LoRa

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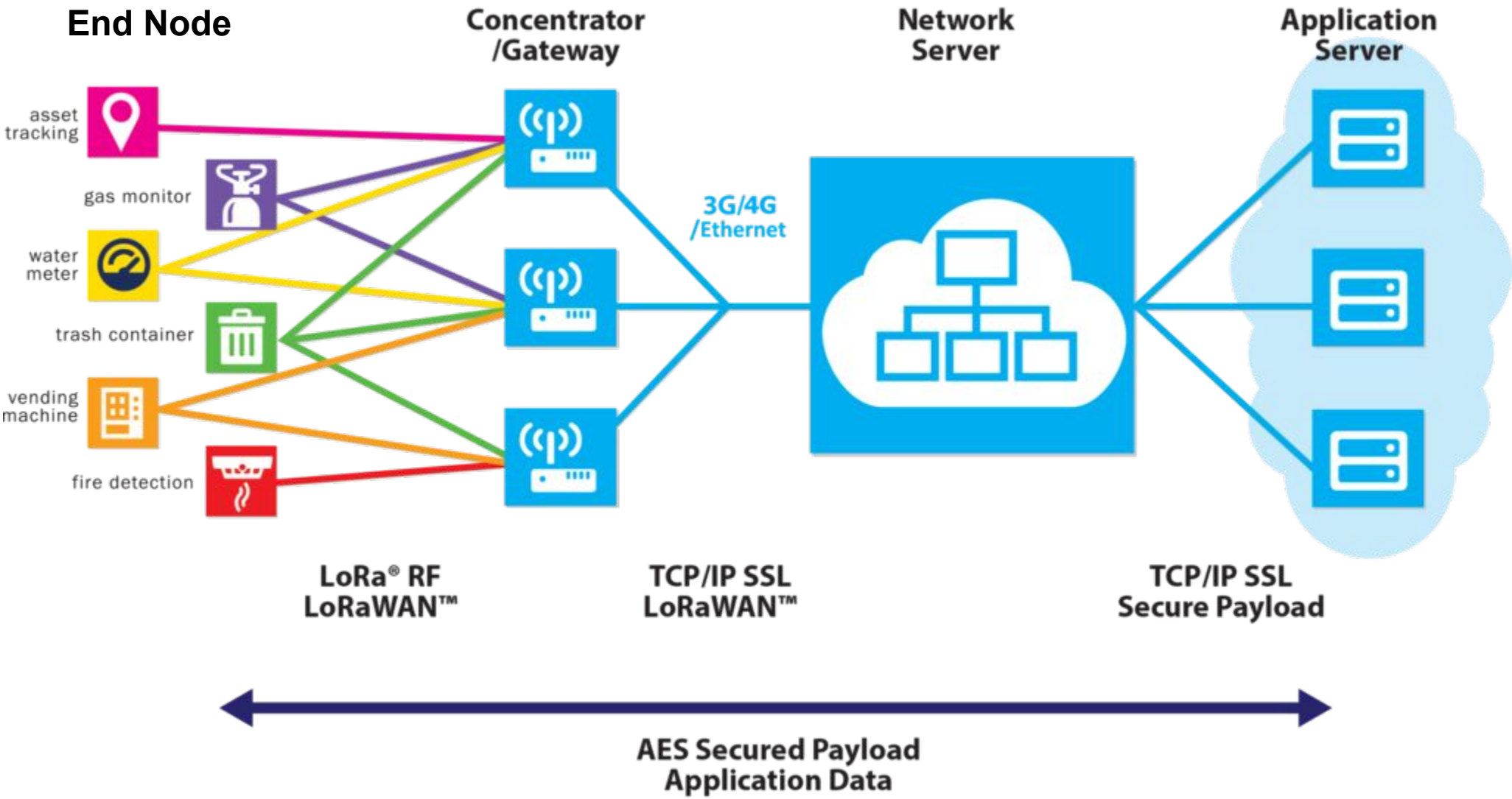
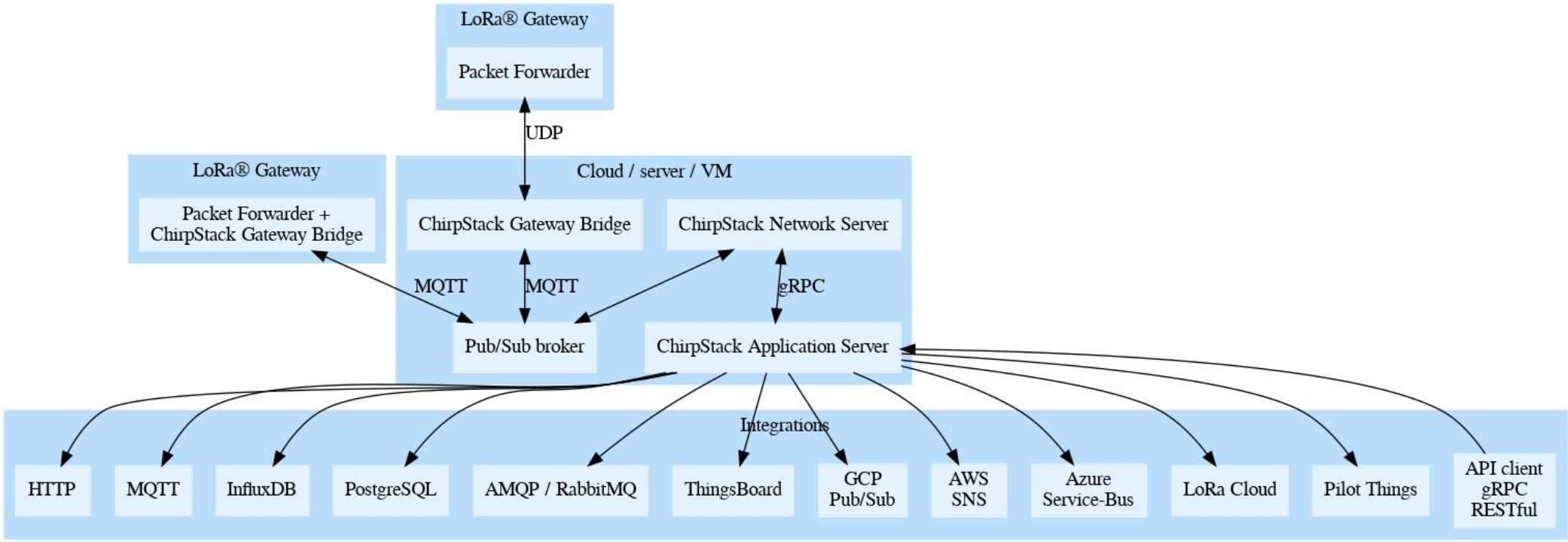
System Architecture



