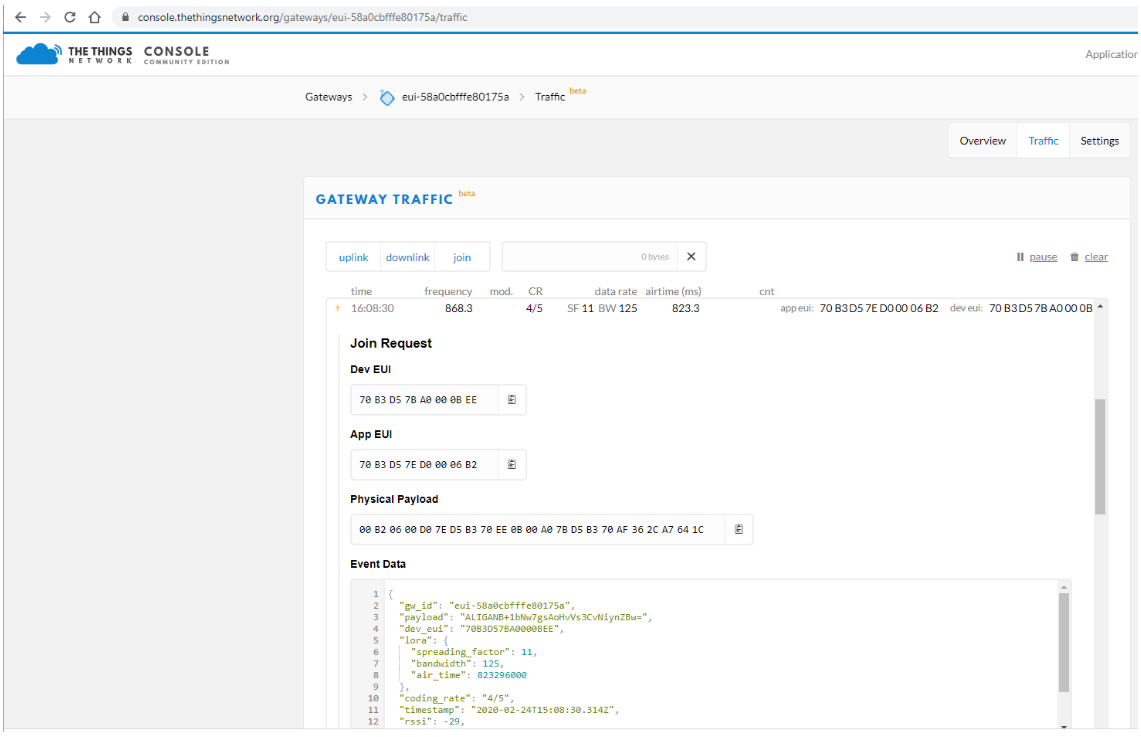
FIRST STEPS WITH DECENTLAB LoRa ambient sensor

TTN

The sensor can be seen from a TTN gateway


console.thethingsnetwork.org/gateways/eui-58a0cbfffe80175a/traffic
THE THINGS NETWORK CONSOLE COMMUNITY EDITION
Applicatior
Gateways > eui-58a0cbfffe80175a > Traffic beta
Overview
Traffic
Settings
GATEWAY TRAFFIC beta
uplink
downlink
join
0 bytes
pause
clear

```
time      frequency  mod.  CR   data rate   airtime (ms)   cnt
16:08:30  868.3            4/5  SF 11 BW 125  823.3        app eui: 70 B3 D5 7E D0 00 06 B2   dev eui: 70 B3 D5 7B A0 00 0B
```

Join Request

Dev EUI

`70 B3 D5 7B A0 00 0B EE`

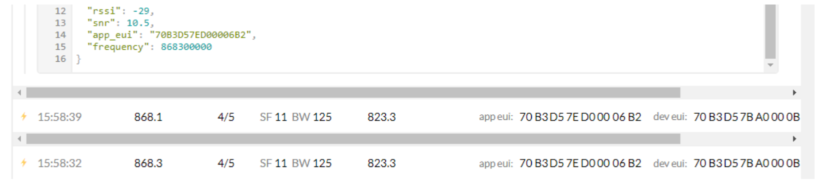
App EUI

`70 B3 D5 7E D0 00 06 B2`

Physical Payload

`00 B2 06 00 D0 7E D5 B3 70 EE 0B 00 A0 7B D5 B3 70 AF 36 2C A7 64 1C`

Event Data

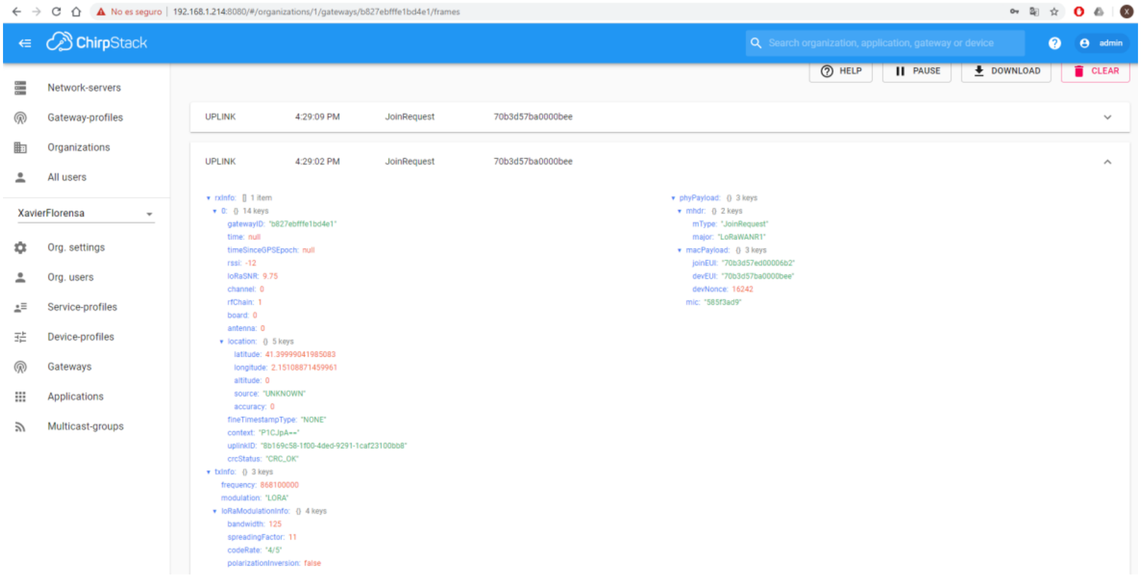


```
{
  "gw_id": "eui-58a0cbfffe80175a",
  "payload": "ALIGANB+1bNw7gsAoHvVs3CvNiynZBw=",
  "dev_eui": "70B3D57BA0000BEE",
  "lora": {
    "spreading_factor": 11,
    "bandwidth": 125,
    "air_time": 823296000
  },
  "coding_rate": "4/5",
  "timestamp": "2020-02-24T15:08:30.314Z",
  "rssi": -29,
  "snr": 10.5,
  "app_eui": "70B3D57ED00006B2",
  "frequency": 868300000
}
```

```
15:58:39  868.1  4/5  SF 11 BW 125  823.3  app eui: 70 B3 D5 7E D0 00 06 B2  dev eui: 70 B3 D5 7B A0 00 0B
15:58:32  868.3  4/5  SF 11 BW 125  823.3  app eui: 70 B3 D5 7E D0 00 06 B2  dev eui: 70 B3 D5 7B A0 00 0B
```

LoRa Server

The sensor is seen by a LoRa server Gateway

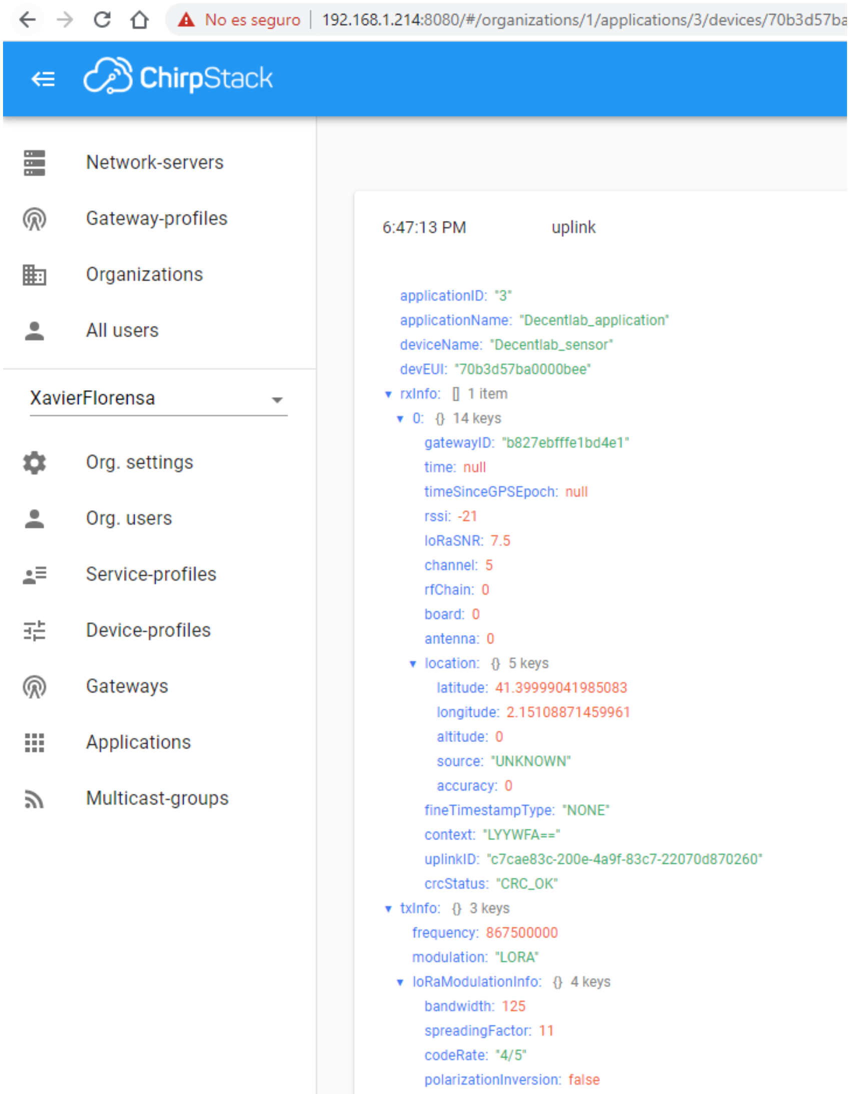


```
UPLINK    4:29:09 PM    JoinRequest    70b3d57ba0000bee

UPLINK    4:29:02 PM    JoinRequest    70b3d57ba0000bee
```

