# Quick Start Guide Introduction

RAK3244 BastWAN puts the RAK4260 module into a Feather compatible format, developed by ElectronicCats The RAK4260 LPWAN Module that is used as the core of RAK3244 BastWAN is based on Microchip's SAM R34 (R34J18B). It is a SiP device integrating a 32-bit ARM Cortex -M0+ MCU with a LoRa Transceiver. It offers full coding support with the Arduino<sup>™</sup> IDE.

For more information about the board, check the ElectronicCats RAK3244 BastWAN repository Z.

## **Hardware Setup**

The BastWAN is a Feather breakout board with everything you need to get started on your project.

#### 🛕 WARNING

Before powering the Feather Board, make sure that you have already connected the included LoRa Antenna. Not doing so might damage the board.

## **Software Setup**

### **Burning a Bootloader**

RAK3244 BastWAN board comes with pre-flashed bootloader upon purchase. However, if it is necessary to replace the bootloader, you can burn the bootloader-bast-wan-v3.4.0.bin 🖄 with Jlink as demonstrated below:

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L	MCU	Atmel ATSAML21J18		0030	00	00	00	00	00	00	00	00	05	03	00	00	FD	02	00	00					
L	Core	Cortex-MU		0040	05	03	00	00	05	03	00	00	05	03	00	00	05	03	00	00					
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Figure 1: Burning the bootloader

You can also flash the bootloader by using the RAKDAP1 Flash and Debug Tool <sup>I</sup>. The guide on how to connect RAK3244 to RAKDAP1 can be found on SWD Programming Interface section of RAK3244 datasheet <sup>I</sup>.

After ensuring the correct wiring connection, you can now flash the bootloader using pyocd command. If you do not have pyocd installed on your system, check the pyocd installation guide  $\Box$ .

pyocd flash -t atsaml21j18a bootloader-bast-wan-v3.4.0.bin

Once the command is executed, the bootloader should be flashed successfully. You can now connect the RAK3244 Bastwan to your PC.

## Setting up the Things Network (TTN)

In this section, The Things Network (TTN) and the procedure to set up the platform to connect with RAK3244 BastWAN is explained.



Figure 2: RAK3244 BastWAN in the context of the TTN

As shown in Figure 2, the RAK3244 BastWAN is one of the devices located on the left side. In the context of an IoT solution, the objective is to deploy devices to sense the relevant process variables and transmit the data to the backend servers located in the cloud. The data will be processed and integrated as part of a larger solution that could generate efficiency, traceability, predictability capacity among others.

The RAK3244 BastWAN can be part of this ecosystem, and the objective of this section is to demonstrate how simple to send data to the TTN using the LoRaWAN protocol. To achieve this, the RAK3244 BastWAN must be located inside the coverage of a LoRaWAN gateway.

#### **NOTE**:

The device name used for the setup is "RAK4260" since it is the core of RAK3244 BastWAN. You can designate any device name you want on your setup.

#### Sign up and Login

If you don't have an account yet, head on to the TTN website 🖾 and create one. Once done, login to your account and go to the Console.



Figure 3: The Things Network Home Page



Figure 4: TTN Console Page

### **Create a New Application**

#### 1. Choose **APPLICATIONS**.

THE THINGS	COMSOLE COMMUNITY EDITION	Applications	Gateways	Support	A ttn_tests
	Warning The Things Network is shutting down v2 clusters later this year. Start moving your applications and devices to a v3 cluster! Click here to read more				
	Applications				
	APPLICATIONS	Ð	add application		

Figure 5: Application Section

#### 2. Click the "**add application**" button.

	SOLE	Applications	Gateways	Support	A ttn_tests
1	Warning The Things Network is shutting down v2 clusters later this year. Start moving your applications and devices to a v3 cluster! Click here to read more				
	Applications > Add Application				
	ADD APPLICATION				
	Application ID The unique identifier of your application on the network				
	Description A human readable description of your new app				
	Eg. My sensor network application  Application EUI An application EUI will be issued for The Things Network block for convenience, you can add your own in the application settings page.		0		
	EULISSued by The Things Network				
	Handler registration Select the handler you want to register this application to				
	ttn-handler-eu		0		

Figure 6: Adding an Application

- Here are the things that you should take note in adding an application:
  - **Application ID** this will be the unique ID of your application in the Network. Note that the characters should be in lower case, no spaces are allowed.
  - **Description** this is a short and concise human readable description of your application.
  - Application EUI this will be generated automatically by The Things Network for convenience.
  - Handler Registration handler you want to register this application to.
- 3. After you fill in the necessary information, press the "Add application" button at the bottom of the page. If you see similar page as shown in Figure 8, then you have successfully registered your application.