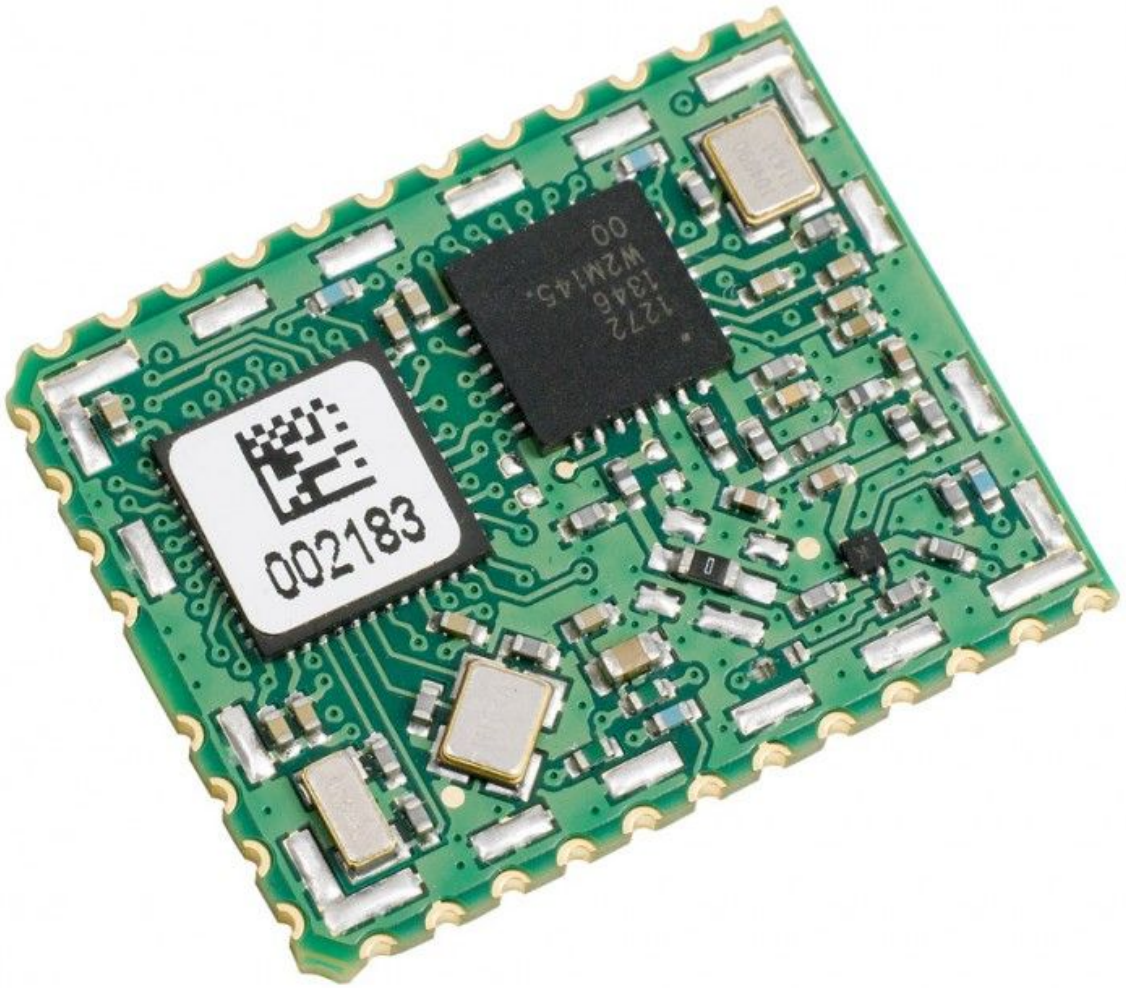
System Architecture



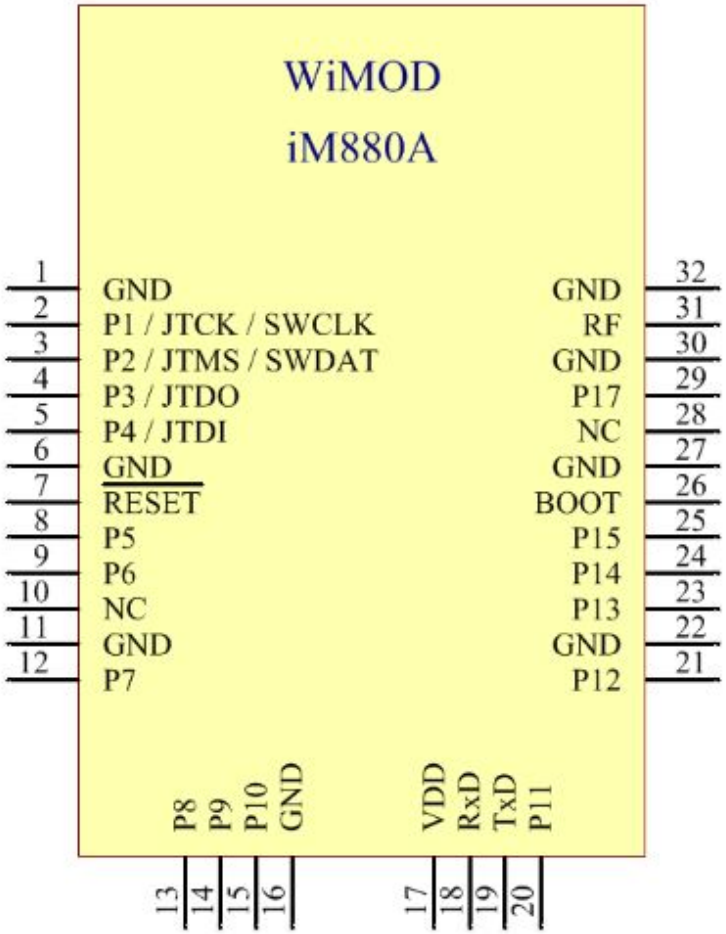
System Architecture

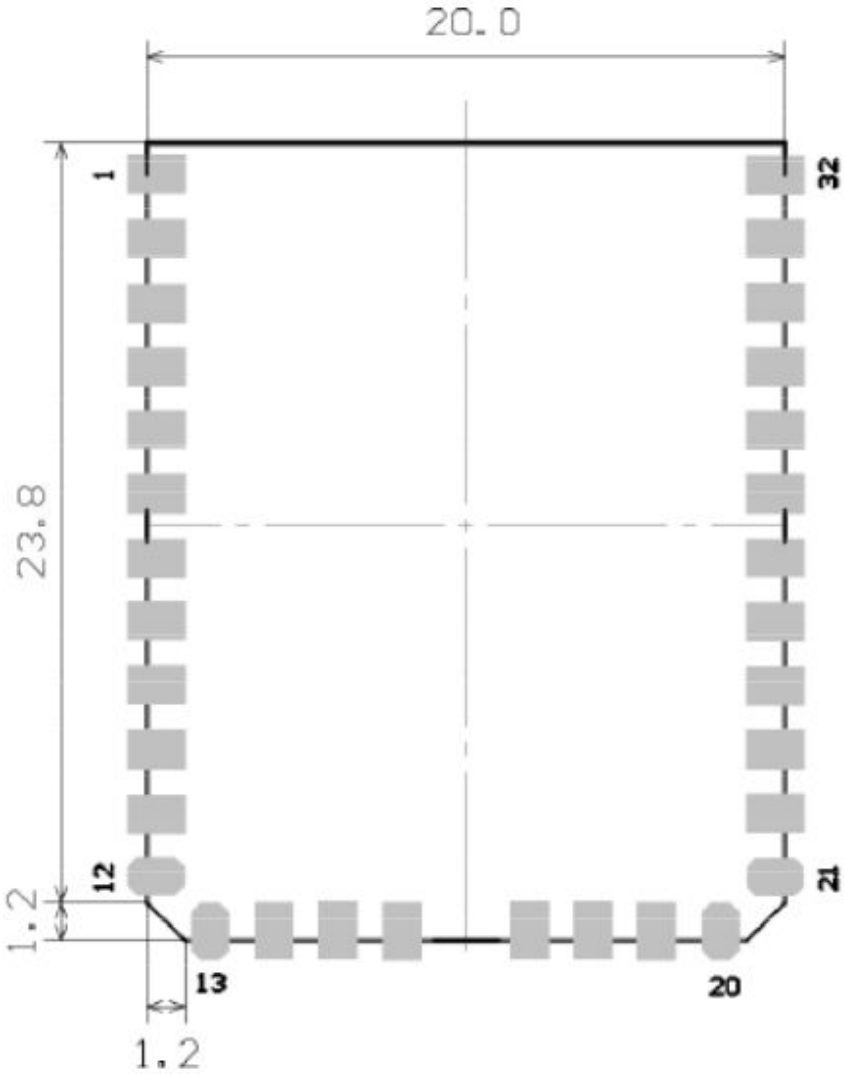
- Gateway Bridge: handles the communication with the LoRaWAN gateways
- Network Server: a LoRaWAN Network Server implementation
- Application Server: a LoRaWAN Application Server implementation
- Gateway OS: Linux-based OS to run the (full) ChirpStack stack on a Raspberry Pi based LoRa gateway

