State of the Project

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# Abstract:[not abstract enough(better as a preface?)]

This project was originally created as a means of implementing an offline LoRaWAN gateway for use in areas without a reliable mobile internet connection. Current LoRaWAN gateways require a netstack and backhaul in order to communicate to an internet service provider [better name]. With this in mind, the project would focus around getting LoRaWAN working on a STMicroElectronics Nucleo board [a cheap prototyping board] and progress to a functional state from there.   
  
Once the Nucleo board was acquired however, it quickly became apparent that getting LoRaWAN running on the board would not be quite as simple as first imagined. The LoRaWAN concentrator board [gateway radio module] required (as much hardware does) a Hardware Abstraction Layer(HAL), and on close examination of this HAL two problems emerged.

Firstly, the driver relied on a UDP connection to function and the Nucleo board had no network stack. It should be noted that while this is the case, there was a useful utility in the driver software that would allow me to gather packets whilst offline.

Secondly, the driver had a lot of POSIX function calls that would work only under a high-level operating system. The nucleo simply does not support running HLOS’s.

With these problems came a choice. Either the project would continue to focus on a post-LoRa scenario, whereby the author simply acquired a board that would be capable of running the ic880A driver without problems. In this case the project would focus more on a post LoRa-implementation state, with the project revolving around getting a GPS-enabled node to send packets to the concentrator setup and storing them onto an SD card.

The second choice was to attempt to rewrite the HAL software in a way that would allow it to run on a “bare metal” environment. With this option being both more technically challenging as well as more directly relevant to the authors area of study, it was decided to rewrite the software. If this was succesfully accomplished then the project could be extended to include the original project as well.

So, the project shifted from a post-LoRa focus to a pre-LoRa focus. Now the main goal was to get the ic880A concentrator board running and receiving LoRaWAN without an internet connection. The HAL software was not a trivial implementation, and with this in mind it was decided to first get the concentrator board functioning on a linux-capable environment. With a functioning version of the software, it would be possible to work backwards and use terminal output via printf functions to debug the project code. For this purpose it was decided that a raspberry pi would be ideal as it has extensive documentation and there were tutorials for getting the ic880A running on this environment.

The last piece of the puzzle was to acquire a node to transmit basic LoRaWAN packets with and assess the rewritten HALs functionality. For this the project supervisor suggested the LoPy chips, as they have a simple API and extensive documentation. Additionally they had been seen to work with the ic880A so any incompatibility issues would be avoided.

The LoPy was also capable of transmitting in two different ways. The first was a full LoRaWAN stack implementation, with all of the associated bells and whistles[not academic]. The second was a form of raw LoRa. [more research is needed to determine whether raw lora will make for an easier HAL implementation or whether the ic880A firmware will pick both up regardless].

To be continued.

# Research:

# Design: