Goals of this Lab

- Learn how to connect to the Internet via WiFi

- Excercises about:
  - scanning available WiFi networks
  - connecting to a WiFi access point
  - sending data to thingspeak

Lab Examples

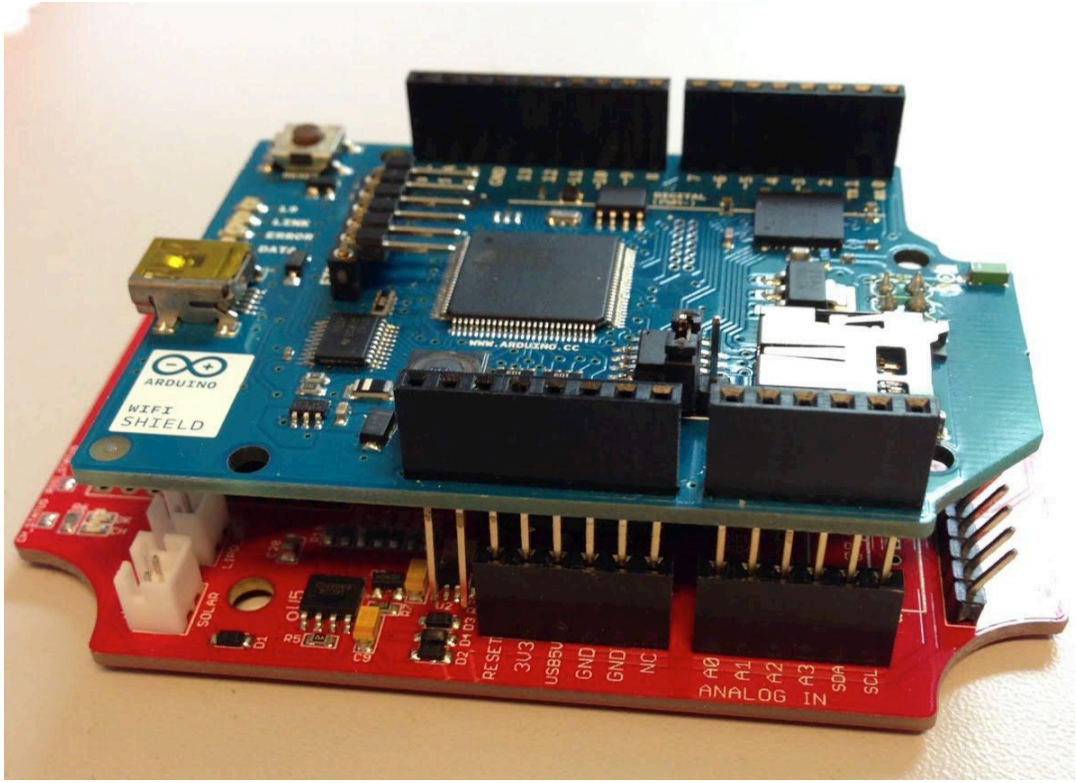
From the Workshop's webpage, download the zip file with all the examples for this Lab 2 Session.

Open the folder called Example_1 and open the Example_1.ino file

Start!

Example_1

Connect the Ardiono WiFi shield on top of the Seeduino board.

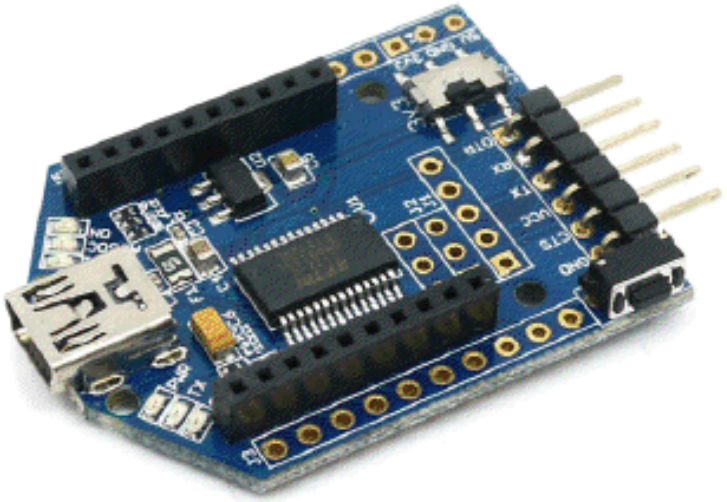


Example_1

Example_1 will scan for available WiFi networks.

