Get Start with RAK7200 Tracker Device

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36 PAGES



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1. Where is the latest firmware file?

If you want to get a pre-compiled firmware instead of compiling the source code by yourself, you can find the latest firmware on RAK website after it is released.

2. How to burn the update firmware into RAK7200?

Firstly, please install the "STM32CubeProgrammer" tool on your Windows PC. You can download it from here:

https://www.st.com/content/st_com/en/products/development-tools/software-develop ment-tools/stm32-software-development-tools/stm32-programmers/stm32cubeprog.h tml#overview

Secondly, connect RAK7200 with your PC's USB interface as follow:



Now, you need to let RAK7200 work in boot mode. You can do it as follow:



- 1. Hold down the BOOT0 button, then press the Reset button;
- 2. Loosen the Reset button, then Loosen the BOOT0 button.



Open the "STM32CubeProgrammer" tool, and select UART type, then configure the Port, Baudrate, and Pairty as the following picture shows:

Prg ST	M32CubeProgrammer			- 🗆 X
STM32 Cube	rogrammer	19	f 🖸	¥ 🛪 😽
	Memory & File edition			Not connected
	Device memory Open file +		UART	Connect
.	Address Size Data width 32-bit - Read		UA	RT configuration
OB			Baudrate	COM5 • Ø 115200 •
			Parity	Even 🔻
			Data bits	8 💌
			Stop bits	1.0 👻
	No data to display		Flow control	Off 👻
			_	
	Log Verbosity level 1 2	3		
	12:36:04 : STM32CubeProgrammer API v2.0.0		De	vice information
Q			Device	
\bigcirc			Device ID	
(?)			Flash size	
\sim		\odot		

Note: It is COM5 on my computer, and it may be another COM port on your computer.

Then press "Connect" button at the top right corner. If there are some errors in the Log box as follow:



Prg ST	M32CubeProgrammer		- 🗆 X
STM32	Programmer 💿	f 🕒 🖇	* 57
	Memory & File edition		Not connected
	Device memory Open file +	UART	Connect
.	Address 0x0800000 - Size 0x400 Data width 32-bit - Read -	UART	configuration
ОВ		Baudrate	COM5 • 3
		Parity	Even 👻
		Data bits	8 -
		Stop bits	1.0 -
	No data to display	Flow control	Off
	Log Verbosity level		
(3)	13:53:45 : Error: GETID command not acknowledged! 13:53:45 : Reemission of GetID command 13:53:45 : Error: GETID command not acknowledged! 13:53:45 : Error: GETID command not acknowledged! 13:53:45 : Error: GETID command not acknowledged! 13:53:45 : Error: GETI command not acknowledged!	Devic Device Type	e information - -
0	13:53:45 : Reenission of Get command not acknowledged!	Device ID Flash size	
?	· · · · · · · · · · · · · · · · · · ·	CPU	-

It means that RAK7200 don't work in BOOT mode. You should let it work in boot mode firstly.

The correct Log you should see is the information like the following picture shows:

Prg ST	M32CubeProgra	ammer							- 🗆 ×
STM32 Cube	Programmer							fi 🕒	¥ 🛪 🛐
Ξ	Memory & File	e edition							🔵 Connected
	Device memory	Open file +	I					UART	Disconnect
	Address 0x0	800000 💌 Siz	e 0x400	Data width	32-bit 💌	•	Read 💌	UAR	T configuration
	Address	0	4	8	с	ASCII		Port	COM5 - S
OB	0x08000000	20005000	08004409	08004459	08000165	.PDYDe	^	Baudrate	115200
	0x08000010	00000000	00000000	00000000	00000000			ant recei	115200
	0x08000020	00000000	00000000	00000000	0800418D	A		Parity	Even 👻
	0x08000030	00000000	00000000	080041A1	080004F9	iAù		Data bits	2
	0x08000040	08004459	08004459	080005E5	08004459	YDYDåYD			•
	0x08000050	08004459	08000BF1	08000c05	08000c19	YDñ		Stop bits	1.0 👻
	0x08000060	08004459	08004459	08000A2D	08000A15	YDYD		Flow control	0/
	0x08000070	08004459	08004459	08004459	08000E15	YDYDYD			
	0x08000080	08004459	08004459	08004459	00000000	YDYDYD			
	0x08000090	08004459	08004459	08004459	08004459	YDYDYDYD			
	0x080000A0	08004459	08004459	08004459	080008D9	YDYDYDÙ			
	0x080000B0	08000A11	08004459	08004459	08004459	YDYDYD	~		
	<						>		
	Log					Verbosity level 💿 1	2 3		
(©)	14:22:15 : Boo 14:22:17 : UPL 14:22:17 : Ban 14:22:17 : Siz 14:22:17 : Siz 14:22:18 : UPL 14:22:18 : VPL 14:22:18 : VPL 14:22:18 : Adda 14:22:18 : Read 14:22:19 : Timm	Lloader protocol AADING OPTION BYT k : 0X00 ress : 0X1ff80000 e : 20 Bytes ADDING e : 1024 Bytes ress : 0X8000000 d progress: a read successful e elapsed during	version: 3.1 ES DATA	ion is: 00:00:01.	.140			Device Type Device ID	vice information STM32L07x/L08x/L010 MCU 0x447
0	L						~	Flash size	-
\odot	2						\otimes	CPU	Cortex-M0+

Now, let's start to burn a firmware into RAK7200.

