Weightless Starter Kit
Arduino Guide

Revision History

Revision Code	Date	Description	Comments
1.0.0	Aug 25 2017	Initial Draft	
1.0.5	Sep 5 2017	Firmware 1.0.5	
1.0.7	Nov 11 2017	Firmware 1.0.7	
1.0.8	Jan 8 2018	Firmware 1.0.8	

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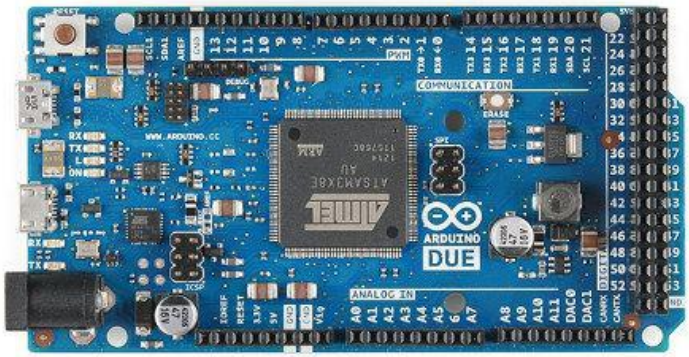
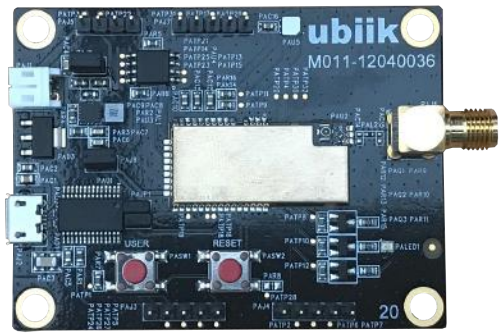
Arduino Setup

Devices

1. Arduino Due (For Multiple Serial Communication with Sensors)



2. End Device EVB



3. Base Station

Sensor	Sensor Model	Communication Method	Baud Rate	Tutorial / Datasheet Link
PM2.5	GP2Y1051AU0F	UART	2400	Tutorial Datasheet
Temperature Humidity	DHT22	PWM	2400	Tutorial Datasheet
GPS	U-blox NEO-7M	UART	9600	Datasheet
LED	N/A	PWM	N/A	Tutorial

Other components:

1. Breadboard for plugging the sensors in places
2. Logical Level Converter for transforming 5v power to 3.3v power (Tutorial)
3. Dupont Wires for connecting Arduino-Breadboard-Sensors

