



RAK

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Technology Co., Ltd.

WisNode-LoRa-Arduino Library Use Guide V1.1

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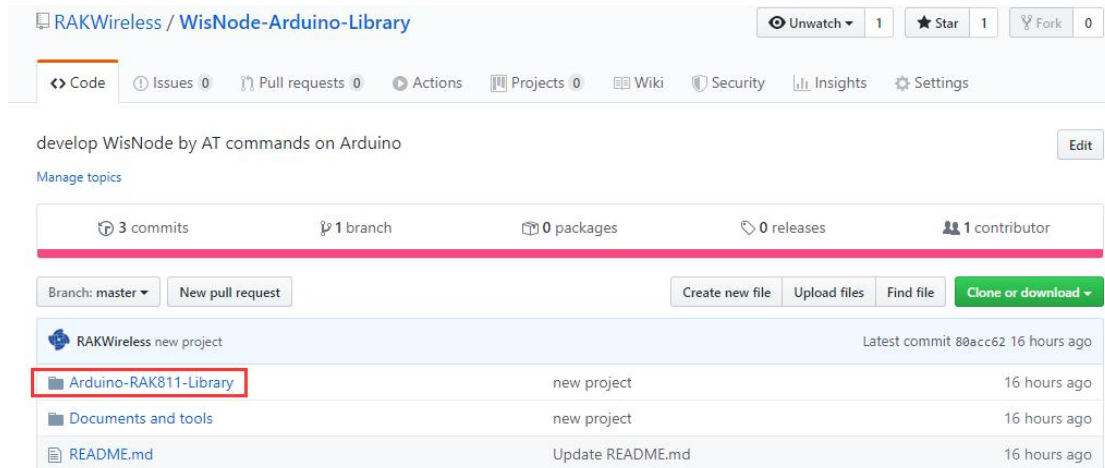
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1. RAK811 Arduino Library Use Guide

(1) Download

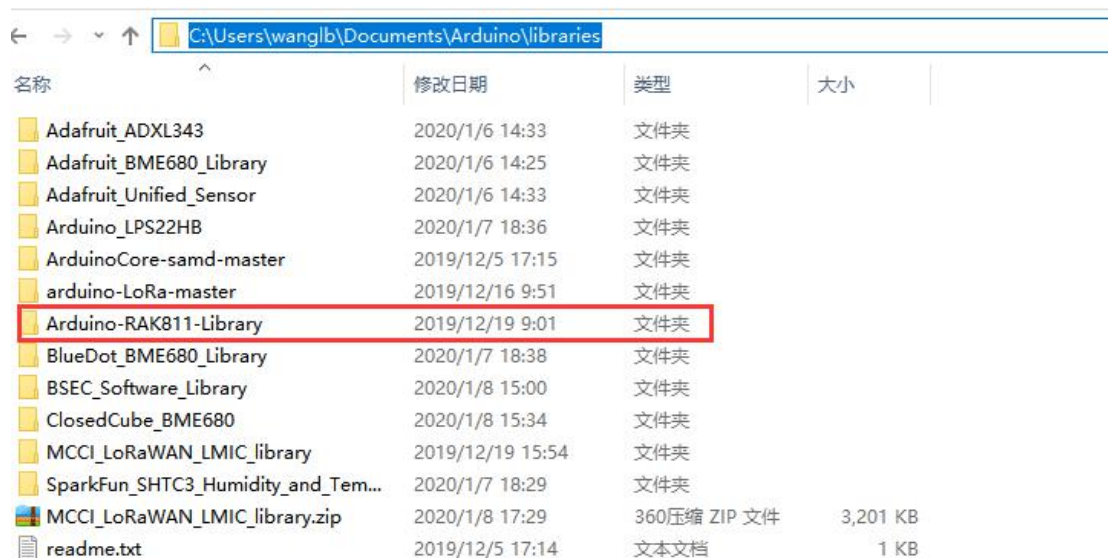
We upload the RAK811 Arduino library code to the official github. You can find this library at github: <https://github.com/RAKWireless/WisNode-Arduino-Library>



Download the library folder “[Arduino-RAK811-Library](#)”.

(2) Add to Arduino IDE

① Copy the “[Arduino-RAK811-Library](#)” folder to the Arduino library folder.



② And then open the Arduino IDE, you can see the RAK811 sample code in the Arduino example.