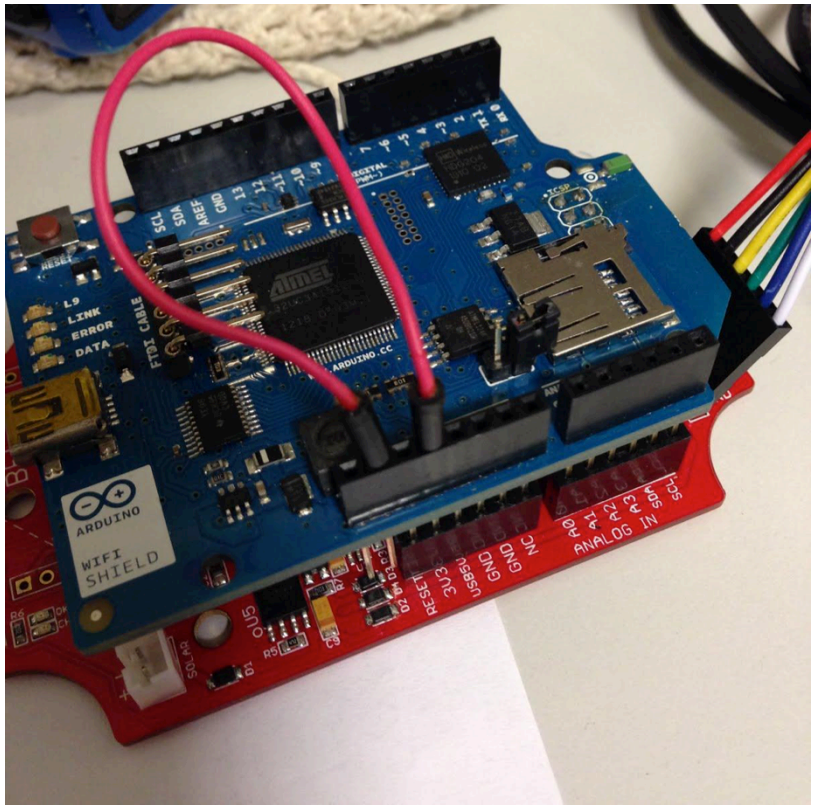
```
number of available networks:7
0) SDU-Wireless SMAC: 78:C4:E:1:D1:4F
Scanning available networks...
** Scan Networks **
number of available networks:6
0) SDU-Wireless Signal: -46 dBm Encryption: None
1) ictp-open    Signal: -54 dBm Encryption: None
2) ictp-secure  Signal: -55 dBm Encryption: WPA2
3) eduroam      Signal: -56 dBm Encryption: WPA2
4) ictp-secure  Signal: -80 dBm Encryption: WPA2
5) eduroam      Signal: -81 dBm Encryption: WPA2
```

Example_1: attention!



On the USB device, select 5V in order for the WiFi Shield to work!

Example_1: attention!



You need to connect pins #2 and #4 with a cable in order for the WiFi Shield to work!

Example_1 - extended

What is the most powerful WiFi Access Point you can see?

Try to move and check how the signal level changes.

Write down the name of the network you want to connect to.

Example_2

Example_2 will connect to a WiFi network with WPA authentication (password).

Adjust the name of the network and the password.

```
#include <WiFi.h>

char ssid[] = "yourNetwork";      //  your network SSID (name)
char pass[] = "secretPassword";  // your network password
int status = WL_IDLE_STATUS;     // the Wifi radio's status
```

Example_2 - output

```
Attempting to connect to WPA SSID: MZTC
You're connected to the networkSSID: MZTC
BSSID: 20:C9:D0:1C:D4:8B
signal strength (RSSI):-47
Encryption Type:4

IP Address: 10.0.1.7
10.0.1.7
MAC address: 78:C4:E:1:D1:4F
SSID: MZTC
BSSID: 20:C9:D0:1C:D4:8B
signal strength (RSSI):-47
Encryption Type:4

SSID: MZTC
BSSID: 20:C9:D0:1C:D4:8B
signal strength (RSSI):-47
Encryption Type:4
```

Example_2 - extended

What is your IP address?

What is the signal level (RSSI)?

Storing your data

There are *many* online platforms to store and visualize your data

http://postscapes.com/internet-of-things-platforms has a list of platforms

I reccomend https://thingspeak.com/ , http://ubidots.com and https://plot.ly/

Storing your data

From http://openmicros.org/index.php/articles/89-iot-and-cloud-provision/141-list-of-cloud-providers
y http://postscapes.com/internet-of-things-platforms?order=author

- **AirVantage** http://www.sierrawireless.com/...
  - Sierra Wireless managed paid for M2M cloud provider
- **Amee** http://www.amee.com/
  - Environmental Intelligence Everywhere
- **Arkessa** http://www.arkessa.com/m2m/
  - 3G/GPRS based paid for M2M solution
- **Axeda** http://www.axeda.com/
  - Paid subscription only M2M cloud provider
- **Bugswarm** http://bugswarm.net/
  - JavaScript environment based around Bug hardware
- **Cloudrfnet** http://www.cloudrfnet.com/
  - Open, Flexible, Affordable. In development and coming soon
- **Evrythng** http://evrythng.net/
  - Currently in beta release, data repository for 'things'
- **Etherios** http://www.etherios.com/...
- **HP Cense** http://www.hp.com/...
  - In-house HP powered nano-sensor network
- **iDigi** http://www.idigi.com/
  - Xbee based pay as you go data logging service (free for 5 device demo)
- **iobridge** http://www.iobridge.com/
  - Free logging site based around IO modules. Linked with ThingSpeak
- **Nimbits** http://www.nimbits.com/
  - Example code available
  - Free logging with detailed triggers and graphing. Paid for support if required
- **One Platform** http://exosite.com/products/onep
  - API driven cloud based logging. Free home/ community user accounts
- **paraimpu** http://paraimpu.crs4.it/
  - Currently in Invite Only Alpha testing
- **Patchube** https://pachube.com/
  - Example code available
  - Free to use with graph generation, triggers and good user support base
- **ProxPlatform** http://www.neuaer.com/developers
  - Mobile phone based object tracking
- **SEN.SE** http://open.sen.se/
  - Example code available
  - Invite only beta testing
- **Sensinode** http://www.sensinode.com/
  - Proprietry NanoStack device network
- **SensorCloud** http://sensorcloud.com/
  - Designed around MicroStrain sensors. API for 3rd party devices. Limited free account
- **SensorLogic** http://sensorlogic.com/
  - M2M cloud network provider
- **ThingSpeak** https://www.thingspeak.com/
  - Has Arduino section in Forum. Looks good, needs testing.
- **Thingworx** http://www.thingworx.com/
  - Complete end to end solution
- **Yaler** http://www.yaler.org/
  - Example code available.
  - Control of devices (Arduino) that are behind a firewall
- **Xively** https://xively.com/

Storing your data - considerations

There are some issues to consider when choosing an online platform:

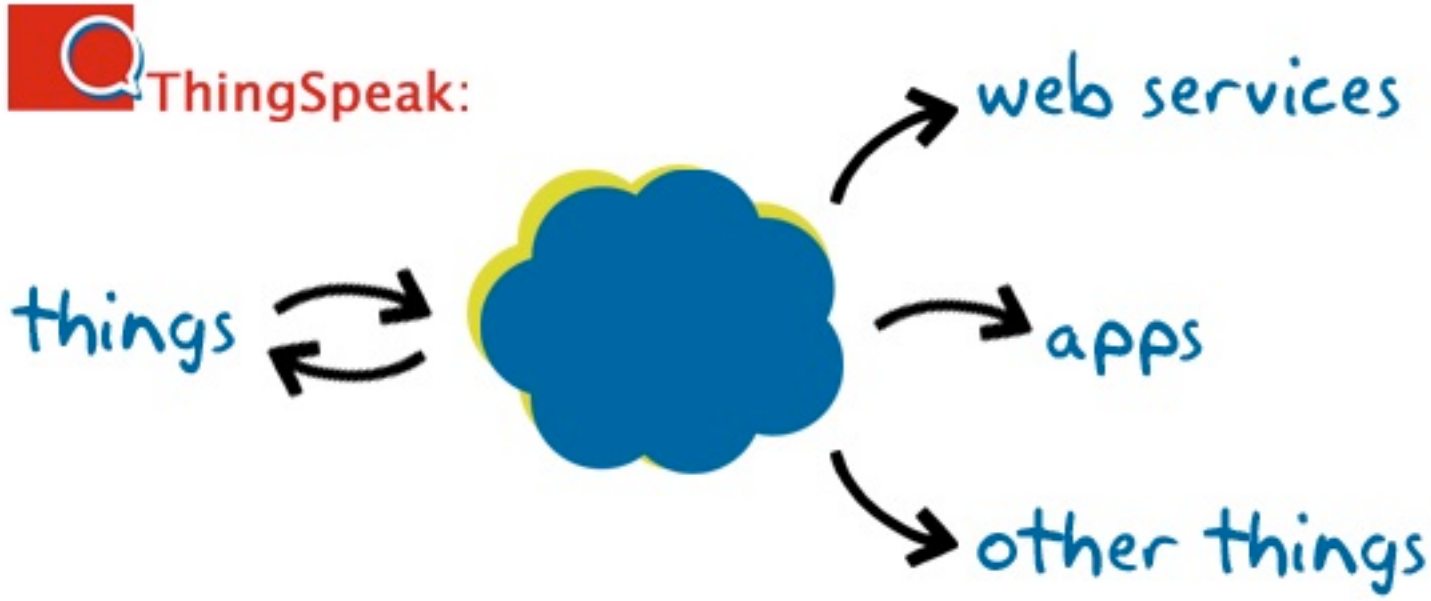
- who owns *your* data?
- how reliable is the platform?
- will it be online next year?
- what about privacy? (how important is your data?)
- open source or proprietary?

