

Goals of this Lab

- Learn how to connect to the Internet via WiFi
- Exercises 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.

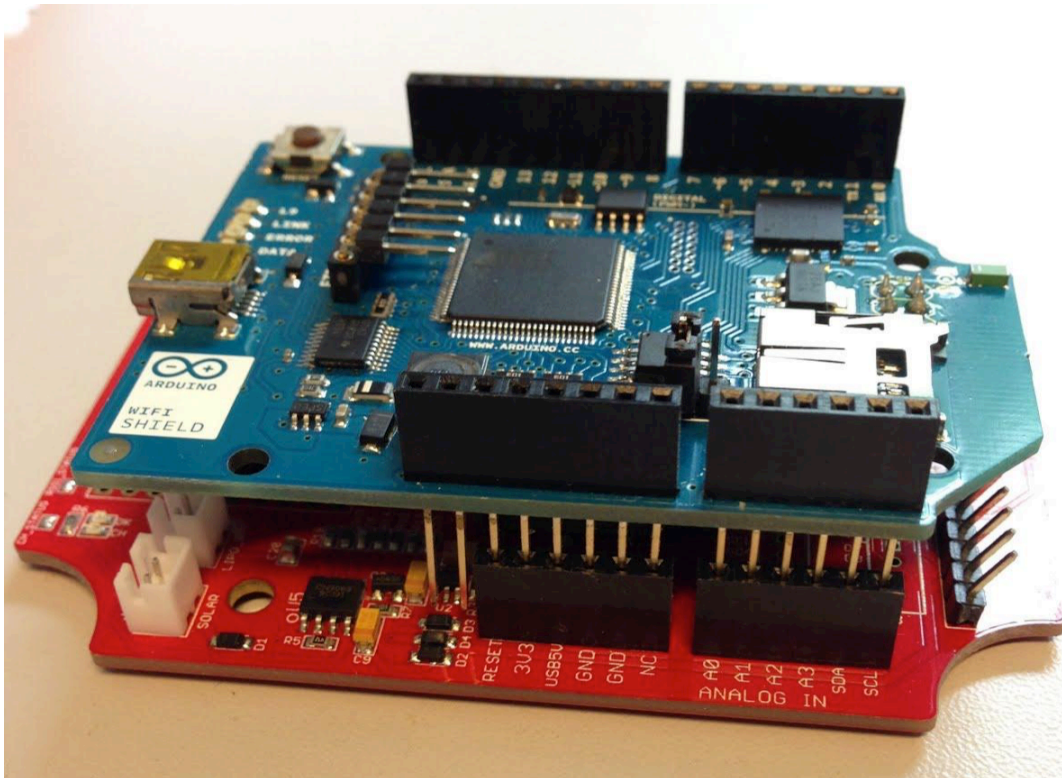
Open the folder called Example_1 and open the Example_1.ino file

Start!



Example_1

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

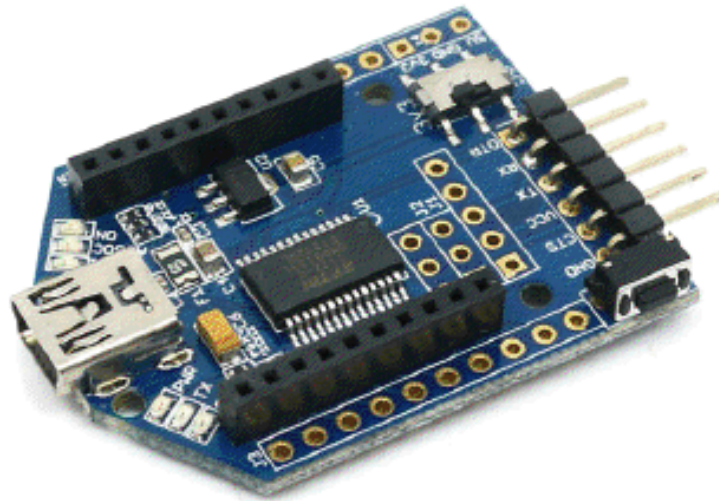


Example_1

Example_1 will scan for available WiFi networks.

