BFTAG03
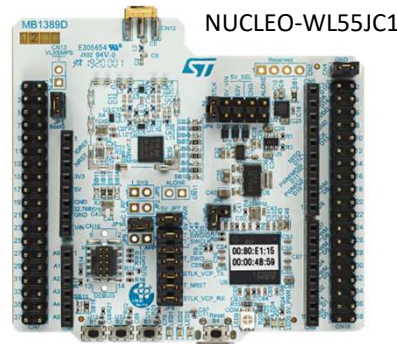
Battery-Free TAG with Sub-GHz Connectivity (LoRa)

PV cell
5 cm x 5 cm
Panasonic AM 1815
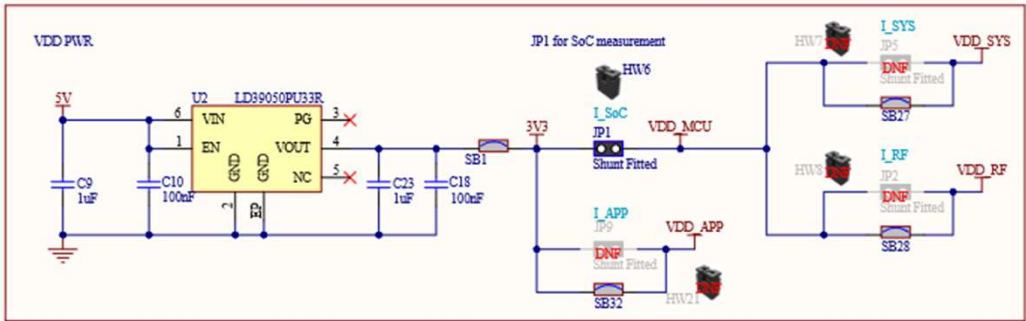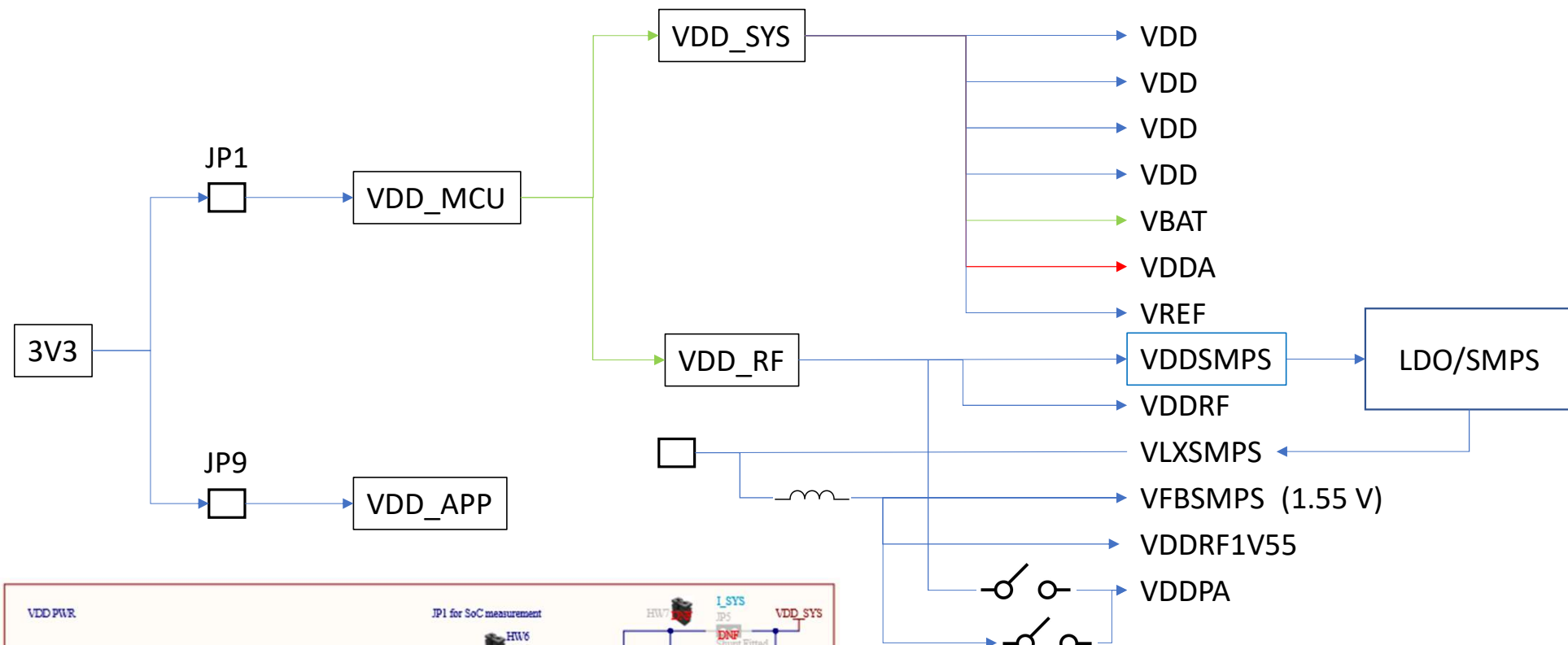
NUCLEO-WL55JC1

Cstorage = 6.6 mF

3V3

JP1 → VDD_MCU

JP9 → VDD_APP

VDD_MCU → VDD_SYS

VDD_MCU → VDD_RF

VDD_SYS → VDD

VDD (×4)

VBAT

VDDA

VREF

VDD_RF → VDDSMPS → LDO/SMPS

VDDRF

VLXSMPS

VFBSMPS (1.55 V)

VDDRF1V55

VDDPA

VDD PWR

5V

U2 LD39050PU33R
VIN   PG
EN   VOUT
GND GND NC

C9 1uF
C10 100nF
C23 1uF
C18 100nF

SB1
3V3

JP1 for SoC measurement

HW6

I_SoC
JP1
Shunt Fitted

VDD_MCU

I_APP
JP9
DNF
Shunt Fitted

VDD_APP

SB32

HW21

HW7
I_SYS
JP5
DNF
Shunt Fitted

VDD_SYS

SB27
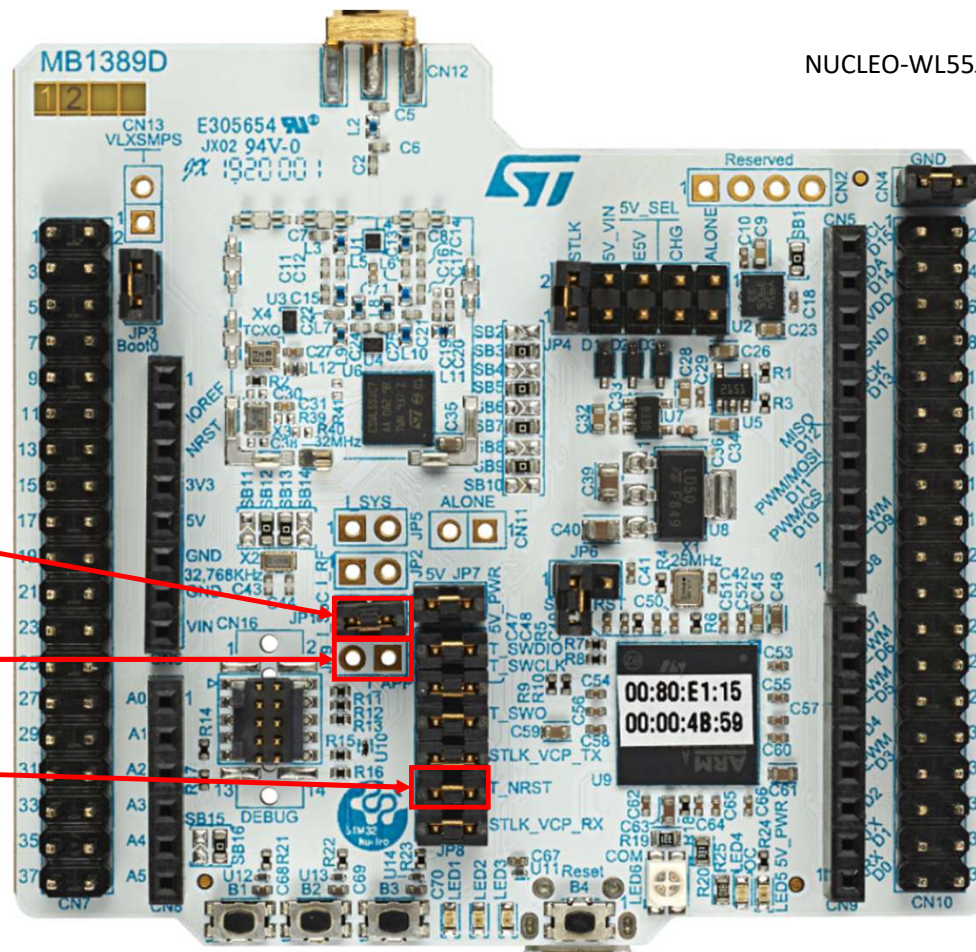
HW8
I_RF
JP2
DNF
Shunt Fitted

VDD_RF
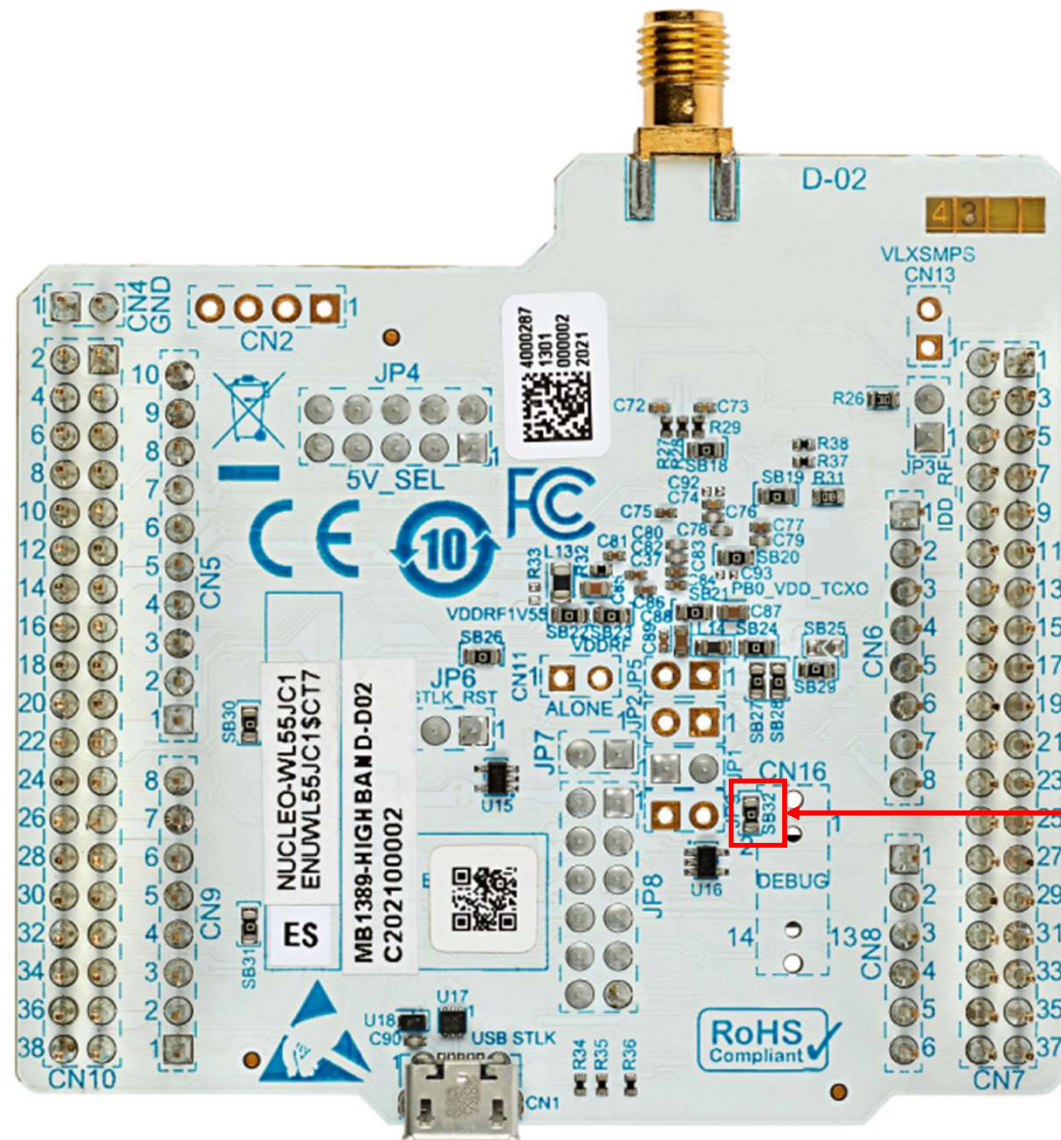
SB28

Battery-Free Setup
For TX Board (1)

NUCLEO-WL55JC1

Remove Jumper JP1

Add pins in JP9

Remove T_NRST

Battery-Free Setup
For TX Board (2)

1) Remove SB32

Battery-Free Connection to Harvester

NUCLEO-WL55JC1

Connect Negative Terminal of the Harvester

Connect the Positive Terminal of the Harvester to both pins in order to bias VDD_MCU and VDD_APP.
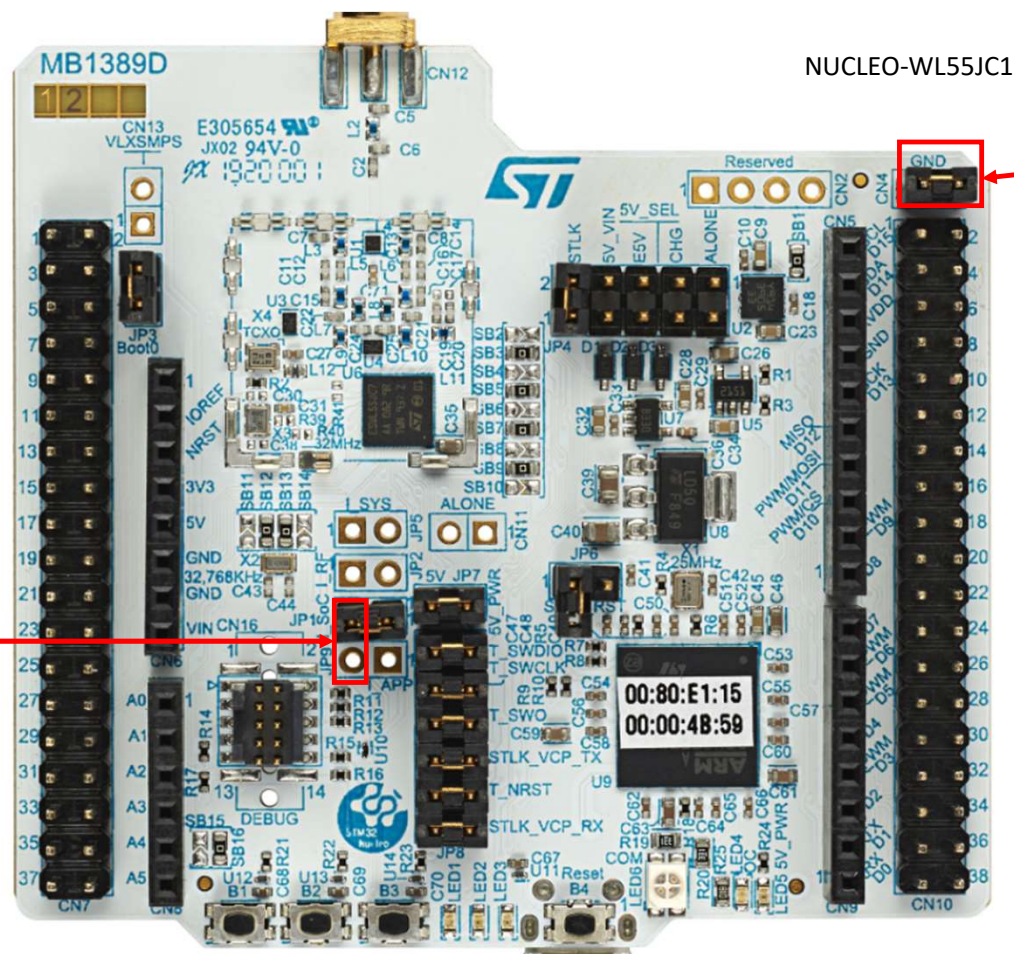
Battery-Free Connection to Computer to Program the Board

NUCLEO-WL55JC1

Connect these pins with 3 jumper cables and plug the micro-USB cable to CN1
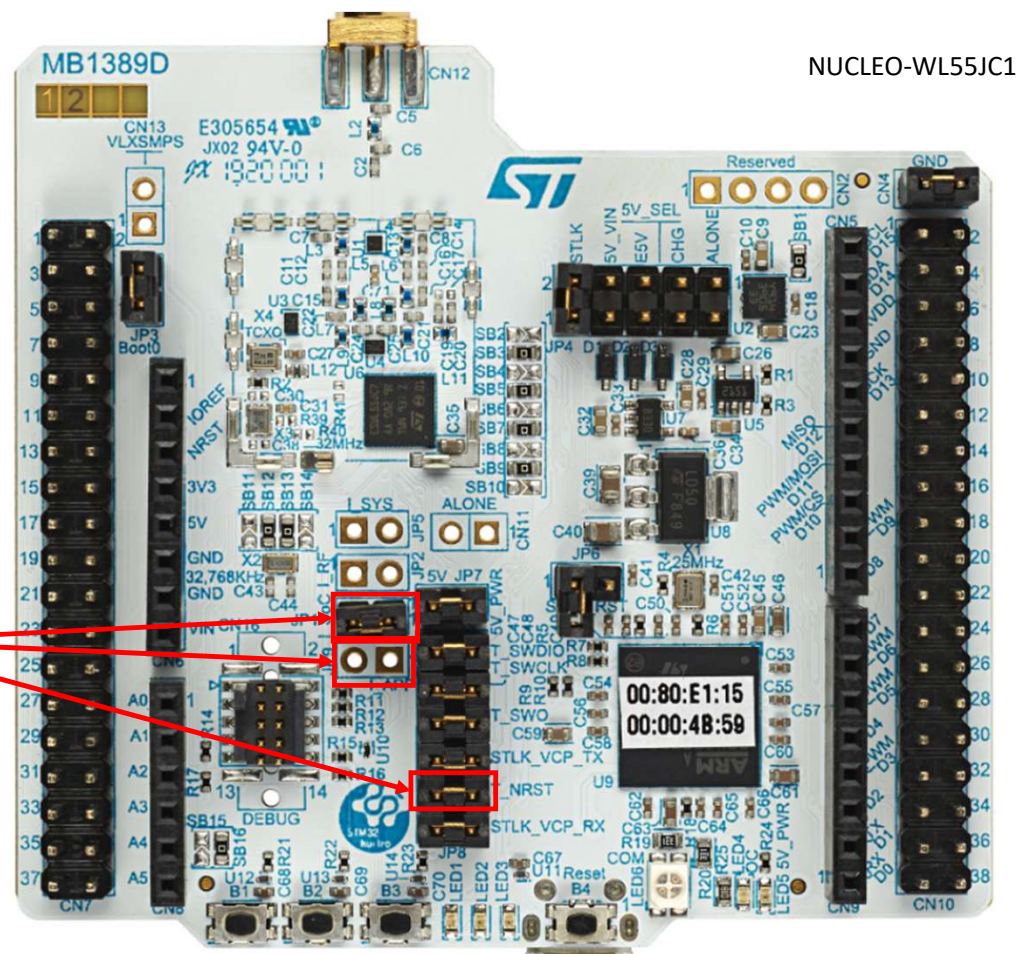
Loriot END-Node Enrollment

- Create an account on the Loriot website (https://www.loriot.io/)
- From the Account Dashboard click on Applications
- Create an application (notice that with a free account it is possible to have 1 application only with a maximum number of nodes equal to 10)
- Open the application
- In the column menu on the left side click on Enroll Device and follow the instructions in the following slides

Open the *se-identity.h* file and fill the followings parameters

DevEUI Provided by the MCU Pltaform

```
#define LORAWAN_DEVICE_EUI                          00,00,00,00,00,00,00,00
/*!
 * App/Join server IEEE EUI (big endian)
 */
#define LORAWAN_JOIN_EUI                            01,01,01,01,01,01,01,01
/*!
 * Device address on the network (big endian)
 * When set to 00,00,00,00 DevAddr is automatically set with a value provided by MCU platform
 */
#define LORAWAN_DEVICE_ADDRESS                      00,00,00,00
/*!
 * Application root key
 */
#define LORAWAN_APP_KEY                             C6,90,43,9D,62,B2,A6,74,B3,59,9B,80,17,E2,96,6F
/*!
 * Network root key
 */
#define LORAWAN_NWK_KEY                             F4,6A,61,AF,5F,53,00,9E,87,63,59,5A,A2,01,34,24

/*!
 * Forwarding Network session key
 */
#define LORAWAN_NWK_S_KEY                           F4,6A,61,AF,5F,53,00,9E,87,63,59,5A,A2,01,34,24

/*!
 * Application session key
 */
#define LORAWAN_APP_S_KEY                           C6,90,43,9D,62,B2,A6,74,B3,59,9B,80,17,E2,96,6F
```
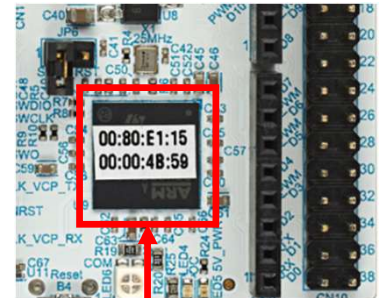
Follow the instruction available at: https://docs.loriot.io/display/LNS/Enroll+a+Device#tab-Manual+Address
to correctly insert every device parameter.

- LORAWAN_APP_S_KEY and LORAWAN_APP_KEY must be the same and they are a 16 bytes hexadecimal parameters randomly generated. To generate them use the following tool: https://loratools.nl/#/keys generating a key with 16 bytes

- LORAWAN_NWK_KEY and LORAWAN_NWK_S_KEY must be the same and they are a 16 bytes hexadecimal parameters. You can generate them in the same way you generate the LORAWAN_APP_KEY

- LORAWAN_DEVICE_EUI must be kept equal to 00,00,00,00,00,00,00,00 on the STM32IDE while it must be equal to the number reported on the ST-Link present on each board. On Every STM32 it starts with 00:80:E1:15 (see previous slide)

- LORAWAN_JOIN_EUI is a parameter that is not necessary in the ABP authentication methos.

- LORAWAN_DEVICE_ADDRESS is an 8-bytes parameter that can be chosen by the user.

- Each Enrolled device MUST have its own parameters.

- Notice that on the IDE these parameters must be written with each byte separated by a column (e.g. XX,XX,XX,XX,XX,XX,XX,XX) while on Loriot they must be reported without columns (e.g. XXXXXXXXXXXXXXXX)

- Write every parameter keeping the letters in the upper case

Choose the LoRaWAN 1.0.x Version

Select the ABP Enrollment Process

LORIOT

Q Search...

← Back to Applications

Enroll a new device

SAMPLEAPP
BE-7A-2B-C8

LoRaWAN® Version

LoRaWAN® 1.0.x

Enrollment Process

ABP

Location   Location is optional   DISABLED | ENABLED

You can define coordinates for static devices enabling this option.

+ Enroll Device

≡ Bulk Import

Write 1   LORAWAN_NWK_S_KEY

Details

Devices

Title   **End-device Address**   **FCnt Number Uplink**   **FCnt Number Downlink**

Devices Map

DevAddr (8 hex digits)   FCntUp (Decimal)   FCntDn (Decimal)

☁ Output

EUI (optional)   **Network Session Key**

Output Data Format

DevEUI (16 hex digits, without dashes)   NWKSKEY (32 hex digits)

⚙ Websocket Applications

Description   **Application Session Key (optional)**

∠ Statistics

APPSKEY (32 hex digits)

⊀ Join Server

Device Template

🔒 Access Tokens

ꕔ Log

☐ Create Another   Enroll   Reset

⬇ Downloads

LORAWAN_APP_S_KEY

Title: User Defined Node Tag

Insert the 16 Hex Digits DevEUI here (it is on the NUCLEO board)

LORAWAN_DEVIDE_ADDRESS

ST Restricted

Example of the Loriot Interface