Improvements for final PCB based on Jolsgard master thesis and cSLIM.

# LoRa gateway and JSON problem

As the NEWEST IoF application expects additional LoRa information, it is currently incompatible with the LoRa Gateways used in the cSLIM or communication using BN-IoT. However, for applications using LoRa Gateways running the SLIM Node-RED flow by Rundhovde, cSLIM should be supported.

**Resolve this issue or use “bypass solution”**

## Power usage

Current LEDs uses 1.46mA (each led blue, green) and 1.06mA (each led red, yellow) and is too much for final PCB.

**Find more power efficient LEDs which is still visible, or use one signaling LED instead of multiple colors to increase battery lifetime?**

Blue led connected to lora, turning on when using LoRa.

Use 1.8V TTL and 3V TTL, is it worth it?

Significant reduction in battery lifetime by 15-20% by retaining the connection with the MQTT broker with keep alive messages. Suggested to look at CoAP or MQTTSN. Increasing the period from 60secound to one-hour cycles for retaining connection.

## GPS random wake-up

GPS wakes up after traffic on the GPSs MOSI SPI input.

**Place a logic level converter, chip selected with the GPS CS, to enable/disable SPI line. Or try the NEO-M9N (estimated available in January 2022)**

## Results from testing

CS to the display active high.

I2C and other pins connected directly to the LoRa module did not work unless the LoRa module is enabled and the pins are configured as inputs.

Not tested RS232

FRAM chip problems, some addresses does not work. May be heat-damage to FRAM chip.

## Software

Src/buffer use Zephyr FIFO buffers instead?

Implementing the address 8-pin DIP-switch for unique LoRa address in case of multiple buoys?

**Further work section 11,**

# Improvements based on Schematics notes

## 2/10: cSLIM-shield-LoRa.sch

* LoRa module pins draw power from nrf GPIO if it is not powered on.   
  Remove unneeded connections and/or LLC for tri-state. Need all bus-pins?
* Functionality on address switch in software.

## 3/10: cSLIM\_RS485.sch

* R303 and R302 are wrong ways. B to ground and A to VDD (this is the shield jumper-fix)
* Chose between MAX3486 or MAX3471. TBR baudrate is 115.200kbps while MAX3471 has a maximum of 64kbps, however more efficient.

## 4/10: cSLIM\_RS232.sch

* Remove electrical rule warnings(?)

## 5/10: cSLIM\_connectors.sch

* Remove J505 and J511 for standalone, nRF9160 to VDD)
* Add SWD connector for nRF9161 here.

## 6/10: cSLIM\_power.sch

* Capacitor for powersupply and diode to protect circuitry of wrong polarization.
* The nRESET pin of the nRF9160 has a 13k internal pull up. Fix RESET circuitry for nRF, to only include a capacitor and button?
* Look at resistors for TPS63000 for giving 3v out. Use TPS63001 instead in no other voltages than 3.3 V is required.

## 8/10: cSLIM\_display.sch

* LCC for display should be removed for future designs, due to display being active high cs.

## 9/10: cSLIM\_GPS.sch

* LLC on GPS to ensure tri-state on MOSI pins when GPS is turned and avoid waking up GPS. Or use new version M9N for future. – make it compatible with new version atleast.
* Decide on passive antenna only?

Questions

Skal jeg se etter annet hardware, eller rett og slett gå utifra arbeidet til Eyvind, de forslagene han har til forbedringer og legge til hardware for nRF9160?