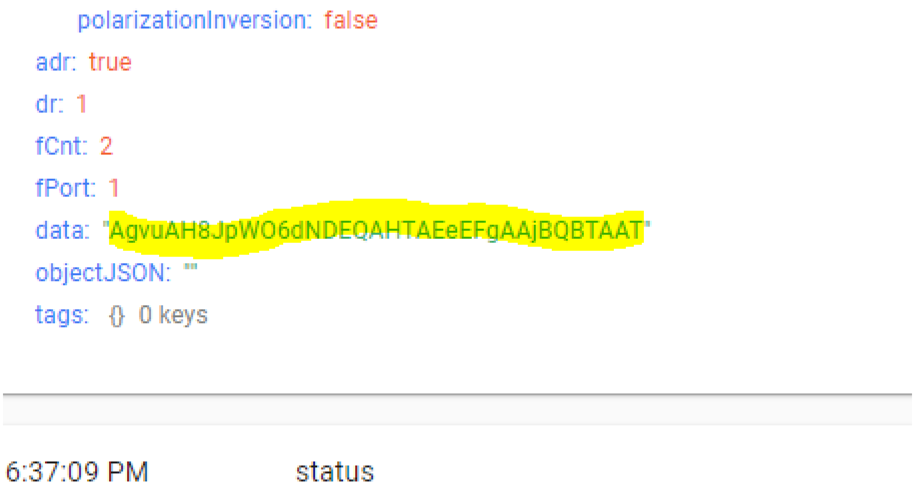
```
▾ rxInfo:  [] 1 item
  ▾ 0:  {} 14 keys
      gatewayID: "b827ebfffe1bd4e1"
      time: null
      timeSinceGPSEpoch: null
      rssi: -12
      loRaSNR: 9.75
      channel: 0
      rfChain: 1
      board: 0
      antenna: 0
    ▾ location:  {} 5 keys
        latitude: 41.39999041985083
        longitude: 2.15108871459961
        altitude: 0
        source: "UNKNOWN"
        accuracy: 0
      fineTimestampType: "NONE"
      context: "P1CJpA=="
      uplinkID: "8b169c58-1f00-4ded-9291-1caf23100bb8"
      crcStatus: "CRC_OK"
▾ txInfo:  {} 3 keys
    frequency: 868100000
    modulation: "LORA"
  ▾ loRaModulationInfo:  {} 4 keys
      bandwidth: 125
      spreadingFactor: 11
      codeRate: "4/5"
      polarizationInversion: false
```

```
▾ phyPayload:  {} 3 keys
  ▾ mhdr:  {} 2 keys
      mType: "JoinRequest"
      major: "LoRaWANR1"
  ▾ macPayload:  {} 3 keys
      joinEUI: "70b3d57ed00006b2"
      devEUI: "70b3d57ba0000bee"
      devNonce: 16242
    mic: "585f3ad9"
```

Let’s build an application to retrieve the data



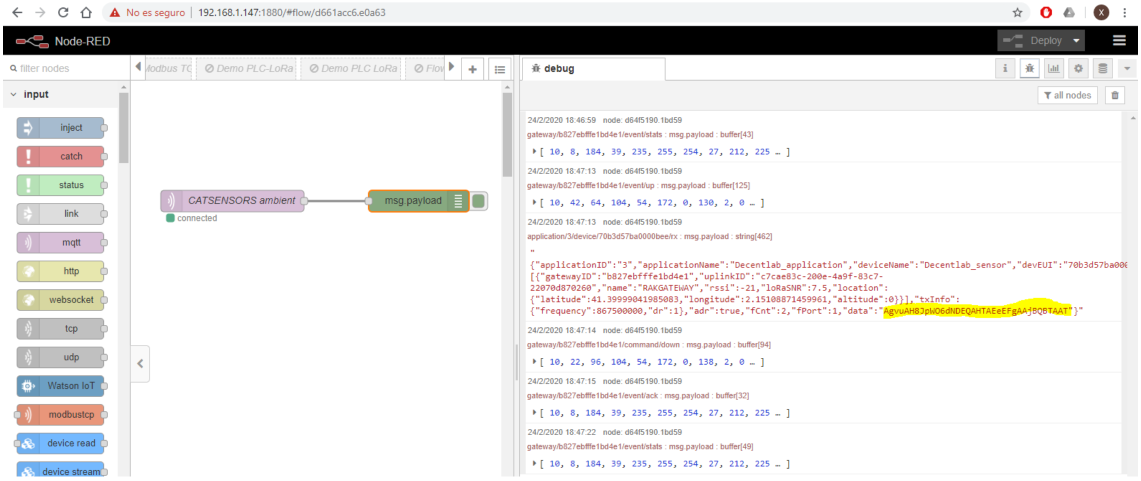
```
6:47:13 PM        uplink

  applicationID: "3"
  applicationName: "Decentlab_application"
  deviceName: "Decentlab_sensor"
  devEUI: "70b3d57ba0000bee"
▾ rxInfo:  [] 1 item
  ▾ 0:  {} 14 keys
      gatewayID: "b827ebfffe1bd4e1"
      time: null
      timeSinceGPSEpoch: null
      rssi: -21
      loRaSNR: 7.5
      channel: 5
      rfChain: 0
      board: 0
      antenna: 0
    ▾ location:  {} 5 keys
        latitude: 41.39999041985083
        longitude: 2.15108871459961
        altitude: 0
        source: "UNKNOWN"
        accuracy: 0
      fineTimestampType: "NONE"
      context: "LYYWFA=="
      uplinkID: "c7cae83c-200e-4a9f-83c7-22070d870260"
      crcStatus: "CRC_OK"
▾ txInfo:  {} 3 keys
    frequency: 867500000
    modulation: "LORA"
  ▾ loRaModulationInfo:  {} 4 keys
      bandwidth: 125
      spreadingFactor: 11
      codeRate: "4/5"
      polarizationInversion: false
```



```
    polarizationInversion: false
adr: true
dr: 1
fCnt: 2
fPort: 1
data: "AgvuAH8JpWO6dNDEQAHTAEeEFgAAjBQBTAAT"
objectJSON: ""
tags: {} 0 keys
```

6:37:09 PM status

On the application we get the data "AgvuAH8JpWO6dNDEQAHTAEeEFgAAjBQBTAAT"



```
24/2/2020 18:46:59   node: d64f5190.1bd59
gateway/b827ebfffe1bd4e1/event/stats : msg.payload : buffer[43]
▸[ 10, 8, 184, 39, 235, 255, 254, 27, 212, 225 … ]
24/2/2020 18:47:13   node: d64f5190.1bd59
gateway/b827ebfffe1bd4e1/event/up : msg.payload : buffer[125]
▸[ 10, 42, 64, 104, 54, 172, 0, 130, 2, 0 … ]
24/2/2020 18:47:13   node: d64f5190.1bd59
application/3/device/70b3d57ba0000bee/rx : msg.payload : string[462]
"
{"applicationID":"3","applicationName":"Decentlab_application","deviceName":"Decentlab_sensor","devEUI":"70b3d57ba00
[{"gatewayID":"b827ebfffe1bd4e1","uplinkID":"c7cae83c-200e-4a9f-83c7-
22070d870260","name":"RAKGATEWAY","rssi":-21,"loRaSNR":7.5,"location":
{"latitude":41.39999041985083,"longitude":2.15108871459961,"altitude":0}}],"txInfo":
{"frequency":867500000,"dr":1},"adr":true,"fCnt":2,"fPort":1,"data":"AgvuAH8JpWO6dNDEQAHTAEeEFgAAjBQBTAAT"}"
24/2/2020 18:47:14   node: d64f5190.1bd59
gateway/b827ebfffe1bd4e1/command/down : msg.payload : buffer[94]
▸[ 10, 22, 96, 104, 54, 172, 0, 138, 2, 0 … ]
24/2/2020 18:47:15   node: d64f5190.1bd59
gateway/b827ebfffe1bd4e1/event/ack : msg.payload : buffer[32]
▸[ 10, 8, 184, 39, 235, 255, 254, 27, 212, 225 … ]
24/2/2020 18:47:22   node: d64f5190.1bd59
gateway/b827ebfffe1bd4e1/event/stats : msg.payload : buffer[49]
▸[ 10, 8, 184, 39, 235, 255, 254, 27, 212, 225 … ]
```

Let’s subscribe to the MQTT bróker on the gateway

```
mosquitto_sub -v -t "#" -h localhost -p 1883
```

On node-red, with MQTT we get the data "AgvuAH8JpWO6dNDEQAHTAEeEFgAAjBQBTAAT"

27 bytes decoded

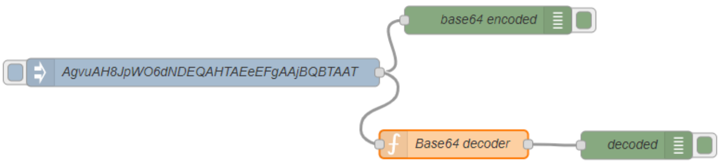
We have to take 2 bytes and then groups of 4 bytes

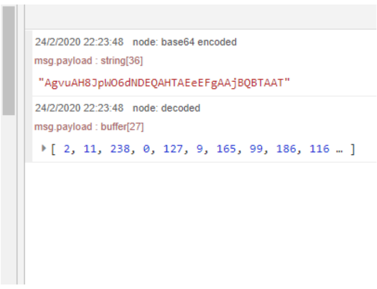
EXAMPLE 1 (ALL SENSOR DATA INCLUDED)

Message (hex):

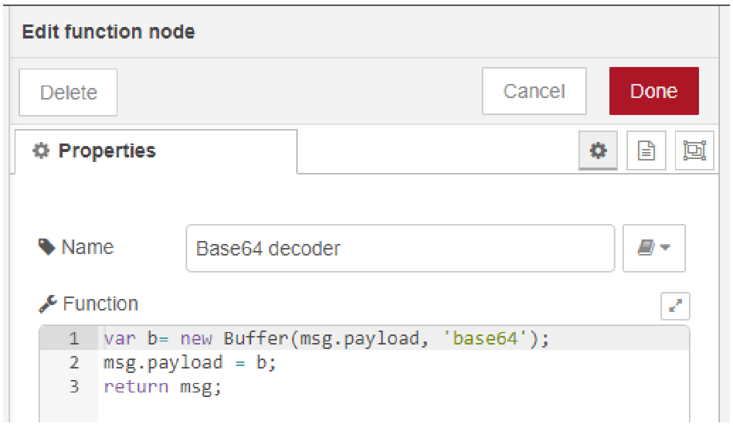
020bbd007f0b926a515d48bc4e0262006981c7000093d4000b0111

02	Version	=	2	
0bbd	Device ID	=	3005	
007f	Flags	=	0b0000000001111111	
0b92	Battery voltage	=	2.96	V
6a51	Air temperature	=	27.68	deg
5d48	Air humidity	=	36.44	%
bc4e	Barometric pressure	=	96412	Pa
0262	Ambient light CH0	=	610	
0069	Ambient light CH1	=	105	
81c7	CO2 concentration	=	455	ppm
0000	CO2 sensor status	=	0	
93d4	Raw IR reading	=	37844	
000b	PIR activity counter	=	11	
0111	Gas sensor: total VOC	=	273	ppb
	Illuminance	=	679	lx





```
24/2/2020 22:23:48   node: base64 encoded
msg.payload : string[36]
"AgvuAH8JpWO6dNDEQAHTAEeEFgAAjBQBTAAT"
24/2/2020 22:23:48   node: decoded
msg.payload : buffer[27]
▸[ 2, 11, 238, 0, 127, 9, 165, 99, 186, 116 … ]
```



