

# Lab 2: Connecting and Sending Data

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# 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 [plot.ly](https://plot.ly)

# Lab Examples

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

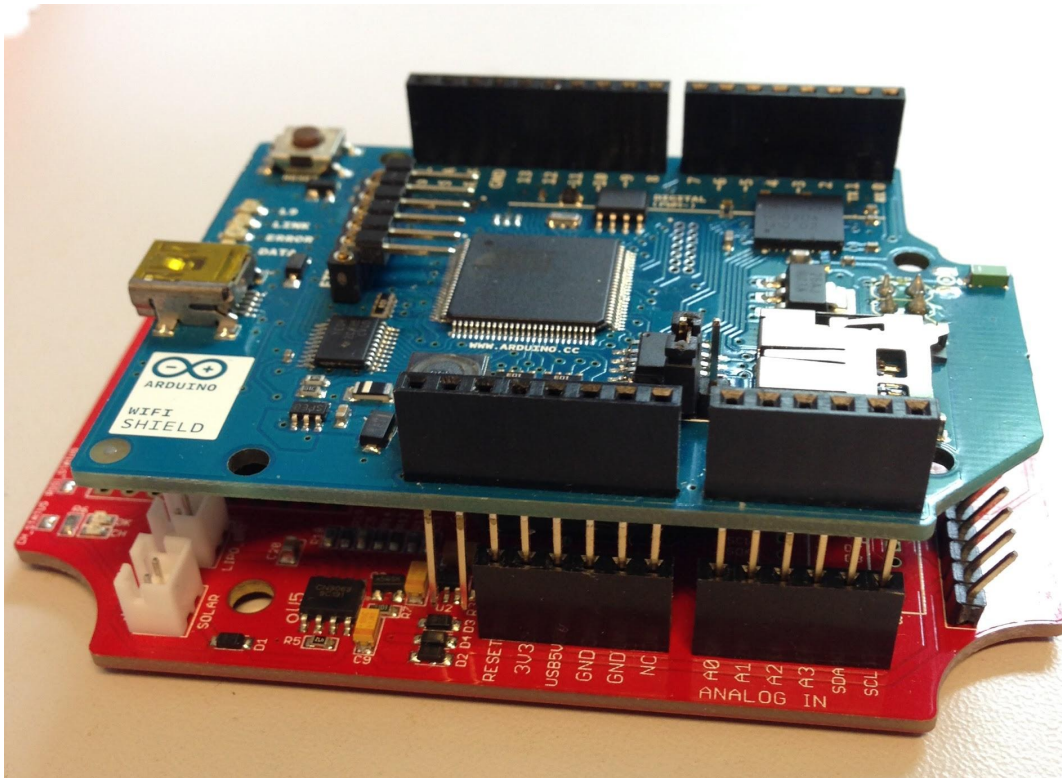
Open the folder called Example\_1 and open the Example\_1.ino file

# Start!



# Example\_1

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

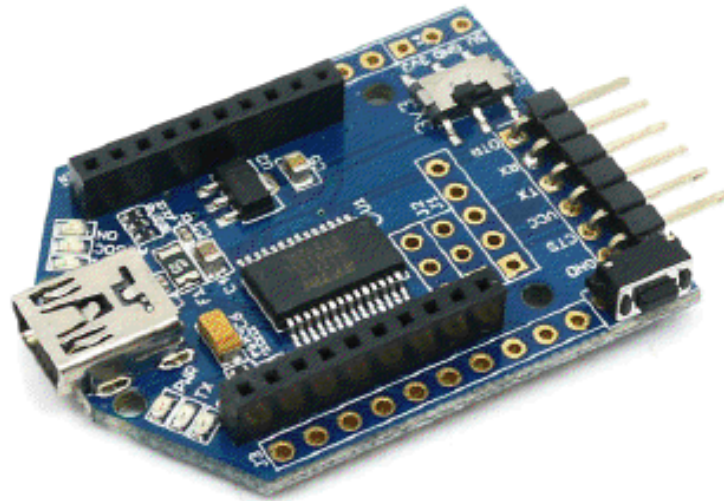


# Example\_1

Example\_1 will scan for available WiFi networks.

