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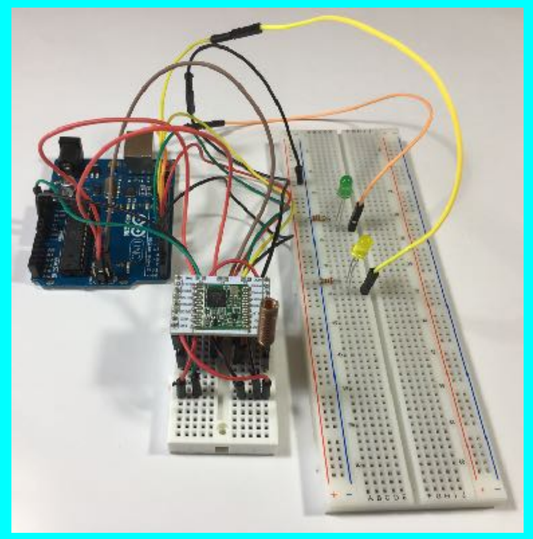
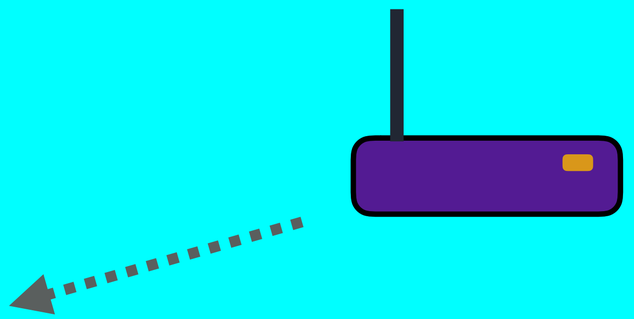
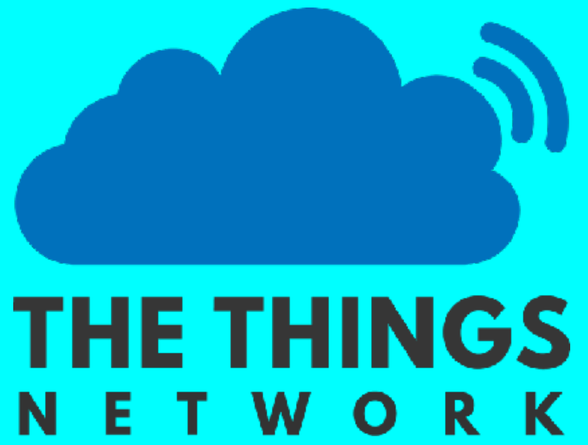
LORA / LORAWAN TUTORIAL 25

Downlink Demonstration With The Things Network







v1.0.0

INTRO

- In this tutorial I will demonstrate how downlink messages are send from The Things Network to my self build LoRa development board using the MCCI Arduino LMIC library.

DEMONSTRATION PREPARATION

- I assume you have watched Tutorial 22.
  In that video I created the ttn-otaa-mydemo sketch and demonstrated the OTAA activation method.

- For security reasons, in the TTN console, the registered device "youtube_demo_device" the DevEUI and AppKey are modified.

- To keep these videos as short as possible, in this Tutorial I already have re-saved the ttn-otaa-mydemo sketch and called it ttn-otaa-downlink and changed the DevEUI and AppKey accordingly.

- Make sure a LoRa gateway is in your area and your LoRa end device can send messages to that gateway.

MODIFY SKETCH

- Open the Arduino IDE and modify the ttn-otaa-downlink sketch.
  Add the codes marked:

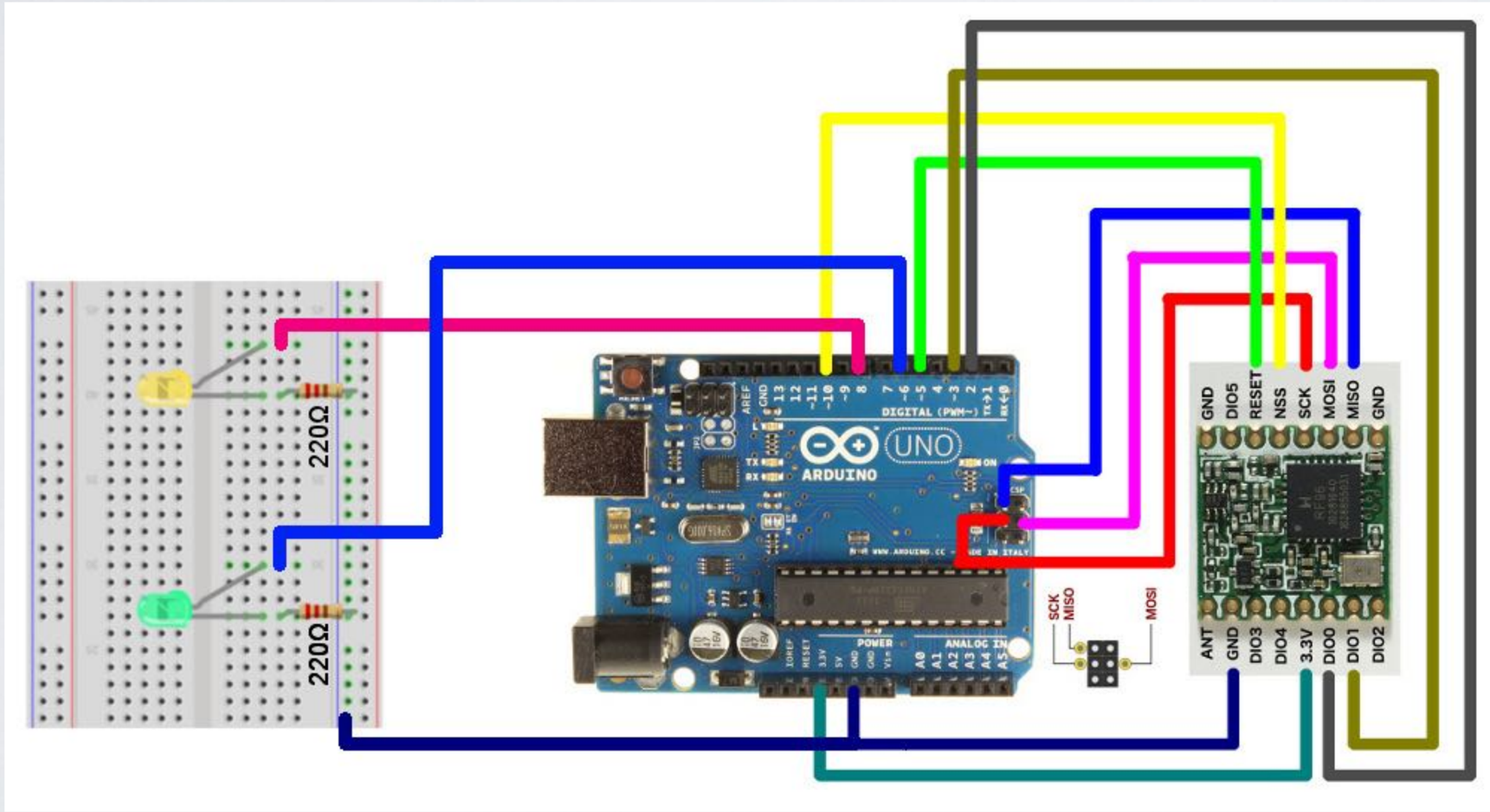
```
//------ Added -----------------
Code
//------------------------------
```

  in https://www.mobilefish.com/download/lora/ttn-otaa-downlink.ino.txt

- Please note this sketch still transmits the message "Hello, world!" every 60 seconds.