LoRa Node – Hardware Setup / iM880A / Layout

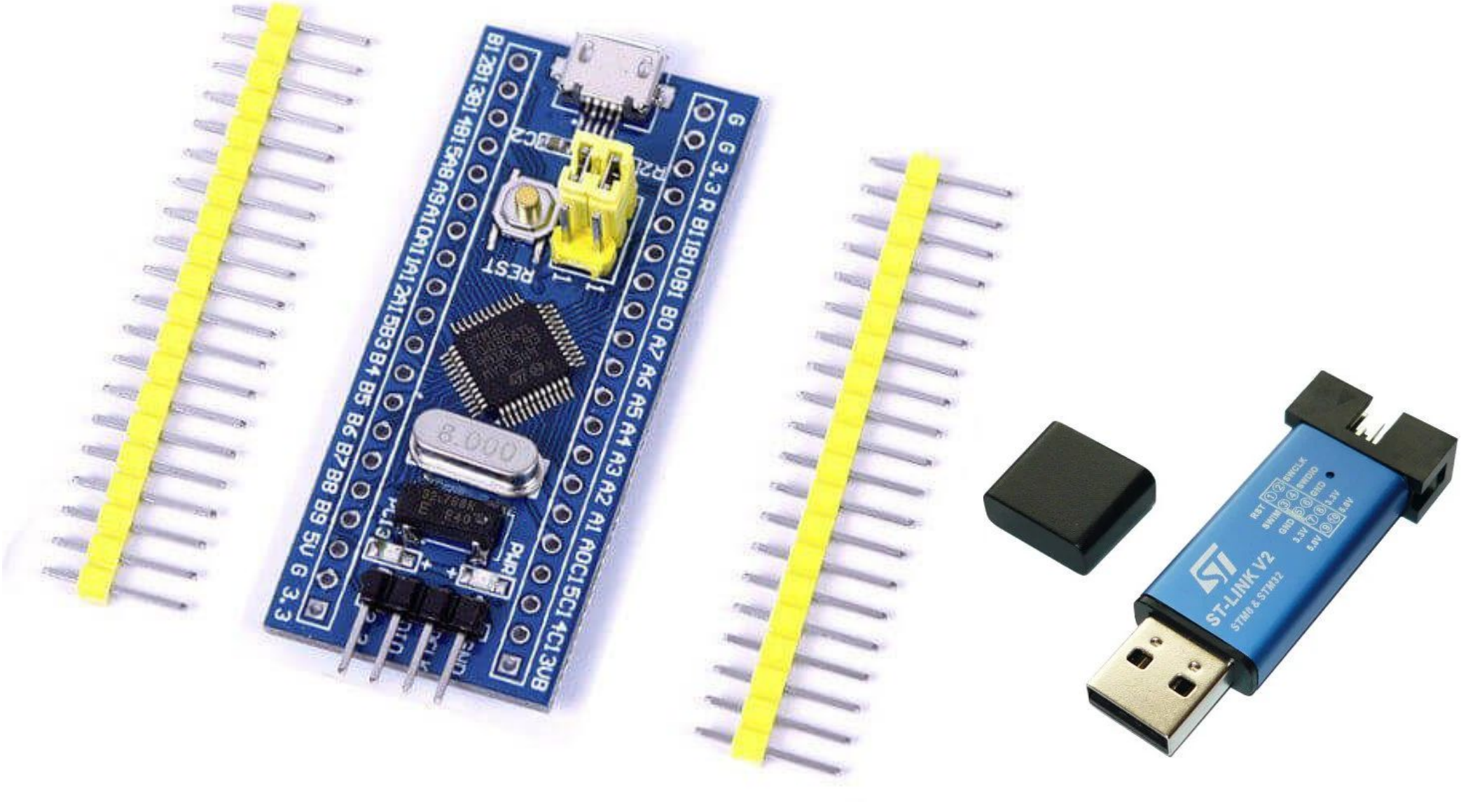


LoRa Node – Hardware Setup / iM880A / Pin-Out

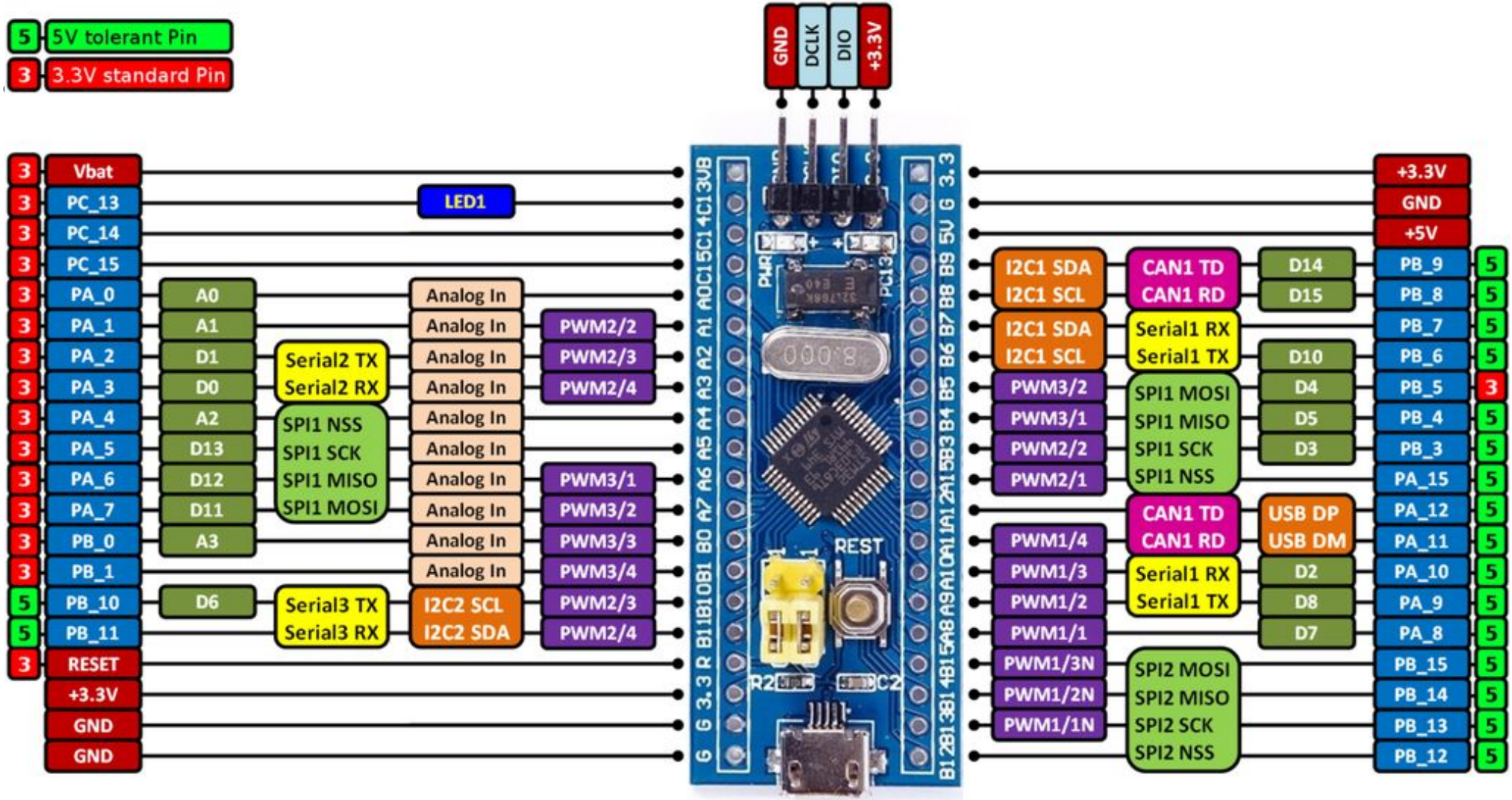




LoRa Node – Hardware Setup / STMF103C8 / Layout



LoRa Node – Hardware Setup / STMF103C8 / Pin-Out



LoRa Node – Hardware Setup / iM880A ↔ STM32F103C8 connection

.Pins mapping

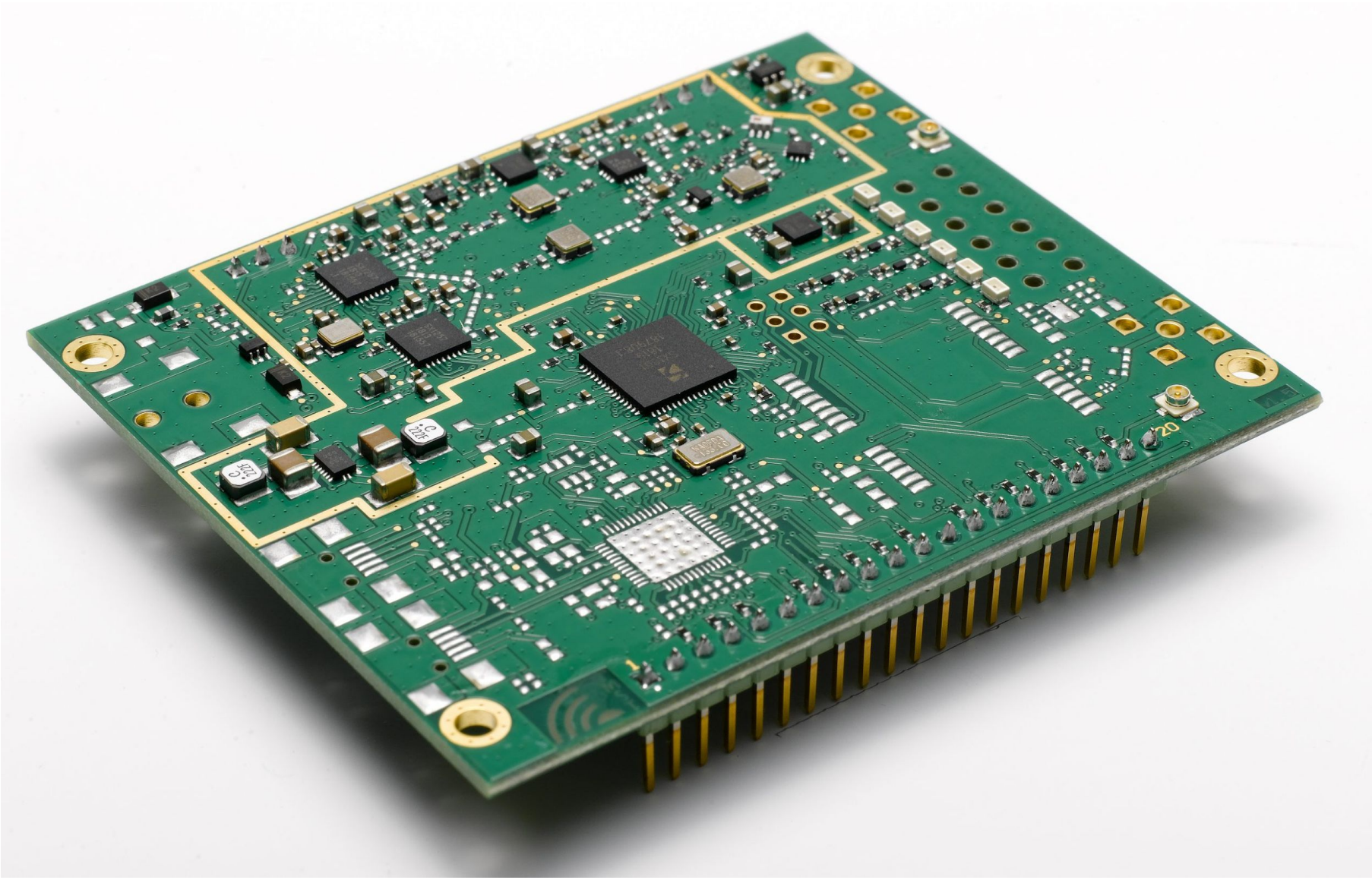
IM880A Pin	Description	STM32F103C8 Pin	Description
1, 6, 11, 16, 22, 27, 30 or 32	GND	GND	GND
17	VDD	3.3	3.3V
18	RxD	A2	Serial2 Tx
19	TxD	A3	Serial2 Rx

LoRa Node – Software Setup / iM880A / EndNode Studio

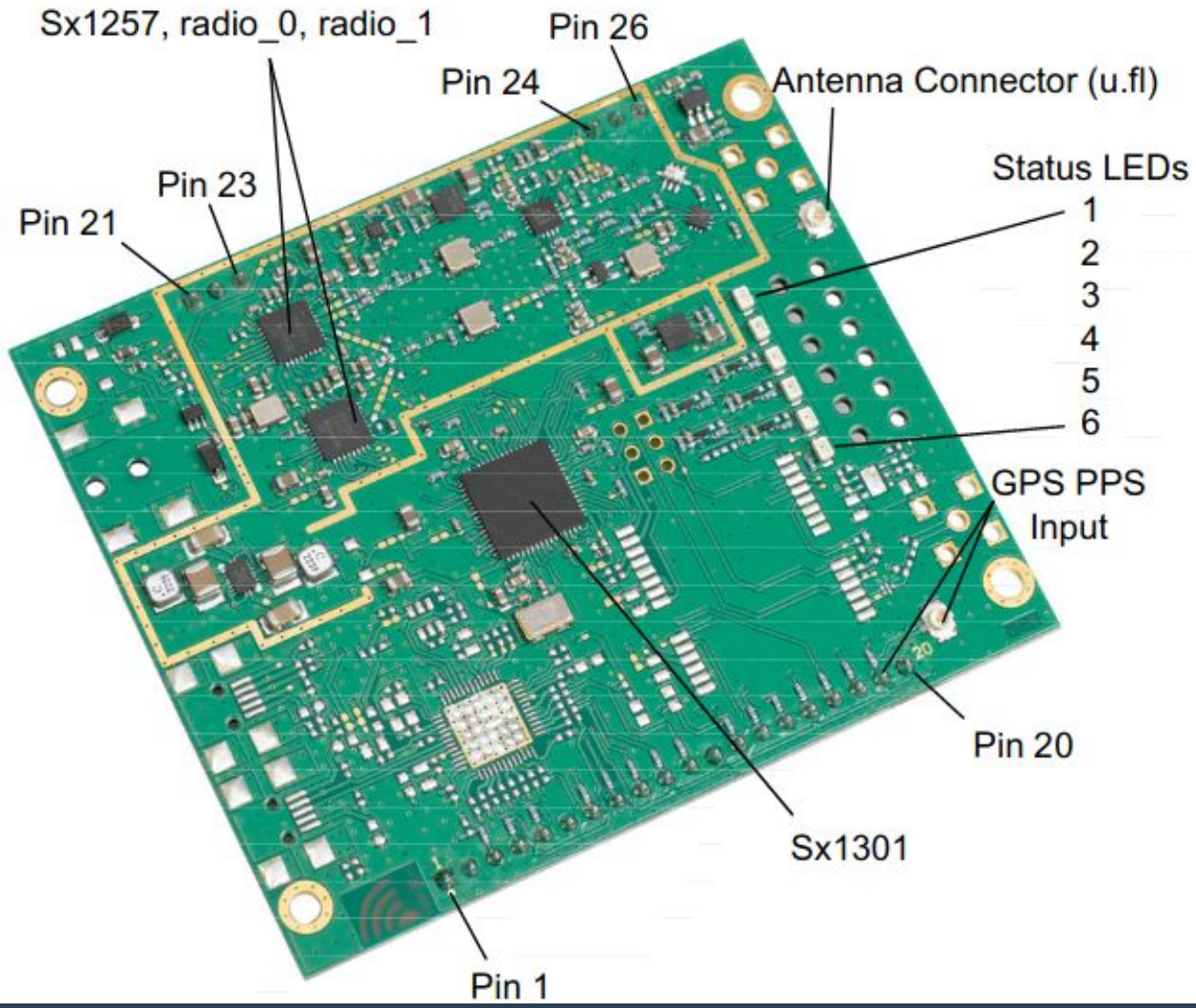
- Download EndNode Studio: (Link)

- Connect iM880A Module to PC using TTL Serial Module

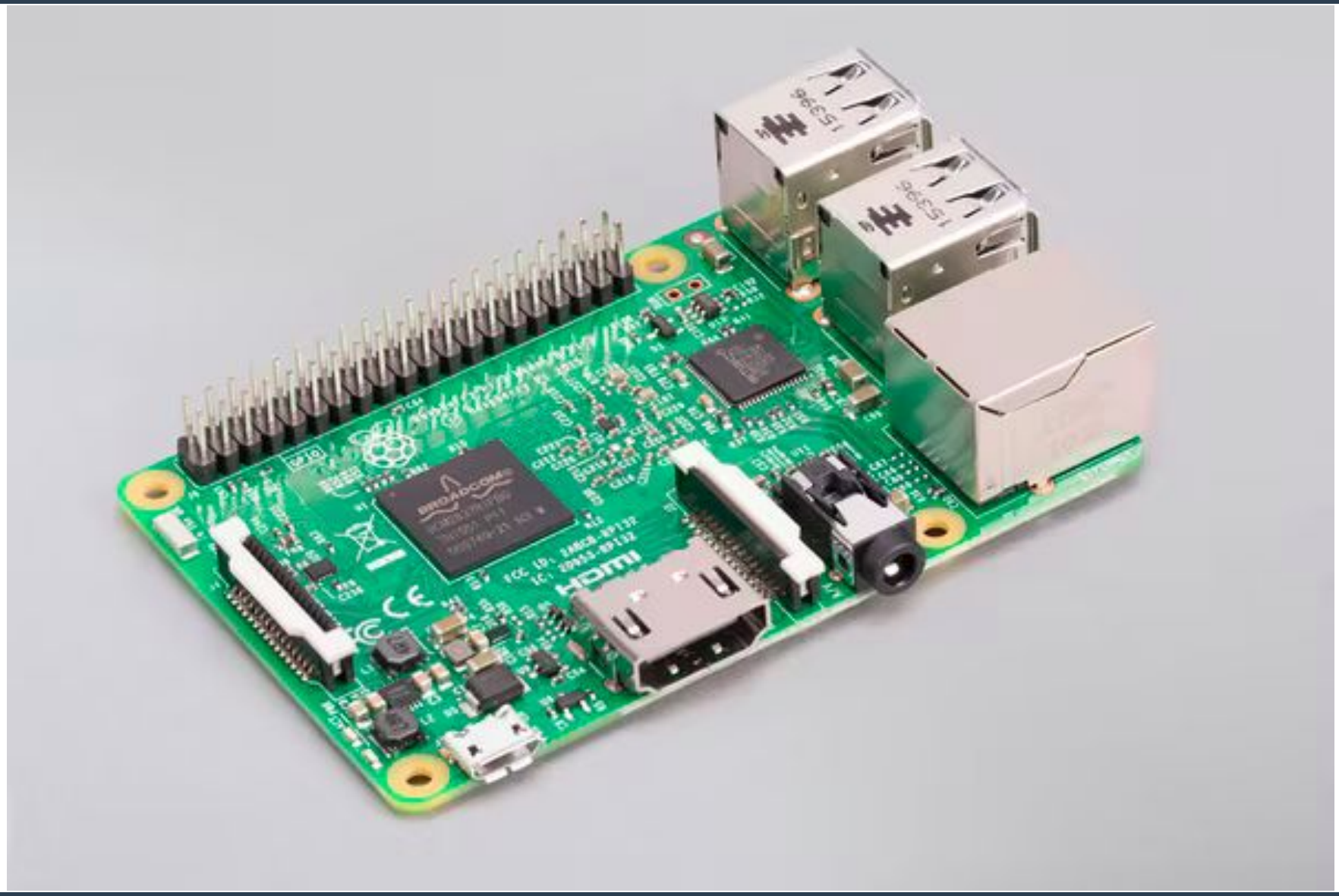
LoRa Gateway – Hardware Setup / iC880a / Layout



