

Deploying an End-to-End LoRaWAN Platform

Starting from September 2016, Saint-Joseph University of Beirut (USJ) will be deploying the first academic **LoRa** network in Lebanon. The network will support monitoring of micro-climate conditions in vineyards. Here below you can find a detailed description of the experimental platform implementing an end-to-end LoRaWAN solution.

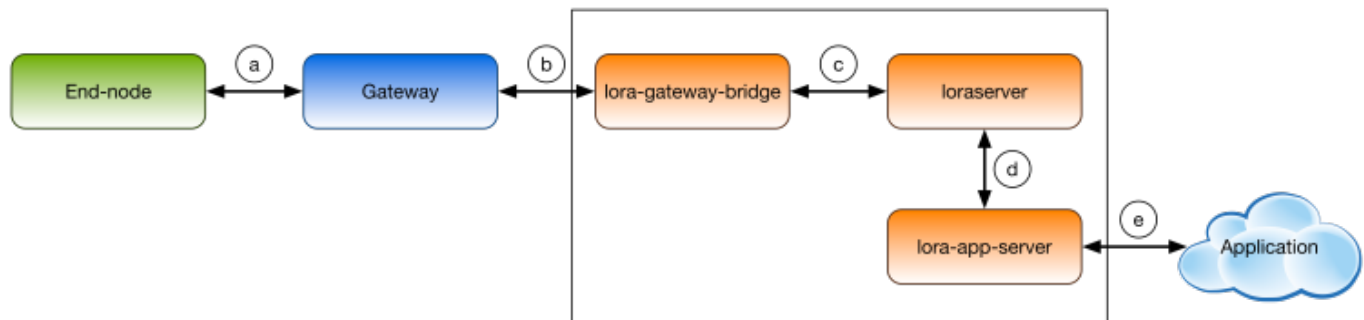


Figure 2. Architecture of the LoRaWAN Platform

- End-nodes

- Autonomo with LoRaBee

- Arduino with Dragino Shield

- Gateways

- Single Channel Gateway

The single channel gateway includes a LoRa transmission module (Dragino Shield) connected to a Raspberry Pi (2 or 3). Communication is done over an SPI interface.

Start by making the connection between the modules: the connection pins are identified in Figures 2 and 3.

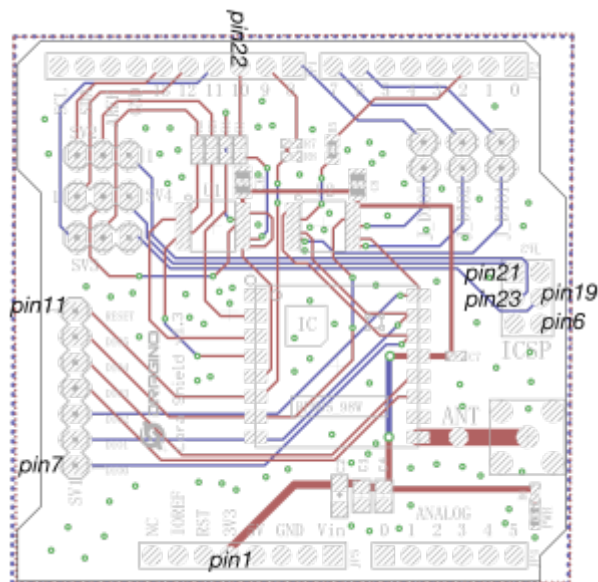


Figure 2. Dragino pin mapping

Pin#	NAME		NAME	Pin#
01	3.3v DC Power		DC Power 5v	02
03	GPIO02 (SDA1, I ² C)		DC Power 5v	04
05	GPIO03 (SCL1, I ² C)		Ground	06
07	GPIO04 (GPIO_GCLK)		(TXD0) GPIO14	08
09	Ground		(RXD0) GPIO15	10
11	GPIO17 (GPIO_GEN0)		(GPIO_GEN1) GPIO18	12
13	GPIO27 (GPIO_GEN2)		Ground	14
15	GPIO22 (GPIO_GEN3)		(GPIO_GEN4) GPIO23	16
17	3.3v DC Power		(GPIO_GEN5) GPIO24	18
19	GPIO10 (SPI_MOSI)		Ground	20
21	GPIO09 (SPI_MISO)		(GPIO_GEN6) GPIO25	22
23	GPIO11 (SPI_CLK)		(SPI_CE0_N) GPIO08	24
25	Ground		(SPI_CE1_N) GPIO07	26
27	ID_SD (I ² C ID EEPROM)		(I ² C ID EEPROM) ID_SC	28
29	GPIO05		Ground	30
31	GPIO06		GPIO12	32
33	GPIO13		Ground	34
35	GPIO19		GPIO16	36
37	GPIO26		GPIO20	38
39	Ground		GPIO21	40



Figure 3. Raspberry pi 3 pins

Now you can connect the Raspberry Pi to the Internet and install the packet forwarding software. The source code of the single channel packet forwarder is available on:

https://github.com/samerlahoud/single_chan_pkt_fwd. In order to install it, you need to:

- Enable SPI on the Raspberry Pi using raspi-config
- Download and unzip the source code:

```
wget https://github.com/hallard/single_chan_pkt_fwd/archive/master.zip
unzip master.zip
```

- Install the wiring library:

```
apt-get update
apt-get install wiring
```

- Compile and run the packet forwarder as root.

```
gcc version 4.6.3
unrecognized command line option '-std=c++11'
CFLAGS = -std=c++0x -c -Wall -I include/
```

-. Kerlink IoT Station

```
# activates eth0 at startup
ETHERNET=yes
# claims dhcp request on eth0
ETHDHCP=yes

# Selector operator APN
GPRSAPN=gprs.touch.com.lb
# Enter pin code if activated
GPRSPIN=0000
# Update /etc/resolv.conf to get dns facilities
GPRSDNS=yes
# PAP authentication
GPRSUSER=
GPRSPASSWORD=

# Bearers priority order
#BEARERS_PRIORITY="eth0,ppp0,eth1"
BEARERS_PRIORITY="ppp0,eth0,eth1"
```

```
./gps-pkt-fwd.sh > /dev/null &
```

```
3270 root      2548 S    /bin/sh ./gps-pkt-fwd.sh
3288 root      34908 S   ./gps_pkt_fwd
```

```
/etc/init.d/gprs start
```

```
[root@Wirgrid_0b03008c demo_gps_loramote]# /etc/init.d/gprs status
pppd (pid 5273) is running...
Session: Rx=58, Tx=163
Globals: Rx=1130457, Tx=1195592
Sum:      Rx=1130515, Tx=1195755
[root@Wirgrid_0b03008c demo_gps_loramote]#
```

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