At first, erase all data on RAK7200 according the following picture shows, it may take several seconds:



Mag STN	132CubeProgrammer								- 0	×
STM32 Cube	Programmer						19	f 🕒	y 🛪 🖌	57
=	Memory & File	edition							😑 Connec	ted
	Device memory	RAK7200_EU868	_test.bin ×					UARI	* Discon	nect
	Address 0x0	•	Size 0x400	Data width	32-bit	Download	*	UAU	RT configuration	
	Address	0	4	8	C	ASCII		Port	COM21	- 3
	0x00000000	20005000	080111C1	08011211	08002511	.P. Á%	â	Baudrate	115200	
	0x00000010	00000000	00000000	00000000	00000000			Parity	(P) and	
	0x00000020	00000000	00000000	00000000	0800FE35	5þ			15321	
	0x0000030	00000000	00000000	0800FF01	08008E81	ÿ		Data bits	8	
	0x00000040	08011211	08011211	08009241	08011211	A		Stop bits	1.0	-
	0x00000050	08011211	08009B4D	08009B61	08009B75	Mau		Flow control	2010	
	0x00000060	08011211	08011211	080097E5	080097CD	åf				
	0x00000070	08011211	08011211	08011211	08009E09					
	0x0000080	08011211	08011211	08011211	00000000					
	0x00000090	08011211	08011211	08011211	08011211					
	0x000000A0	08011211	08011211	08011211	08009625	%				
	0х00000в0	080097C9	08011211	08011211	08011211	É				
	0x000000C0	4C06B510	2B007823	4B05D107	D0022B00	.µ.L#x.+.Ñ.K.+.Đ				
1	0.0000000		22010500	00107033	20000670		~			
	Log					Verbosity level 💿 1 💿 2	3			
(b)	18:55:17 : Addr 18:55:17 : Size 18:55:18 : UPLO 18:55:18 : Size 18:55:18 : Addr 18:55:18 : Read 18:55:19 : Time 18:58:54 : Read 18:58:54 : Read	ess : 0X1TT800 : 20 Bytes ADING : 1024 Bytes ess : 0x800000 progress: elapsed durin File: D:\IOT& or offer	0 0 g the read operat 7200\RAK7200_EU86	ion is: 00:00:01. 8_test.bin	128		^ 😽	De Device Type	vice information STM32L07x/L0	08x/L010 MCU
	18:59:17 : Eras	er of segments ent[0]: address e all flash se	: 1 s= 0x0, size- 0x1 ctors	9678		Erase chip	ų,	Device ID Flash size		0x447 -
9								CPU	Cor	tex-M0+

Press "Open file" and select the correct firmware file in the pop-up window as follow:

Prg ST	M32CubeProgra	ammer							– 🗆 ×
STM32 Cube	Programmer						19	f 🕒	¥ 🛪 😽
	Memory & File	e edition							Connected
	Device memory	Open file +						UART	Disconnect
	Address 0x0	800000 -	Size 0x400	Data width	32-bit 🔻	Read	-	UAI	RT configuration
	Address	0	4	8	С	ASCII		Port	COM5 👻 🧭
OB	0x08000000	00000000	00000000	00000000	00000000		^	Baudrate	115200 -
	0x08000010	00000000	00000000	00000000	00000000			(Destain)	
	0x08000020	00000000	00000000	00000000	00000000			Parity	Even
	0x08000030	00000000	00000000	00000000	00000000			Data bits	
	0x08000040	00000000	00000000	00000000	00000000				
	0x08000050	00000000	00000000	00000000	00000000			Stop bits	1.0 👻
	0x08000060	00000000	00000000	00000000	00000000			Flow control	DH -
	0x08000070	00000000	00000000	0000000	00000000				
	0x08000080	00000000	00000000	0000000	00000000				
	0x08000090	00000000	00000000	0000000	00000000				
	0x080000A0	00000000	00000000	00000000	0000000				
	0x080000B0	00000000	00000000	0000000	00000000		~		
	Log 14:22:19 : Dat 14:22:19 : Tim	a read successfi	illy	tion is: 00:00:01	.140	Verbosity level	3		
0	14:26:35 : Era 14:26:41 : Fla be erased. 14:26:42 : UPL 14:26:42 : Siz	se all flash se sh page/sector OADING e : 1024 Bytes	erase command co	prrectly executed.	Note: if flash :	sector is protected, it will not		De Device	vice information STM32L07x/L08x/L010
Q	14:26:42 : Add 14:26:42 : Rea	ress : 0x8000000 d progress:)				-	Туре	MCU
O	14:26:43 : Dat 14:26:43 : Tim	a read successfu e elapsed during	the read opera	tion is: 00:00:01	. 142	l.		Device ID	0x447
6					N 01027	2	4	Flash size	
9	8						\otimes	CPU	Cortex-M0+





Prg Open file						×
← → ∽ ↑ 📕 >	此电脑 〉 桌面 〉 RAK7200 〉 beta	~	Ū	搜索"beta"	,	p
组织 • 新建文件夹					- 🔳 (2
🛆 OneDrive	名称 ^	修改日期		类型	大小	
▶ 此由時	Rak7200_AU915_test.bin	2019/5/17 12:08		BIN 文件	104 KB	1
3D 对条	RAK7200_EU868_test.bin	2019/5/17 9:43		BIN 文件	104 KB	
 課 视频 副 图片 ① 文档 ◆ 下载 ♪ 音乐 ■ 桌面 Unindows (C: ◇ 网络 						
×	c件名(N): RAK7200_EU868_test.bin		~	Firmware files 打开(O)	取消]

Press the "Download" button to start the burning process:

Prg ST	M32Cube	Progra	mmer								— c	
STM32 Cube	Programmer	e.							F		¥ ×	57
	Memory	& File	edition								😑 Cor	nnected
	Device me	emory	Rak7200_AU91	l.5_test.	bin × +					UART	⇒ Di	isconnect
	Address	0x0	•	Size	0x400	Data width	32-bit	- Download -		UA	RT configurat	tion
	Add	ress	0		4	8	С	ASCII			COM5	- Ø
OB	0x000000	000	20005000	(08010FE1	08011031	08002511	.P. á1%	-		115200	
	0x000000	010	00000000	(0000000	00000000	0000000					_
	0x000000	020	00000000	(0000000	00000000	0800FC55	Uü			Even	*
	0x000000	030	00000000	(0000000	0800FD21	08008CA5	!ý¥			8	
	0x000000	040	08011031	(08011031	08009065	08011031	11e1				
	0x000000	050	08011031	(08009971	08009985	08009999	1q			1.0	*
	0x000000	060	08011031	(08011031	08009609	080095F1	11ñ			Off	
	0x000000	070	08011031	(08011031	08011031	08009C2D	11				
	0x000000	080	08011031	(08011031	08011031	00000000	111				
	0x000000	090	08011031	(08011031	08011031	08011031	1111				
	0x000000	0A0	08011031	(08011031	08011031	08009449	11II				
	0x000000	080	080095ED	(08011031	08011031	08011031	í111				
	0~00000	000	AC060510		0007873	1005n107	DUU228UU	מיעווי עוויי שווי	~			
	Log 14:26:41 be erase	: Flasi d.	h page/secto	r erase	e command co	rrectly executed.	Note: if flash	Verbosity level	3			
0	14:26:42	: UPLO	: 1024 Byte	s						De	evice informat	tion
Q	14:26:42 14:26:42	: Addr : Read	ess : 0x80000 progress:	000						Device	STM32L	07x/L08x/L010
0	14:26:43	: Data : Time	elapsed dur	ing the	e read opera	tion is: 00:00:01	142			Туре		MCU
(14:33:11 14:33:11	: Read : Numb	er of segment	ers\For	nn\Desktop\R	AK7200\beta\Rak720	00_AU915_test.	onn		Device ID		0x447
0	14:33:11	: segm	ent[0]: addr	ess= 0	(0, size= 0x	19098] >		Flash size		
(?)				_						CPU		Cortex-M0+



Prg ST	M32CubeProg	rammer							- 🗆 ×
STM32 Cube	• 🍞 Programmer						19	f 🕨	y 🛧 😽
Ξ	Memory & Fi	le edition							Connected
	Device memory	Rak7200_AU9:	15_test.bin × +					UART	 Disconnect
	Address Ox	•	Size 0x400	Data width	32-bit	-	Download 🔹	UAI	RT configuration
	Address	0	4	8	С	ASCI	I	Port	COM5 👻 💋
OB	0x00000000	20005000	08010FE1	08011031	08002511	.P. á1%	^	Baudrate	115200 *
	0x00000010	00000000	00000000	00000000	00000000			Davity	
	0x00000020	00000000	00000000	00000000	0800FC55	Uü		Panty	Even
	0x0000030	00000000	00000000	0800FD21	08008CA5	lý¥		Data bits	-
	0x00000040	08011031	08011031	08009065	08011031	11e1		142 143	
	0x00000050	08011031	08009971	08009985	08009999	1q		Stop bits	1.0 🔻
	0x0000060	08011031	08011031	08009609	080095F1	11ñ		Flow control	01
	0x00000070	08011031	08011031	08011031	08009C2D	111			
	0x0000080	08011031	08011031	08011031	00000000	111			
	0x00000090	08011031	08011031	08011031	08011031	1111			
	0x000000A0	08011031	08011031	08011031	08009449	11I			
	0x000000B0	080095ED	08011031	08011031	08011031	i111			
	0200000000	AC060510	2007823	4050107	D0022800		~		
() () () () () () () () () () () () () (Log 14:33:11 : Re: 14:33:11 : Se: 14:33:11 : Se: 14:36:04 : Mo 14:36:04 : Cp 14:36:04 : Si 14:36:04 : Er: 14:36:04 : Er: 14:36:04 : Do	ad File: C:\Us mber of segmen mory Programmi ening and pars le: Rak7200_A ze: 105624 By dress: 0x0800 asing memory c asing internal wnload in Prog	erš\Fomi\Desktop ts:1 ng ing file: Rak720(U915_test.bin tes D000 orresponding to s memory sectors ress:	(RAK7200\beta\Rak720)x19C98 0_AU915_test.bin segment 0: [0 825]	00_AU915_tes	Verbosity level	1 2 3	De Device Type Device ID Flash size	vice information STM32L07x/L08x/L010 MCU 0x447
\odot							\otimes	CPO	Contex-MU+

OK, you have upgraded the firmware for RAK7200 successfully!

Prg ST	M32CubeProgra	mmer							- 🗆 X
STM32 Cube	Programmer						(19)	f 🕒	¥ 🕹 😽
	Memory & File	edition							Connected
	Device memory	Rak7200_AU91	5_test.bin × +					UART	Disconnect
2	Address 0x0	•	Size 0x400	Data width	32-bit	•	Download 🔻	UAR	T configuration
=	Address	0	4	8	С	ASCII		Port	COM5 🔻 🗭
OB	0x00000000	20005000	08010FE1	08011031	08002511	.P. á1%	Â	Baudrate	115200 -
	0x00000010	00000000	00000000	00000000	00000000			Devision	
	0x00000020	00000000	00000000	00000000	0800FC55	Uü		Parity	Even 💌
	0x00000030	00000000	00000000	0800ED21	08008645	lý ¥	_	Data bits	
	0x00000040	08011031	08011031	Prg 消息		×		ant was	
	0x00000050	08011031	08009971					Stop bits	1.0 💌
	0×00000060	08011031	08011031	File dow	nload comple	ete		Flow control	
	0x00000070	08011031	08011031	\smile					
	0x00000080	08011031	08011031			确定			
	0×00000090	08011031	08011031						
	0x000000A0	08011031	08011031	08011031	08009449	11II			
	0х000000В0	080095ED	08011031	08011031	08011031	í111			
	0~00000000	AC068510	20002823	10050107	D0022800	ת י א A י א +	~		
	Log					Verbosity level	1 🔘 2 🔘 3		
©	14:33:11 : segn 14:36:04 : Mema 14:36:04 : Oper 14:36:04 : Sider 14:36:04 : Sider 14:36:04 : Sider 14:36:04 : Eras 14:36:04 : Eras 14:36:06 : Down 14:36:25 : File 14:36:25 : Time	<pre>tent[0]: addre ry Programmin ing and parsi : Rak7200_AU : 105624 Byt ess : 0x08000 ing memory co ing internal load in Progr download com : elapsed duri</pre>	ss= 0x0, size= 0x g 915_test.bin es 000 rresponding to se memory sectors [0 ess: plete ng download opera	19C98 AU915_test.bin gment 0: 825] tion: 00:00:21.70	5		∛	Device Type Device ID Flash size	vice information STM32L07x/L08x/L010 MCU 0x447
(?)								CPU	Cortex-M0+

Now, "Disconnect" and close the "STM32CubeProgrammer" tool, then open a serial port tool on your PC. Choose the correct COM port and baud rate is 115200. Then press the Reset button on RAK7200, you'll see the following log on serial port tool:



[14:17:22.929]收+◆



Note: If you haven't a serial port tool, we recommend you to use RAK serial port tool. You can get it from RAK website and use it freely.

http://docs.rakwireless.com/en/LoRa/RAK811/Tools/RAK_SERIAL_PORT_TOOL_V1. 2.1.zip

3. How to configure RAK7200?

You can configure LoRa Button by sending AT commands into it from a serial port tool running on your PC.