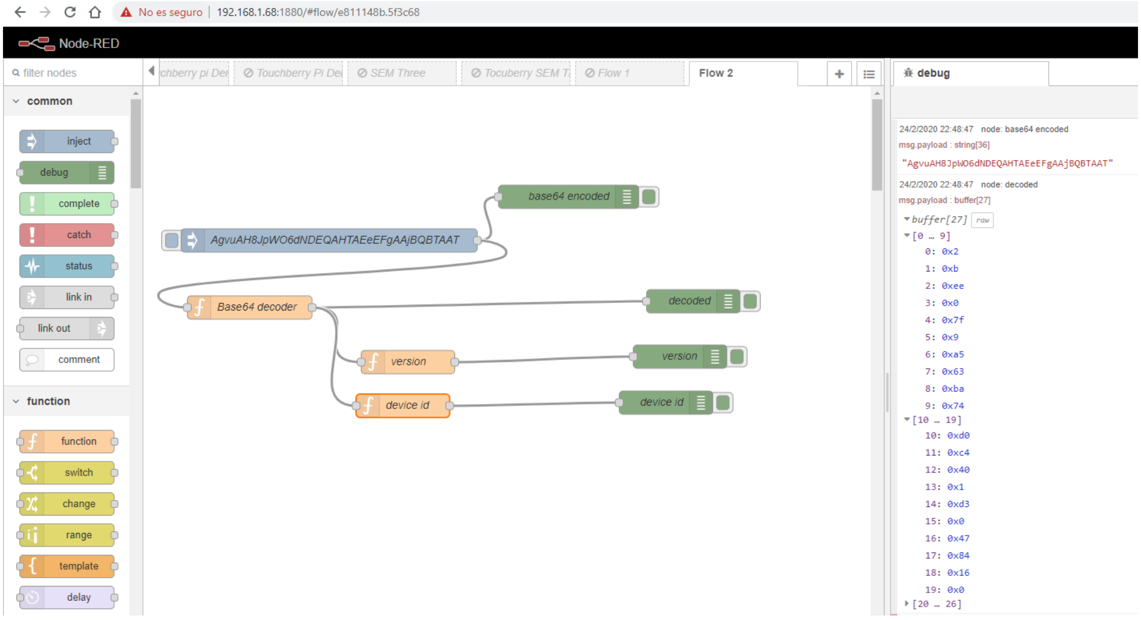
Edit function node

Name: Base64 decoder

Function

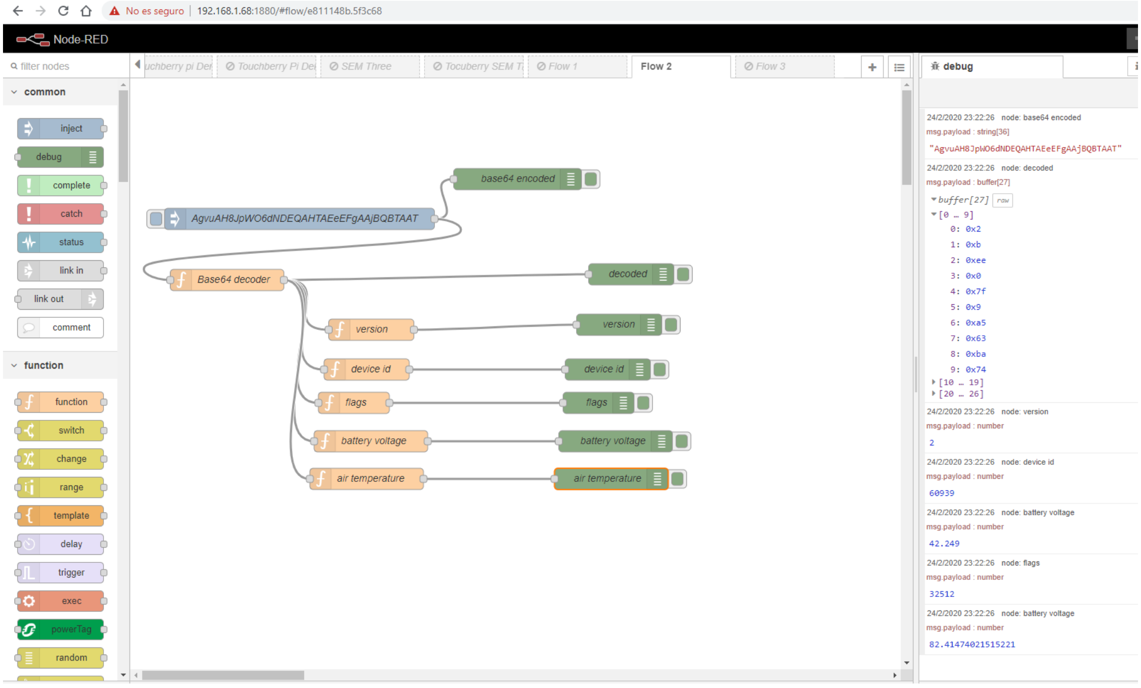
```
var b= new Buffer(msg.payload, 'base64');
msg.payload = b;
return msg;
```

If we open the contento f the array we see the data of the example

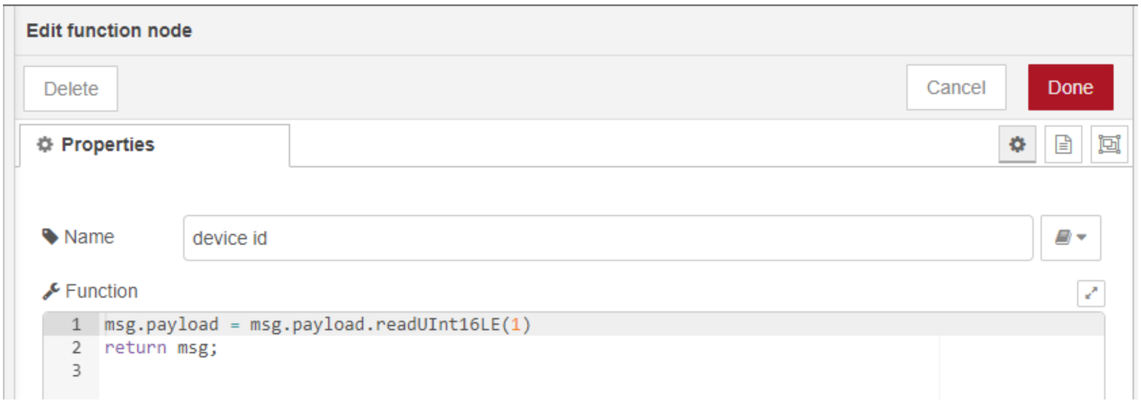


```
24/2/2020 22:48:47  node: base64 encoded
msg.payload : string[36]
 "AgvuAH8JpWO6dNDEQAHTAEeEFgAAjBQBTAAT"
24/2/2020 22:48:47  node: decoded
msg.payload : buffer[27]
 ▾buffer[27] raw
 ▾[0 … 9]
    0: 0x2
    1: 0xb
    2: 0xee
    3: 0x0
    4: 0x7f
    5: 0x9
    6: 0xa5
    7: 0x63
    8: 0xba
    9: 0x74
 ▾[10 … 19]
    10: 0xd0
    11: 0xc4
    12: 0x40
    13: 0x1
    14: 0xd3
    15: 0x0
    16: 0x47
    17: 0x84
    18: 0x16
    19: 0x0
 ▸[20 … 26]
```

There must be something wrong in decoding



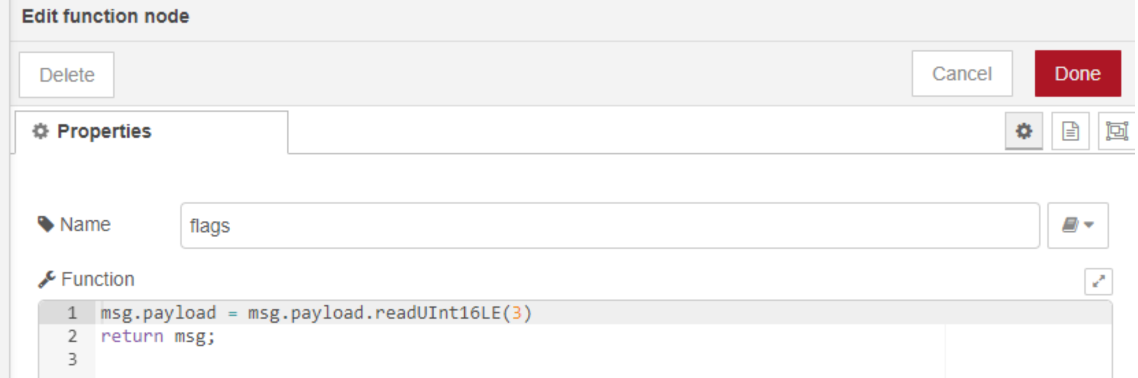
```
24/2/2020 23:22:26  node: base64 encoded
msg.payload : string[36]
 "AgvuAH8JpWO6dNDEQAHTAEeEFgAAjBQBTAAT"
24/2/2020 23:22:26  node: decoded
msg.payload : buffer[27]
 ▾buffer[27] raw
 ▾[0 … 9]
    0: 0x2
    1: 0xb
    2: 0xee
    3: 0x0
    4: 0x7f
    5: 0x9
    6: 0xa5
    7: 0x63
    8: 0xba
    9: 0x74
 ▸[10 … 19]
 ▸[20 … 26]
24/2/2020 23:22:26  node: version
msg.payload : number
 2
24/2/2020 23:22:26  node: device id
msg.payload : number
 60939
24/2/2020 23:22:26  node: battery voltage
msg.payload : number
 42.249
24/2/2020 23:22:26  node: flags
msg.payload : number
 32512
24/2/2020 23:22:26  node: battery voltage
msg.payload : number
 82.41474021515221
```



Name: device id

Function

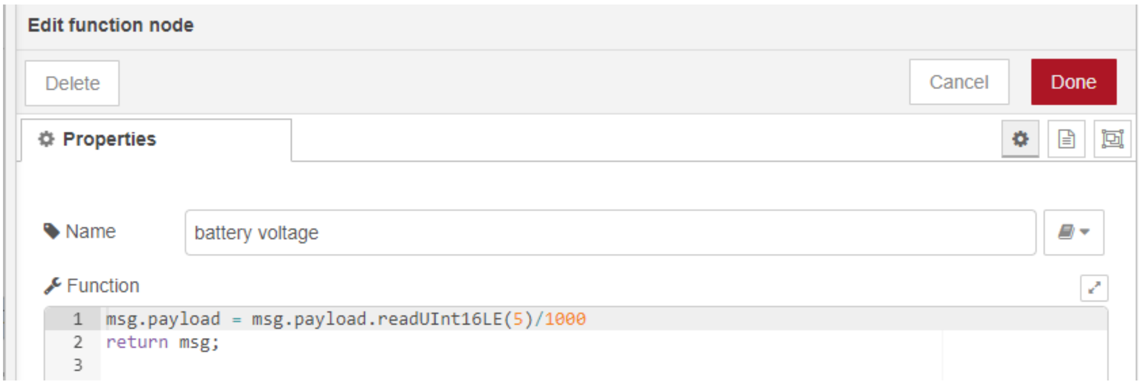
```
msg.payload = msg.payload.readUInt16LE(1)
return msg;

```



Name: flags

Function

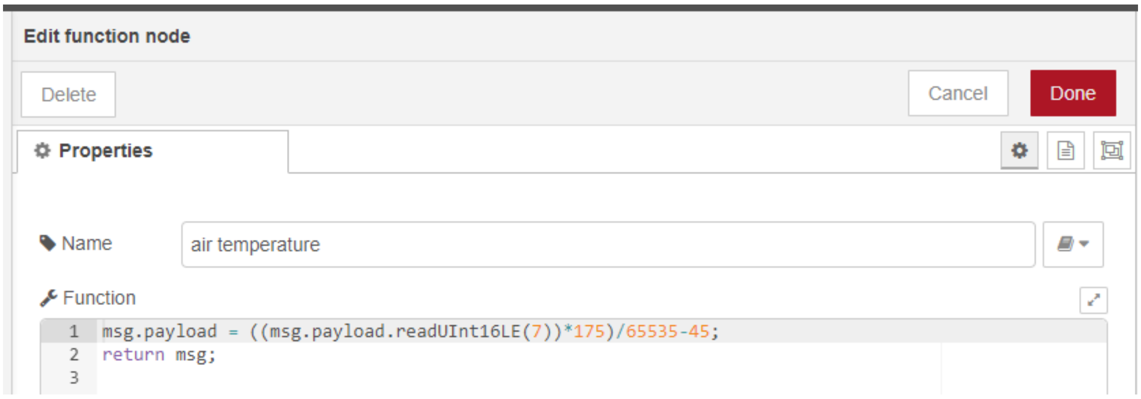
```
msg.payload = msg.payload.readUInt16LE(3)
return msg;
```