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JoinNetworkOTAA | Arduino 1.8.10

File Edit Sketch Tools Help

The screenshot shows the Arduino IDE interface. The 'File' menu is open, and the 'Examples' submenu is displayed. The 'Arduino-RAK811-Library' option is highlighted. The background code shows the setup of a LoRaWAN module with various pins and serial communication.

```
14 #define JOIN_NODE = RAK811
15 String NwkSKey = "69AF
16 String AppSKey = "8419
17 String DevAddr = "2601
18 #endif
19 #define TXpin 11 //
20 #define RXpin 10
21 #define ATSerial Serial
22 SoftwareSerial DebugSe
23 char buffer[] = "72616B
24
25 bool InitLoRaWAN(void)
26 RAK811 RAKLoRa(ATSerial
27
28
29 void setup() {
30   DebugSerial.begin(11
31   while(DebugSerial.re
32   while(!DebugSerial);
33   DebugSerial.println(
34
35   ATSerial.begin(11520
36   while(ATSerial.avail
37   {
38     ATSerial.read();
39   }
40
41   DebugSerial.println(
42   delay(200);
43
44   DebugSerial.println(
45   if(!RAKLoRa.rk_setSe
46   {
47     DebugSerial.printl
```

(3)Code introduction

On the library contains the available functions, the user can refer to the RAK811.h file, which has a detailed note on the use of each function.