AT Command	Description
at+version	Get the current firmware version number.
at+get_config=device:status	Get all information about the device's hardware components and their current status.
at+set_config=device:restart	After set, the device will restart.

The following list shows the AT commands:





at+set_config=device:XXX:YYY	Set a certain sensor's status.
	XXX definition:the sensor's flag, gps means GPS, acc means Accelerate,
	magn means Magnetic,
	gyro means Gyroscope,
	pressure means Pressure,
	temperature means Temperature,
	humidity means Humidity,
	light_strength means Light_strength,
	voltage means Voltage.
	YYY definition: 0: close, 1: open
at+join	Start to join LoRa network.
at+send=X:YYY	Send a customized data.
	X definition: LoRa port
	YYY definition: the data which you want to send. The limited length is 50 Bytes, and the data must be in HEX format.
at+set_config=lora:work_mode:X	Set the work mode for LoRa.
at+set_config=lora:work_mode:X	Set the work mode for LoRa. X definition: 0: LoRaWAN, 1: LoRaP2P, 2: Test Mode.
at+set_config=lora:work_mode:X at+set_config=lora:join_mode:X	Set the work mode for LoRa. X definition: 0: LoRaWAN, 1: LoRaP2P, 2: Test Mode. Set the join mode for LoRaWAN.
at+set_config=lora:work_mode:X at+set_config=lora:join_mode:X	Set the work mode for LoRa. X definition: 0: LoRaWAN, 1: LoRaP2P, 2: Test Mode. Set the join mode for LoRaWAN. X definition: 0: OTAA, 1: ABP
at+set_config=lora:work_mode:X at+set_config=lora:join_mode:X at+set_config=lora:class:X	Set the work mode for LoRa. X definition: 0: LoRaWAN, 1: LoRaP2P, 2: Test Mode. Set the join mode for LoRaWAN. X definition: 0: OTAA, 1: ABP Set the class for LoRa.
at+set_config=lora:work_mode:X at+set_config=lora:join_mode:X at+set_config=lora:class:X	Set the work mode for LoRa. X definition: 0: LoRaWAN, 1: LoRaP2P, 2: Test Mode. Set the join mode for LoRaWAN. X definition: 0: OTAA, 1: ABP Set the class for LoRa. X definition: 0: Class A, 1: Class B, 2: Class C
at+set_config=lora:work_mode:X at+set_config=lora:join_mode:X at+set_config=lora:class:X at+set_config=lora:region:XXX	Set the work mode for LoRa. X definition: 0: LoRaWAN, 1: LoRaP2P, 2: Test Mode. Set the join mode for LoRaWAN. X definition: 0: OTAA, 1: ABP Set the class for LoRa. X definition: 0: Class A, 1: Class B, 2: Class C Set the region for LoRa.
at+set_config=lora:work_mode:X at+set_config=lora:join_mode:X at+set_config=lora:class:X at+set_config=lora:region:XXX	Set the work mode for LoRa. X definition: 0: LoRaWAN, 1: LoRaP2P, 2: Test Mode. Set the join mode for LoRaWAN. X definition: 0: OTAA, 1: ABP Set the class for LoRa. X definition: 0: Class A, 1: Class B, 2: Class C Set the region for LoRa. XXX define: one of the following items:



at+set_config=lora:confirm:X	Set the type of messages which will be sent out through LoRa.
	X definition: 0: unconfirm, 1: confirm
at+set_config=lora:ch_mask:X:Y	Set a certain channel on or off.
	X definition: the channel number, and
	you can check which channel can be set
	before you set it.
	Y definition: 0: off, 1: on
at+set_config=lora:dev_eui:XXXX	Set the device EUI for OTAA.
	XXXX definition: the device EUI, for
	example, 3534353165375300
at+set_config=lora:app_eui:XXXX	Set the application EUI for OTAA.
	XXXX definition: the application EUI, for
	example, 70B3D57ED001A1E2
at+set_config=lora:app_key:XXXX	Set the application key for OTAA.
	XXXX definition: the application key, for
	example,
	D9988A5F02D80FAB8BA5F453C4A2C
	Cat the device address for ADD
at+set_config=lora:dev_addr:XXXX	Set the device address for ABP.
	XXXX definition: the device address, for example, 2601116D
at+set_config=lora:apps_key:XXXX	Set the application session key for ABP.
	XXXX definition: the application session
	key, for example,
	BCE
at+set_config=lora:nwks_key:XXXX	Set the network session key for ABP.
	XXXX definition: the network session
	key, for example,
	C2AA51E61BA45F57045BF48249BC3
	070
at+set_config=lora:send_interval:X	Set the interval time of sending data.



	X definition: the interval time, units are seconds.
at+get_config=lora:status	It will return all of the current information of LoRa, except LoRa channel.
at+get_config=lora:channel	It will return the state of all LoRa channels, then you can see which channel is closed and which channel is open very clearly.

More information, please have a look at the next section <How to Connect with TTN?>.

4. How to connect with TTN?

In this section, we'll do some practice to show how to connect RAK7200 with TTN.

Firstly, open the serial port tool on your PC.