Storing your data - thingspeak

All purpose data storage and retrieval

Tweet sized data

Push data from devices



Storing your data - thingspeak

Data types: sensor data, text data, geolocation data

Data visualization:charts, maps

Open Source API and Web App

https://github.com/iobridge/ThingSpeak

Example_3 - thingspeak

Channel - The name for where data can be inserted or retrieved within the ThingSpeak API, identified by a numerical Channel ID

Field - One of eight specific locations for data inside of a channel, identified by a number between 1 to 8 – A field can store numeric data from sensors or alphanumeric strings from serial devices or RFID readers

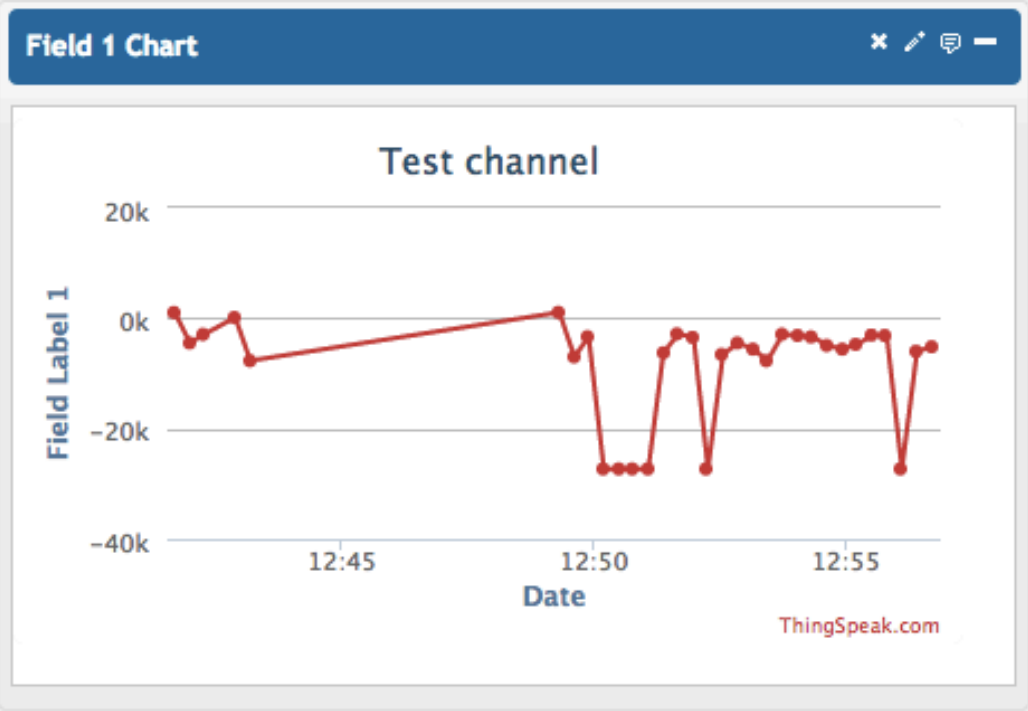
Status - A short status message to augment the data stored in a channel

Example_3 - thingspeak

Test channel

by marcozennaro

This channel has temperature, humidity and pressure in Bangkok.



Example_3 - thingspeak

Location - The latitude, longitude, and elevation of where data is being sent from

Feed - The collective name for the data stored inside a channel, which may be any combination of field data, status updates, and location info

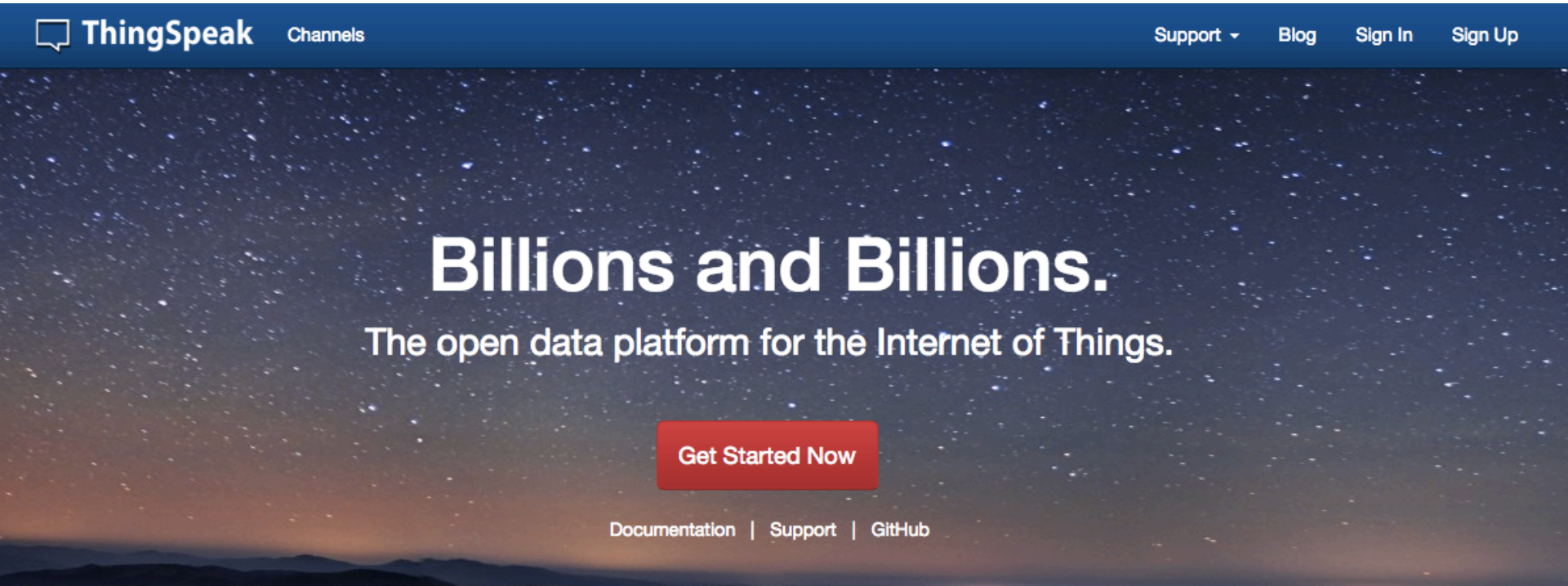
Write API Key – A 16 digit code that allows an application to write data to a channel