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```
1  /*
2  * A library for controlling RAK811 LoRa radio.
3  *
4  * @Author Leopold.wang
5  * @Date 14/01/2020
6  */
7
8
9
10 #ifndef RAK811_h
11 #define RAK811_h
12 #define LoRaWAN 0
13 #define LoRaP2P 1
14 #define OTAA 0
15 #define ABP 1
16
17 #include "Arduino.h"
18
19 // #define DEBUG_MODE
20
21 class RAK811
22 {
23 public:
24
25 /*
26 * A simplified constructor taking only a Stream ((Software/Hardware)Serial) object.
27 * The serial port should already be initialised when initialising this library.
28 */
29 RAK811(Stream& serial,Stream& serial1);
30
31 /*
32 * Gets the firmware version number of the module.
33 * Only applies to the firmware that the module programmed for the RAK811 AT command.
34 * AT commands refer to: https://downloads.rakwireless.com/en/LoRa/RAK811/Application\_Notes/Get\_Start\_with\_RAK811\_WisNode-LoRa.pdf
35 */
36 String rk_getVersion(void);
37
38 /*
39 * Get the frequency band of the module.
40 * This feature request to receive at least 800 bytes buffer size.
41 */
42 String rk_getLoRaStatus(void);
43
44 /*
45 * Let the module enter the ultra low power sleep mode.
46 * When the module is in sleep mode, the host can send any character to wake it up.
47 * mode = 0->wake up, 1-> sleep
48 * When the module is awakened, the event response will automatically return through the serial information.
49 */
50 void rk_sleep(int mode);
51
52 /*
53 * Reset the module or reset the LoRaWAN or LoRaP2P protocol stack.
54 * mode = 0: Reset and restart module.
55 * mode = 1: Reset LoRaWAN or LoRaP2P stack and Module will reload LoRa configuration from EEPROM.
56 */
57 void rk_reset(int mode);
58 }
```

Note:Before compile by Arduino IDE,user should better configure Serial RX and TX buffer size.This must be configured manually in Arduino installation directory. The following are the minimum recommended sizes.

名称	修改日期	类型	大小
abi.cpp	2017/12/11 16:14	C++ Source File	2 KB
Arduino.h	2019/5/16 20:52	H 文件	8 KB
binary.h	2019/5/16 20:52	H 文件	11 KB
CDC.cpp	2019/5/16 20:52	C++ Source File	9 KB
Client.h	2019/5/16 20:52	H 文件	2 KB
HardwareSerial.cpp	2019/5/16 20:52	C++ Source File	9 KB
HardwareSerial.h	2020/1/16 14:48	H 文件	6 KB
HardwareSerial_private.h	2019/5/16 20:52	H 文件	5 KB
HardwareSerial0.cpp	2019/5/16 20:52	C++ Source File	3 KB
HardwareSerial1.cpp	2019/5/16 20:52	C++ Source File	3 KB
HardwareSerial2.cpp	2019/5/16 20:52	C++ Source File	2 KB
HardwareSerial3.cpp	2019/5/16 20:52	C++ Source File	2 KB
hooks.c	2017/11/27 19:21	C 文件	2 KB
IPAddress.cpp	2019/5/16 20:52	C++ Source File	3 KB
IPAddress.h	2019/5/16 20:52	H 文件	3 KB
main.cpp	2019/5/16 20:52	C++ Source File	2 KB
new.cpp	2017/12/11 16:14	C++ Source File	2 KB
new.h	2017/12/11 16:14	H 文件	1 KB
PluggableUSB.cpp	2019/5/16 20:52	C++ Source File	3 KB
PluggableUSB.h	2019/5/16 20:52	H 文件	3 KB
Print.cpp	2019/5/16 20:52	C++ Source File	6 KB
Print.h	2019/5/16 20:52	H 文件	3 KB
Printable.h	2019/5/16 20:52	H 文件	2 KB
Server.h	2019/5/16 20:52	H 文件	1 KB
Stream.cpp	2019/5/16 20:52	C++ Source File	9 KB
Stream.h	2019/5/16 20:52	H 文件	6 KB
Tone.cpp	2019/5/16 20:52	C++ Source File	15 KB
Udp.h	2019/5/16 20:52	H 文件	5 KB
USBAPI.h	2019/5/16 20:52	H 文件	7 KB
USBCore.cpp	2019/5/16 20:52	C++ Source File	20 KB
USBCore.h	2019/5/16 20:52	H 文件	9 KB
USBDesch	2019/5/16 20:52	H 文件	2 KB
WCharacter.h	2019/5/16 20:52	H 文件	5 KB
WInterrupts.c	2019/5/16 20:52	C 文件	10 KB
wiring.c	2018/10/29 15:58	C 文件	12 KB
wiring_analog.c	2017/12/18 15:53	C 文件	8 KB
wiring_digital.c	2019/5/16 20:52	C 文件	5 KB
wiring_pulse.c	2017/12/18 15:53	C 文件	2 KB



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```
C:\Program Files (x86)\Arduino\hardware\arduino\avr\cores\arduino\HardwareSerial.h - Notepad++ [Administrator]
文件(F) 编辑(E) 搜索(S) 视图(V) 编码(N) 语言(L) 设置(T) 工具(O) 宏(M) 运行(R) 插件(P) 窗口(W) ?

HardwareSerial.h
28 #include "Stream.h"
29
30 // Define constants and variables for buffering incoming serial data. We're
31 // using a ring buffer (I think), in which head is the index of the location
32 // to which to write the next incoming character and tail is the index of the
33 // location from which to read.
34 // NOTE: a "power of 2" buffer size is recommended to dramatically
35 // optimize all the modulo operations for ring buffers.
36 // WARNING: When buffer sizes are increased to > 256, the buffer index
37 // variables are automatically increased in size, but the extra
38 // atomicity guards needed for that are not implemented. This will
39 // often work, but occasionally a race condition can occur that makes
40 // Serial behave erratically. See https://github.com/arduino/Arduino/issues/2405
41
42 #if !defined(SERIAL_TX_BUFFER_SIZE)
43 #if ((RAMEND - RAMSTART) < 1023)
44 #define SERIAL_TX_BUFFER_SIZE 16
45 #else
46 #define SERIAL_TX_BUFFER_SIZE 70
47 #endif
48 #endif
49 #if !defined(SERIAL_RX_BUFFER_SIZE)
50 #if ((RAMEND - RAMSTART) < 1023)
51 #define SERIAL_RX_BUFFER_SIZE 16
52 #else
53 #define SERIAL_RX_BUFFER_SIZE 110
54 #endif
55 #endif
56 #if (SERIAL_TX_BUFFER_SIZE > 256)
57 typedef uint16_t tx_buffer_index_t;
58 #else
59 typedef uint8_t tx_buffer_index_t;
60 #endif
61 #if (SERIAL_RX_BUFFER_SIZE > 256)
62 typedef uint16_t rx_buffer_index_t;
63 #else
64 typedef uint8_t rx_buffer_index_t;
65 #endif
```

If the RAM size of Arduino board is enough big, these two buffer size need config better bigger.