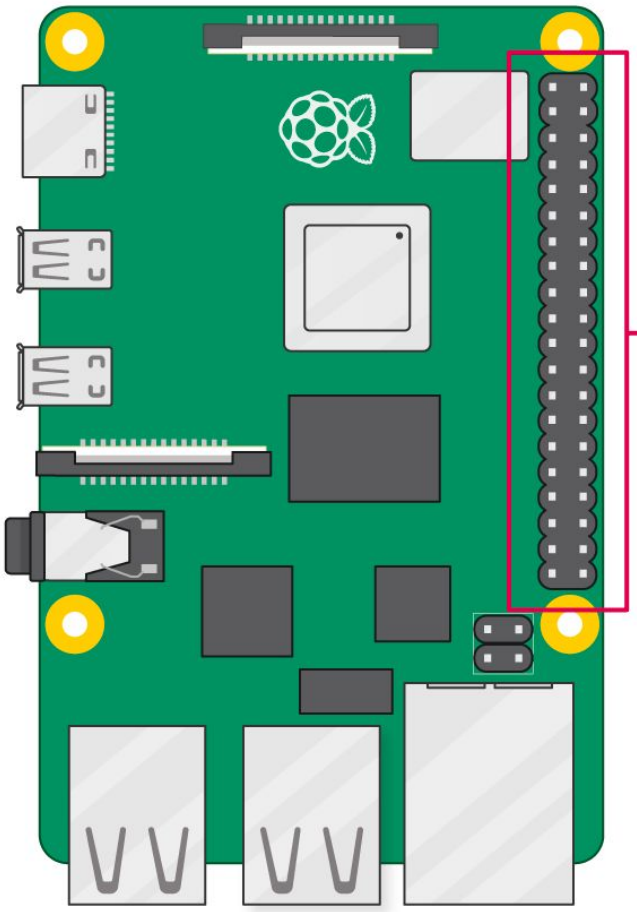
LoRa Gateway – Hardware Setup / iC880a / Pin-Out

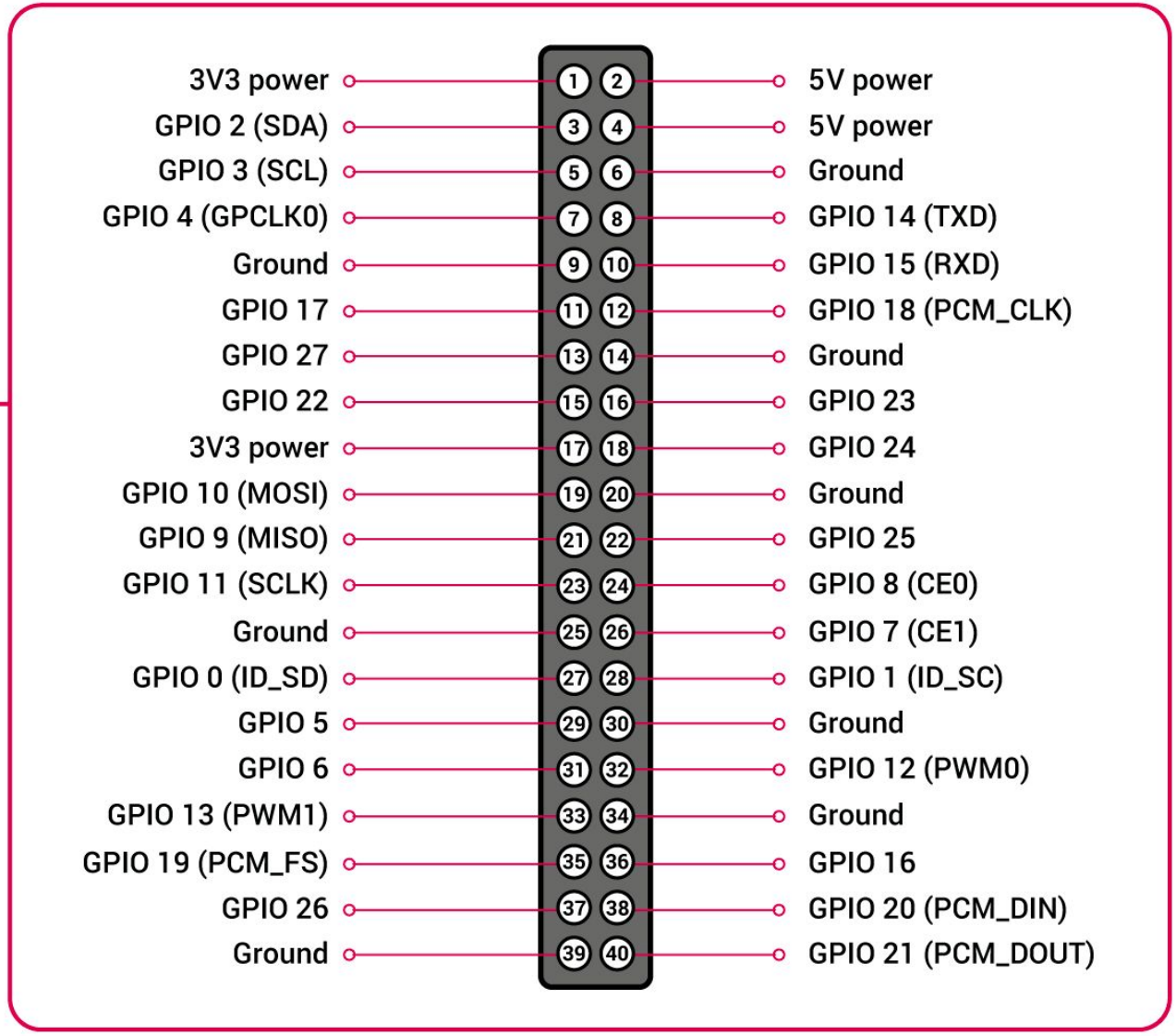


LoRa Gateway – Hardware Setup / RaspberryPi 3B / Layout



LoRa Gateway – Hardware Setup / RaspberryPi 3B / Pin-Out





LoRa Gateway – Hardware Setup / iC880A ↔ RaspberryPi 3 connection

iC880A Pin	Description	Raspberry Pi 3
21	5V	2
22	GND	6
13	Reset (Active High)	22
14	SPI CLK	23

iC880A Pin	Description	Raspberry Pi 3
15	MISO	21
16	MOSI	19
17	NSS	24
12	GND	9

LoRa Gateway – Software Setup / Chirpstack / Install

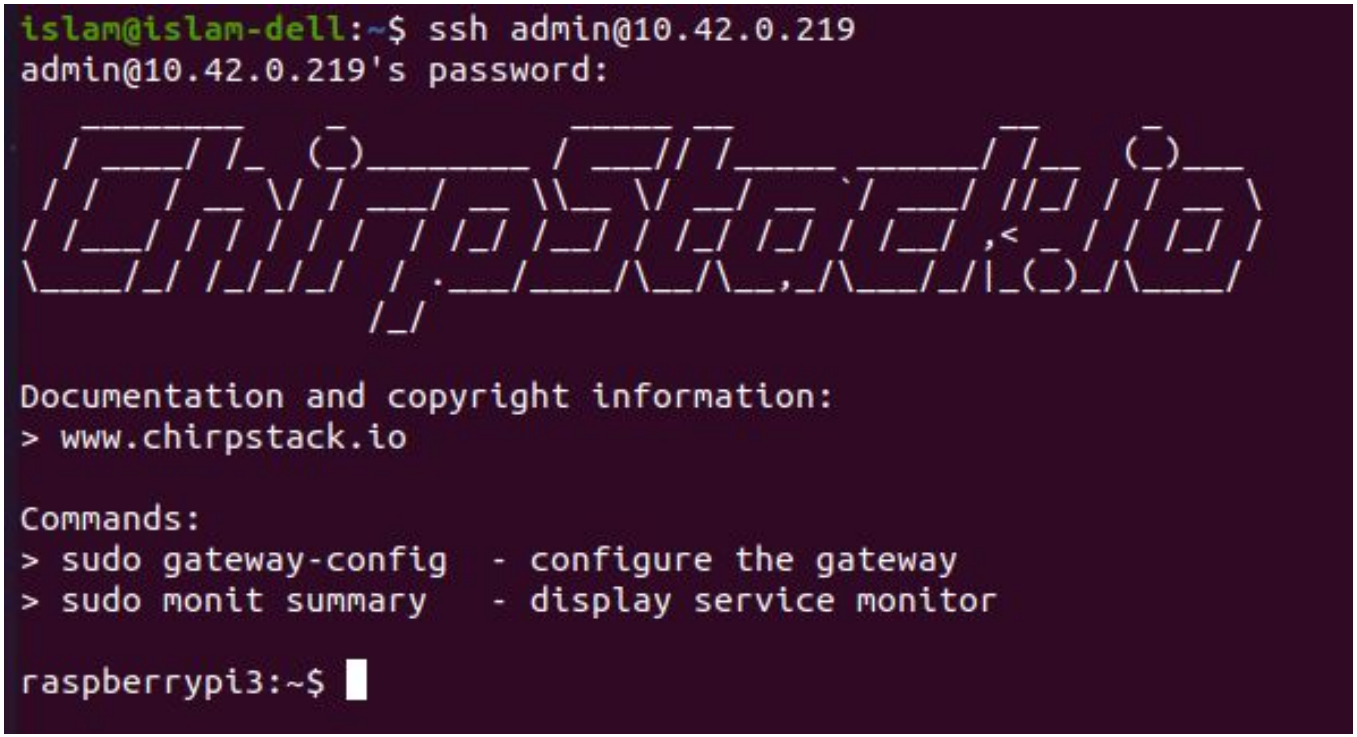
- Chirpstack installation:
- Follow chirpstack tutorial to install `gateway-os-full`
- https://www.chirpstack.io/gateway-os/install/raspberrypi/