Open the serial port by click the following button:



RAK	端口:	COM5	•	波特率:	115200	•	开启
接收窗口						清空	<u> </u>
送窗口(默认发	送回车)						
送窗口(默认发	送回车)						

Open the link <u>https://www.thethingsnetwork.org/</u> and login, then open the "Console" page from the right corner at the top:



Press "APPLICATIONS":





THE THINGS CON	SOLE INITY EDITION		Applications	Gateways	Support	A fomi
	Applications					
	APPLICATIONS		0	add application		
		You do not have any applications. Get started by adding one!				

"add application":

SOLE	Applications	Gateways	Support	A fomi
Applications \rightarrow 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. EUI issued by The Things Network		•		
Handler registration Select the handler you want to register this application to ttn-handler-eu		0		

Fill in the correct contents.

Please note that the content you fill in "Application ID" item should be in low case, and it must be the unique ID on TTN network.

CONSOLE COMMUNITY EDITION	Applications	Gateways	Support	A fomi
Applications > Add Application				
ADD APPLICATION				
Application ID The unique identifier of your application on the network				
rak7200au915		0		
Description A human readable description of your new app				
test rak7200 on AU915		0		
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.				
EUI issued by The Things Network				
Handler registration Select the handler you want to register this application to				
ttn-handler-eu		۰		

Then press the "Add application" button at the bottom of this page, and you can see the following page:



NSOLE MMUNITY EDITION				Applications	Gatev	ways Support	A fomi
Applications > 😸 rak7200au915							
	Overview	Devices	Payload Formats	Integrations	Data	Settings	
APPLICATION OVERVIEW							
Application ID rak7200au915 Description test rak7200 on AU915 Created 8 seconds ago Handler ttn-handler-eu (current handler)					<u>dc</u>	xumentation	
APPLICATION EUIS					0	manage euis	
↔ ⇒ 70 B3 D5 7E D0 01 C5 44 箇							

At the middle of this page, you can find the box named "DEVICES":

DEVICES			e register device	p manage devices
	0	registered devices		

Just "register device":

CONSOLE community edition	Applications	Gateways	Support	A fomi
Applications > 🤤 rak7200au915 > Devices				
REGISTER DEVICE		bulk import de	vices	
Device ID This is the unique identifier for the device in this app. The device ID will be immutable.				
Device EUI The device EUI is the unique identifier for this device on the network. You can change the EUI later.		0 bytes		
App Key The App Key will be used to secure the communication between you device and the network.				
App EUI 70 B3 D5 7E D0 01 C5 44		<	,	

You can click the following icon and "Device EUI" will be generated automatically in the next step:



CONSOLE	Applications	Gateways	Support	A fomi
Applications > 🥪 rak7200au915 > Devices				
REGISTER DEVICE		bulk import de	vices	
Device ID This is the unique identifier for the device in this app. The device ID will be immutable.				
353730345a377e11		٥		
Device EUI The device EUI is the unique identifier for this device on the network. You can change 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 01 C5 44		<		

The following picture shows the final page:

THE THINGS COI	NSOLE MUNITY EDITION		Applications	Gateways	Support	A fomi
,	Applications > 🤤 rak7200au915 >	Devices				
	REGISTER DEVICE			bulk import de	vices	
	Device ID This is the unique identifier for the dev	ice in this app. The device ID will be immutable.				
	353730345a377e11			٥		
	Device EUI The device EUI is the unique identifier	for this device on the network. You can change the EUI later.				
	1	this field will be generated				
	App Key The App Key will be used to secure the	communication between you device and the network.				
	1	this field will be generated				
	App EUI					
	70 B3 D5 7E D0 01 C5 44			0		
			Cancel	Registe	er 📄	

Then press the "Register" button at the bottom of this page to finish.

MAUNITY EDITION		Applications Gateways Support 闪 fomi
Applications > 🥪 rak7200au91	5 > Devices > 📰 353730345a377e11	
		Overview Data Settings
DEVICE OVERVIEW		
Application ID	rak7200au915	
Device ID 3	53730345a377e11	
Device EUI	<> ⇒ 00 60 5E 75 74 9F CD 6D (E)	
Application EUI	↔ 二 70 B3 D5 7E D0 01 C5 44 <	
App Key	○ = ●	
Status	never seen	
Frames up (Frames down (reset frame counters	



4.1 Join in OTAA mode

As you see in the above page, the default activation method is OTAA.

These three parameters will be used on RAK7200:

ONSOLE MMUNITY EDITION	Applications Gateways Support 闪 fomi
Applications > 🥪 rak7200au915 > Devices > 🔚 353730345a377e11	
	Overview Data Settings
DEVICE OVERVIEW	
Application ID rak7200au915 Device ID 353730345a377e11 Activation Method OTAA	
Device EUI Image: Constraint of the state o	
App Key 🕢 🌐 👁 📓	
Status e never seen Frames up 0 reset frame counters Frames down 0	

OK! Now, let's join in OTAA mode and AU915 frequency for example!

The default LoRa work mode is LoRaWAN 1.0.2, the default LoRa join mode is OTAA, and the default LoRa class is Class A.

Set the frequency/region to AU915:



多收窗口 清空	接收
*****	^
DMP is disabled	
GPS Init OK	
Selected LoRaWAN 1.0.2 Region: AU915	
Parameter not found.	
>>at+set_config=lora:join_mode:0	
ок	
>>at+set_config=lora:class:0	
OK	
>>at+set_config=lora:region:AU915	
No switch region.Current region:AU915	
ОК	
	~
发送窗口(默认发送回车)	
at+set_config=lora:region:AU915	发送

Set the Device EUI:



Set the Application EUI:









Set the Application Key:





Join in OTAA mode:

RAK	端口:	COM5	波特率:	115200	Ŧ	关闭
接收窗口					清空排	観
ОК						^
OTAA:						
DevEui:00605E	75749F0	CD6D				
AppEui:70B3D	57ED001	1C544				
AppKey:4E200	3296FC5	CD26F46E9	40A6DAFA	9D1		
OTAA Join Sta	rt					
OK						
Join retry Cnt:2	2					
Joined Success	sed!					
Battery Voltag	e = 411	7 mV				
ACC X : 36 mg	, Y : 450	mg, Z : 932	2 mg			
GYRO X : -3, Y	: 0, Z : 1	1				
Press:950.375	Pa					
Temperature:3	1.87deg	gree				
Unconfirm dat	a send (OK				
						~
发送窗口(默认发	送回车)					
at+join						
						发送

Join successfully! You can see that RAK7200 is sending data frequently.