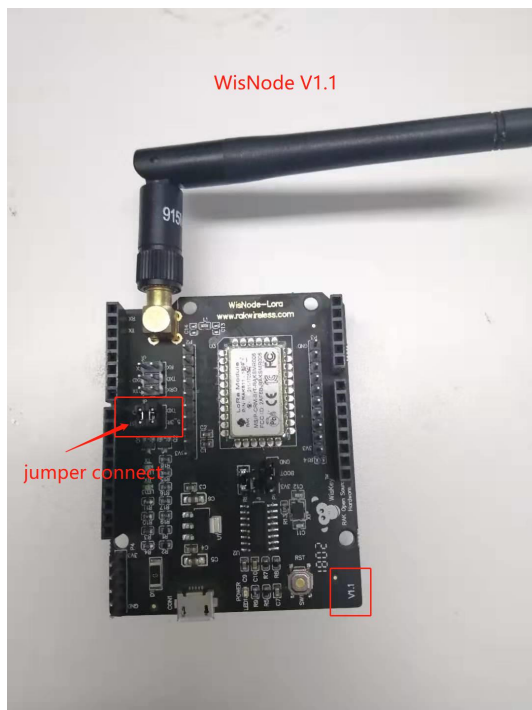
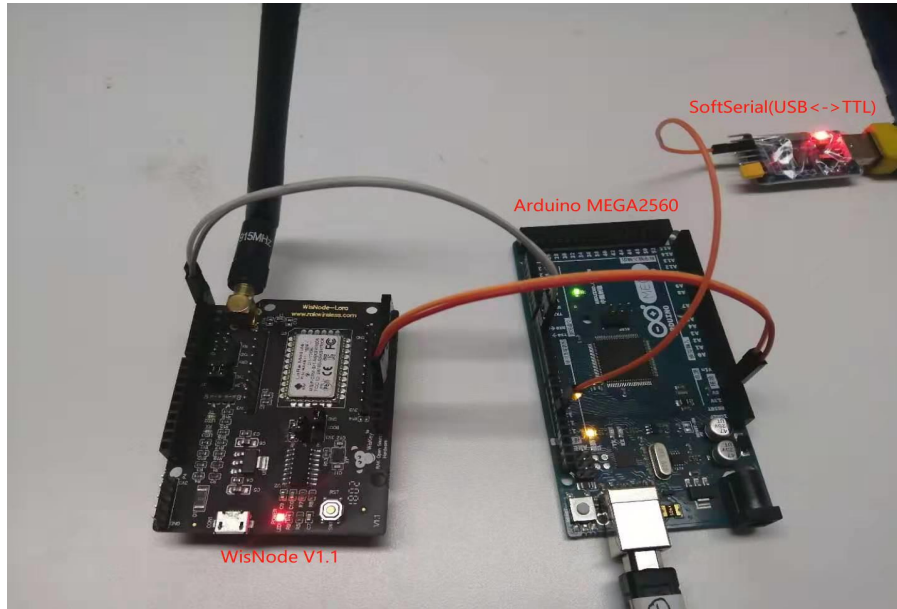


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2. Hardware connect

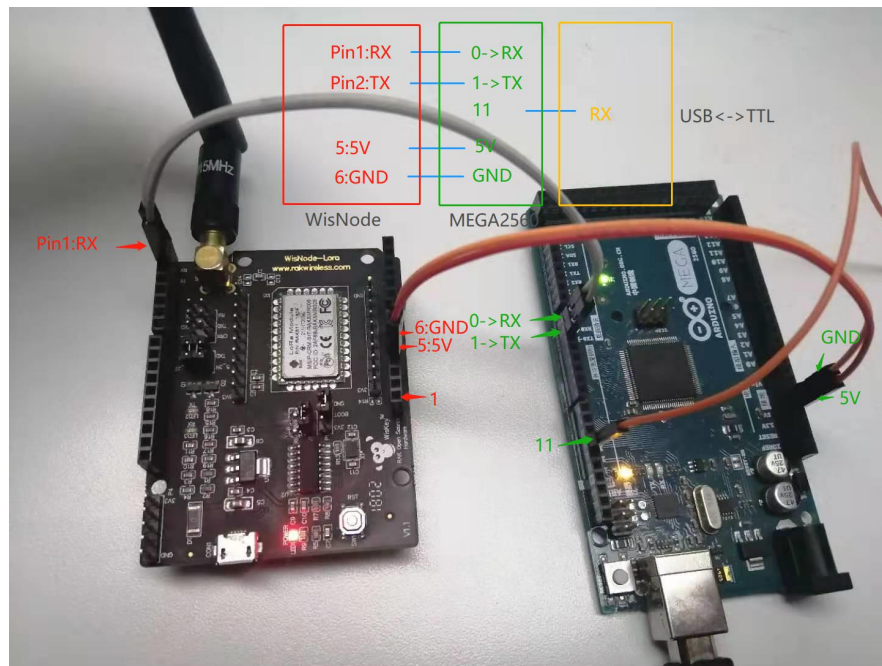
This document will use **Arduino MEGA2560 + WisNode-LoRa** as an example.