LoRa Gateway – Software Setup / Chirpstack / Configuration

.Gateway configuration:

.- Connect RaspberryPi with ethernet

.- SSH to raspberrypi



LoRa Gateway – Software Setup / Chirpstack / Configuration

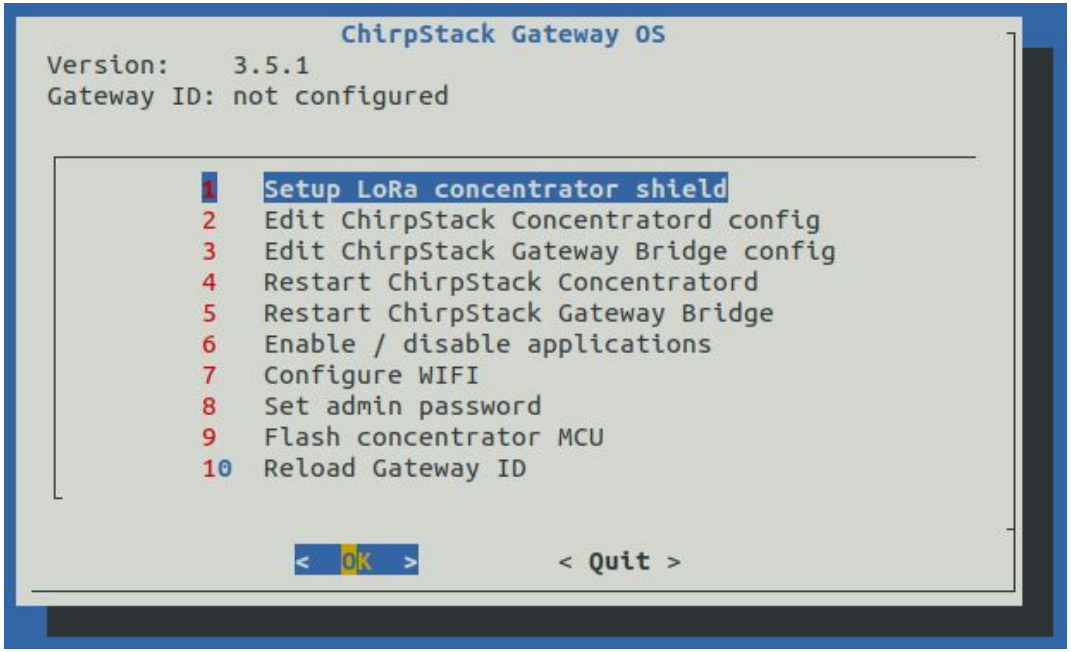
.Enter command

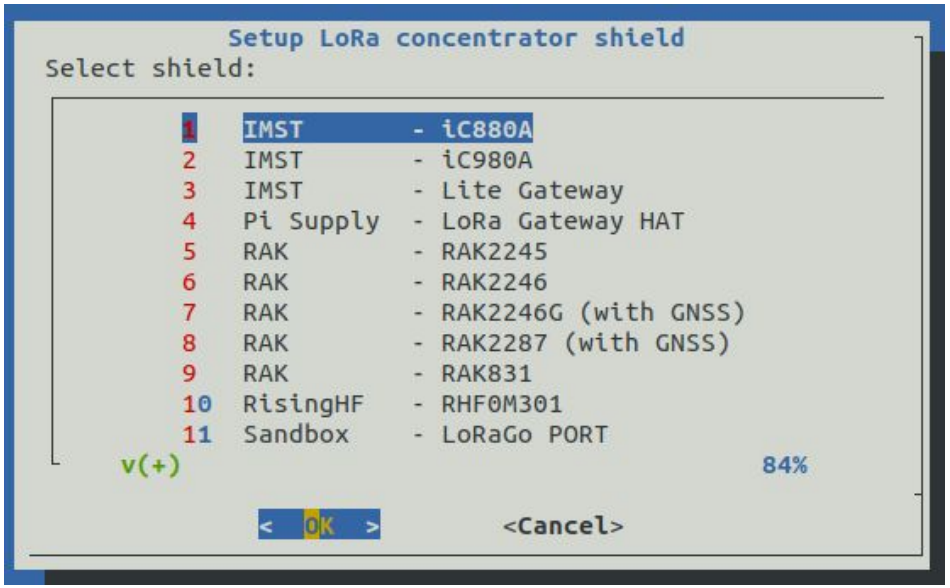
. “sudo gateway-config”

.Select (1)

.Select iC880A

.





.Select iC880A

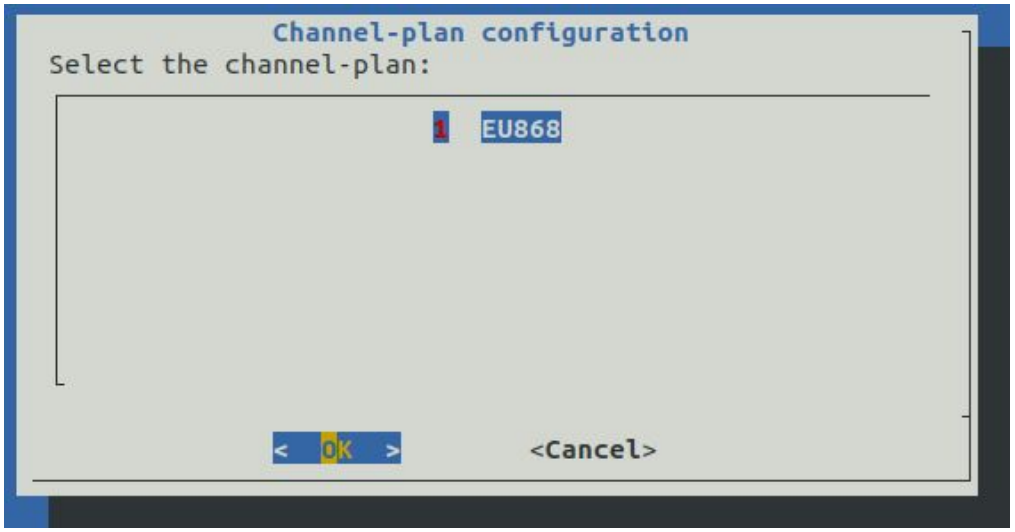
.or your concentrator model

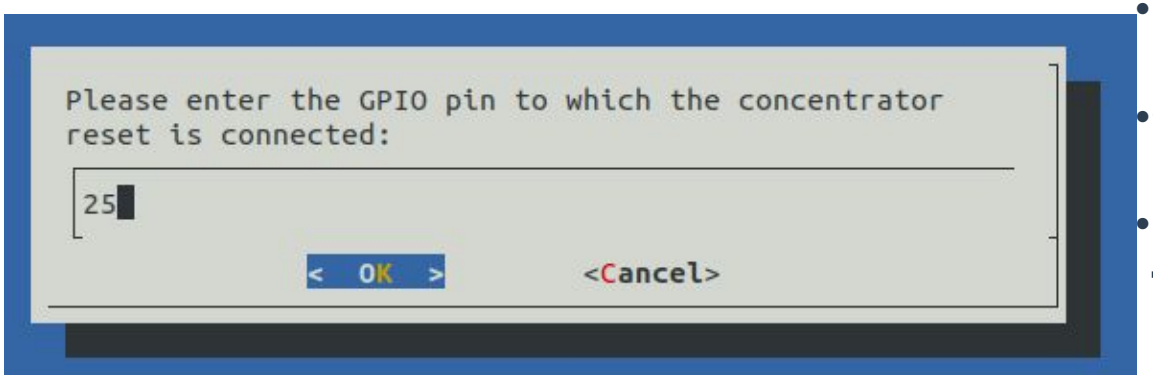
.

LoRa Gateway – Software Setup / Chirpstack / Configuration

.Select (1)

.





.Enter “25”,

.as GPIO25 = Pin 22

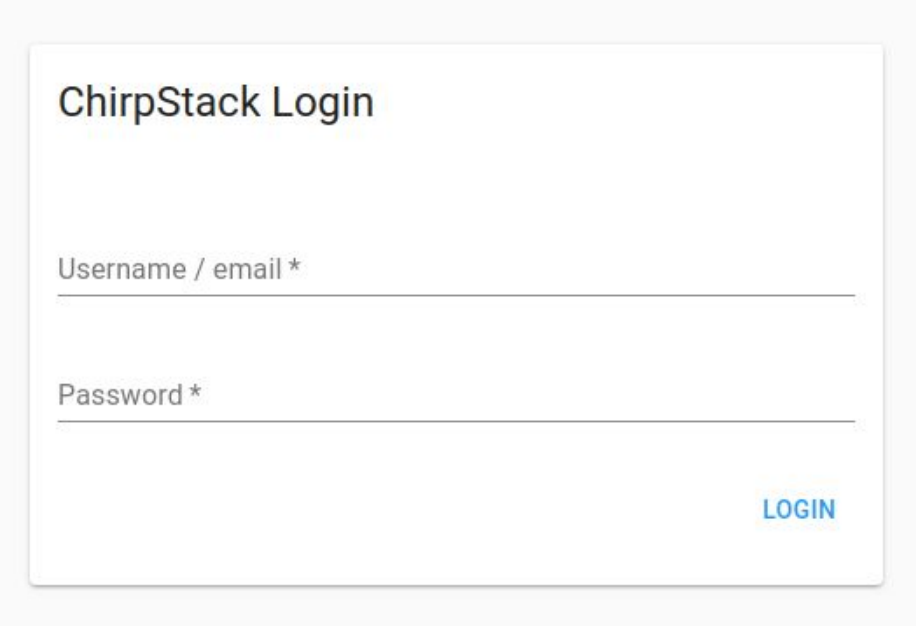
.If concentrator connected correctl to raspberrypi,

.it should restarts and

.the led blinks once

LoRa Gateway – Software Setup / Chirpstack / Configuration

- Enter to Application server on
- http://192.168.1.100:8080/
- Replace “192.168.1.100” with RaspberryPi IP
- Enter username and password, “admin” and “admin”
-



LoRa Gateway – Software Setup / Chirpstack / Configuration

.From sidebar, select (Network Servers),

.then click “ADD”

.Enter following details:

–Network server name:

– ** Type any thing **

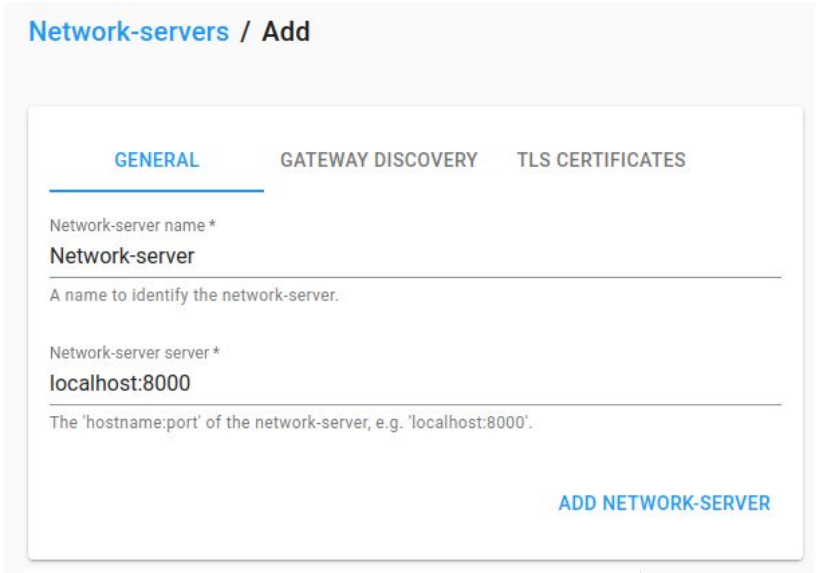
–Network server server:

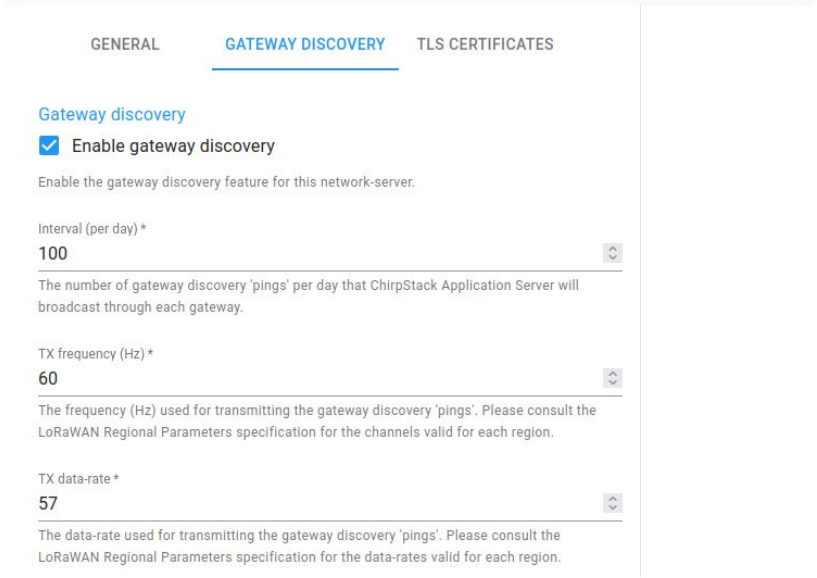
– “localhost:8000”

–Interval (per day):

–100

–TX frequency (Hz):





LoRa Gateway – Software Setup / Chirpstack / Configuration

.From sidebar, select (Gateway Profiles

.then click “Create”

.Enter following details:

–Name: * *Type any thing* *

–Stats Interval: 30

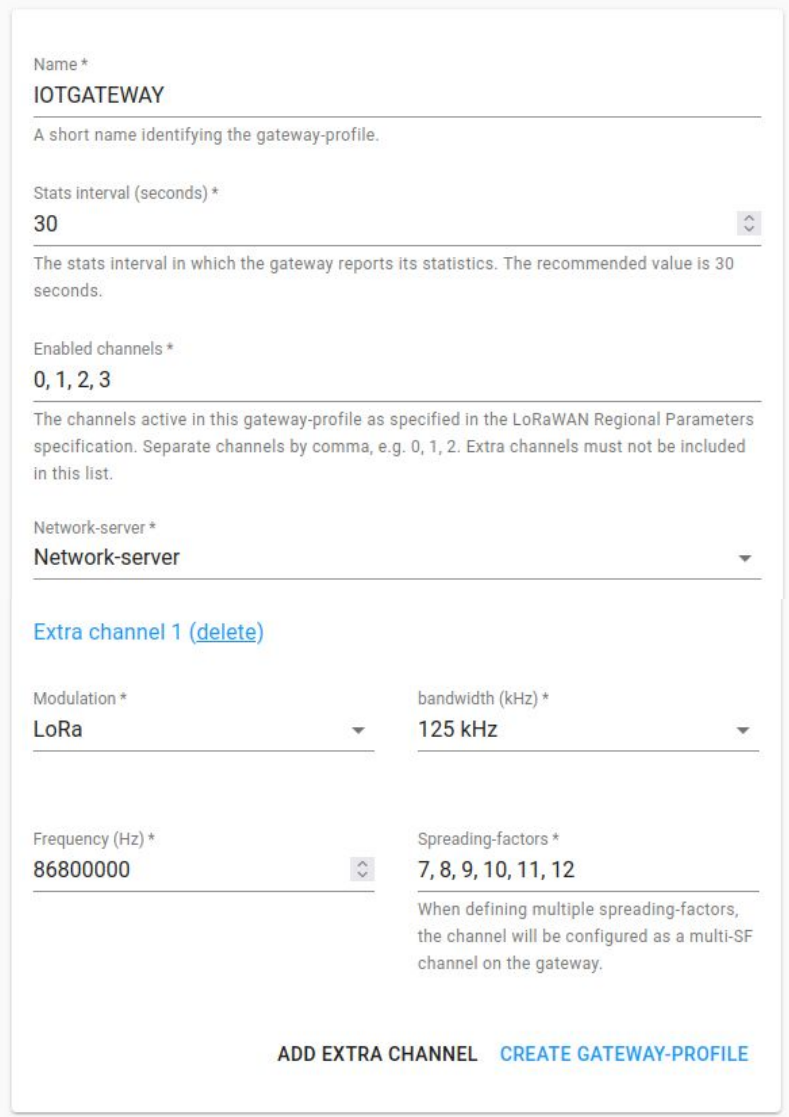
–Enabled channels: 0, 1, 2, 3

–Network Server: * *Select recently crea*

.Click “Add Extra-Channel”

.Enter the following details:

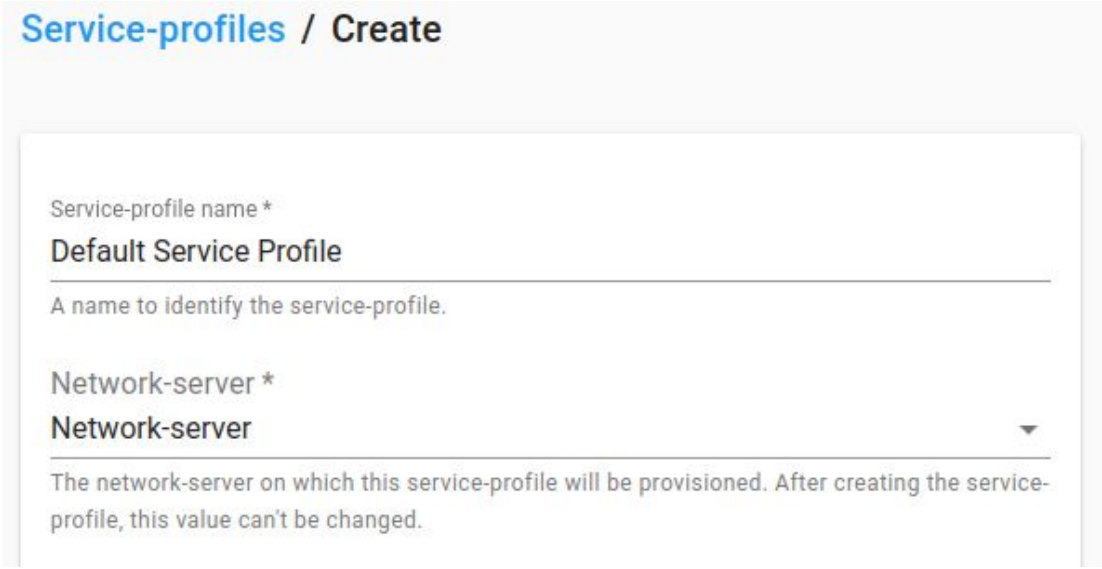
–Modulation: LoRa



LoRa Gateway – Software Setup / Chirpstack / Configuration

.From sidebar, select (Service Profiles),

.then click “Create”



.Enter following details:

–Service-Profile name:

– ** Type any thing **

–Network Server:

– ** Select recently created server **

.Click “Create Service-Profile”

LoRa Gateway – Software Setup / Chirpstack / Configuration

.From sidebar, select (Device Profiles),

.then click “Create”

.Enter following details:

–Device-profile Name: * *Type any thing* *

–Network Server: * *Select recentlv created server* *

–LoRaWAN MAC Version: 1.0.2

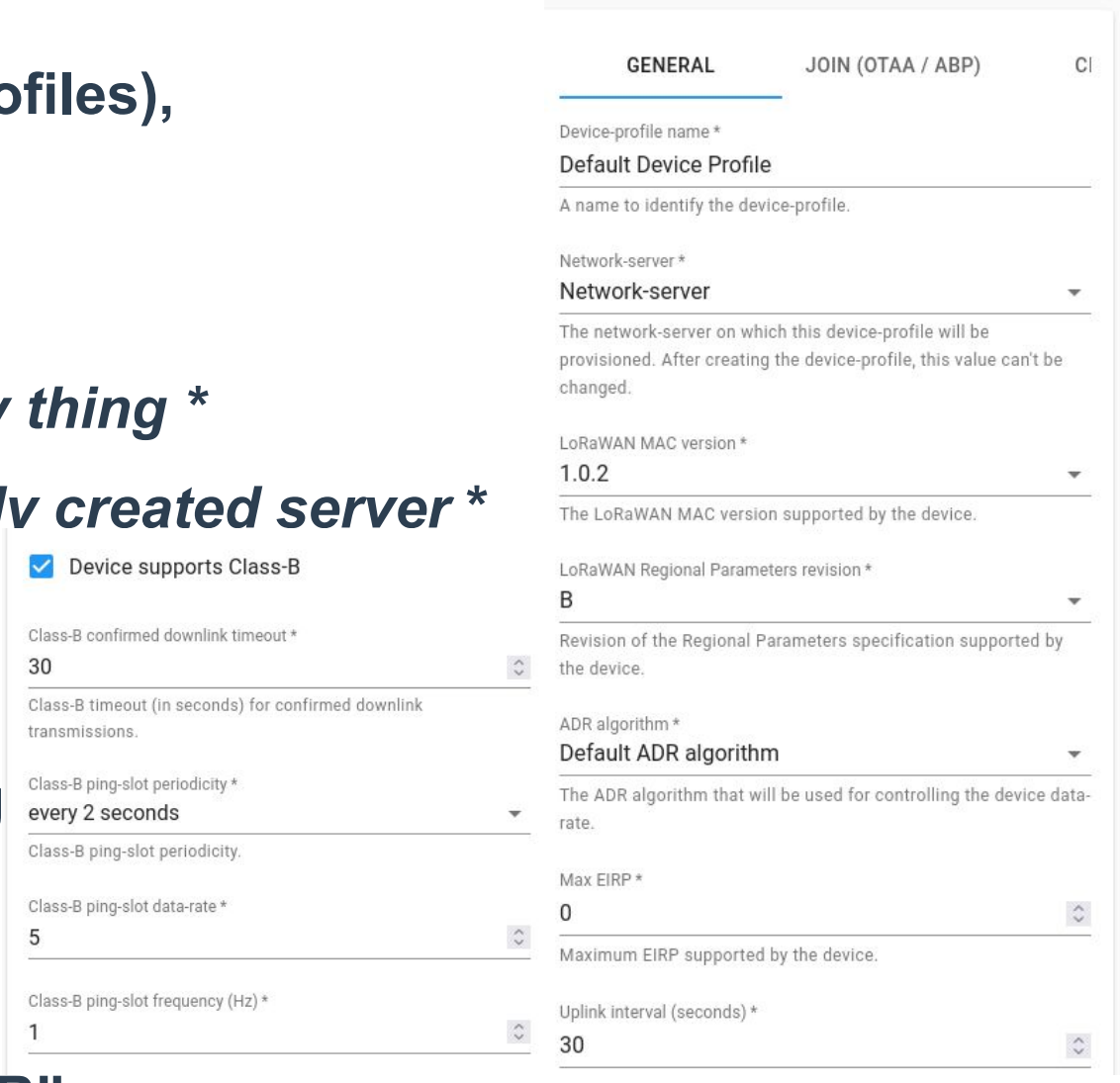
–LoRaWAN Regional Parameters

–ADR algorithm: Default ADR alg

–MAX EIRP: 0

–Uplink interval: 30

–Check “Device Supports Class-B”



