Node-RED Dashboard Presentation

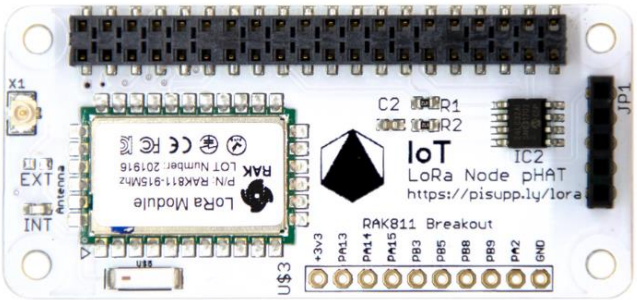
In this part we will discuss these topics:

- Description about our Gateway and its shield to receive the data
- Node-RED Introduction
- How Smart-Agriculture Dashboard works

Description about our Gateway and its shield to receive the data

To receive the information's from the device node we used a Raspberry Pi 3B+ (RPi3), because is so smart for many applications, low power consumption, you can interface on it in several ways, configurable as you can want and and 40 GPIO PIN to put the shield that you want, and but not less important, is very small, and is usable also for the users that are not practical with CLI commands.

Our choice about the shield for the RPi3 is fell on IoT LoraNode pHAT (IoT LoRa Node pHAT for Raspberry Pi (Multi Frequency) – Pi Supply (pi-supply.com), that used a RAK811 LoRa Module RAK811 LoRa / LoRAWAN module (based on SX1276) - 868MHz/915MHz – Pi Supply (pi-supply.com) based on SX1276, because can manage a very high number of node, has low consumption (50mA in transmission) and high range coverage (up to 10km).



By default, this shield is not thought to use as gateway, the basic configuration is to send the data, but our goal for this project is to reduce the costs, and the gateway shield has a significant cost, so we configured the pHAT module as gateway.

It has 2 antennas, one internal, used by default, and one external to improve the range of the transmission.

In our beta test for the firsts data transmission, we used the internal antenna because is smart, but in the end of final tests we used the external antenna for improve the data range, to use it we de-solder the inductor from on the INT solder pads and put it on the EXT solder pads.

From the official pi-supply repository on github [IoTLoRaRange/IoT LoRa Raspberry Pi Node pHAT at master · PiSupply/IoTLoRaRange (github.com)](#) you can find additional informations and software.

Node-RED Introduction

What's Node-RED?

Node-RED, based on JavaScript, is a graphical object programming platform to perform different type of projects.

One of the major features is to programming using the *nodes*, link to each other to obtain the result, and every node can contain a little script or information to manipulate the input message, this feature allows to the people who are unfamiliar with coding, to create their own project very quickly.

Another feature of NR it can be installed in different type of devices, for example on Raspberry Pi, your PC, etc.

Also, you can secure it using a password, to do that you need to modify *settings.js* (hidden) file, for more details: [Securing Node-RED : Node-RED (nodered.org)](#).

For more details about Node-RED watch on the official website [Node-RED](#).

How Smart-Agriculture Dashboard works

In this part we describe the main flow with the same name of the project, where the script will launch and data's management, so let's start.

At Start&Stop (Figure 1) nodes group you can manually start (Message Reception) or stop the script (Stop Searching New Message), or you can use the button on the Home Tab.

The connection with the next group is done with the link highlighted in red.