Now, you can see the sensor data send from RAK7200 on TTN website as follow:



Great! That's all about OTAA mode.

4.2 Join in ABP mode

(to add)



5. How to connect with LoRaServer?

The LoRaServer is an open source project which you can find in <u>https://www.loraserver.io/</u>.

You can use RAK7200 to connect with LoRaServer according to the following steps:

In this document, i assume that you are using RAK LoRa gateway and its built-in LoRaServer, or you are using RAK cloud testing LoRaServer. But if you are using a LoRaServer which is built by yourself, maybe you need to configure it by yourself too.

OK! Let's get start!

Open the web page of the LoRaServer which you want to connect with and login.

€	LoRa Server			Q Search organ	nization, application, gateway or device	?	θ	admin
81 81 81	Network-servers	Applications					+ CRE	ATE
\bigcirc	Gateway-profiles	Applications						
	Organizations	ID	Name	Service-profile	Description			
•	All users	1	AppModel	ServiceProfileModel	AppModel			
loras	verver 👻				Rows per page: 10▼	1-1 of 1	< >	>
\$	Org. settings							
•	Org. users							
<u>.</u> ≡	Service-profiles							
	Device-profiles							
\mathbb{R}	Gateways							
	Applications							
2	Multicast-groups							

By default, there is already one or more items in this page, you can use it or create a new item. Now, let's create a new item by click the "CREATE" button, and fill in them.

€	DoRa Server	Q Search organization, application, gateway or device	ıdmin
■	Network-servers Gateway-profiles Organizations All users	Applications / Create Application name * The party may object of the party and depters.	
loras	erver 👻	Application description *	
\$	Org. settings	September Science profile	
	Service-profiles	The service profile to which this application will be attached. Note that you can't change this value after the application has been created. Payload codec	_
ш	Device-profiles	None	*
@	Gateways	CREATE APPLICATI	ON
<i>۳</i>	Applications Multicast-groups		



€	DoRaServer	Q. Search organization, application, gateway or device	?	θ	admir	0
	Network-servers Gateway-profiles	Applications / Create				
•	Organizations All users	Application name* RAK7200_test The name may only contain words, numbers and disates.				
loras	erver 👻	Application description * This application is used to test RAK7200				
¢ ÷	Org. settings Org. users	serve-profile * ServiceProfileModel			Ŧ	
4 ≣	Service-profiles	The service-profile to which this application will be attached. Note that you can't change this value after the application has been created. Pplyoad codec Commons IDD				
₩ ®	Device-profiles Gateways	Cayelline Linn By defining a psyload codec, LoRa Agp Server can encode and decode the binary device psyload for you.			*	
	Applications		CREATE AP	PLICAT	TION	
2	Multicast-groups					

"CREATE APPLICATION".

∉	DoRaServer					Q Search or	ganization, application	, gateway or d	evice	0	Θ	admin
	Network-servers Gateway-profiles	A	pplications									REATE
	Organizations		ID	Name	Service-profile		Description					
•	All users		1	AppModel	ServiceProfileModel		AppModel					
loras	loraserver +		2	RAK7200_test	ServiceProfileModel		This application is used to	test RAK7200				
\$	Org. settings							Rows per page:	10-	1-2 of 2	<	>
<u>.</u>	Org. users											
≛≡	Service-profiles											
	Device-profiles											
\bigcirc	Gateways											
	Applications											
2	Multicast-groups											

Click the new item name "RAK7200_test":

€	LoRa Server					Q Search organization, applicati	on, gateway or de	vice	0	θ	sdmin
• •	Network-servers Gateway-profiles Organizations	Applications / F	AK7200_test	INTEGRATIONS						DEL	ETE
•	All users									+ CRE	ATE
loras	server -										
\$	Org. settings	Last seen	Device name		Device EUI	Link margin		B	ttery		
•	Org. users						Rows per page:	10-	of 0		5
.≞≡	Service-profiles										
	Device-profiles										
\bigcirc	Gateways										
	Applications										
2	Multicast-groups										

Add a LoRa node device into LoRaServer by clicking the "CREATE" button:



€	LoRa Server		Q Search organization, application, gateway or device	? 🖰 admin
■ ©	Network-servers Gateway-profiles Organizations	Applications / RAK7200_test DEVICES APPLICATION CONFIGURATION INTEGRATIONS		DELETE
•	All users			+ CREATE
loras	erver 👻			
\$	Org. settings	Last seen Device name Device EU	Link margin	Battery
•	Org. users		Rows per page: 10 -	< > 0100-0
±≡	Service-profiles			
	Device-profiles			
@	Gateways			
	Applications			
21	Multicastgroups			
100	~			
€	ఉన్ని LoRaServer		Q Search organization, application, gateway or device	? 😁 admin
	Network-servers	Applications / RAK7200_test / Devices / Create		
R	Gateway-profiles			
Ξ	Organizations	Designment of		
•	All users	The name may only contain words, numbers and dashes.		
lora	server 👻	Device description *		
ф	Org. settings			
<u>+</u>	Org. users	Device EUI *		MSB C
	Service-profiles	Device-profile * Device-profile		
111	Device-profiles			
\bigcirc	Gateways	Disable frame-counter validation Note that disablen the formu-ounter validation will promovine construct as it enables pends to perform replacettacke		
	Applications	нов или чискоту на напечовкет такалон ти сопротное вечину во к еквиез речуле (0 perform tepla)-attachs.		
2	Multicast-groups			CREATE DEVICE

Fill in them. You can generate a Device EUI automatically by click the following icon, or you can write a correct Device EUI in the edit box.