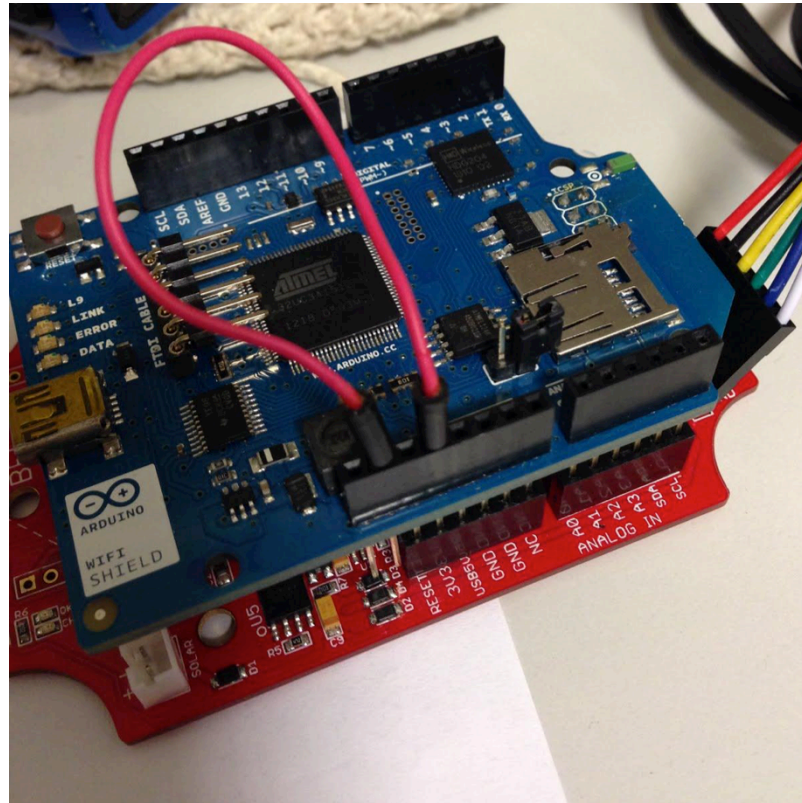
```
number of available networks:7
0) SDU-Wireless SMAC: 78:C4:E:1:D1:4F
Scanning available networks...
** Scan Networks **
number of available networks:6
0) SDU-Wireless Signal: -46 dBm Encryption: None
1) ictp-open     Signal: -54 dBm Encryption: None
2) ictp-secure  Signal: -55 dBm Encryption: WPA2
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 recommend <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/...](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/...](http://www.etherios.com/)
- **HP Cense** [http://www.hp.com/...](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://patchube.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/>