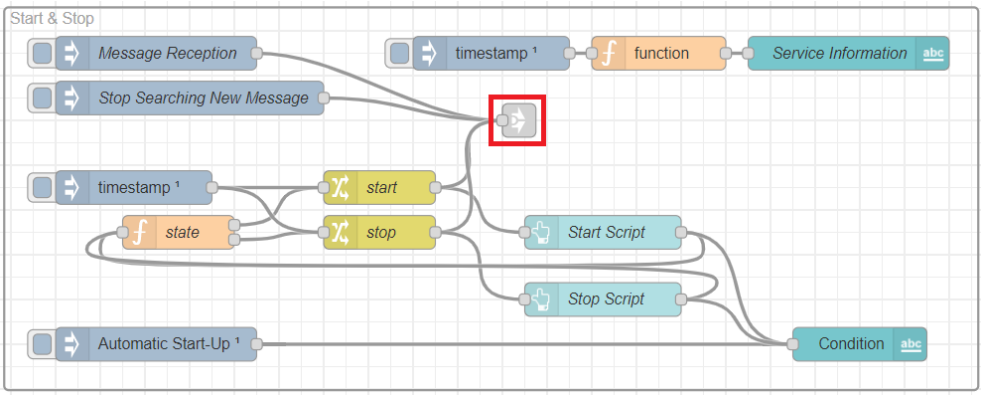


Figure 1

In the following group arrives the input on *LoraPi Receive Script* node and it launch (break) the .py script with the command previously set and return that the gateway will receives from the LoRa Nodes, as you can see in the next screen.

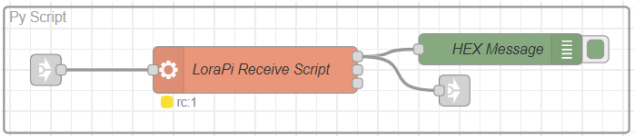


Figure 2

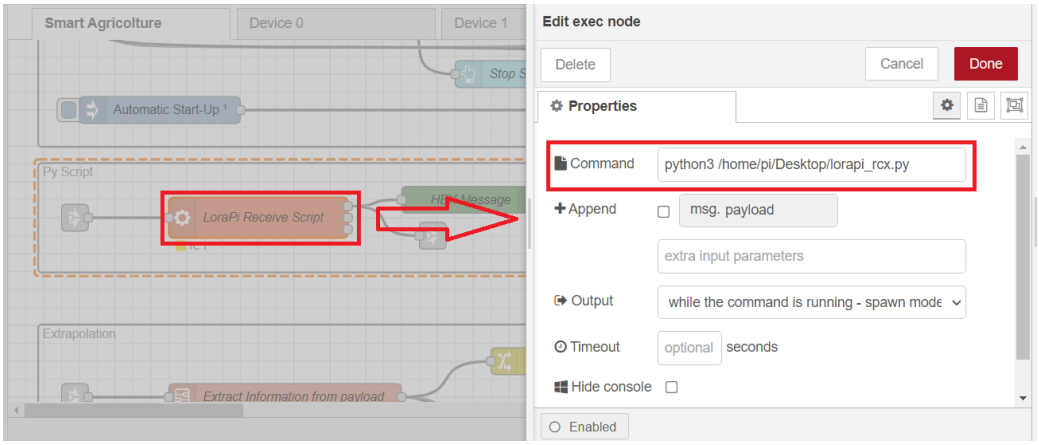


Figure 3

About the Extrapolation group, we will focus on *Extract Information from payload* and *DevAddr* subgroups.

A focus is on *Decrypt LoraWAN*, where you need to put your personal *Network Secret Key* and *Application Secret Key*.

On the first one, we have all the conversion and manipulation part of the payload that our gateway receives.

The Sensor data hex/string decode will return the original message with $ separator, and the last node create a dictionary with all the values, and example is at Figure 5, where the values are generated from our test board.