Read API Key – A 16 digit code that allows an application to read the data stored in a channel

Example_3 - thingspeak

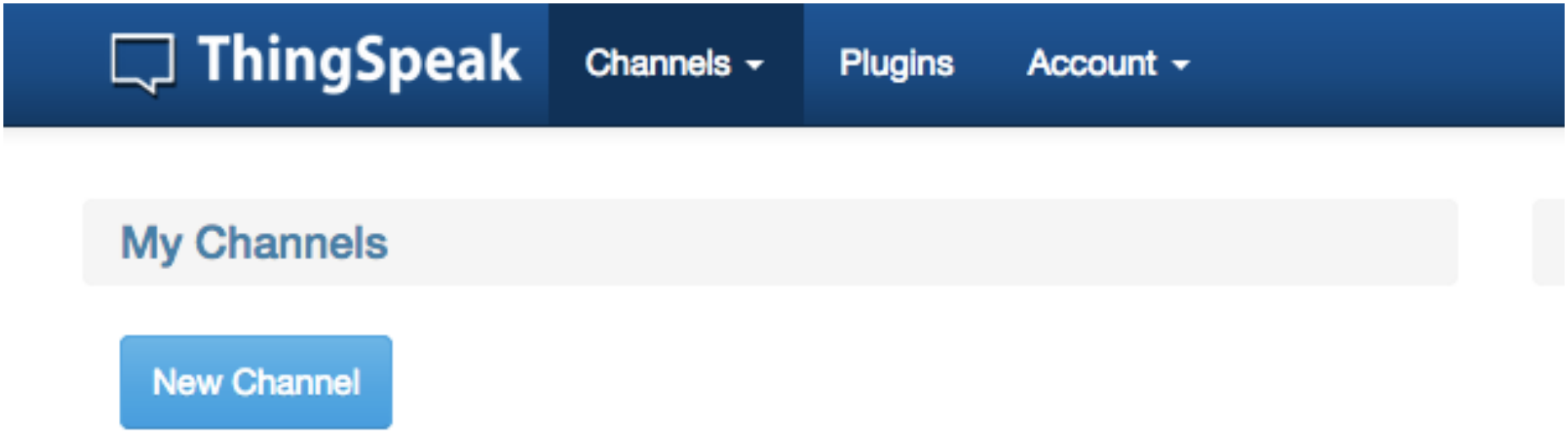
Sign up to our local thingspeak:

http://203.159.0.30:3000/ (it's free!)