 - Proprietary 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:

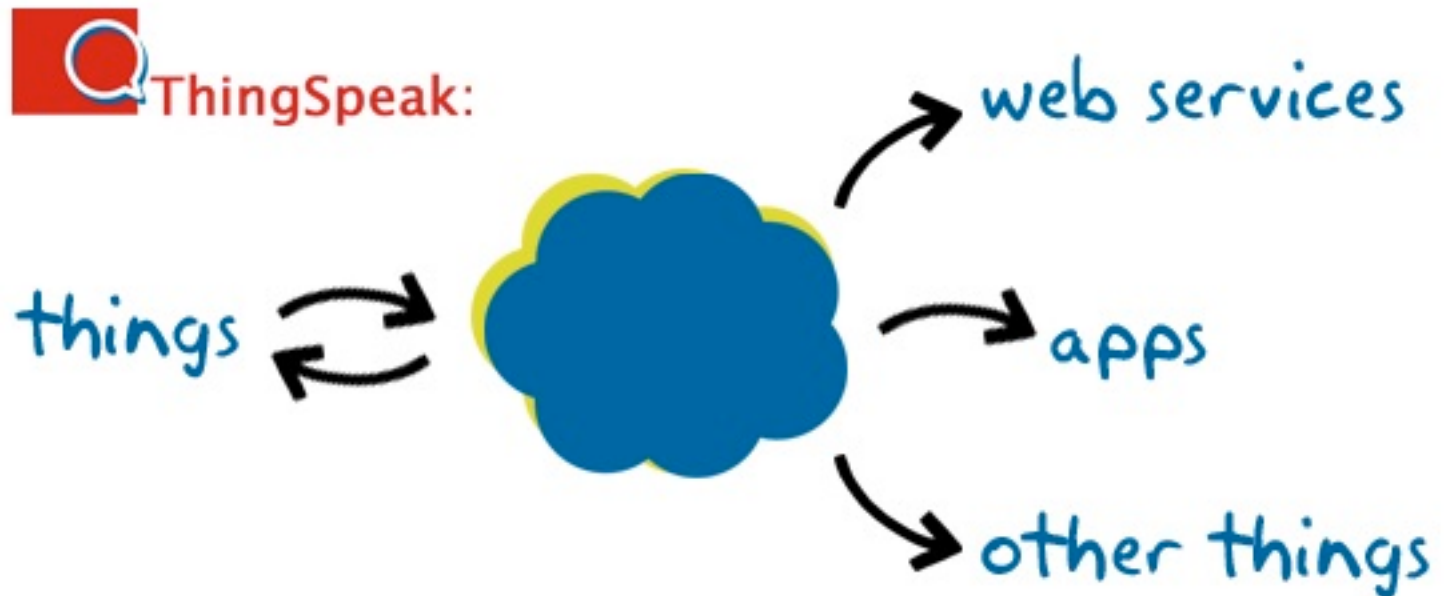
- who owns *your* data?
- how reliable is the platform?
- will it be online next year?
- what about privacy? (how important is your data?)
- open source or proprietary?

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

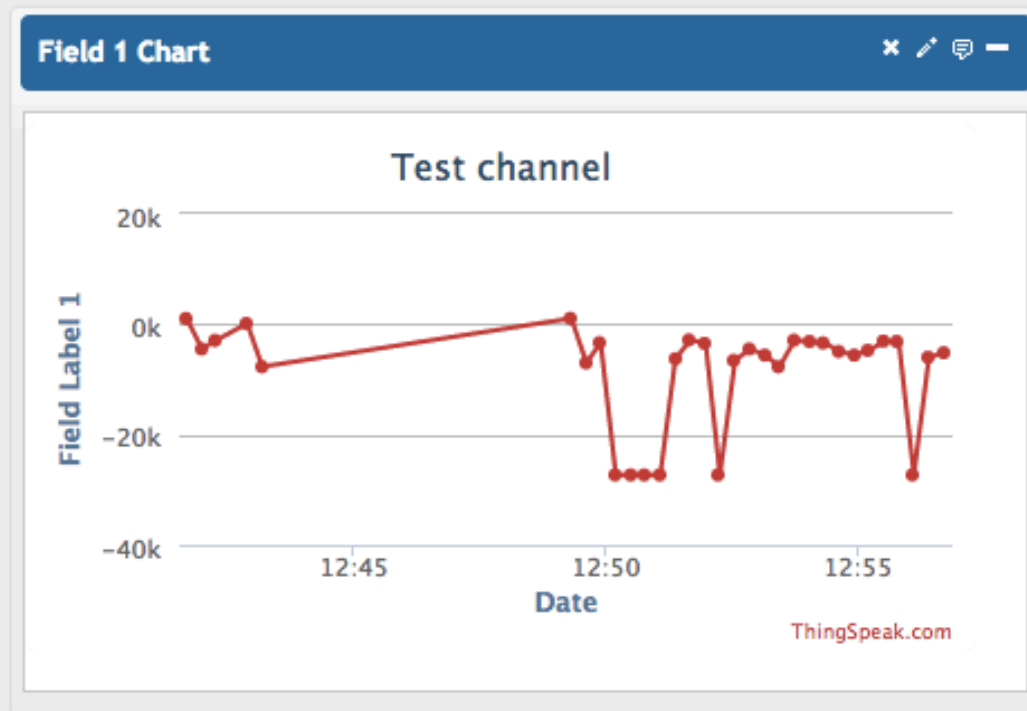
Status - A short status message to augment the data stored in a channel

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!)



ThingSpeak

Channels

Support ▾

Blog

Sign In

Sign Up

Billions and Billions.

The open data platform for the Internet of Things.