SOLE	Applications	Gateways	Support	\Lambda ttn_tests
Warning The Things Network is shutting down v2 clusters later this year. Start moving your applications and devices to a v3 cluster! Click here to read more				
Applications > 🥪 raktests01				
APPLICATION OVERVIEW				
Application ID raktests01 Description rak4600 Created 28 days ago Handler ttn-handler-eu (current handler)		documentatio	٥	
APPLICATION EUIS		manage euis		
〈> 二 70 B3 D5 7E D0 03 AD 70 图				

Figure 7: Application Overview

#### **Register a New Device**

1. Scroll down until you see the Devices section. Or, you can click the "Devices" button at the top.

DEVICES			• register device	manage devices
	0	registered devices		

Figure 8: Register a New Device

2. Then, register a new device by clicking on the "register devices".

THE THINGS CONSO	DLE Y EDITION				Applicatio	ons Ga	ateways	Support	A ttn_tests	s ~
War	rning The Things Network is shutting down v2 clusters later this year. Start moving your applications and d	evices to a v3 clus	ter! Click here t	to read more						
Ap	pplications > 😸 raktests01 > Devices									
		Overview	Devices	Payload Formats	Integrations	Data	Settings			
1	REGISTER DEVICE					bulk im	nport devices			
	Device ID This is the unique identifier for the device in this app. The device ID will be immutab	le.								
	Device EUI The device EUI is the unique identifier for this device on the network. You can chang	ge the EUI later								
	×						0 bytes			
	App Key The App Key will be used to secure the communication between you device and the	network.								
	this field will	be generated								
	App EUI									
	70 B3 D5 7E D0 03 AD 70						\$			

Figure 9: Add your Device

In this form, the device ID must be unique for the application and must be completed with a lower case, alphanumeric characters. The rest of the parameters in the form are very important for the LoRaWAN protocol:

- Device EUI
- Application Key
- Application EUI

The TTN platform can generate these parameters randomly by leaving those fields empty, or you can enter already existing values.

3. Press the "**Register**" button at the bottom of this page to finish the process.

SOLE		Applications	Gateways	Support	\Lambda ttn_tests 🗸
Warning The Things Network is shutting dow	n v2 clusters later this year. Start moving your applications and devices to a v3 cluster! Click here to read more				
Applications > 🤤 raktests01 >	Devices > 🔚 rak4260				
DEVICE OVERVIEW					
Application ID	raktests01 rak4260				
Activation Method	OTAA				
Device EUI	<>				
Application EUI	<> コ 70 B3 D5 7E D0 03 AD 70 图				
Арр Кеу					
Device Address	<>				
Network Session Key					
App Session Key	↔ 芸 ⊗				

Figure 10: Device Overview

Now that the Device EUI, Application EUI, and Application Key are defined, you can now proceed with the setup of RAK3244 BastWAN LoRa configurations.

## **Using Arduino IDE to Modify and Flash Firmware**

In this section, you will be introduced on how to use the RAK3244 BastWAN with Arduino™ IDE.

### **BSP** Installation

 After successful flashing of the bootloader, the BSP library should be installed. To add board support for the RAK3244 BastWAN, start Arduino IDE and open the Preferences window by navigating through File > Preferences. Now, copy and paste the following URL into the 'Additional Boards Manager URLs' input field: https://electroniccats.github.io/Arduino\_Boards\_Index/package\_electroniccats\_index.json . Then, press the "OK" button.

Preferences		×					
Settings Network							
Sketchbook location:							
C: \Users\user\Documents\Arduino							
Editor language:	System Default v (requires restart of Arduino)						
Editor font size: 12							
Interface scale: 🛛 Automatic 100 🚖 % (requires restart of Arduino)							
Theme: Default theme v (requires restart of Arduino)							
Show verbose output during	: compilation upload						
Compiler warnings:	None 🗸						
Display line numbers	Enable Code Folding						
Verify code after upload	Use external editor						
Check for updates on st	artup Save when verifying or uploading						
Use accessibility feature	S						
Additional Boards Manager U	RLs: https://electroniccats.github.io/Arduino_Boards_Index/package_electroniccats_index.json						
More preferences can be edited directly in the file							
C: \Users\user\AppData\Local\Arduino15\preferences.txt							
(edit only when Arduino is no	ot running)						
	ОК	Cancel					

Figure 11: Arduino additional board support

#### VOTE:

If there is already an existing URL on the textbox, click the button at the right end of the field. This will open an editing window, allowing you to paste the above URL onto a new line as demonstrated in Figure 12.

## Section Center

Preferences	$\times$
Settings Network	
Sketchbook location:	
C: \Users \user \Documents \Arduino	Browse
Editor language: System Default v (requires restart of Arduino)	
Edi 💿 Additional Boards Manager URLs	×
Inter additional URLs, one for each row	
The https://electroniccats.github.io/Arduino_Boards_Index/package_electronic Shc Cor	cats_index.json
Click for a list of unofficial boards support URLs	OK Cancel
Additional Boards Manager URLs: https://dl.espressif.com/dl/package_esp32_index.json More preferences can be edited directly in the file	
C:\Users\user\AppData\Local\Arduino15\preferences.txt (edit only when Arduino is not running)	
	OK Cancel

Figure 12: Alternative method for additional board support

4. Open the "Boards Manager" by navigating through Tools > Board > Boards Manager.



Figure 13: Arduino boards manager

1. Look for **Electronic Cats SAMD Boards** in the Boards Manager search bar. Click **Install** for the **Electronic Cats SAMD Boards**, and wait for the installation to finish before closing the window.

### BAK<sup>®</sup> Documentation Center

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pe	✓ Electronic Cats SAMD Boards	
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by I	tronic Cats	
Boa	included in this package: Many Common USE Stick, Common Paley, based, Basewan, Common Officer, Based Brandier, MD, Freedorch Malerah, Common	
Tra	NEOW, CELWAN USB-SLICK, CELWAN REIEY BOARD, BESLWAN, CELWAN CILIZER, BESL PIO MINI MU, ESCOMEDOL MARECH, CELWAN F.	
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	2.0.5 V Install	
		_

Figure 14: Installing Electronic Cats SAMD Boards

 RAK3244 BastWAN should now be on the list of Boards by navigating through Tools > Board > Electronic Cats SAMD(L)(C) Core for Arduino.



Figure 15: RAK3244 BastWAN available in Boards list

### **LoRaWAN** Library Installation

RAK3244 BastWAN board uses the Beelan-LoRaWAN library which supports LoRaWAN Class A and Class C implementations operating in EU-868, AS-923, US-915 and AU-915 bands. You can recognize this library as the <a href="https://www.communications.com">lorawan.h></a> on the sample code.

In order for the sample code to work, the Beelan-LoRaWAN library must be installed. To do this, navigate to **Tools** > **Manage Libraries** on Arduino IDE. Then search for **Beelan LoraWAN** and install the latest version of the library. The window indicates if the library is installed, as shown in Figure 15.

## **AK** Documentation Center

pe All	✓ Topic All	✓ Beelan-LoRaWAN	
eelan LoRaW	/AN		
y Beelan Ver oRaWAN Are nd AS. Suppo tore info	rsion 1.5.4 INSTALLED duino Library for standal ort SX1276/72 or RFM95	one LoRaWAN modules class A and C with a simple API. Devi	ce library for LoRaWAN network US, EU
Select version	✓ Install		

Figure 16: Beelan LoRaWAN library installed

Visit the Beelan-LoRaWAN official github repository <sup>I</sup> for more information.

## **First Test**

For a quick test, a sample source code is provided for a LoRaWAN Class A node with OTAA support. Download the source code and open it with Arduino IDE.

Example source code for RAK3244 BastWAN 12

The following sections will demonstrate how to modify LoRaWAN parameters to establish a connection with The Things Network (TTN).

### **Modifying LoRaWAN Parameters**

For the RAK3244 BastWAN to successfully connect to a LoRaWAN Platform, several parameters must be properly configured. Not doing so will result in connection failure.

The most volatile parameters on LoRaWAN configuration are the Device EUI, Application EUI, and Application Keys. These data must match with the ones on The Thing Network (TTN) platform. Copy the EUIs and Keys from the TTN platform and paste them on the sample source code. Figure 17 shows the lines of codes that should be modified:



Figure 17: Device EUI, Application EUI, and Application Keys

### **Compiling and Flashing the Firmware**

Now that the LoRaWAN parameters are set, you can now run the sample program.

Click the **Verify** button on the upper left of Arduino IDE to compile the code. Before uploading the sample firmware, make sure that the RAK3244 BastWAN is connected and recognized by your PC. To verify this, there must be an assigned port on the **Tools** toolbar of Arduino IDE. It should not be grayed out.

C bastwar_test   Arduino 1.8.13	٥	×
File Edit Sketch Tools Help		
🕼 🔶 🗈 🔯 Upload		<b>P</b>
basbvan_test		
//wait for 10s to try again		^
delay(10000); bwhile(is:arbined):		
Serial println("Joined to network");		
void loop() (		
// Check interval overflow		
In (minist) - previousminis > interval) ( previousminis = minist):		
<pre>sprint(myst, "Counter-ta", counter;;</pre>		
<pre>Serial.print("Sending: ");</pre>		
Serial println (myötr);		
lora.sendUplink(myStr, strlen(myStr), 0, 1);		
counter++;		
		- 11
recvStatus = lora.readData(outStr);		
if(recvStatus) (		
Serial.println(outStr);		
// Check Lora RX		
lora.update();		
1 I		
Done compling.		
		^
Sketch uses 19144 bytes (7%) of program storage space. Maximum is 253952 bytes.		
Global variables use 3184 bytes of dynamic memory.		
54	BastWAN on CO	OM14

Figure 18: Compilation of sample source code

If everything is well, you can now click the **Upload** button and the firmware should be flashed to your RAK3244 BastWAN.



Figure 19: Uploading of sample source code

The RAK3244 BastWAN will try to join the LoRaWAN network server, and if it is successful, it will send a string to verify its presence. You can find more details of the operation by examining the sample source code and opening the serial monitor.

Feel free to experiment with your own and explore the capabilities of RAK3244 BastWAN.