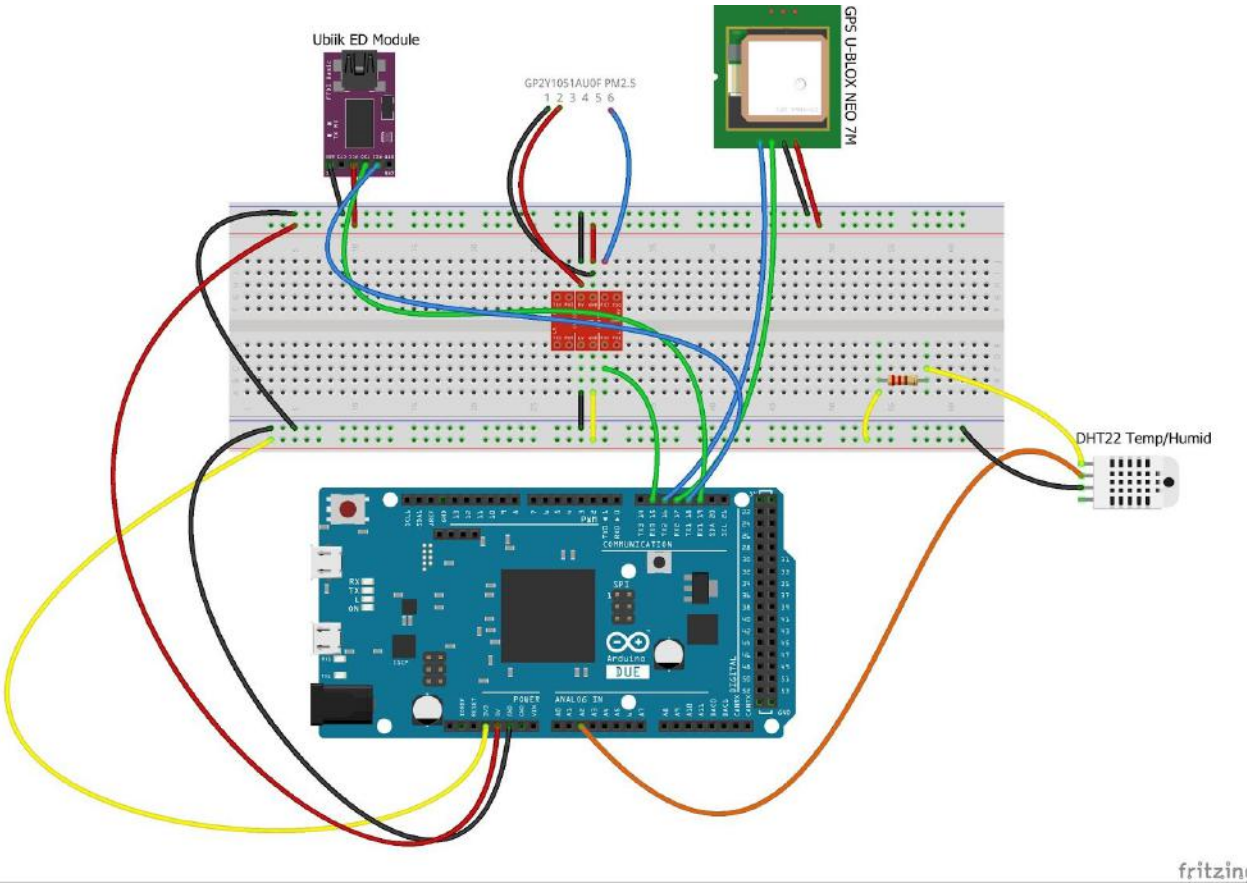
Arduino Libraries

1. TinyGPSPlus: Library for GPS sensor by TinyGPS++
   https://github.com/mikalhart/TinyGPSPlus/releases
2. DHT: Library for Temperature / Humidity sensor by LadyAda
   https://github.com/adafruit/DHT-sensor-library
3. Hardware Serial: Library for Arduino to change the Serial Communication Mechanism
   https://github.com/esp8266/Arduino/blob/master/cores/esp8266/HardwareSerial.h

Arduino-EVB Sample Code

Full working code in Arduino can be downloaded here : link

Wire Configuration



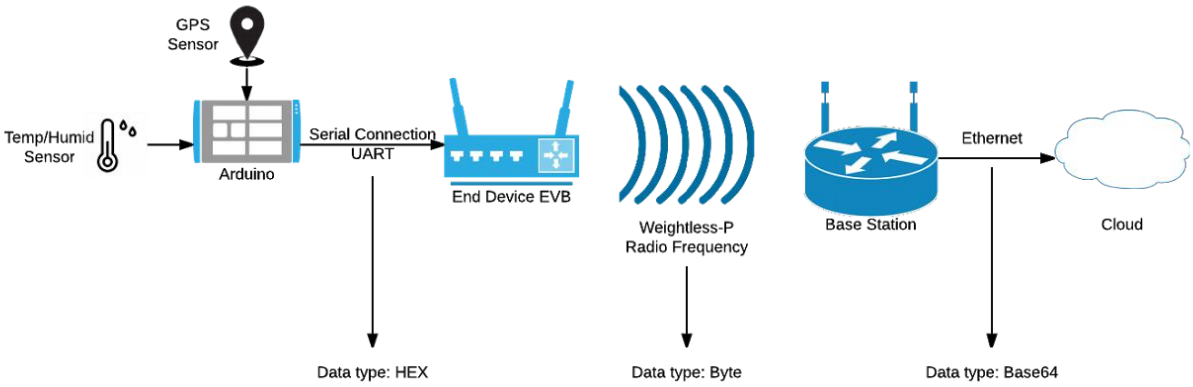
**The diagram above is for wiring reference*
***Sensor appearances may vary*

Connection and Data Flowchart

In order to send data from the sensors to the Base Station, use the AT+TX command on the End Device EVB.

For full AT Command Reference Guide, see link: https://www.ubiik.com/resources

Flowchart:



1. The Arduino will retrieve the attached sensor value(s) and pass the data to the End Device EVB. The Arduino is connected with End Device EVB using Serial Communication UART. To control the End Device EVB, AT Commands are used. The data sent using AT+TX should be in HEX String. Each AT Command sent have to end with “\r” character to make it valid.
2. The End Device EVB will send the sensor value wirelessly to the Base Station through Weightless LPWAN (Low Power Wide Area Network) technology. The sensor value will be converted into bytes during this transmission.
3. After receiving the data from the End Device EVB, the Base Station will send the data to Cloud.
4. The Cloud will receive the transmission data and store it in Base64 format.