Get Started Now

[Documentation](#) | [Support](#) | [GitHub](#)

Example_3 - thingspeak

Create a new channel



ThingSpeak

Channels ▾

Plugins

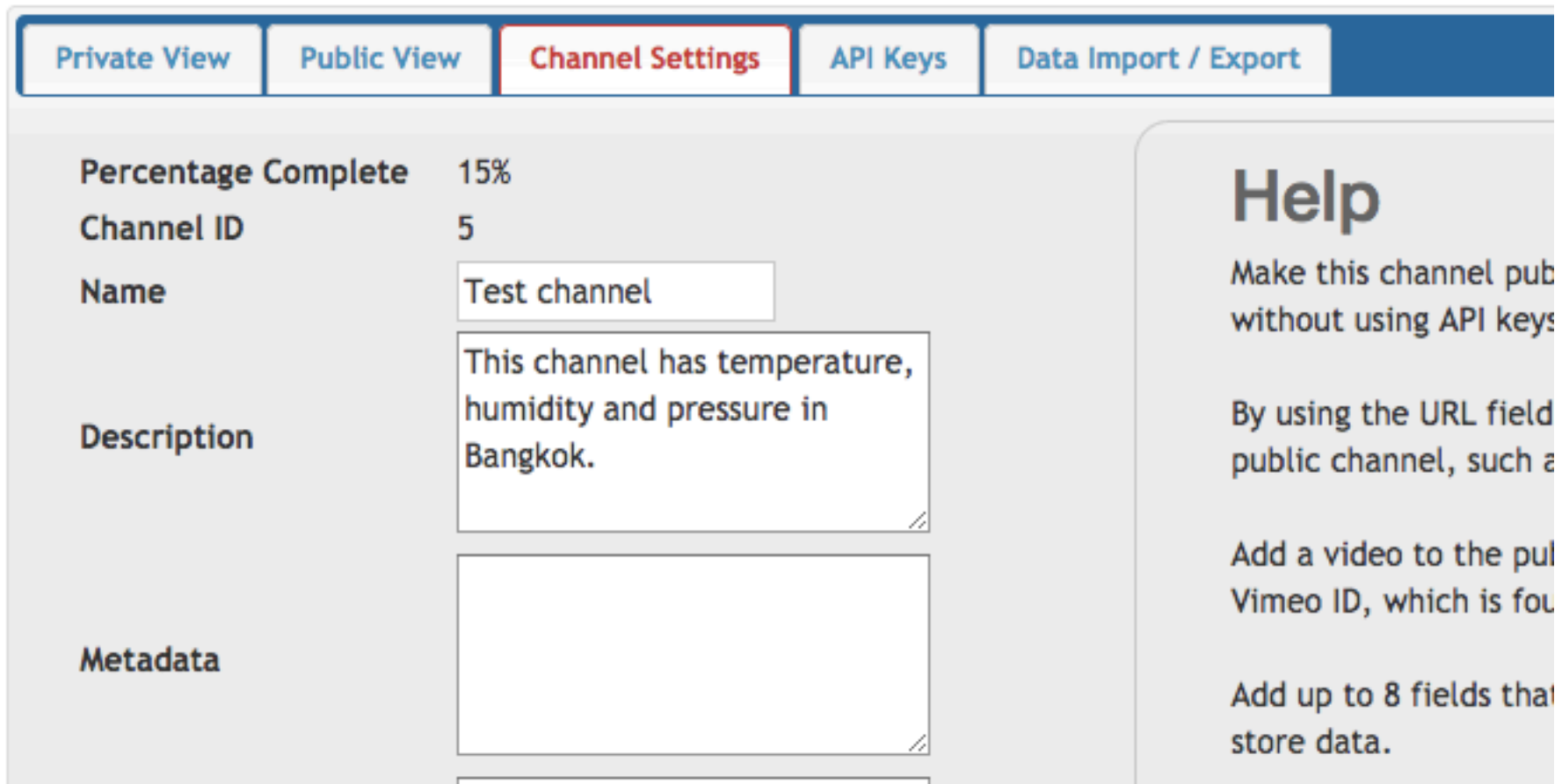
Account ▾

My Channels

New Channel

Example_3 - thingspeak

Give the channel a name and description



The screenshot shows the 'Channel Settings' tab of a Thingspeak channel. The interface includes a top navigation bar with tabs for 'Private View', 'Public View', 'Channel Settings' (which is highlighted with a red border), 'API Keys', and 'Data Import / Export'. Below the navigation bar, the 'Channel Settings' section contains several fields: 'Percentage Complete' is set to 15%; 'Channel ID' is 5; 'Name' is 'Test channel'; 'Description' is 'This channel has temperature, humidity and pressure in Bangkok.'; and 'Metadata' is an empty text area. To the right of the settings is a 'Help' section with text explaining how to make the channel public without API keys, how to use the URL field for a public channel, how to add a video to the public channel using a Vimeo ID, and how to add up to 8 fields to store data.