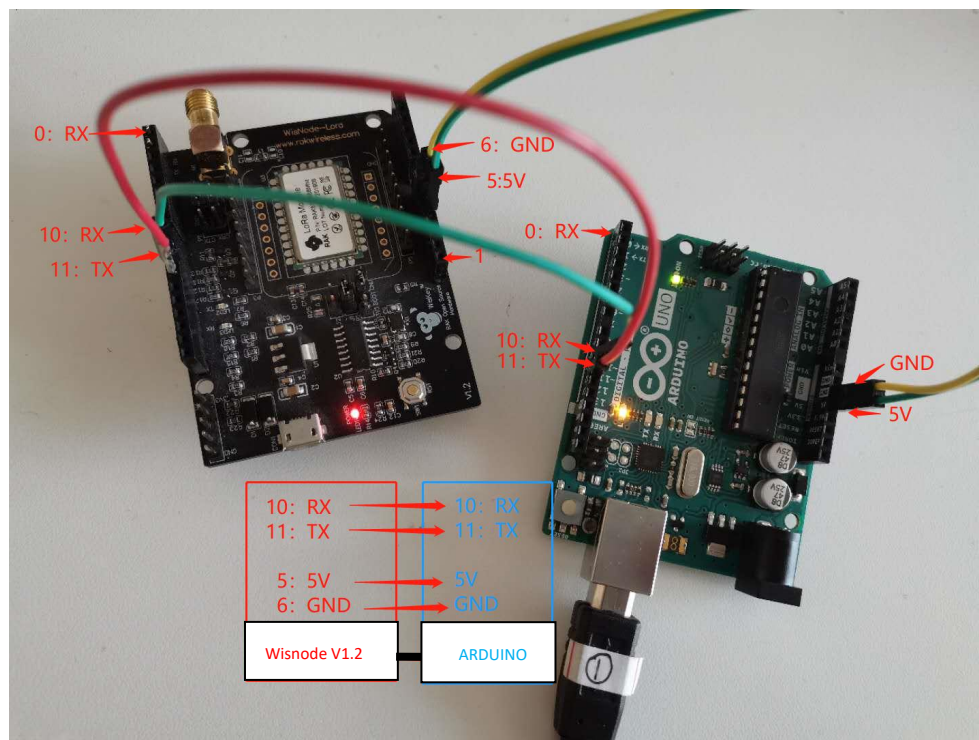


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Wisnode V1.1 connection mode



Wisnode V1.2 connection mode

Note: The five wires are connected in the same way with WisNode V1.1 and WisNode V1.2.



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3. Flash firmware

①Flash firmware for RAK811 refer to :[Get Start with RAK811 WisNode-LoRa.pdf](#)

RAK811-Firmware:<https://github.com/RAKWireless/WisNode-Arduino-Library/tree/master/Documents%20and%20tools/RAK811-Firmware>

②Complie and Flash app demo [JoinNetworkOTAA.ino](#) through Arduino IDE.

JoinNetworkOTAA | Arduino 1.8.10

File Edit Sketch Tools Help

Auto Format Ctrl+T

Archive Sketch

Fix Encoding & Reload

Manage Libraries... Ctrl+Shift+I

Serial Monitor Ctrl+Shift+M

Serial Plotter Ctrl+Shift+L

WiFi101 / WIFININA Firmware Updater

Board: "Arduino/Genuino Mega or Mega 2560" >

Processor: "ATmega2560 (Mega 2560)" >

Port: "COM31 (Arduino/Genuino Mega or Mega 2560)" >

Get Board Info

Programmer: "AVRISP mkII" >

Burn Bootloader

JoinNetworkOTAA

13 String AppKey = "000F1023555F9FF74D1A55202EDF2B1";

14 #else JOIN_MODE == ABP

15 String AppKey = "49AF20A2A3C01B243940A30C9175D43";

16 String AppKey = "84186913ACD008C28E2475D70F3220";

17 String DevAddr = "260125D7";

18 #endif

19 #define TXpin 11 // Set the virtual serial port pins

20 #define RXpin 10

21 #define ATSerial Serial

22 SoftwareSerial DebugSerial(RXpin, TXpin); // Declare a virtual serial port

23 char buffer[] = "72616B76972656C657373";