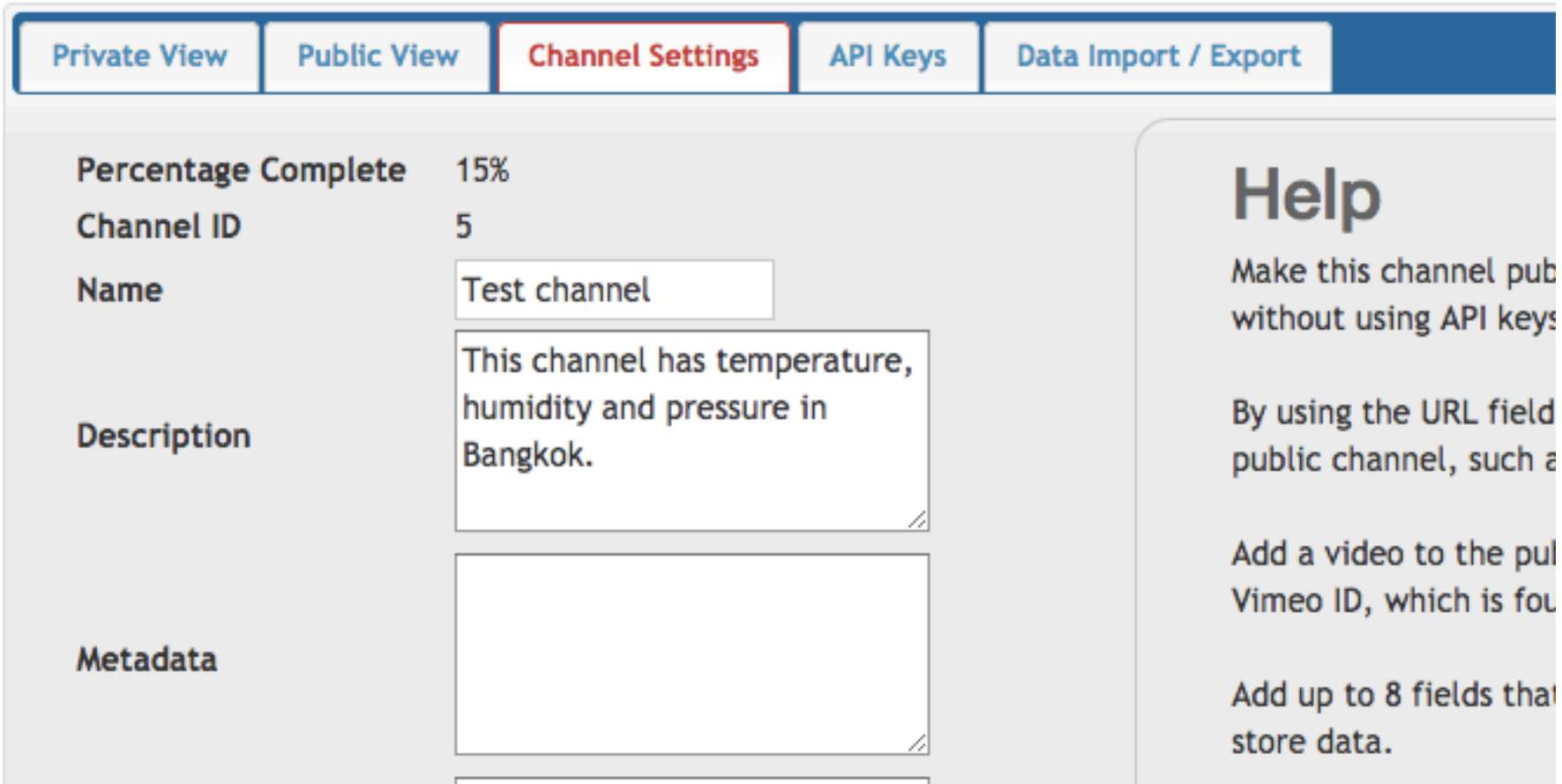
Example_3 - thingspeak

Create a new channel

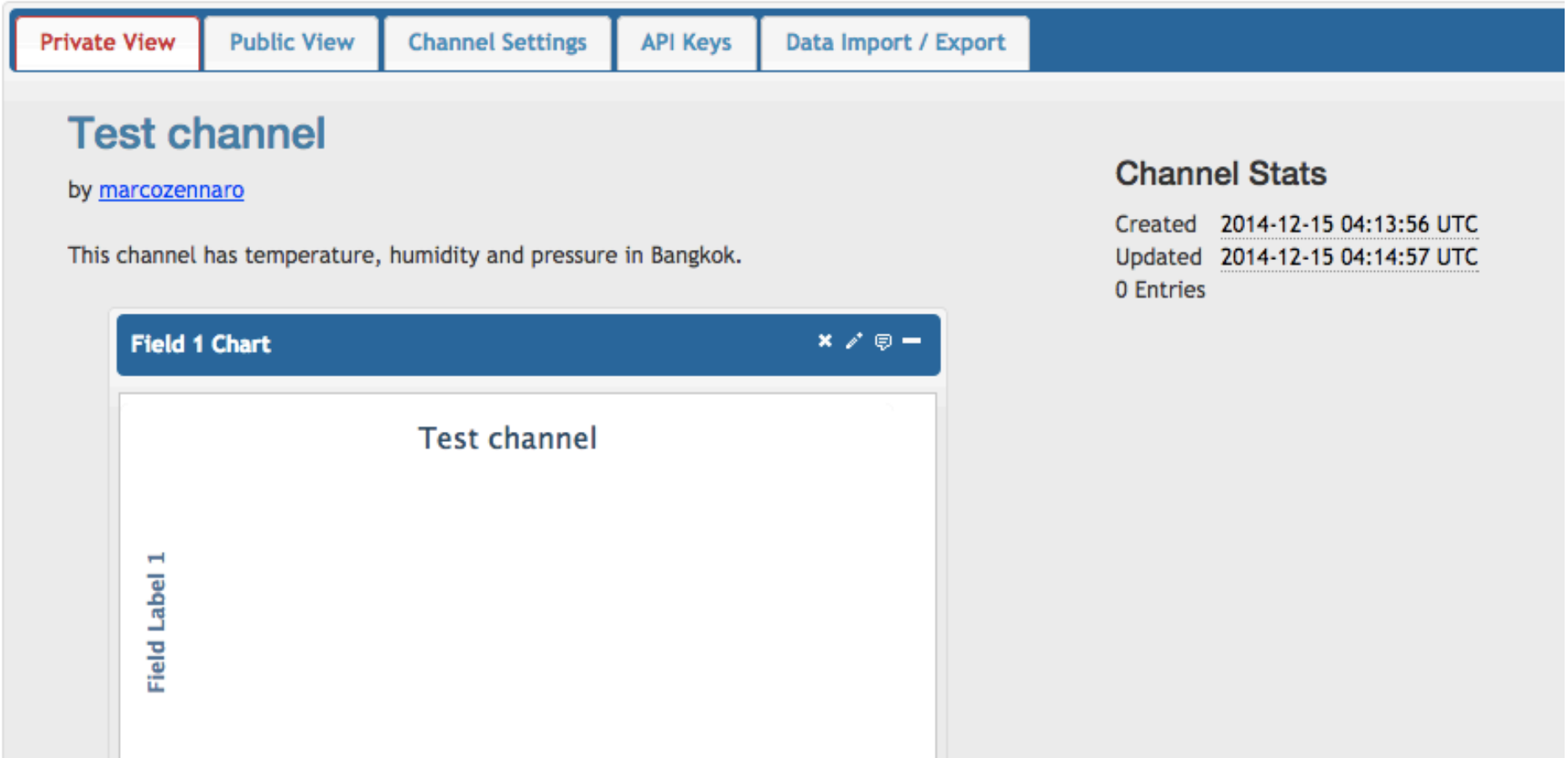


Example_3 - thingspeak

Give the channel a name and description

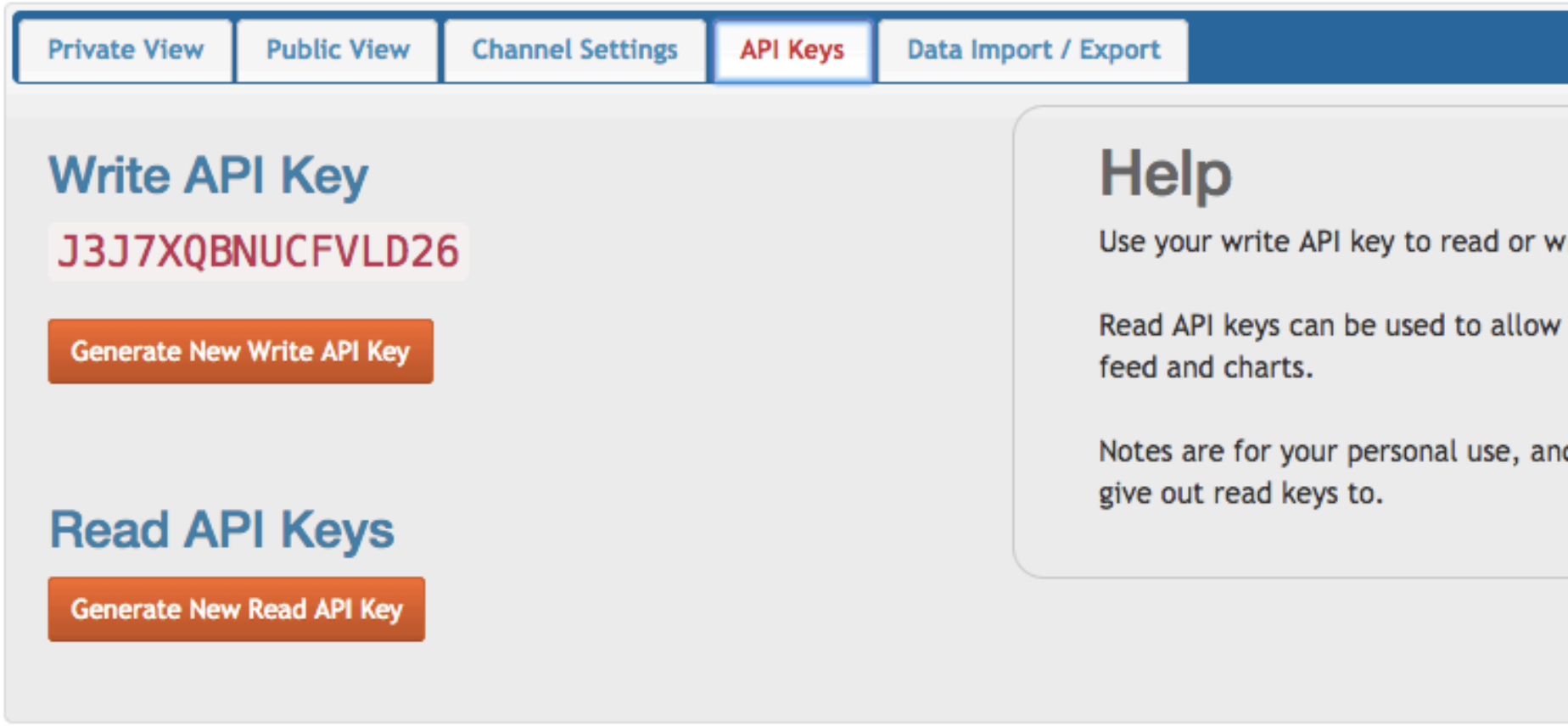


Example_3 - thingspeak



Example_3 - thingspeak

Copy the Write API Key



Example_3 - thingspeak

Fill in your thingspeak writeAPI, WiFi ssid and password.

```
 // ThingSpeak Settings
char thingSpeakAddress[] = "203.159.0.30";  //TS

String writeAPIKey = "J3J7XQBNUCFVLD26";    //TS
const int updateThingSpeakInterval = 16 * 1000;      // Time interval in
milliseconds to update ThingSpeak (number of seconds * 1000 = interval)

char ssid[] = "WSN_1";     //  your network SSID (name)