€	DoRa Server	Q Search organization, application, gateway or device	0	e ad	dmin
• •	Network-servers Gateway-profiles	Applications / RAK7200_test / Devices / Create			
	Organizations	Device name* RAK7200 test1			
•	All users	The name may only contain words, numbers and dashes.			-
loras	server 👻	Device description * the first RAK7200 to test			
æ	Org. settings	Device BU*			
•	Org. users	/ 4 40 44 52 00 59 US /C	MSI	G	-
*= 7±	Device-profiles	DeviceProfile_OTAA			1
R	Gateways	DeviceProfile_ABP			
	Applications				
٣	Multicast-groups				

Note: If you want to join in OTAA mode, you should select "**DeviceProfile_OTAA**" in the "Device-profile" item. If you want to join in ABP mode and CN470 frequency, you should select "**DeviceProfile_ABP_CN470**" in the "Device-profile" item. If you want to join in ABP mode and other frequencies except AS923 and CN470, you should select "**DeviceProfile_ABP**" in the "Device-profile" item. What about AS923 in ABP mode? Sorry! LoRaServer can not support it now.



5.1 Join in OTAA mode

If you select "DeviceProfile_OTAA", it means you want to join LoRaServer in OTAA mode.

€	C LoRaServer	Q. Search organization, application, gateway or device	?	e admin
	Network-servers	Applications / RAK7200 test / Devices / Create		
R	Gateway-profiles			
	Organizations	Device name *		
•	All users	RAK7200_test1 The name may only contain words, numbers and dashes.		
loras	erver 👻	Device description * the first RAK7200 to test		
\$	Org. settings	Device EUI*		
:	Org. users	74 4d 44 52 dd 39 03 7c	MSB	C
±≡	Service-profiles	Device profile * DeviceProfile_OTAA		
	Device-profiles			
R	Gateways	Disable frame-counter validation		
	Applications	Note that disabling the frame-counter validation will compromise security as it enables people to perform replay-attacks.		
2	Multicast-groups		CREAT	E DEVICE

"CREATE DEVICE". Then generate the application key in this page. You can write it by yourself or generate it automatically by clicking the following icon:

∉	DoRaServer					Q Search organization,	application, gateway or device	?	e admin
	Network-servers	Applications / RA	K7200 test / De	Nices / PAK720	0 test1				DELETE
R	Gateway-profiles	Approaction ()			0_10011				-
	Organizations	CONFIGURATION	KEYS (OTAA)	ACTIVATION	LIVE DEVICE DATA	LIVE LORAWAN FRAMES			
*	All users								
loras	erver 👻	Application key (LoRi	aWAN 1.0) *					MSB	C R
\$	Org. settings	For LoRaWAN 1.0 devices, t	his is the only key you need to	set. In case your device sup	ports LoRaWAN 1.1, update the	device-profile first.		L	
•	Org. users							SET	DEVICE-KEYS
≟ ≡	Service-profiles								
	Device-profiles								
R	Gateways								
	Applications								
2	Multicast-groups								
€	DoRaServer					Q Search organization, a	pplication, gateway or device	9	e admin
	Network-servers							r.	
R	Gateway-profiles	Applications / RA	K7200_test / De	evices / RAK720	0_test1				DELETE
	Organizations	CONFIGURATION	KEYS (OTAA)	ACTIVATION	LIVE DEVICE DATA	LIVE LORAWAN FRAMES			
•	All users								
loras	erver 👻	Application key (LoRaWAN 1 b3 7a 45 35 8f 6d ed	1.0)* 58.6c 22.06 38.4f 1c 9	la 42				MSB	C 10
<u>n</u>	Ora, settinas	For LoRaWAN 1.0 devices, th	his is the only key you need to	set. In case your device supp	ports LoRaWAN 1.1, update the	device-profile first.			<u> </u>
+	Org. users							SET D	DEVICE-KEYS
±≡	Service-profiles								
	Device-profiles								
R	Gateways								
	Applications								

"SET DEVICE-KEYS". That's OK! You've complete the configuration on LoRaServer. As you see, the Device EUI which will be set into RAK7200 as "dev_eui" is this one:



€	DRa Server				Q Search organization, application, gateway or device	?	θ	admin
	Network-servers	Applications / F	AK7200 toot				DEI	ETE
R	Gateway-profiles	Applications / F	AR7200_lest					
E	Organizations	DEVICES	APPLICATION CONFIGURATION	INTEGRATIONS				
•	All users						+ CRI	ATE
lora	server 👻							
4	Org. settings	Last seen	Device name	Device EUI	Link margin	Battery		
•	Org. users	n/a	RAK7200_test1	744d4452dd39037c	n/a	n/a		
<u>.</u> =	Service-profiles				Rows per page: 10▼	1-1 of 1	<	>
크는	Device-profiles							
R	Gateways							
	Applications							
2	Multicast-groups							

The Application Key which will be set into RAK7200 as "app_key" is this one:

€	DoRaServer	Q. Search organization, application, gateway or device	?	e	admin
	Network-servers Gateway-profiles	Applications / RAK7200_test / Devices / RAK7200_test1			DELETE
	Organizations	CONFIGURATION KEYS (OTAA) ACTIVATION LIVE DEVICE DATA LIVE LORAWAN FRAMES			
*	All users				
loras	erver 👻	Addication (ev.) (2000) 1 (0.1) b3 7a 45 35 8f 6d ed 58 6c 22 06 38 4f 1c 9a 42	MSB	C	8
\$	Org. settings	For LoRaWAN 1.0 devices, this is the only key you need to set. In case your device supports LoRaWAN 1.1, update the device-profile first.			
<u>+</u>	Org. users		SET	DEVICE	-KEYS
≟ ≡	Service-profiles				
뉁	Device-profiles				
\bigcirc	Gateways				
	Applications				
2	Multicast-groups				

The Application EUI which will be set into RAK7200 as "app_eui" is useless for LoRaServer, and you can set it to any value with a correct format, for example: 7083D57ED001C1CF.

Next, let's configure RAK7200 by using AT command.

Connect your RAK7200 with a PC, power on and open RAK Serial Port Tool.