24

25 bool InitLoRaWAN(void);

26 RAK811 LoRaWAN(ATSerial, DebugSerial);

27

28

29 void setup() {

30 DebugSerial.begin(115200);

31 while (DebugSerial.read() >= 0) {}

32 while (!DebugSerial);

33 DebugSerial.println("StartUP");

34

35 ATSerial.begin(115200); // Note: Please manually set the baud rate of the WisNode device to 115200.

36 while (ATSerial.available())

37 {

38 ATSerial.read();

39

40

41 DebugSerial.println(RAKLoRa.ch_getVersion()); //get RAK811 firmware version

42 delay(200);

43 DebugSerial.println("Start init RAK811 parameters...");

44 if (RAKLoRa.ch_getSendInterval(0,0)) //close auto join and send to LoRaWAN

45 {

46 DebugSerial.println("Close auto join and send to LoRaWAN failed, please reset module.");

47 while (1);

48

49

50 if (!InitLoRaWAN()) //init LoRaWAN

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4. Test LoRa Node with LoRaWAN

Serial console log:

```
[18:03:55.444]收←StartUP
[18:03:57.647]收←att+version
Firmware Version: RUI v3.0.0.13.H
OK
[18:03:57.851]收←Start init RAK811 parameters...
[18:04:02.263]收←Current work region: EU868
[18:04:11.079]收←RAK811 init OK!
Start joining LoRaWAN
[18:04:22.516]收←[LoRa].Join Success
OK
[18:04:24.722]收←Start send data...
[18:04:30.793]收←[LoRa]: RUI_MCPS_UNCONFIRMED send success
OK
[18:04:45.202]收←Start send data...
[18:04:50.929]收←[LoRa]: RUI_MCPS_UNCONFIRMED send success
OK
att+recv=0,-33,8,0
[18:05:11.413]收←[LoRa]: RUI_MCPS_UNCONFIRMED send success
OK
[18:05:25.825]收←Start send data...
[18:05:31.896]收←[LoRa]: RUI_MCPS_UNCONFIRMED send success
OK
[18:05:46.306]收←Start send data...
[18:05:52.378]收←[LoRa]: RUI_MCPS_UNCONFIRMED send success
OK
[18:06:06.787]收←Start send data...
[18:06:12.859]收←[LoRa]: RUI_MCPS_UNCONFIRMED send success
OK
```

SoftSerial port

```
att+version
[18:03:57.855]收←att+set_config=lorawan:send_interval:0:0
[18:04:00.058]收←att+set_config=lorawan:join_mode:0
[18:04:02.263]收←att+set_config=lorawan:region:EU868
[18:04:04.465]收←att+set_config=lorawan:dev_eui:8680000000000001
[18:04:06.673]收←att+set_config=lorawan:app_eui:70B3D57ED00285A7
[18:04:08.876]收←att+set_config=lorawan:app_key:D00FB1023885F8FF74D3A55202EDF2B1
[18:04:11.083]收←att+join
[18:04:22.519]收←att+set_config=lorawan:confirm:0
[18:04:24.724]收←att+send=lorawan:1:72616B776972656C657373
[18:04:30.797]收←att+set_config=device:sleep:1
[18:04:43.003]收←att+set_config=device:sleep:0
[18:04:45.205]收←att+send=lorawan:1:72616B776972656C657373
[18:04:50.935]收←att+set_config=device:sleep:1
[18:05:03.141]收←att+set_config=device:sleep:0
[18:05:05.346]收←att+send=lorawan:1:72616B776972656C657373
[18:05:11.419]收←att+set_config=device:sleep:1
[18:05:23.624]收←att+set_config=device:sleep:0
[18:05:25.824]收←att+send=lorawan:1:72616B776972656C657373
[18:05:31.901]收←att+set_config=device:sleep:1
[18:05:44.102]收←att+set_config=device:sleep:0
[18:05:46.308]收←att+send=lorawan:1:72616B776972656C657373
[18:05:52.381]收←att+set_config=device:sleep:1
```