Private View	Public View	Channel Settings	API Keys	Data Import / Export
Percentage Complete 15%				
Channel ID 5				
Name Test channel				
Description This channel has temperature, humidity and pressure in Bangkok.				
Metadata				

Help

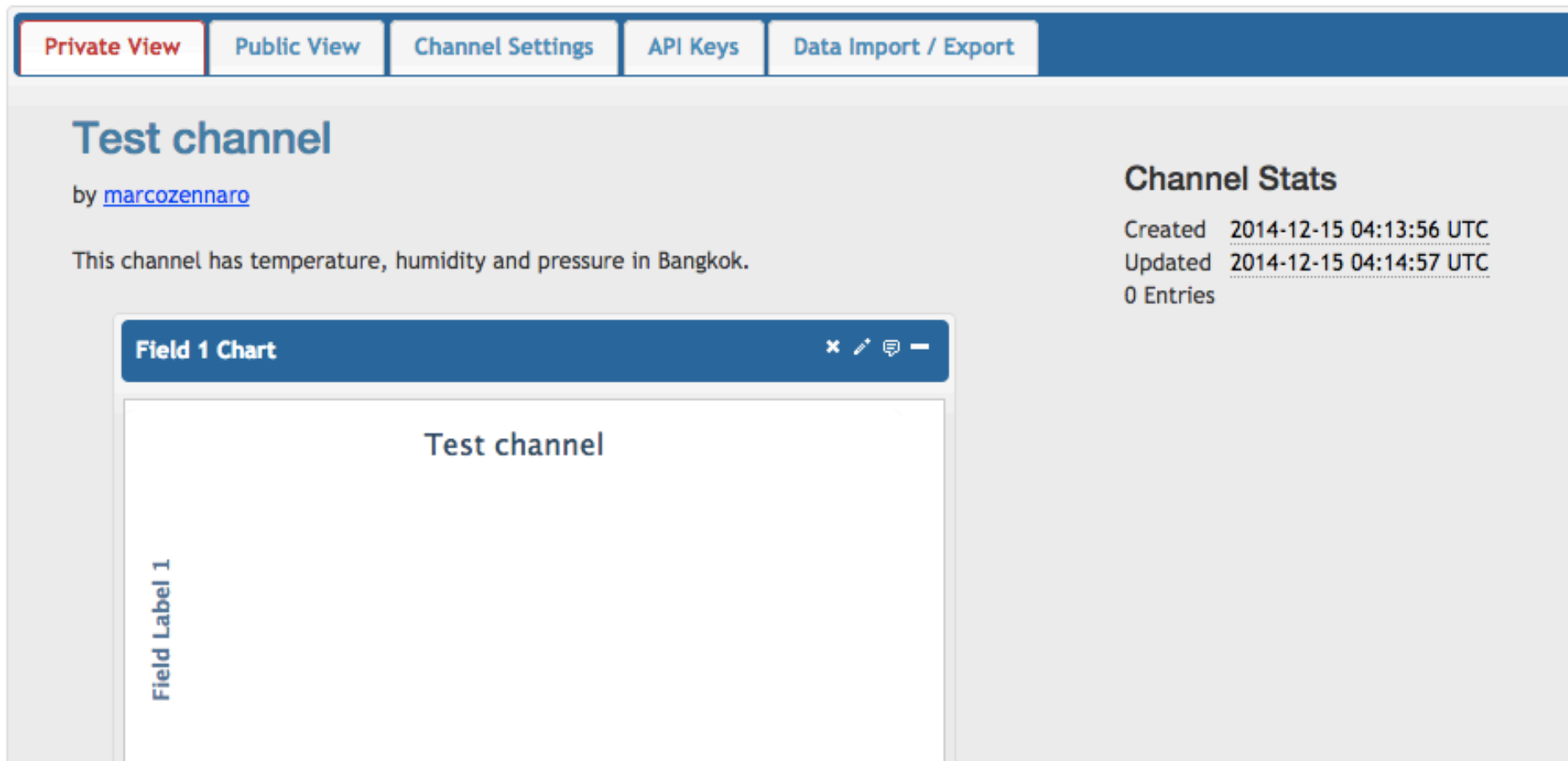
