humidity/Temp Sensor (DHT11)
ESP8266
Potentiometer
Many sensor possibilities!
Example: NeoPixel Controller

RGB LEDs
Many control possibilities!
Example: Smart Pet Food Dish

- ESP8266
- Infrared receiver
- Infrared LED
Example: Smart Pet Food Dish

IF Recipes run automatically in the background.

Create a Recipe

- If feed
- petfood-bowl
- is
- equal to
- value

Cat Food Bowl Monitor

Monitor Your Data in IO

This trigger fires anytime a data value sent to your feed satisfies the conditions you set. Example below.

- If feed
- petfood-bowl
- is
- equal to
- value

EMPTY

This is the value you would like to compare against.
Example: Smart Pet Food Dish

Trigger

Monitor Your Data in IO

Cat food bowl is empty!

Tony DiCola <tony@tonydicola.com>
11:59 PM (3 minutes ago)
to me

The cat food bowl is empty--go fill it up!
Coming Soon

- Triggers with IFTTT, Zapier, and other services.
- Geo metadata and maps.
Summary

- Bill of Rights for Internet of Things
- Adafruit.IO is a sandbox for using and learning about the Internet of Things.
- To check out the beta: http://io.adafruit.com
  http://learn.adafruit.com/adafruit-io