Arduino USB port

TTN log:

APPLICATION DATA						pause	clear
Filters							
uplink downlink activation ack error							
time	counter	port					
18:05:48	0	1	payload: 72 61 6B 77 69 72 65 6C 65 73 73				
18:05:48	4	1	payload: 72 61 6B 77 69 72 65 6C 65 73 73				
18:05:28	0	1					
18:05:27	3	1	payload: 72 61 6B 77 69 72 65 6C 65 73 73				
18:05:12	0	1					
18:05:07	2	1	payload: 72 61 6B 77 69 72 65 6C 65 73 73				
18:04:48	0	1					
18:04:47	1	1	payload: 72 61 6B 77 69 72 65 6C 65 73 73				
18:04:27	0	1					
18:04:26	0	1	payload: 72 61 6B 77 69 72 65 6C 65 73 73				
18:04:13			dev addr: 26 01 21 3D app eui: 70 B3D5 7E D002 85 A7 dev eui: 86 80 00 00 00 00 00 01				



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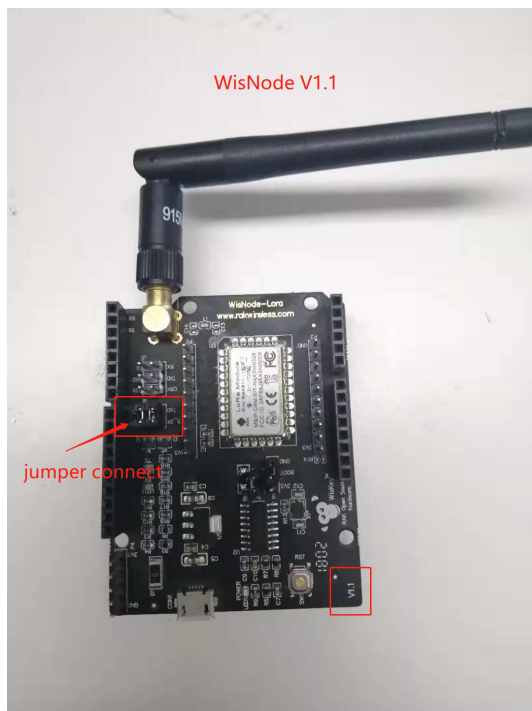
5. Quickly connection boards

Note: This section serves as a reference only.

(1) WisNode + MEGA2560 can directly connect as above picture, but WisNode must be done something as following.



WisNode + MEGA2560 directly connect



WisNode V1.1

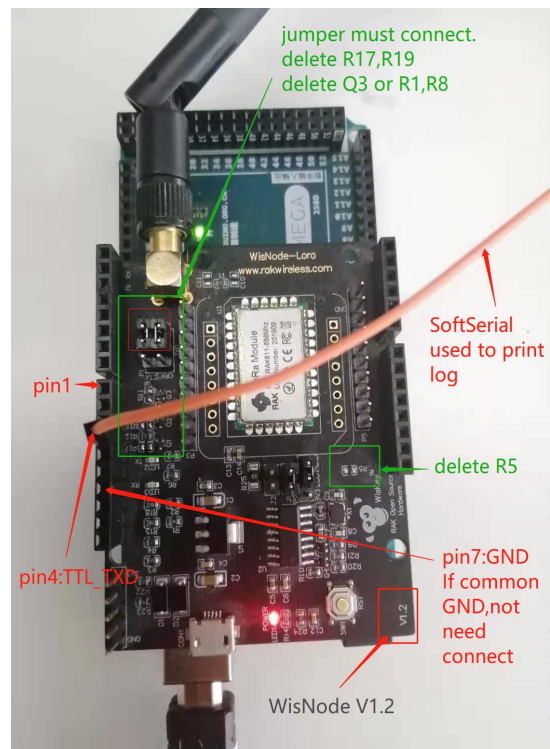
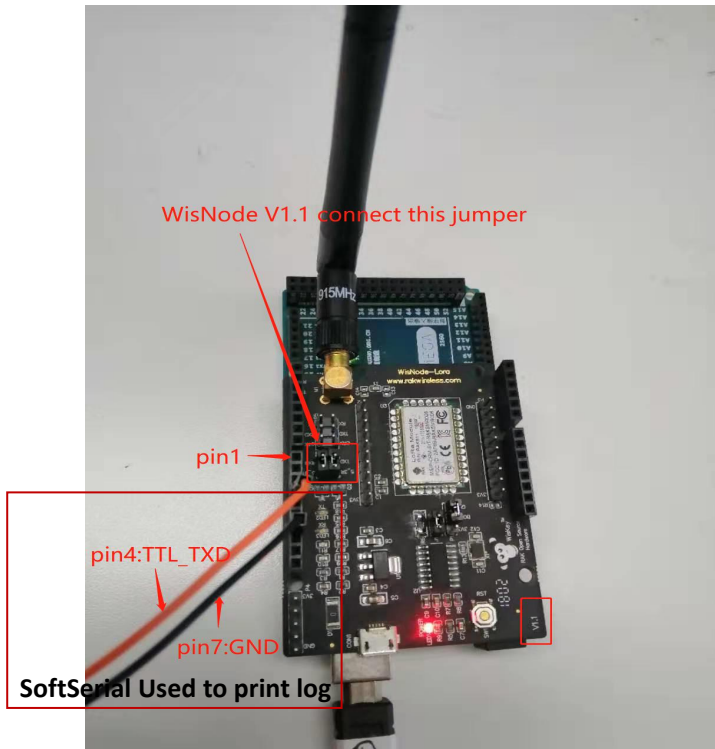