LoRa Gateway – Software Setup / Chirpstack / Configuration

.From sidebar, select (Gateways),

.then click “Create”

.Enter following details:

–Gateway Name:

– Type any thing ****

–Gateway Description:

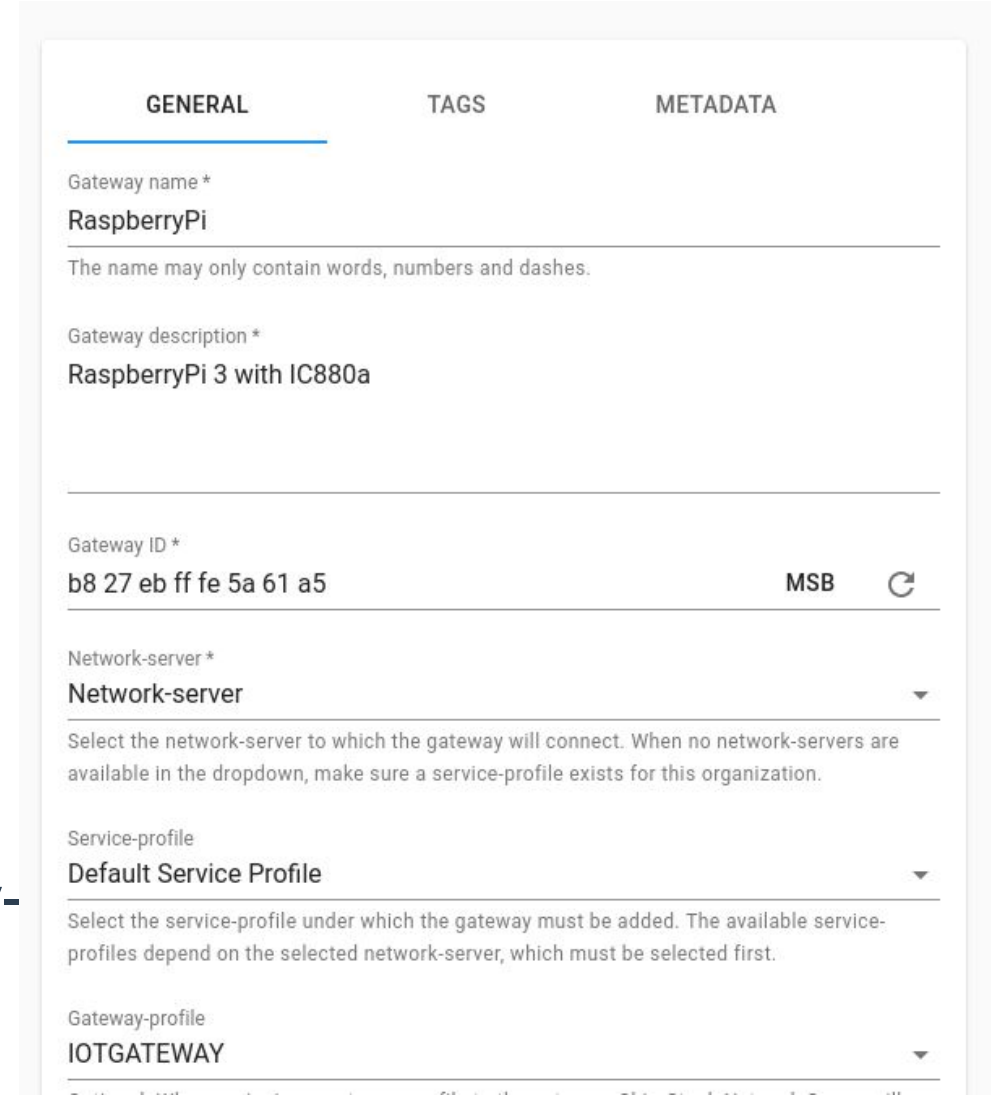
– Type any thing ****

–Gateway ID:

–Enter gateway ID as shown in “gateway-

–with “MSB” mode

–Network Server:



LoRa Gateway – Software Setup / Chirpstack / Configuration

.From sidebar, select (Applications),

.then click “Create”

.Enter following details:

–Gateway Name:

–* *Type any thing* *

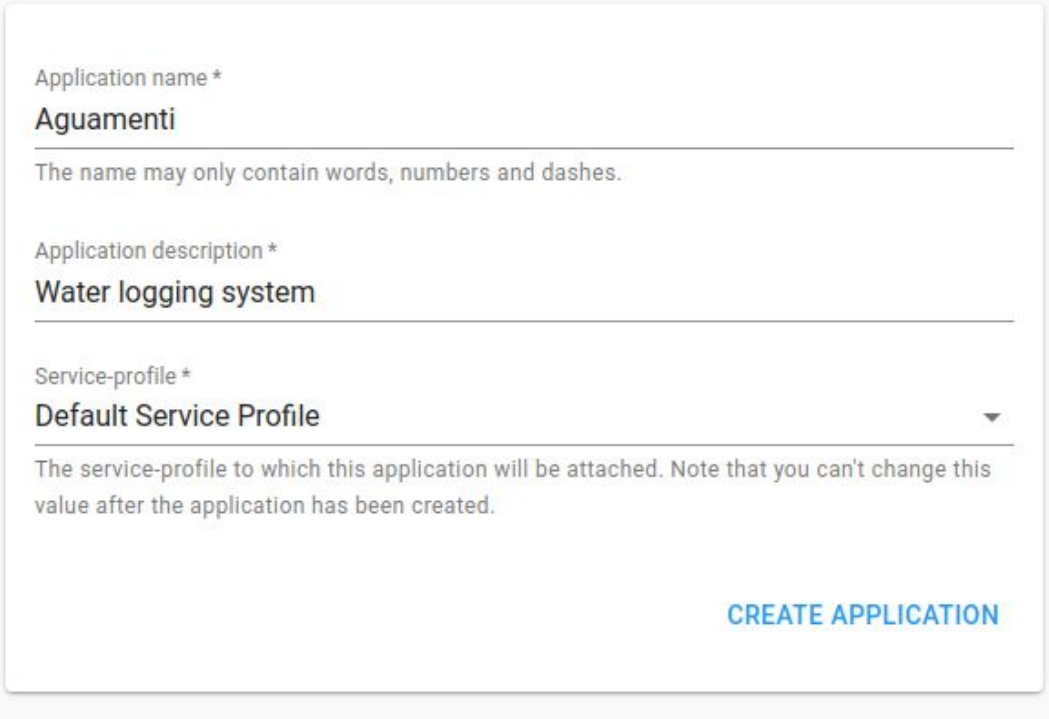
–Application Description:

–* *Type any thing* *

–Service profile:

–* *Select recently created profile* *

.Click “Create Application”



LoRa Gateway – Software Setup / Chirpstack / Configuration

.From sidebar, select (Applications),

.then select recently created application, and click “Create”

.Enter following details:

–Device Name:

–** Type any thing **

–Device Description:

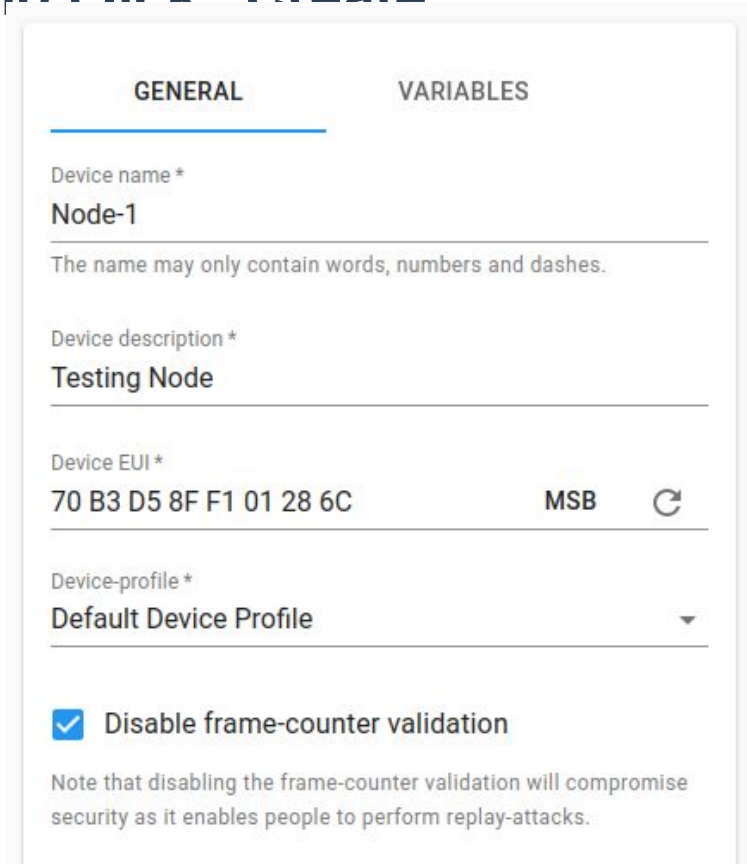
–** Type any thing **

–Device EUI:

–Write device EUI from step #? (MSB)

–Device profile:

–** Select recently created profile **



LoRa Gateway – Software Setup / Chirpstack / Configuration

.Next, you will be redirected automatically to “activation” tab

.for the recently created device.