Serial Communication mechanism of End Device EVB:

Baud rate	Data bits	Parity	Stop bits
115200	8	No Parity	2

Downlink Demo:Change LED Light Bulb Brightness

In order to update the brightness of our LED light, use the AT Command AT+RX on the End Device EVB. When downlink command is sent from Base Station to the End Device EVB, the End Device EVB will sent Unsolicited Command of +RX to the Arduino Due. The Arduino will need to parse the data that the End Device EVB sent. The Arduino will modify the LED light bulb brightness based on the value received.

Sensor Value is recommended to be in HEX. The sample code is configured to receive 3 type of Downlink command: Turn ON/OFF a light bulb and command the ED to read and send PM2.5 / GPS sensor value. When PM2.5 or GPS is in demand, it will be automatically turned off after 30 seconds.

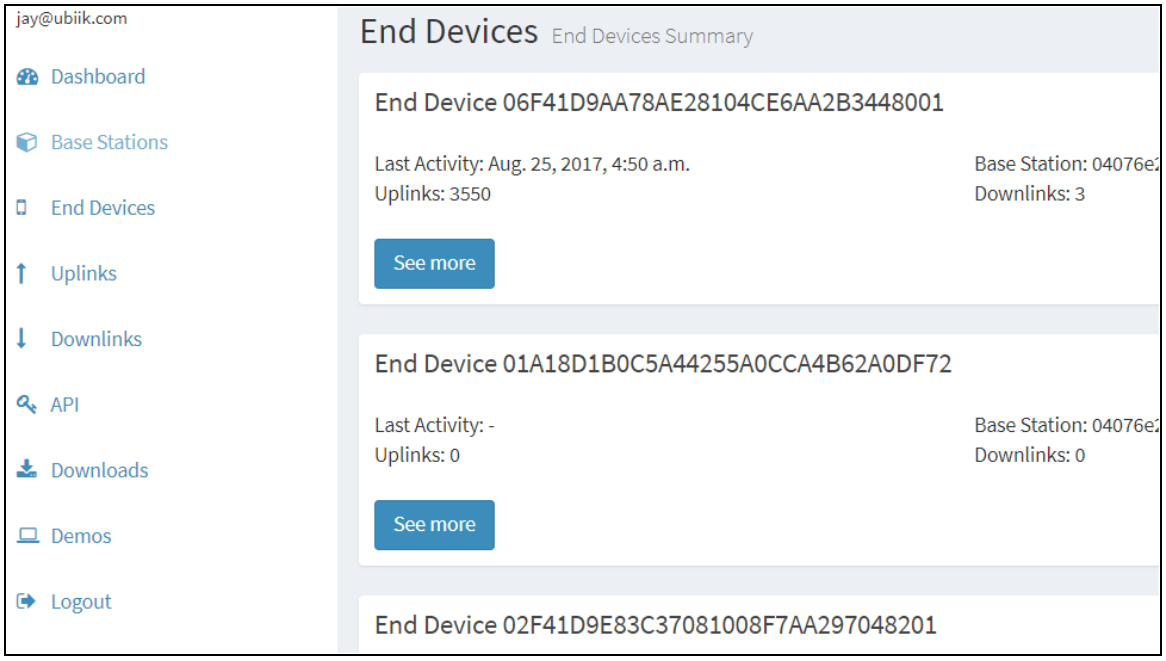
Table below list the downlink format value in Sample Code:

Sensor	HEX Flag	HEX Value	Function
Light Bulb	99	0-5	Turn ON/OFF Light Bulb
PM2.5	01	0 or 1	Dis/Enable ED to read and send PM2.5 sensor value
GPS	02	0 or 1	Dis/Enable ED to read and send GPS sensor value