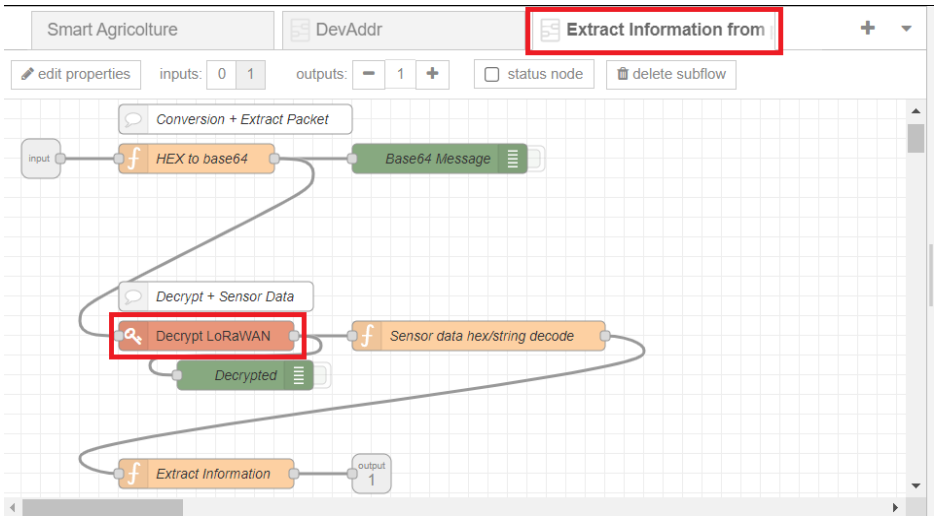


Figure 4

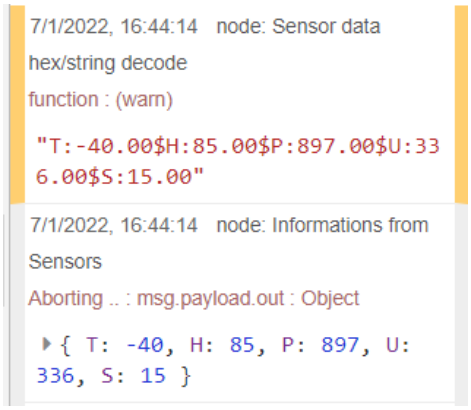


Figure 5

At this point, we have obtained the original message, and the DevAddr (Figure 6), but is not in string format as we need, so to convert it we used the second one subgroup, and it done other secondaries activities, for example you can add additional information to better identify the board on the Dashboard.

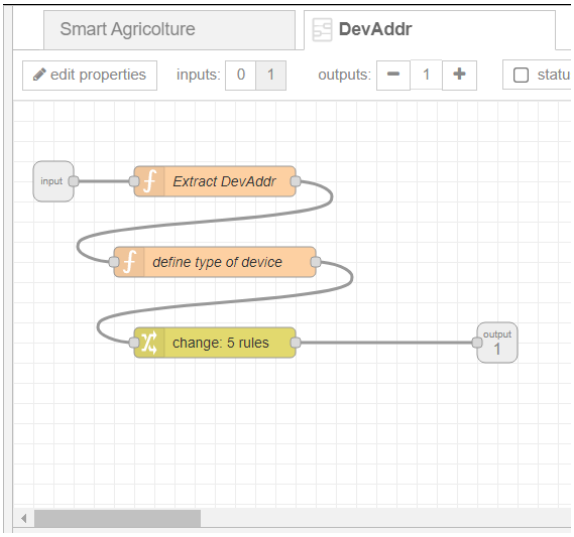


Figure 6

At the end of all of this, there's the last fundamental group (*Devices*) that from the DevAddr identify redirect to the proper flow, as you can see in this Figure.

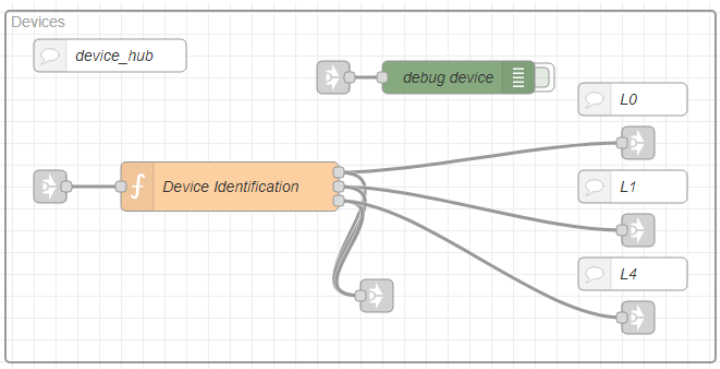


Figure 7