■ RAK 端口: COM5 → 波特率: 115200 → 关键	8
接收窗口 清空接收	_
	^

\$76G_B version:2.0.0.0.0	

DMP is disabled	
GPS Init OK	
Selected LoPaWAN 1.0.2 Passion: ALIO15	
Deserved Lokawald 1.0.2 Region: A0915	
Parameter not found.	
	~
发送窗口(默认发送回车) 发送	

The default LoRa work mode is LoRaWAN 1.0.2.

Set the LoRa join mode to OTAA:





v2.0.0.0.0

Set the LoRa class to Class A:



Set the frequency/region to AU915:





Set "dev_eui":

金收窗口					at state	ult r
>>at+set conf	ig=lora:	dev eui:74	4d4452dd3	9037c	<u><u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u></u></u>	-DX
OK	ig-iora.	dev_cull 4		50570		
党送窗口(默认发	送回车)					

Set "app_eui":





Set "app_key":

	Millio	COIVIS	#X1	140.	113200	清空	大肉
>>at+set_confi OK	g=lora:a	app_key:l	o37a453	358f6d	led586c	220638-	<u>1984</u> 4f1c9a42
发送窗口(默认发)	送回车)						
at +set_config=lo 1c9a42	ra:app_	key:b37a	45358f6	ded58	36c2206	384f	发送

Start to join:





Join succeessfully!

You can see the data which RAK7200 sends on LoRaServer page:

€	C LoRaServer					Q Search	organization, applicat	ion, gateway c	r device	? \varTheta admin
	Network-servers	Applications / F	AK7200 toot /	Dovince / PAK72	100 toot1					
R	Gateway-profiles	Applications / h	IAR/200_lest /	Devices / RAR72	loo_test i					DELETE
▦	Organizations	CONFIGURATION	KEYS (OTAA)	ACTIVATION	LIVE DEVICE DATA	LIVE LORAWAN FRAMES				
÷.	All users						HELP	PAUSE		CLEAR
loras	server +		5-27-40 DM	UncerformedDateUn	010-020-					
ф	Org. settings	UPLINK	5.27.40 PM		01908204					•
•	Org. users	UPLINK	5:25:46 PM	UnconfirmedDataUp	U19082Ua					~
<u>.</u> ≡	Service-profiles									
The second seco	Device-profiles									
R	Gateways									
	Applications									
2	Multicast-groups									

The data format is LPP.

OK, that's all about "Join in OTAA mode" with LoRaServer.

5.2 Join in ABP mode

If you select "DeviceProfile_ABP" or "DeviceProfile_ABP_CN470", it means you want to join LoRaServer in OTAA mode.

€	DeRa Server	Q Search organization, application, gateway or device	? 🔒 admin
• •	Network-servers Gateway-profiles Organizations	CONFIGURATION KEYS (0TAA) ACTIVATION LIVE DEVICE DATA LIVE LORAWAN FRAMES	DELETE
loras	All users	Cevice name * RAK/2200_test1	
* •	Org. settings Org. users	The name may only contain words, numbers and deahes. Device description * the first RAK7200 to test	
	Service-profiles	Device-profile_ABP PerviceProfile_ABP	*
® ::	Gateways	Disable frame counter validation Note that disabling the hame-counter validation will compromise security as it enables people to perform replay-attacks.	
2	Applications Multicast-groups		UPDATE DEVICE

Then you can see that there are some parameters for ABP in the "ACTIVATION" item:



RAK	RAKwireless Technology Co., Ltd.

€	DoRaServer	Q Search organization, application, gateway or device	0	\rm e admin
■	Network-servers Gateway-profiles Organizations All users	Applications / RAK7200_test / Devices / RAK7200_test1 configuration KEYS (0TAA) ACTIVATION LIVE DEVICE DATA LIVE LORAWAN FRAMES		j delete
loras	erver 👻	Device address * 01 9c 82 0a	MSE	C
¢ •	Org. settings Org. users	Network session key (LoRaMAN 1.0) +		0
<u>∔</u> ≡	Service-profiles	- Administration (administration of the second s		o
	Device-profiles	Uplink frame-counter * 26		
R	Gateways			
	Applications	Lowfunk frame-counter (network) * 1		
ψ	Multicast-groups		RE)ACTIVAT	E DEVICE

Next, let's use these parameters to set RAK7200 by using AT command.

Set LoRa join mode to ABP:



Set LoRa class to Class A:





Set the frequency/region to AU915:



Set "dev_addr":







Set "nwks_key":



Set "apps_key":





Start to join:



Great! Join and send data successfully!

You can see the data which is just sent from RAK7200 on LoRaServer page:



€		er					Q Search o	organization, appli	ication, gateway c	or device	?	e a	dmin
	Network-servers		Applications / F	AK7200 test /	Devices / RAK72	00 test1						DELE	TE
\bigcirc	Gateway-profiles		Applications / I	unit/200_tcot/	Derioes / Itali/2								
	Organizations		CONFIGURATION	KEYS (OTAA)	ACTIVATION	LIVE DEVICE DATA	LIVE LORAWAN FRAMES						
<u>.</u>	All users							⑦ HELP	PAUSE			CLE	AR
loras	erver	*		5-59-02 PM	UnconfirmedDataLin	019-8209							
\$	Org. settings		UDUNK	5.59.12 DM	UnconfirmedDataUp	010+920+							_
<u>+</u>	Org. users		OPLINK	3.36.13 PM	oncommeduataop	01908208							
≛≡	Service-profiles												
1 1 1	Device-profiles												
R	Gateways												
	Applications												
2	Multicast-groups												

That's all about "Join in ABP mode" with LoRAServer.



6. Revision History

Revision	Description	Date
1.0	Initial version	2019-07-16

7. Document Summary

Prepared by	Checked by	Approved by
Fomi	Penn&Fomi	



About RAKwireless:

RAKwireless is the pioneer in providing innovative and diverse cellular and LoRa connectivity solutions for IoT edge devices. It's easy and modular design can be used in different IoT applications and accelerate time-to-market.

For more information, please visit RAKwireless website at www.rakwireless.com.