.Enter following details:

–Device address:

–Write device address as shown in step #‘

–Network session key (LoRaWAN 1.0):

–** Generate random key as MSB **

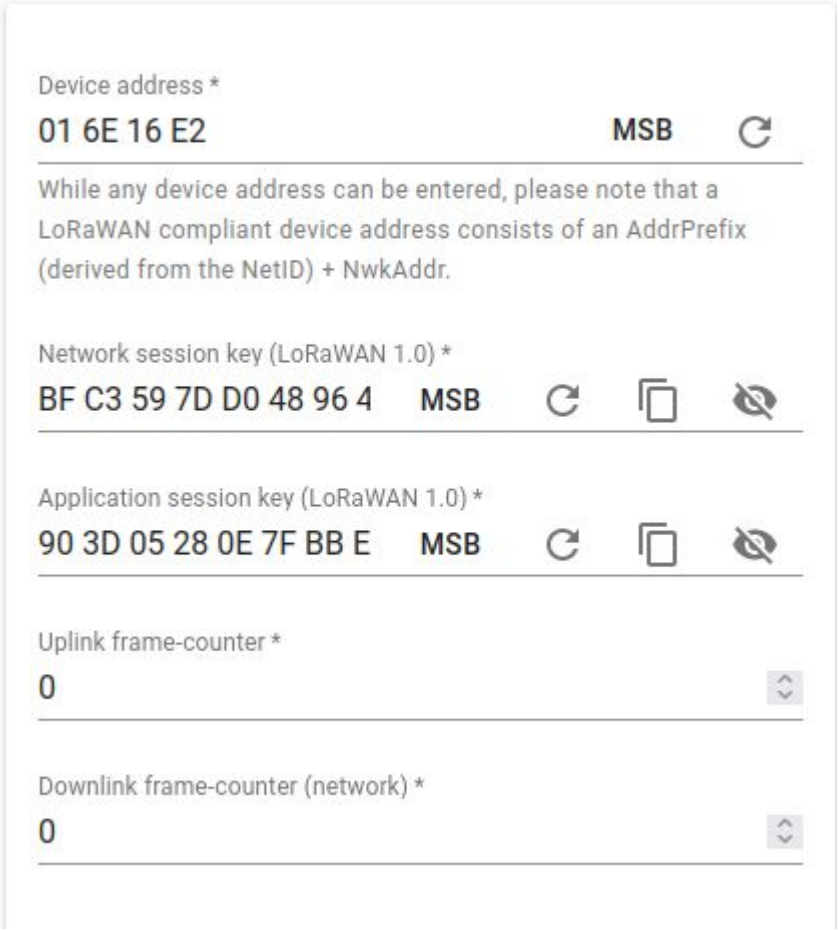
–Application session key (LoRaWAN 1.0):

–** Generate random key as MSB **

–Uplink frame-counter:

–0?

–Downlink frame-counter (network):

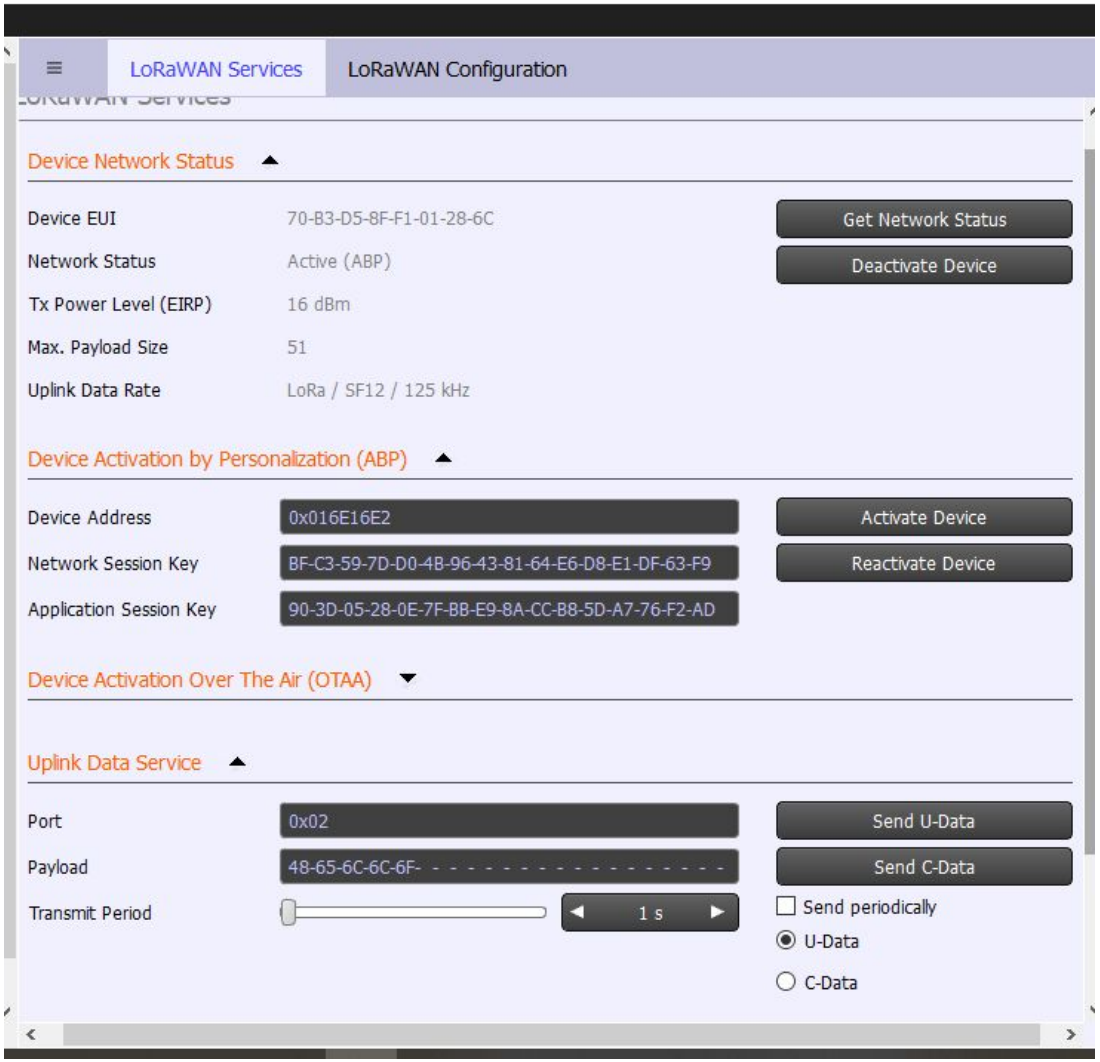


LoRa Test

.Using EndNode Studio

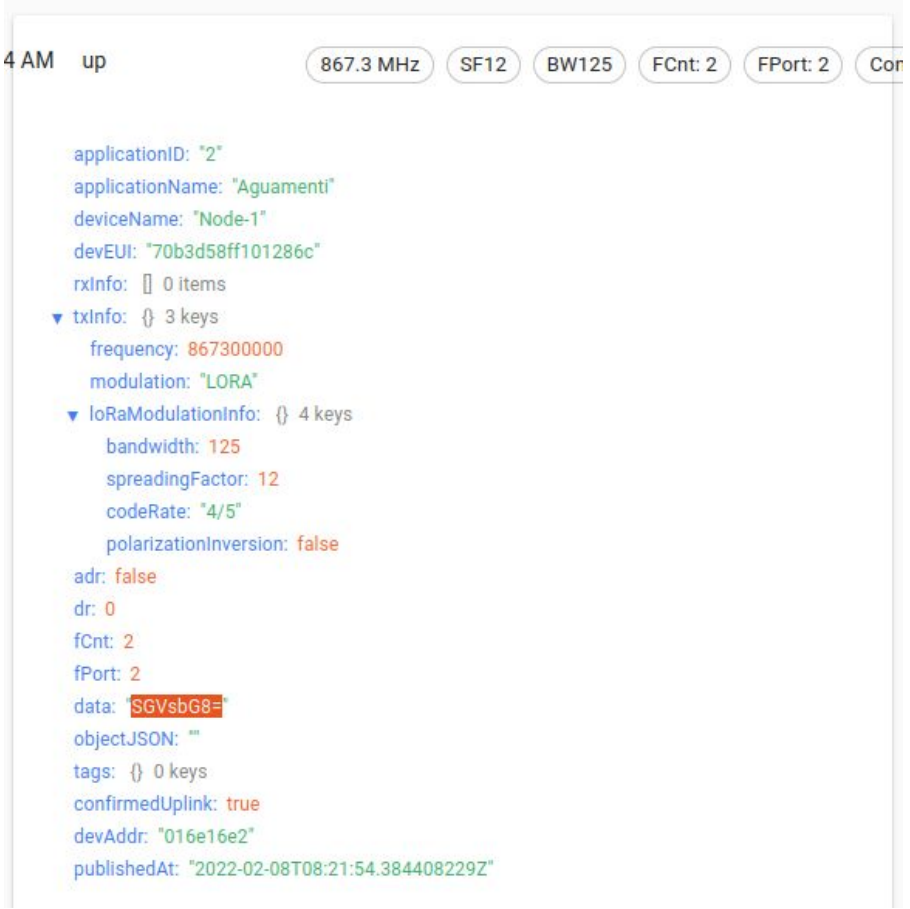
.Change payload

.Send U-Data



LoRa Test

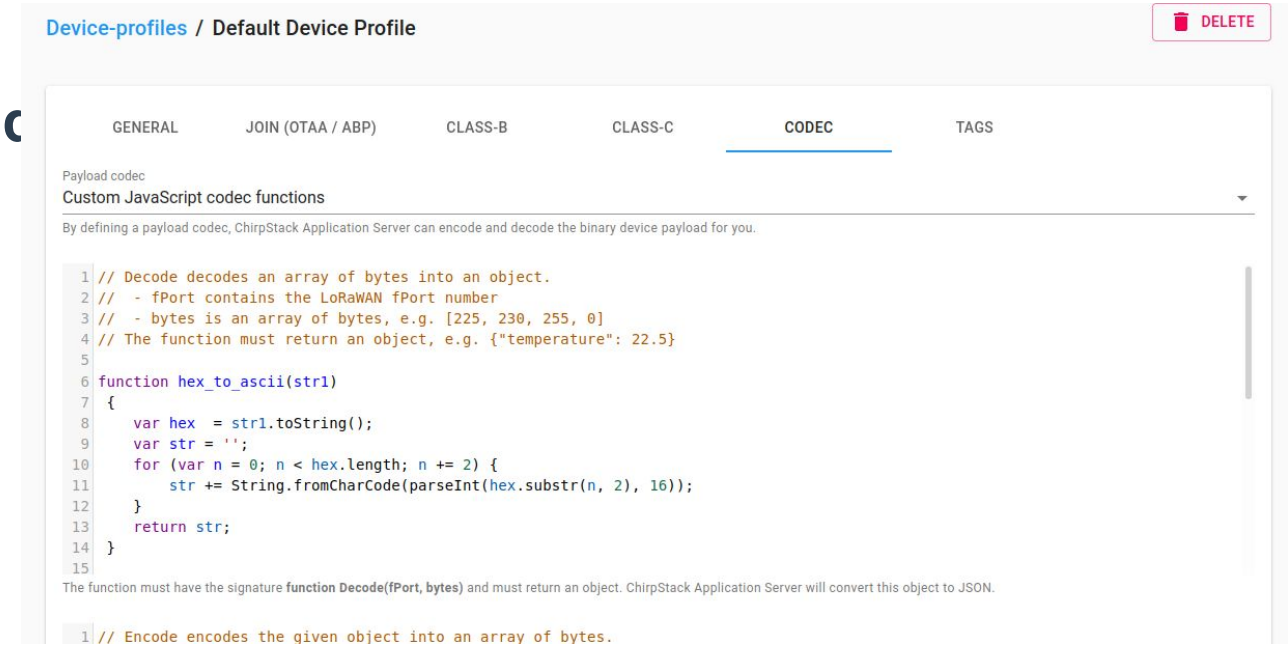
- Enter to Application → Devices → and select recently created device
- Select the “Device Data” tab
- Send data from EndNode Studio
- Decode the received data by Base64 Decoder to find the sent data



LoRa Test / Message decoding

.From sidebar, select (Device Profiles),

.then select recently created profile.



.Select the “CODEC”

.tab

.Select “Custom

Thank you

References

- LoRa Alliance: https://lora-alliance.org/lora_products/ic880a-lora-concentrator/
- Instructables:
- https://www.instructables.com/Raspberry-Pi-LoRaWAN-Gateway/
- RaspberryPi:
- https://www.raspberrypi.com
- Wireless Solutions: