

LoRaWAN Setup Reference Design

n-Blocks

LoRaWAN Setup

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LoRaWAN Setup

To configure all the necessary tools to start working with the n-PN board, two main elements need to be downloaded by the user.

- An **Integrated development environment (IDE)**. Although the n-PN board can support a wide variety of IDEs to work with, KEIL environment can be chosen for two main reasons:
 - a. STM provides all the necessary LoRaWAN protocol drivers for the microcontroller embedded in the n-PN board for this IDE.
 - b. KEIL IDE (MDK Version 5) is free for STM32F0 and STM32L0 microcontrollers and due to the n-PN board has an STM32L0 microcontroller, we are allowed to activate the license for this software environment (follow the instructionshere).
- The Nimbus SDK which contains the minimum files to start working with the n-PN board as well as some basic examples that the user can use as templates (Nimbus SDK is based on STM32CubeExpansion_LRWAN_V1.1.4 and can be found in the next repository: https://bitbucket.org/nimbus_it/pn_lora_node).
- After installing KEIL (MDK) IDE(and the license activated) and downloading the Nimbus SDK, there are several basics examples (using LoRaWAN technology) which the user can start working with. The examples can be found following the path: LoRaWAN_Examples / STM32CubeExpansion_LRWAN_V1.1.4 / Projects / Multi / Applications / LoRa /.
- Open Any Example folder (Button folder for this example) and open MDK-ARM folder.



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• Open Button project (Double click on Button.uvprojx).



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😻 Dropbox	Button.uvoptx	09/03/2018 13:52	UVOPTX File	32 KB	
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7 items					

• The project is ready to be tested.



NOTES:



- a. KEIL IDE (MDK) may not have the libraries installed for the microcontroller embedded in the n-PN board, so a pop-up window will appear asking us to install those libraries. Just follow the instructions to install them up. You may reset your computer after the installation.
- b. If we double click on Button.uvprojx (a project file) and Windows does not recognise the extension file, just choose KEIL (MDK).

Integrated Development Environment (IDE)

As stated, KEIL IDE (MDK) was chosen, this section explains the minimum configuration to improve our work flow.

- Click on Options for Target...
- In Debug tab, make sure to use the right programmer (mostly ST-Link Debugger).

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- In Debug tab, Click on Settings
- Make sure under Reset is chosen in Connect (Debug tab).



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• In Flash Download tab, make sure that Program, Verify and Reset and Run are selected.

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Embedded Systems Research

LoRaWAN Setup

Firmware Structure

• In Keil a project is structured as shown below:



- The main folders are explained below:
 - **n-PN_Board:** The b-l072z-lrwan1.c file defines all the pinout of the n-PN board.
 - **Projects/Application:** The main.c file for the application is placed into this folder.
 - **N-PN/Sensors:** The drivers for the external sensors embedded on n-PN board are placed in this folder.
- Keil IDE does not show the header files until the project is compiled, once the project is compiled, the header files can be found under the function files (clicking on the cross sign next to the function file).
- Another important file is the header file called **Commissioning.h** which can be found under the main.c file. This header file contains the necessary parameters to configure your own LoRaWAN network: LORAWAN_DEVICE_EUI, LORAWAN_APPLICATION_EUI and LORAWAN_APPLICATION_KEY(These parameters can be obtained from The Things Network website).



The Things Network

• The user can create an account on the THE THINGS NETWORK, to quickly get started.

	THE THINGS
	CREATE AN ACCOUNT
Cre	eate an account for The Things Network and start exploring the world of Internet of Thing with us.
	USERNAME
	This will be your username - pick a good one because you will not be able to change it.
R	
	EMAIL ADDRESS
	You will receive a confirmation email, as well as occasional account related emails. If this email address is managed by a third party (such as for corporate email addresses), this third party might block emails coming from The Things Network. This email address is no public.
M	
	PASSWORD
	Use at least 6 characters.
<u> </u>	
	NEWSLETTER
1	Subscribe to the newsletter

• After creating the account, the user can add Applications and Gateways in the TTN CONSOLE.

		Applications Gateways
	Welcome to The Thin This is where the magic happens. Here you can work with your data. R collaborators	rgs Network Console. legister applications, devices and gateways, manage your integrations, and settings.
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GATEWAYS		repister pateway
eui-b827ebfffebf5ea8 Nimbo	us Centre TEC Cork gateway Mobile	connected EU_863_870

• On the application page, the user can register devices under the devices section.



			Overview	Devices	Payload Formats	Integrations	Data	Settings
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Application ID	786 ·							
Description N	IC .							
Created 7	months ago							
Handler t	tn-handler-eu (current handler)							
PPLICATION EUIS							0	manage eui
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• All the registered devices will appear on the Devices page.



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2272600				00 55 4C D2	9E A6 89 2	•
2272601				66 9D 87 C9	44 FD 86 8	•
2272602				00 FF 14 52	2 A5 14 98 0	•

• The following information: LORAWAN_DEVICE_EUI, LORAWAN_APPLICATION_EUI and LORAWAN_APPLICATION_KEY can be obtained from the device overview page by clicking on the selected device.

DEVICE OVERVIEW			
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Device ID	2272	602	
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Network Session Key	0	=	eo E
App Session Key	0	=	• • • • • • • • • • • • • • • • • • • •
Status	• 5	month	is ago
Frames up	1535	teset	frame counters
Frames down	24		

• Similarly, a gateway can be added on the gateway page.



Sateway ID unique, human-readable identifier for your gateway. It can b	e anything so be creative!			
I'm using the legacy packet forwarder Select this if you are using the legacy <u>Semtech packet forw</u>	ander.			
Description human-readable description of the gateway				
requency Plan the frequency plan this gateway will use				
no selection				
Couter The router this gateway will connect to. To reduce latency, pick	a router that is in a regio	n which is close to the	location of the gates	vay.
.ocation The exact location of you gateway. This will be used if your gate	eway cannot determine its	location by itself. Set	a location by clicking	; on the map.
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