WisNode V1.2

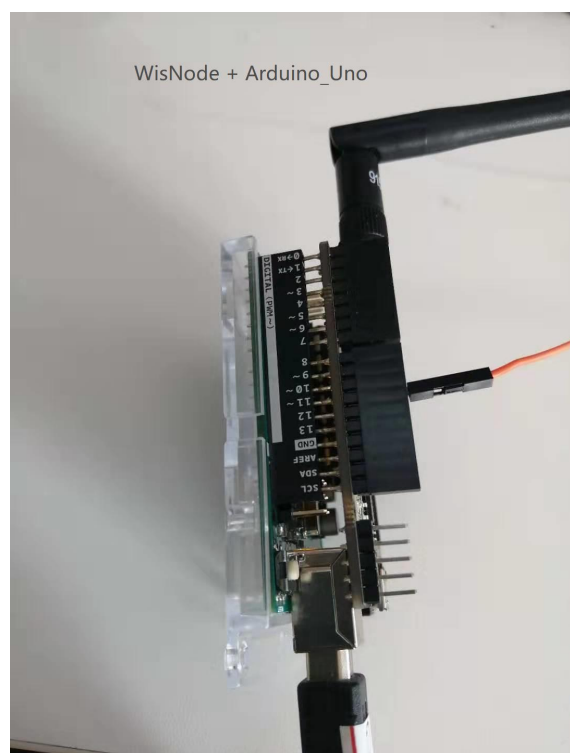
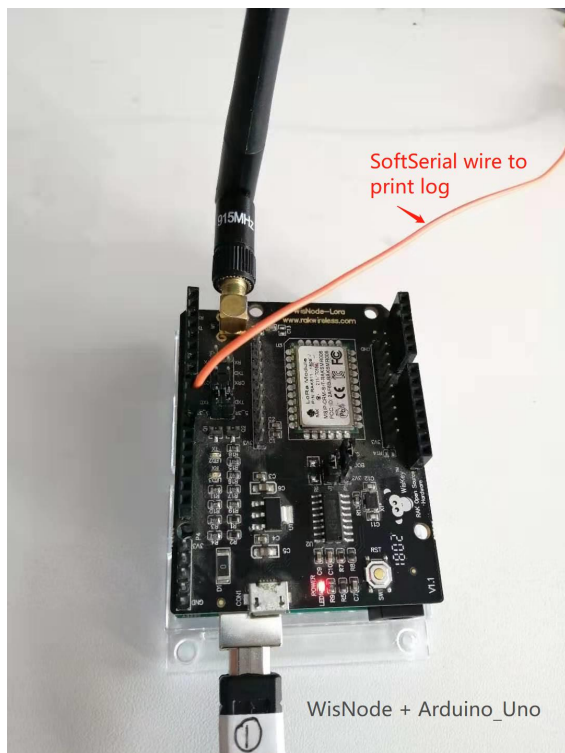


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(2) WisNode + Arduino_Uno : WisNode must be done something Same as above.





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If you have any questions, welcome to our forum to ask your question:

<http://support.rakwireless.com/>.

You can also send your question to this email: ken.yu@rakwireless.com