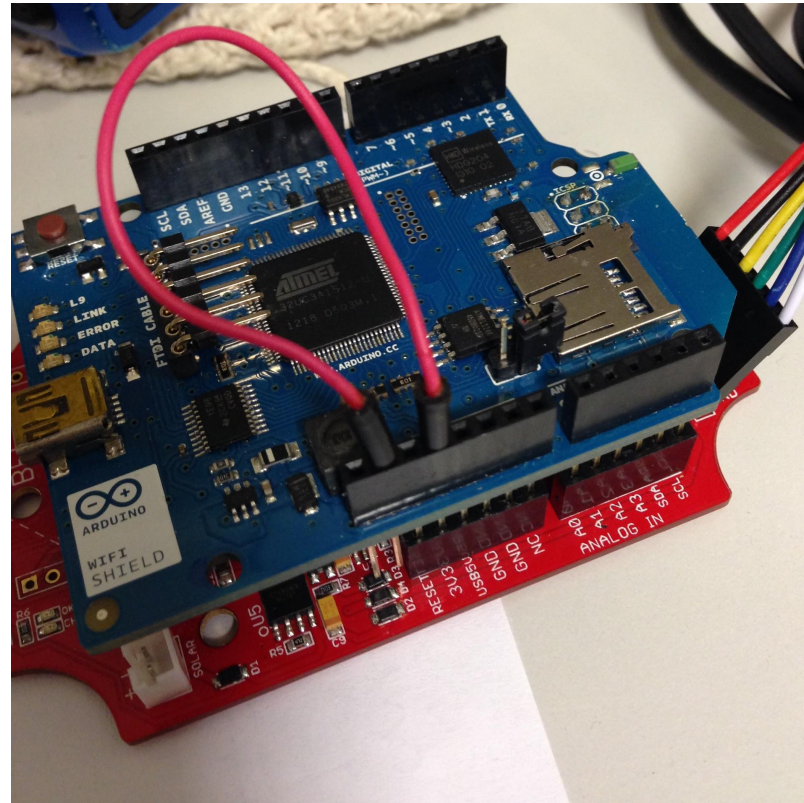
```
number of available networks:7
0) SDU-Wireless SMAC: 78:C4:E:1:D1:4F
Scanning available networks...
** Scan Networks **
number of available networks:6
0) SDU-Wireless Signal: -46 dBm Encryption: None
1) ictp-open Signal: -54 dBm Encryption: None
2) ictp-secure Signal: -55 dBm Encryption: WPA2
3) 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/> and <https://plot.ly/>

# 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 - plot.ly

**Plotly** is a collaborative data analysis and graphing tool.

Plotly's Arduino libraries connects Arduinos to plotly's online graphing tool for real-time, interactive data logging and graphing.

It's free, open source, and your graphs and data are entirely online.

# Example\_3 - plot.ly

Sign up to plotly: <https://plot.ly> (it's free!)

Download and uncompress the latest plotly release:

<https://github.com/plotly/arduino-api/releases>



# Example\_3 - plot.ly

Place the plotly WiFi library (called plotly\_streaming\_wifi) in your Arduino libraries folder: /users/name/XXXXXX

Restart the Arduino IDE so that the new library is loaded.

Load Example\_3 from the folder Lab\_2.

# Example\_3 - plot.ly

Fill in your plotly username, filename (you choose it) and WiFi information.

```
// Supply as many tokens as data traces
// e.g. if you want to ploty A0 and A1 vs time, supply two tokens
char *tokens[nTraces] = {"token_1", "token_2"};
// arguments: username, api key, streaming token, filename
plotly graph = plotly("plotly_username", "plotly_api_key", tokens,
"your_filename", nTraces);

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

# Example\_3 - plot.ly

If you want to plot two variables vs time, you need to supply two tokens

You can find your API key and stream tokens here: <https://plot.ly/settings>

# Example\_3 - plot.ly

Fill in your plotly API key and stream tokens.

```
// Supply as many tokens as data traces
// e.g. if you want to ploty A0 and A1 vs time, supply two tokens
char *tokens[nTraces] = {"token_1", "token_2"};
// arguments: username, api key, streaming token, filename
plotly graph = plotly("plotly_username", "plotly_api_key", tokens,
"your_filename", nTraces);

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

# Example\_3 - output

```
... Attempting to connect to WPA network...  
... Connected to network  
... Attempting to connect to plotly's REST servers  
... Connected to plotly's REST servers  
... Sending HTTP Post to plotly  
... Sent message, plotly's response:  
... A-ok from plotly, All Streams Go!  
... View your streaming plot here: https://plot.ly/~streaming-demos/6  
... Connecting to plotly's streaming servers...  
... Connected to plotly's streaming servers  
... Initializing stream  
... Done initializing, ready to stream!
```

# Example\_3 - output

The graph and data is saved in your plotly account, so you can view it in your plotly file list here: <https://plot.ly/plot> .

You can view, edit, and share your graphs while data is streaming to them in real-time.

Everybody that views the graph will see the exact same data at the same time (try it out yourself: open your graph in two different browser windows).

# Example\_3 - extended

Visit <https://github.com/plotly/arduino-api> and adjust the code to make the graph:

- 1) private
- 2) with 100 points plotted at a time
- 3) timezone set to Japan.

# Exercise

I own a chalet in Switzerland and want to monitor its temperature every 2 minutes using an existing WiFi network. I want to visualize how temperature changes over time.