Make this channel public without using API keys

By using the URL field of a public channel, such as

Add a video to the public channel using a Vimeo ID, which is found

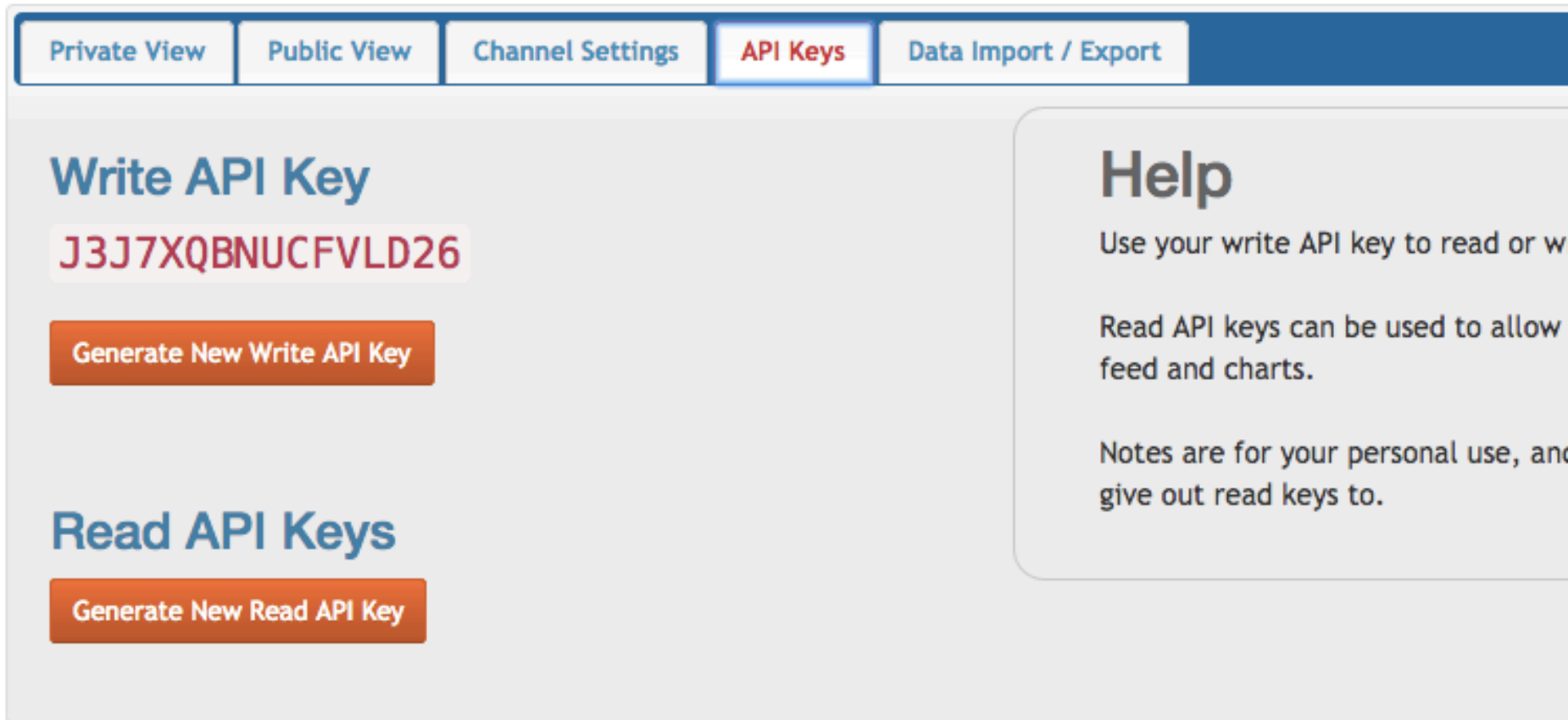
Add up to 8 fields that can store data.