char pass[] = "wsn@2014";  // your network password
```

Example_3 - thingspeak

You can add one or mode fields.

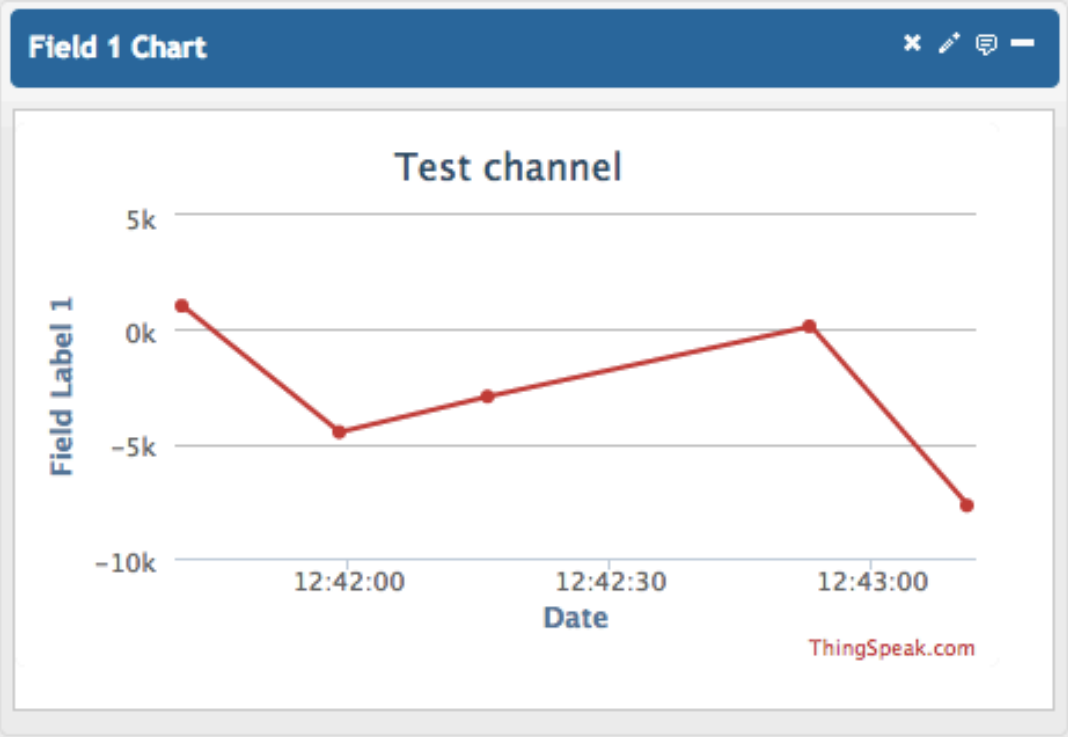
```
 // Update ThingSpeak
  if(!client.connected() && (millis() - lastConnectionTime >
updateThingSpeakInterval))
  {
    updateThingSpeak("field1="+analogPin0);
     Serial.print(analogPin0);
     Serial.write(186);
     Serial.println("C");
     printCurrentNet();
  }
```

Example_3 - thingspeak

Test channel

by marcozennaro

This channel has temperature, humidity and pressure in Bangkok.



Channel Stats

Created 2014-12-15 04:13:56 UTC
Updated 2014-12-15 05:41:58 UTC
2 Entries

Example_3 - thingspeak

API Rate Limit

The open service via ThingSpeak.com has a rate limit of **an update per channel every 15 seconds**. This limit is so that the service can remain free and give everyone a high-level of service. The API source will also be made available on GitHub so that you can run this locally or via a shared web host provider. At that point you will be able to tweak settings for your application requirements.

Example_3 - extended

Graph data from the internal temperature (RTC) sensor.

Share the links of your graphs on the mailing list.

Add an external Grove sensor to the graph. Add a second one. And then a third one!

Thanks

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www.wsnblog.com