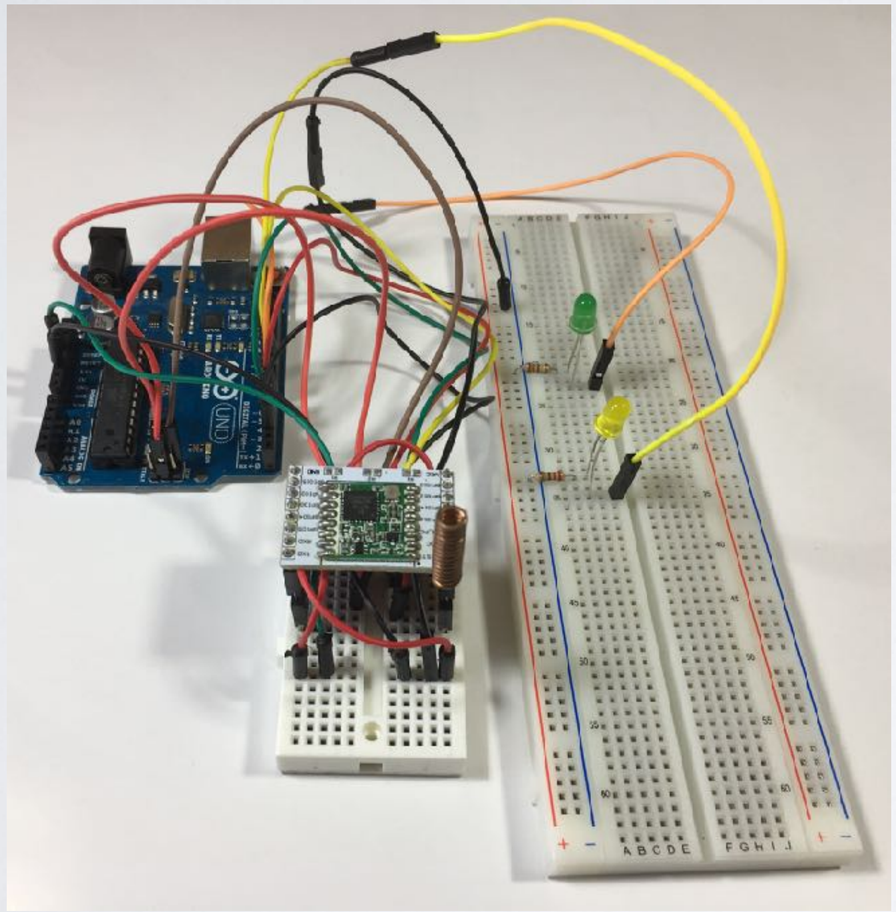
MODIFY HARDWARE SETUP

- To detect the received downlink messages, two leds, green and yellow, including 220Ω resistors are connected to the Arduino Uno.



MODIFY HARDWARE SETUP

- https://www.mobilefish.com/images/developer/lorawan_rfm95_arduino_leds.jpg
  https://www.mobilefish.com/images/developer/lorawan_rfm95_arduino_leds_overview.jpg



DEMONSTRATION

- Connect the self build LoRa development board to your computer using the USB cable.

- In the Arduino IDE, select menu Tools | Board and select: Arduino/Genuino Uno
  In the Arduino IDE, select menu Tools | Port and select: *your_port*

- Compile and upload the ttn-otaa-downlink sketch.
  You should not see any errors.

- In the Arduino IDE, select menu Tools | Serial Monitor
  Select baud rate: 9600

DEMONSTRATION

- Goto The Things Network console:
  - Select the app: youtube_demo_app
  - Select the registered device: youtube_demo_device
  - Select reset frame counters. Do this each time your end device is powered up.

- In the Device Overview screen, top right corner, select Data.

- The message "Hello, world!" (in hex: 48 65 6c 6c 6f 2c 20 77 6f 72 6c 64 21) is received by a gateway and send to the network server and displayed in the The Things Network console.

- Go back to the Device Overview screen and scroll down to the Downlink section.

DEMONSTRATION

- Send the following hex values from TTN console to the end device.
  Depending on the hex value send, the yellow and green leds can be On or Off.

Hex value	Yellow Led	Green Led
00	Off	Off
01	On	Off
02	Off	On
03	On	On

TTN FAIR ACCESS POLICY

- The TTN Fair Access Policy allows at most 10 downlink messages per day, including the ACKs for confirmed uplinks.

- More information about TTN Fair Access Policy can be found at: https://www.thethingsnetwork.org/docs/lorawan/duty-cycle.html