Example_3 - thingspeak



Example_3 - thingspeak

Copy the Write API Key



The screenshot shows the Thingspeak API Keys management interface. At the top, there is a navigation bar with five tabs: 'Private View', 'Public View', 'Channel Settings', 'API Keys' (which is highlighted with a blue border and red text), and 'Data Import / Export'. Below the navigation bar, the main content area is divided into two sections. The left section is titled 'Write API Key' in blue text and displays a red API key 'J3J7XQBNUCFVLD26' inside a light red box. Below the key is an orange button labeled 'Generate New Write API Key'. The right section is titled 'Read API Keys' in blue text and features an orange button labeled 'Generate New Read API Key'. On the far right, there is a 'Help' sidebar with the title 'Help' in large bold text. The help text explains that the write API key is used for reading or writing, and that read API keys can be used to allow feed and charts. It also notes that these are for personal use and should be given out to others.

Private View Public View Channel Settings **API Keys** Data Import / Export

Write API Key

J3J7XQBNUCFVLD26

Generate New Write API Key

Read API Keys

Generate New Read API Key

Help

Use your write API key to read or w

Read API keys can be used to allow feed and charts.

Notes are for your personal use, and give out read keys to.

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 more 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](#)

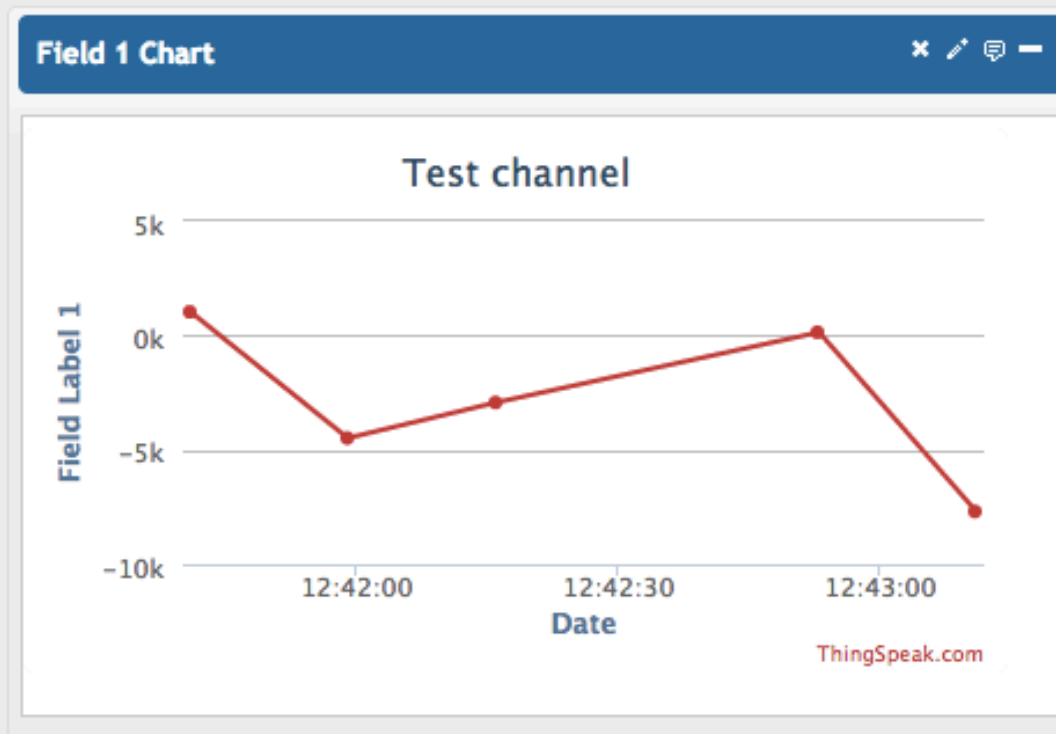
This channel has temperature, humidity and pressure in Bangkok.

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