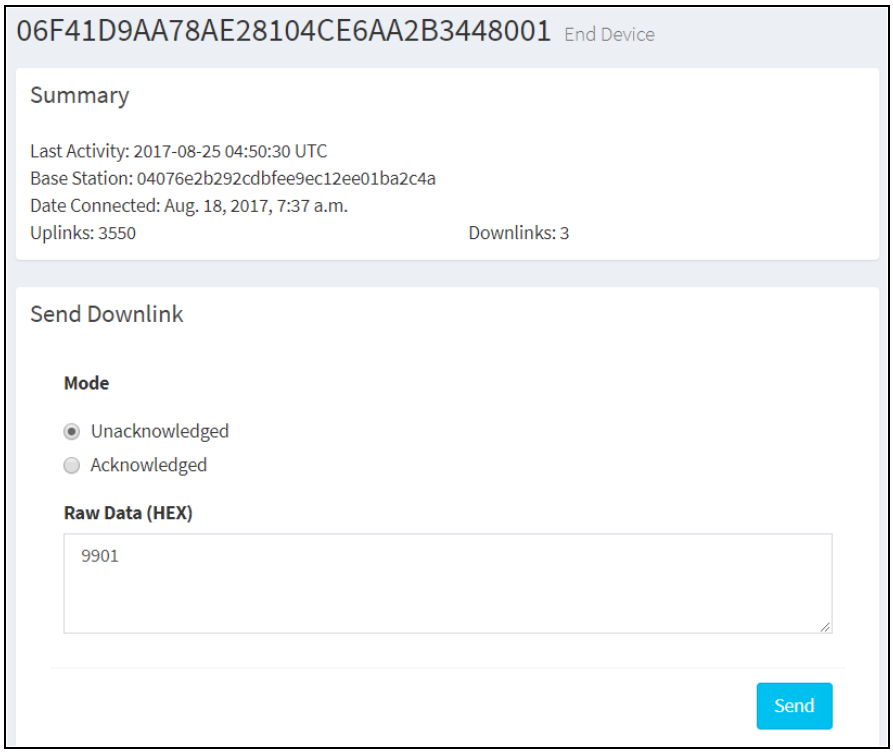
**HEX Flag is used to tell the Arduino when parsing, that the data value is meant for specific sensor*
***Value of HEX Flag can be change as needed*

Sending Downlink With Ubiik Cloud

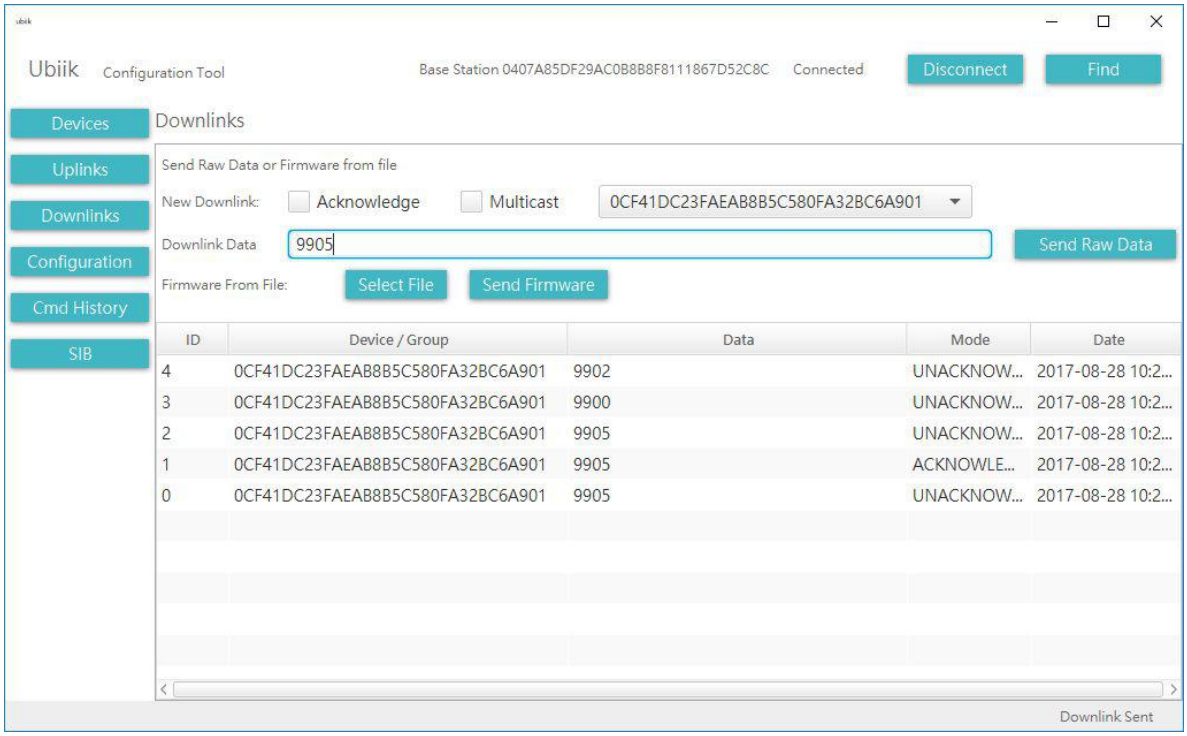
Step 1: Click **End Devices** in left panel
Step 2: Select the target End Device EVB by clicking **See more** button from list



Step 2: Put the sensor value at **Raw Data (HEX)** text column and click **Send**



Sending Downlink With Offline Tool



Step 1: Choose which **End Device EVB ID** to send the data by clicking on drop down menu

(ED-ID example on pic: “0CF41...901”)

Step 2: Input sensor value at **Downlink Data** input field

Step 3 : Click **Send Raw Data** to send the data

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END