Name: battery voltage

Function

```
msg.payload = msg.payload.readUInt16LE(5)/1000
return msg;
```

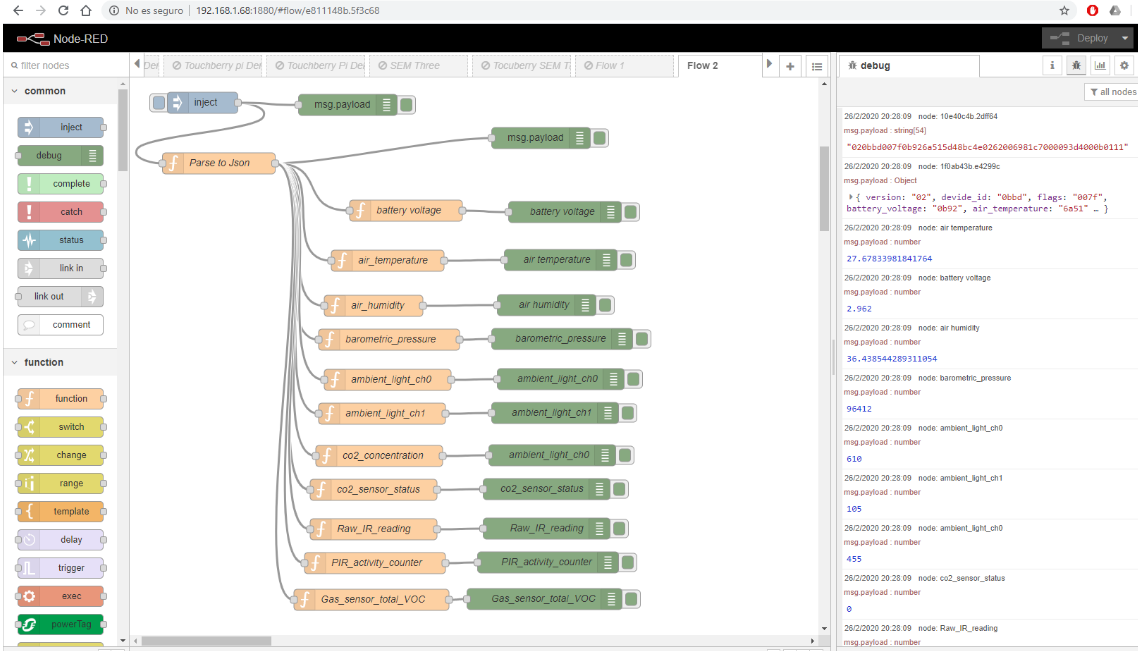


Name: air temperature

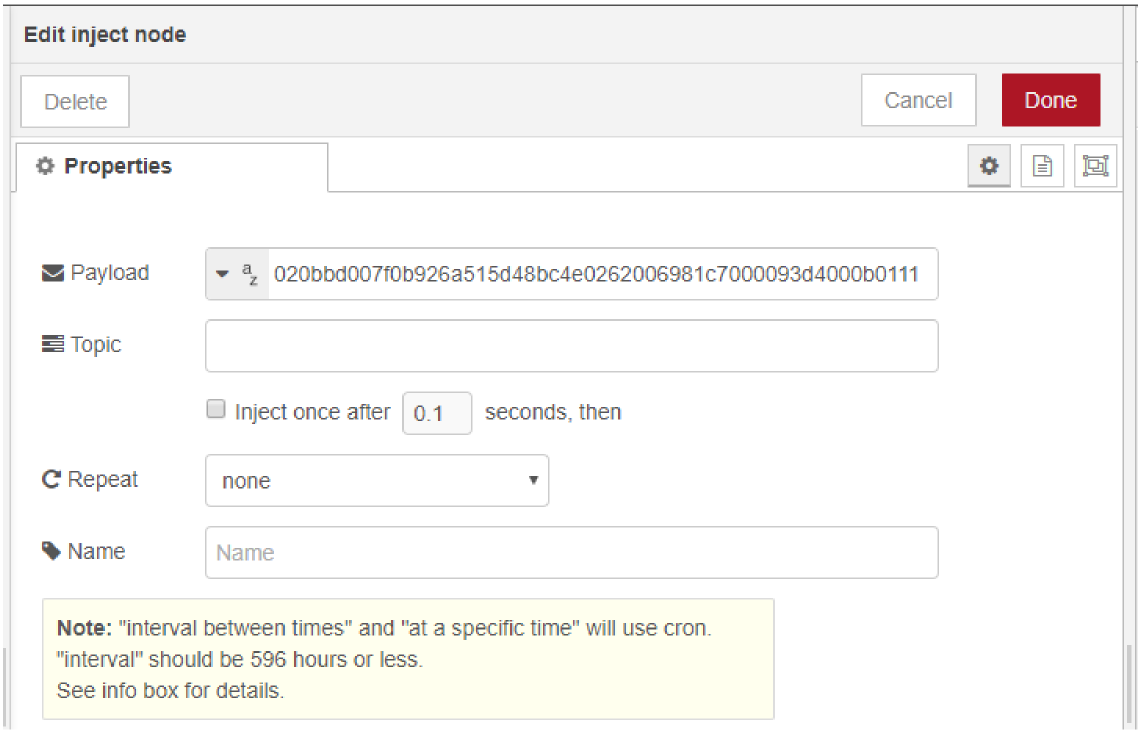
Function

```
msg.payload = ((msg.payload.readUInt16LE(7))*175)/65535-45;
return msg;
```

THE RIGHT DECODING



```
26/2/2020 20:28:09   node: 10e40c4b.2dff64
msg.payload : string[54]
"020bbd007f0b926a515d48bc4e0262006981c7000093d4000b0111"
26/2/2020 20:28:09   node: 1f0ab43b.e4299c
msg.payload : Object
▸{ version: "02", devide_id: "0bbd", flags: "007f",
battery_voltage: "0b92", air_temperature: "6a51" … }
26/2/2020 20:28:09   node: air temperature
msg.payload : number
27.67833981841764
26/2/2020 20:28:09   node: battery voltage
msg.payload : number
2.962
26/2/2020 20:28:09   node: air humidity
msg.payload : number
36.438544289311054
26/2/2020 20:28:09   node: barometric_pressure
msg.payload : number
96412
26/2/2020 20:28:09   node: ambient_light_ch0
msg.payload : number
610
26/2/2020 20:28:09   node: ambient_light_ch1
msg.payload : number
105
26/2/2020 20:28:09   node: ambient_light_ch0
msg.payload : number
455
26/2/2020 20:28:09   node: co2_sensor_status
msg.payload : number
0
26/2/2020 20:28:09   node: Raw_IR_reading
msg.payload : number
```



Edit inject node

Payload: 020bbd007f0b926a515d48bc4e0262006981c7000093d4000b0111

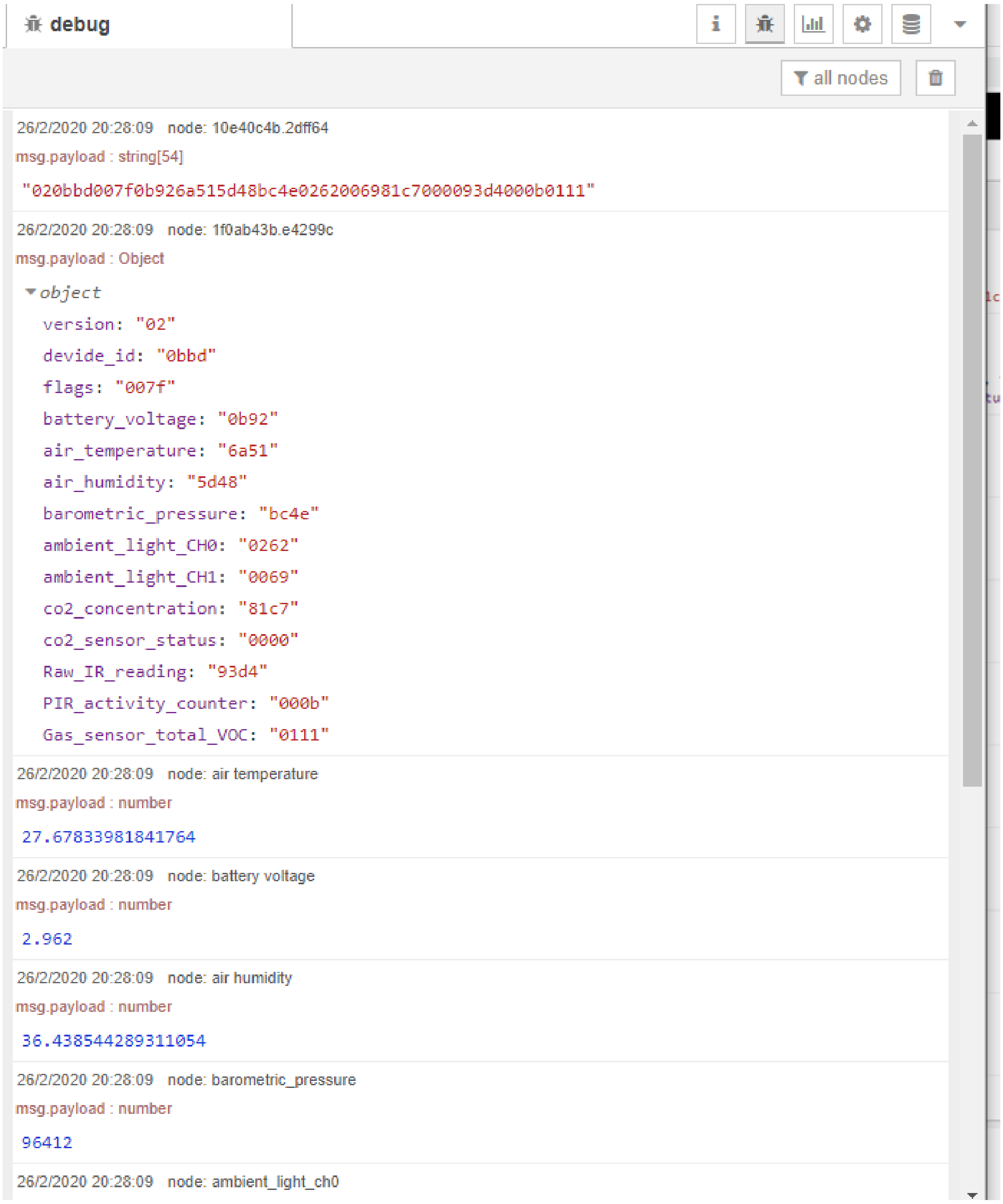
Topic:

☐ Inject once after 0.1 seconds, then

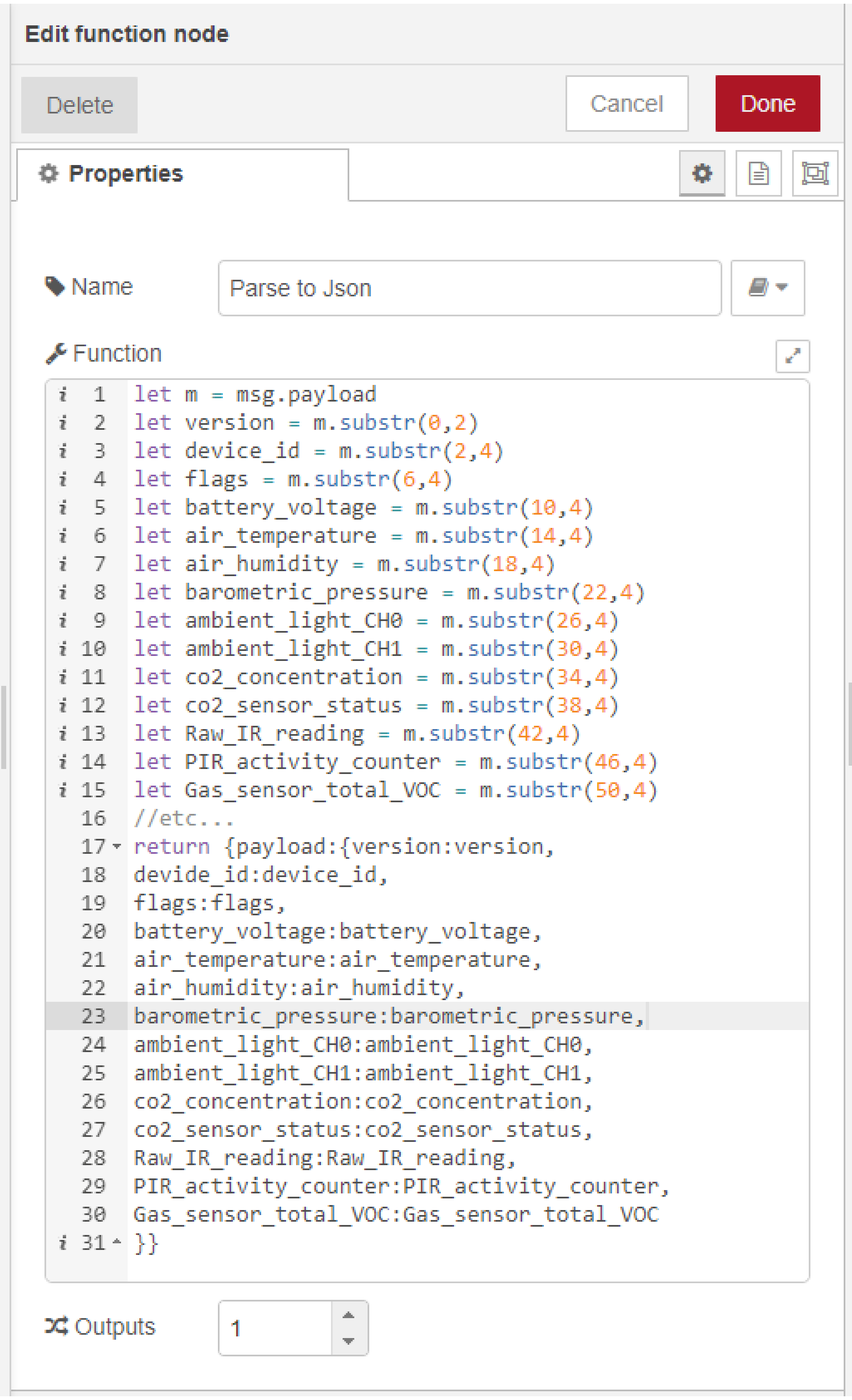
Repeat: none

Name: Name

Note: "interval between times" and "at a specific time" will use cron.
"interval" should be 596 hours or less.
See info box for details.



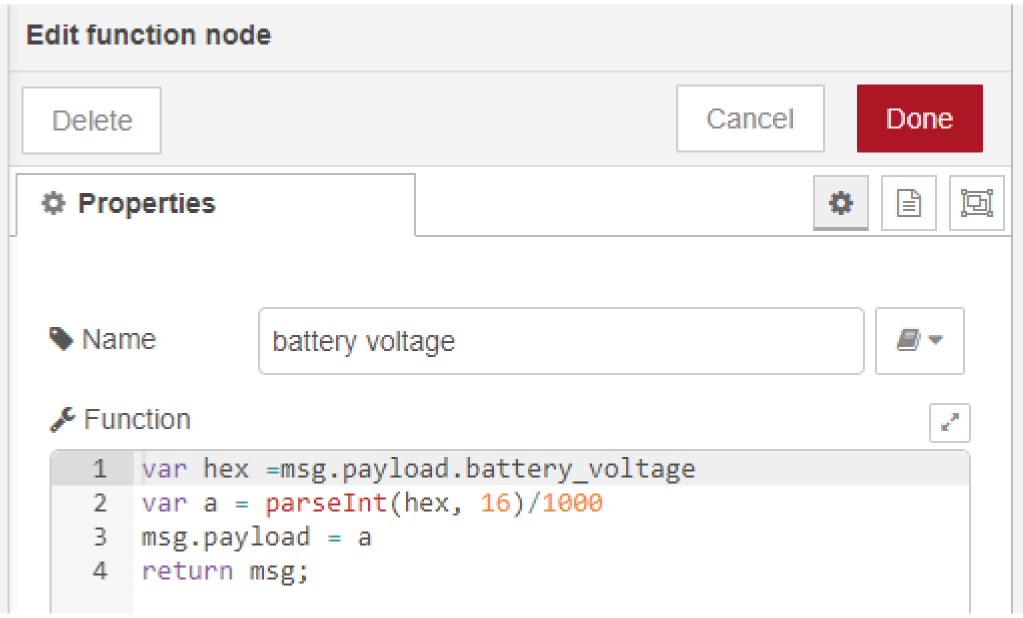
```
26/2/2020 20:28:09   node: 10e40c4b.2dff64
msg.payload : string[54]
 "020bbd007f0b926a515d48bc4e0262006981c7000093d4000b0111"
26/2/2020 20:28:09   node: 1f0ab43b.e4299c
msg.payload : Object
 ▾object
   version: "02"
   devide_id: "0bbd"
   flags: "007f"
   battery_voltage: "0b92"
   air_temperature: "6a51"
   air_humidity: "5d48"
   barometric_pressure: "bc4e"
   ambient_light_CH0: "0262"
   ambient_light_CH1: "0069"
   co2_concentration: "81c7"
   co2_sensor_status: "0000"
   Raw_IR_reading: "93d4"
   PIR_activity_counter: "000b"
   Gas_sensor_total_VOC: "0111"
26/2/2020 20:28:09   node: air temperature
msg.payload : number
 27.67833981841764
26/2/2020 20:28:09   node: battery voltage
msg.payload : number
 2.962
26/2/2020 20:28:09   node: air humidity
msg.payload : number
 36.438544289311054
26/2/2020 20:28:09   node: barometric_pressure
msg.payload : number
 96412
26/2/2020 20:28:09   node: ambient_light_ch0
```



Name: Parse to Json

```
let m = msg.payload
let version = m.substr(0,2)
let device_id = m.substr(2,4)
let flags = m.substr(6,4)
let battery_voltage = m.substr(10,4)
let air_temperature = m.substr(14,4)
let air_humidity = m.substr(18,4)
let barometric_pressure = m.substr(22,4)
let ambient_light_CH0 = m.substr(26,4)
let ambient_light_CH1 = m.substr(30,4)
let co2_concentration = m.substr(34,4)
let co2_sensor_status = m.substr(38,4)
let Raw_IR_reading = m.substr(42,4)
let PIR_activity_counter = m.substr(46,4)
let Gas_sensor_total_VOC = m.substr(50,4)
//etc...
return {payload:{version:version,
devide_id:device_id,
flags:flags,
battery_voltage:battery_voltage,
air_temperature:air_temperature,
air_humidity:air_humidity,
barometric_pressure:barometric_pressure,
ambient_light_CH0:ambient_light_CH0,
ambient_light_CH1:ambient_light_CH1,
co2_concentration:co2_concentration,
co2_sensor_status:co2_sensor_status,
Raw_IR_reading:Raw_IR_reading,
PIR_activity_counter:PIR_activity_counter,
Gas_sensor_total_VOC:Gas_sensor_total_VOC
}}
```

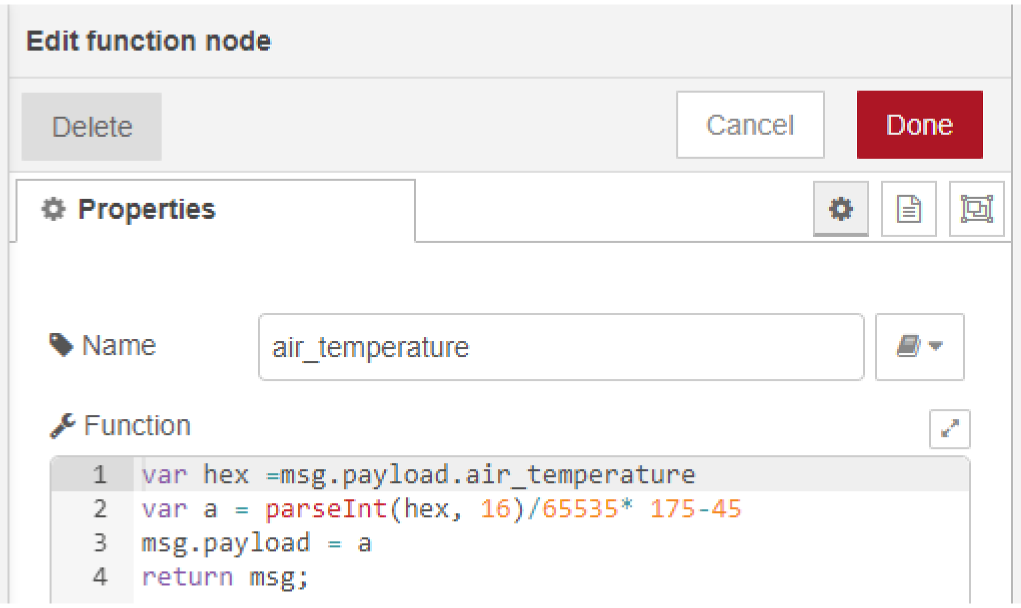
Outputs: 1



Name: battery voltage

Function

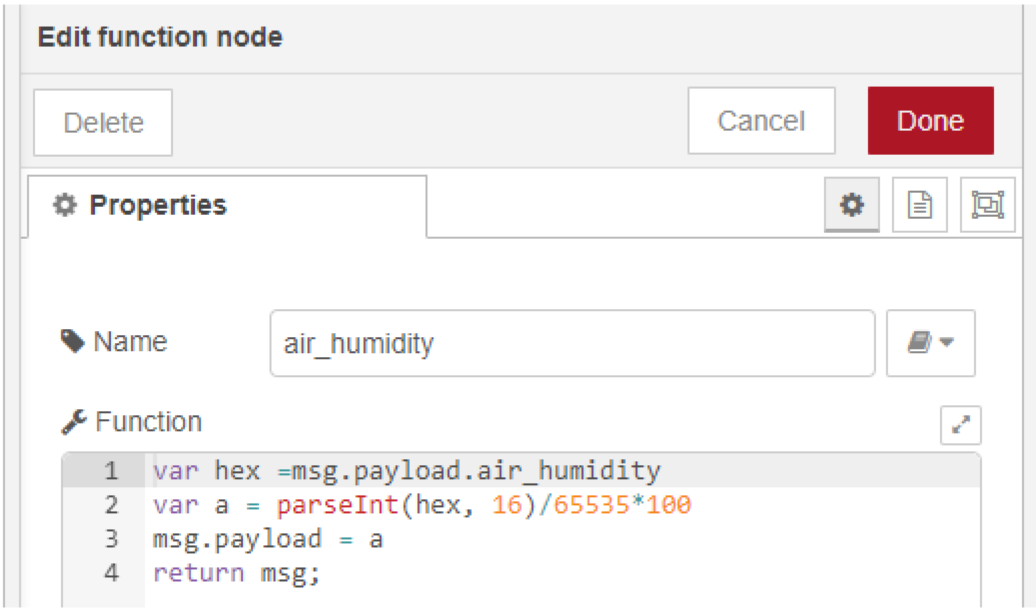
```
var hex =msg.payload.battery_voltage
var a = parseInt(hex, 16)/1000
msg.payload = a
return msg;
```



Name: air_temperature

Function

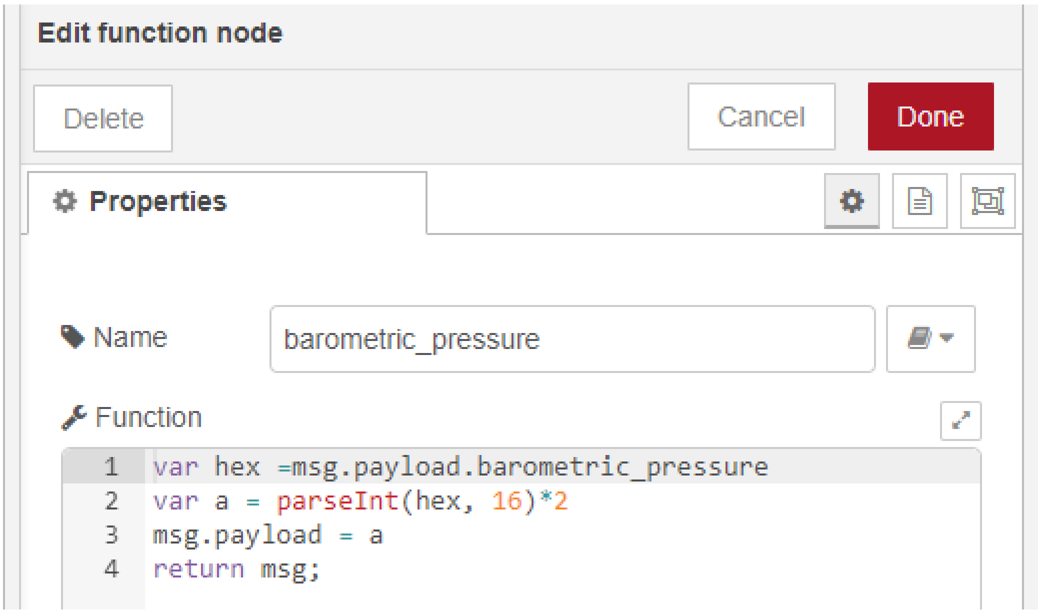
```
var hex =msg.payload.air_temperature
var a = parseInt(hex, 16)/65535* 175-45
msg.payload = a
return msg;
```



Name: air_humidity

Function

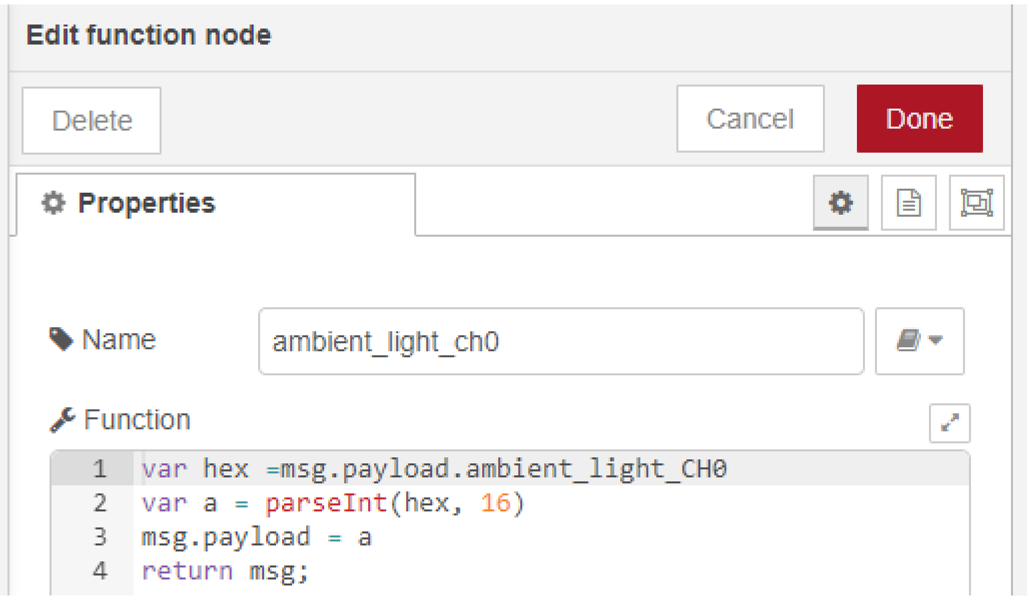
```
var hex =msg.payload.air_humidity
var a = parseInt(hex, 16)/65535*100
msg.payload = a
return msg;
```



Name: barometric_pressure

Function

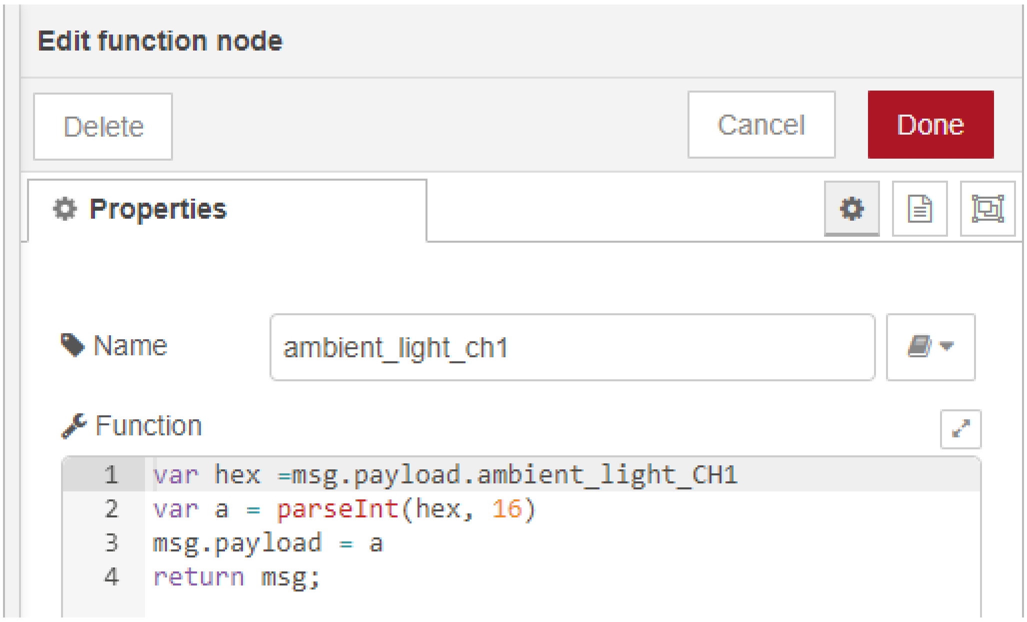
```
var hex =msg.payload.barometric_pressure
var a = parseInt(hex, 16)*2
msg.payload = a
return msg;
```



Name: ambient_light_ch0

Function

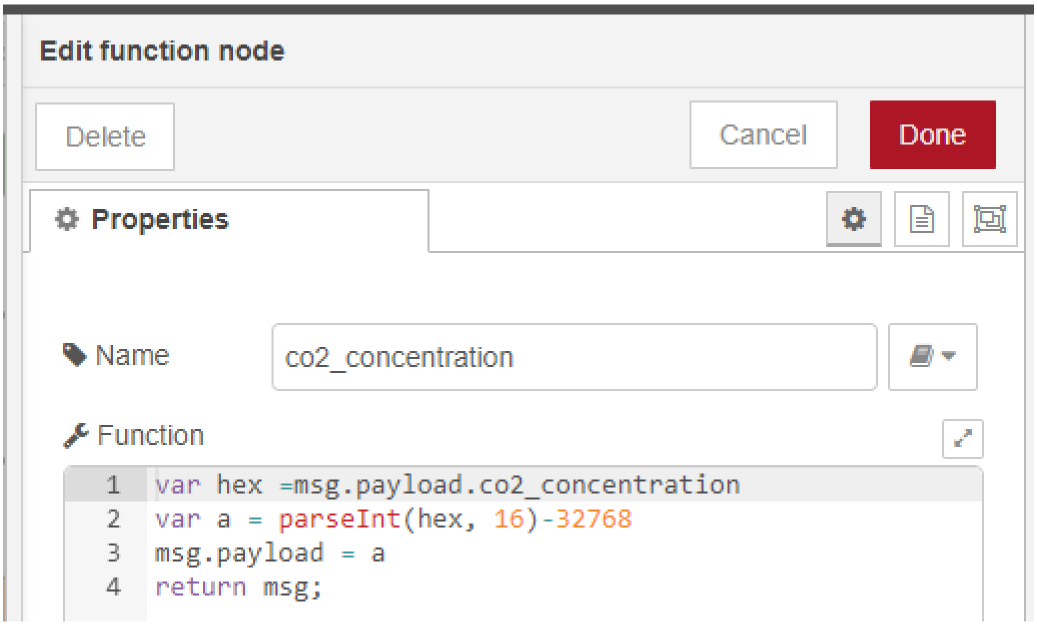
```
var hex =msg.payload.ambient_light_CH0
var a = parseInt(hex, 16)
msg.payload = a
return msg;
```



Name: ambient_light_ch1

Function

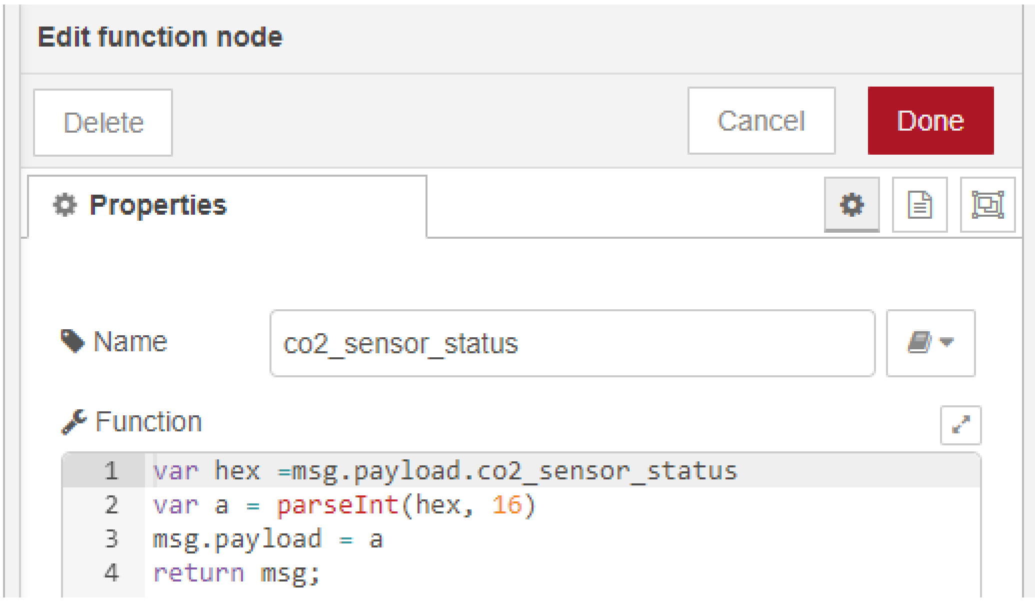
```
var hex =msg.payload.ambient_light_CH1
var a = parseInt(hex, 16)
msg.payload = a
return msg;
```



Name co2_concentration

Function

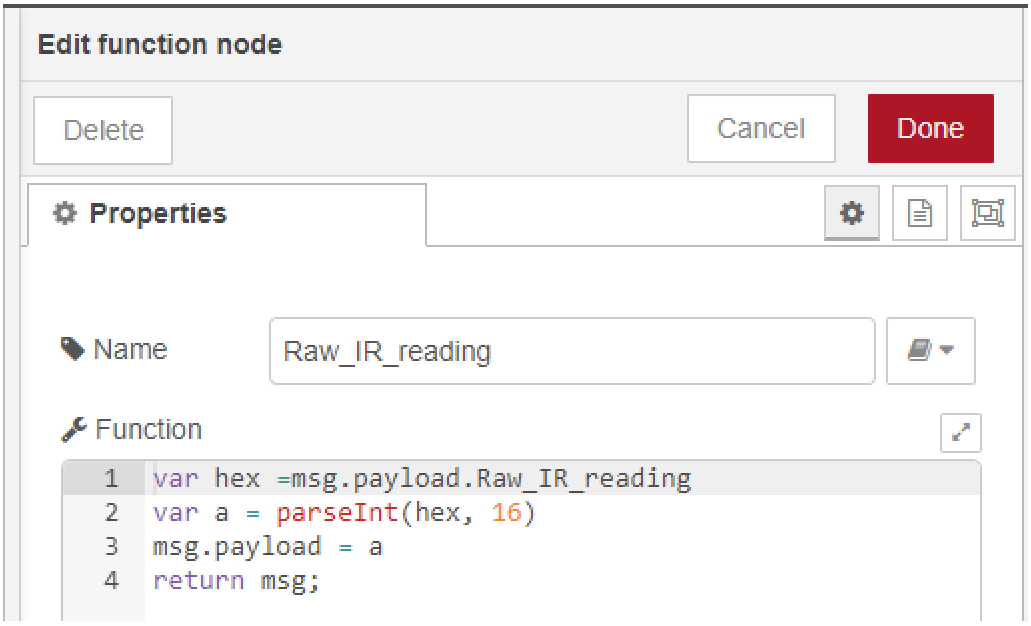
```
var hex =msg.payload.co2_concentration
var a = parseInt(hex, 16)-32768
msg.payload = a
return msg;
```



Name co2_sensor_status

Function

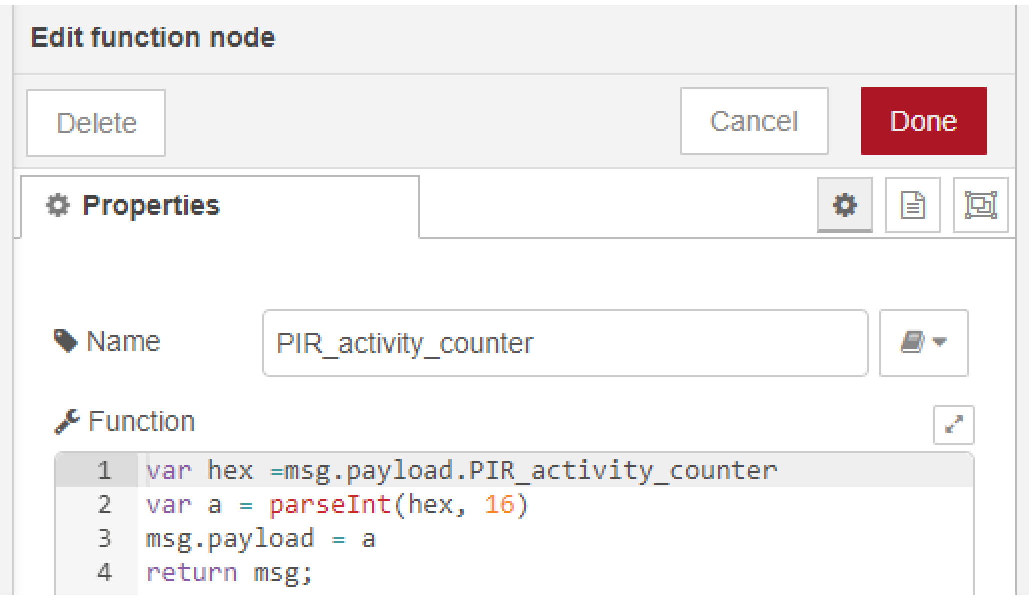
```
var hex =msg.payload.co2_sensor_status
var a = parseInt(hex, 16)
msg.payload = a
return msg;
```



Name: Raw_IR_reading

Function

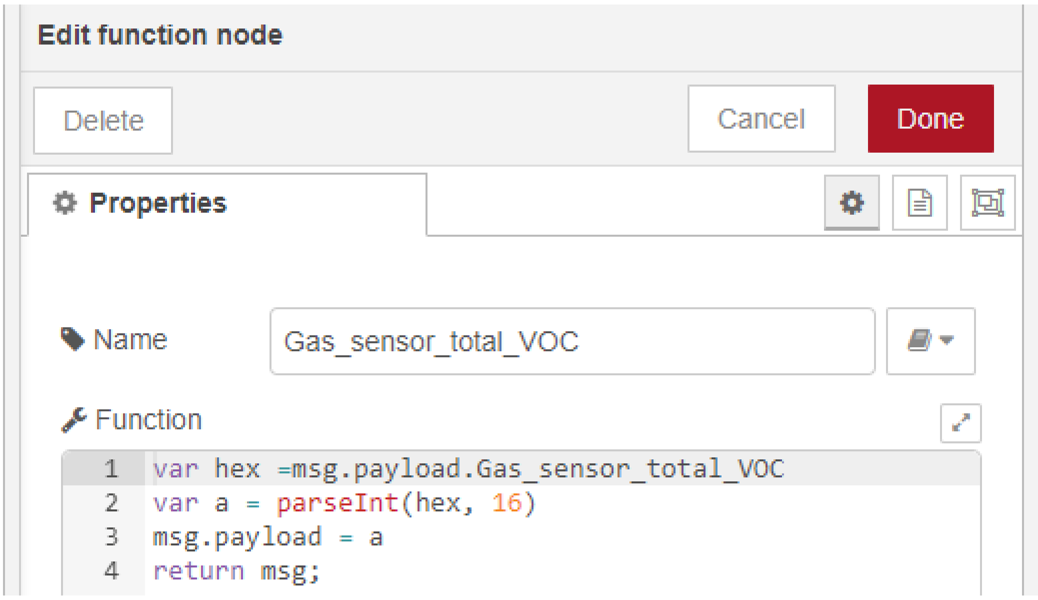
```
var hex =msg.payload.Raw_IR_reading
var a = parseInt(hex, 16)
msg.payload = a
return msg;
```



Name: PIR_activity_counter

Function

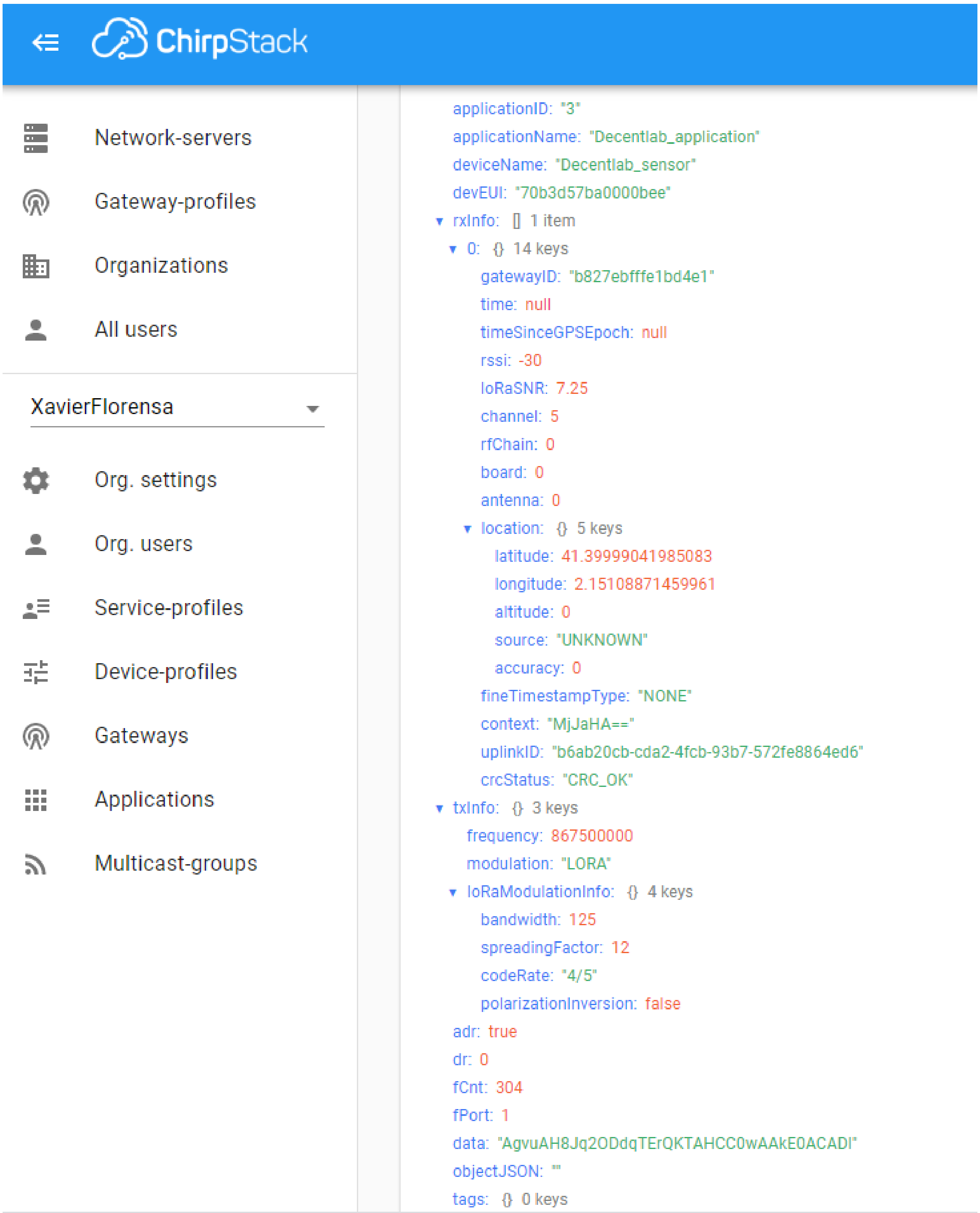
```
var hex =msg.payload.PIR_activity_counter
var a = parseInt(hex, 16)
msg.payload = a
return msg;
```



Name: Gas_sensor_total_VOC

Function

```
var hex =msg.payload.Gas_sensor_total_VOC
var a = parseInt(hex, 16)
msg.payload = a
return msg;
```

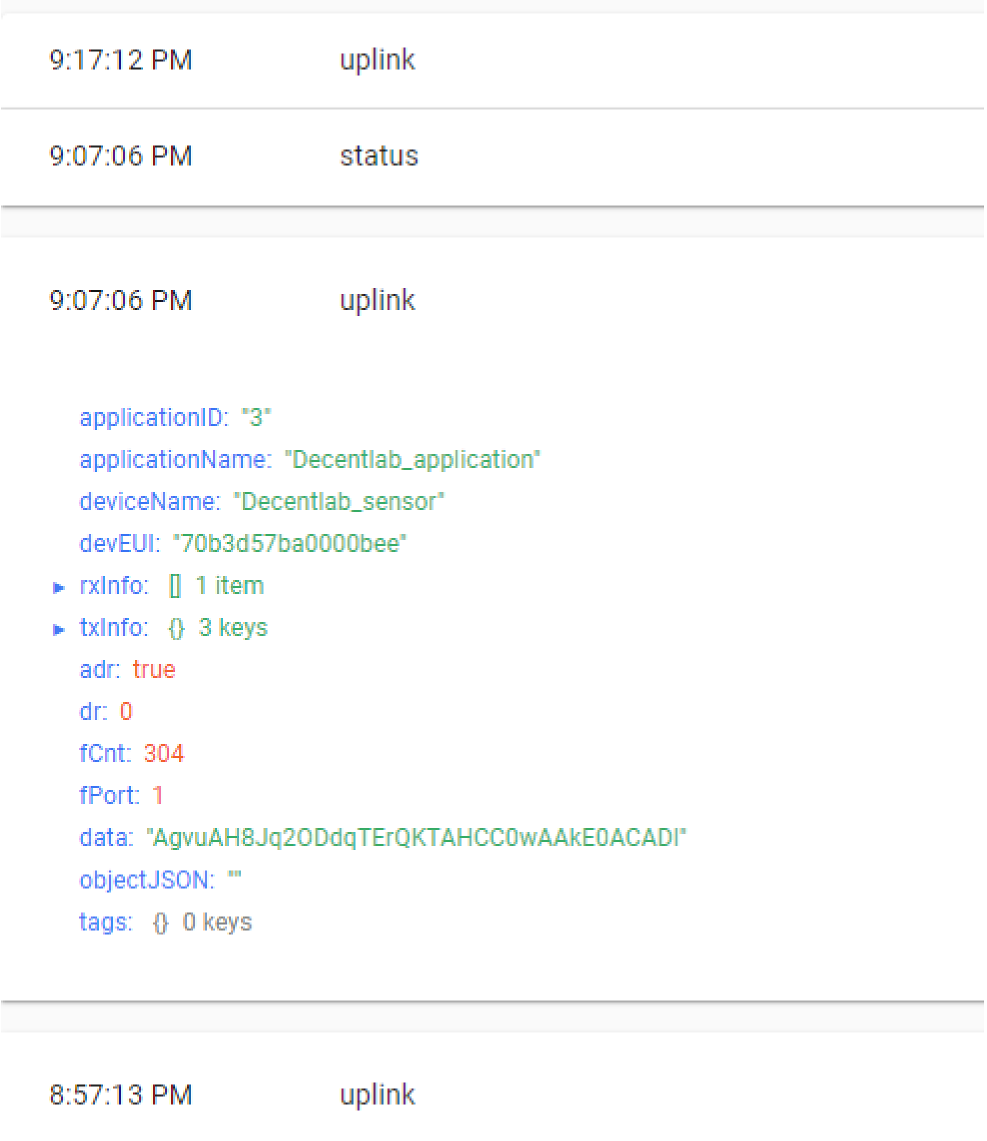


```
    applicationID: "3"
    applicationName: "Decentlab_application"
    deviceName: "Decentlab_sensor"
    devEUI: "70b3d57ba0000bee"
  ▾ rxInfo: [] 1 item
    ▾ 0: {} 14 keys
        gatewayID: "b827ebfffe1bd4e1"
        time: null
        timeSinceGPSEpoch: null
        rssi: -30
        loRaSNR: 7.25
        channel: 5
        rfChain: 0
        board: 0
        antenna: 0
      ▾ location: {} 5 keys
          latitude: 41.39999041985083
          longitude: 2.15108871459961
          altitude: 0
          source: "UNKNOWN"
          accuracy: 0
        fineTimestampType: "NONE"
        context: "MjJaHA=="
        uplinkID: "b6ab20cb-cda2-4fcb-93b7-572fe8864ed6"
        crcStatus: "CRC_OK"
  ▾ txInfo: {} 3 keys
      frequency: 867500000
      modulation: "LORA"
    ▾ loRaModulationInfo: {} 4 keys
        bandwidth: 125
        spreadingFactor: 12
        codeRate: "4/5"
        polarizationInversion: false
    adr: true
    dr: 0
    fCnt: 304
    fPort: 1
    data: "AgvuAH8Jq2ODdqTErQKTAHCC0wAAkE0ACADI"
    objectJSON: ""
    tags: {} 0 keys
```

{"applicationID":"3","applicationName":"Decentlab_application","deviceName":"Decentlab_sensor","devEUI":"70b3d57ba0000bee","rxInfo":[{"gatewayID":"b827ebfffe1bd4e1","uplinkID":"b6ab20cb-cda2-4fcb-93b7-572fe8864ed6","name":"RAKGATEWAY","rssi":-30,"loRaSNR":7.25,"location":{"latitude":41.39999041985083,"longitude":2.15108871459961,"altitude":0}}],"txInfo":{"frequency":867500000,"dr":0},"adr":true,"fCnt":304,"fPort":1,"data":"AgvuAH8Jq2ODdqTErQKTAHCC0wAAkE0ACADl"}

Let’s see its format

```
{"applicationID":"3",

"applicationName":"Decentlab_application",

"deviceName":"Decentlab_sensor",

"devEUI":"70b3d57ba0000bee",

"rxInfo":

        [{"gatewayID":"b827ebfffe1bd4e1",

        "uplinkID":"b6ab20cb-cda2-4fcb-93b7-572fe8864ed6",

        "name":"RAKGATEWAY",

        "rssi":30,

        "loRaSNR":7.25,

        "location":

                {"latitude":41.39999041985083,

                "longitude":2.15108871459961,

                "altitude":0}

        }],

"txInfo":

        {"frequency":867500000,"dr":0},

"adr":true,"fCnt":304,

"fPort":1,

"data":"AgvuAH8Jq2ODdqTErQKTAHCC0wAAkE0ACADl"}
```



9:17:12 PM uplink

9:07:06 PM status

9:07:06 PM uplink

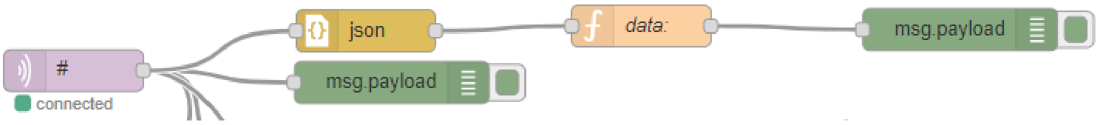
```
applicationID: "3"
applicationName: "Decentlab_application"
deviceName: "Decentlab_sensor"
devEUI: "70b3d57ba0000bee"
▸ rxInfo: [] 1 item
▸ txInfo: {} 3 keys
adr: true
dr: 0
fCnt: 304
fPort: 1
data: "AgvuAH8Jq2ODdqTErQKTAHCC0wAAkE0ACADI"
objectJSON: ""
tags: {} 0 keys
```

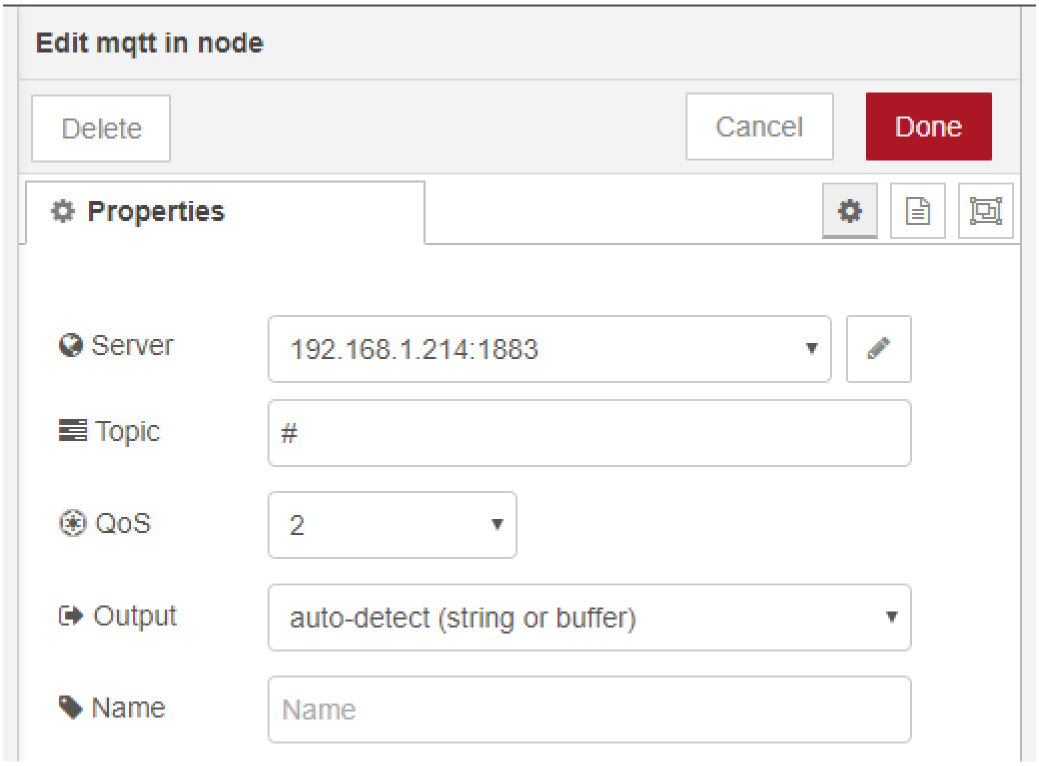
8:57:13 PM uplink

How to decode data

We just use mqqt subscribe node

And we format to Javascript Object





Edit mqtt in node

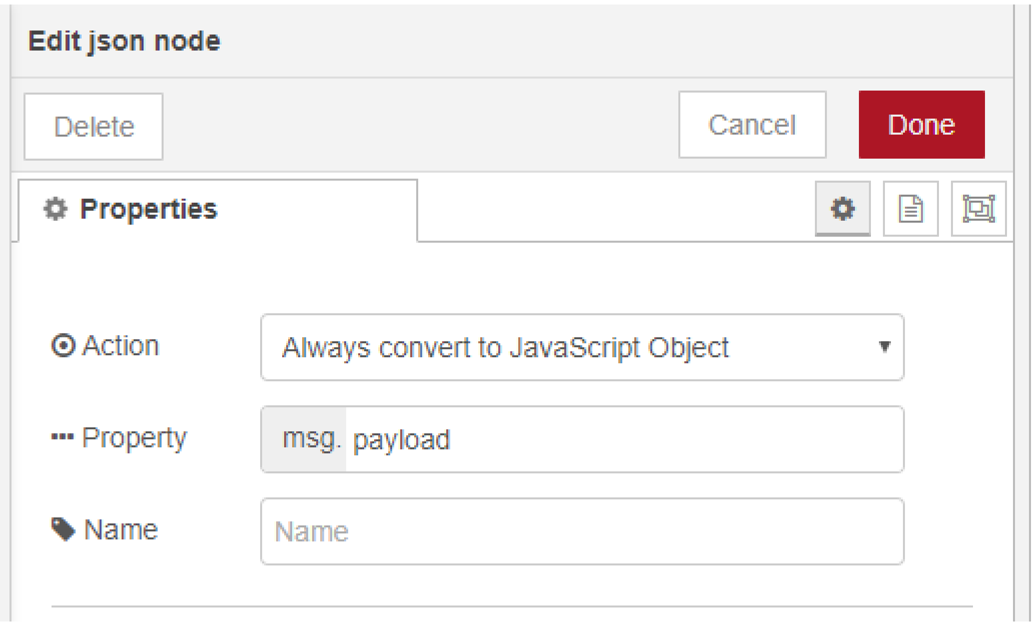
Server 192.168.1.214:1883

Topic #

QoS 2

Output auto-detect (string or buffer)

Name Name

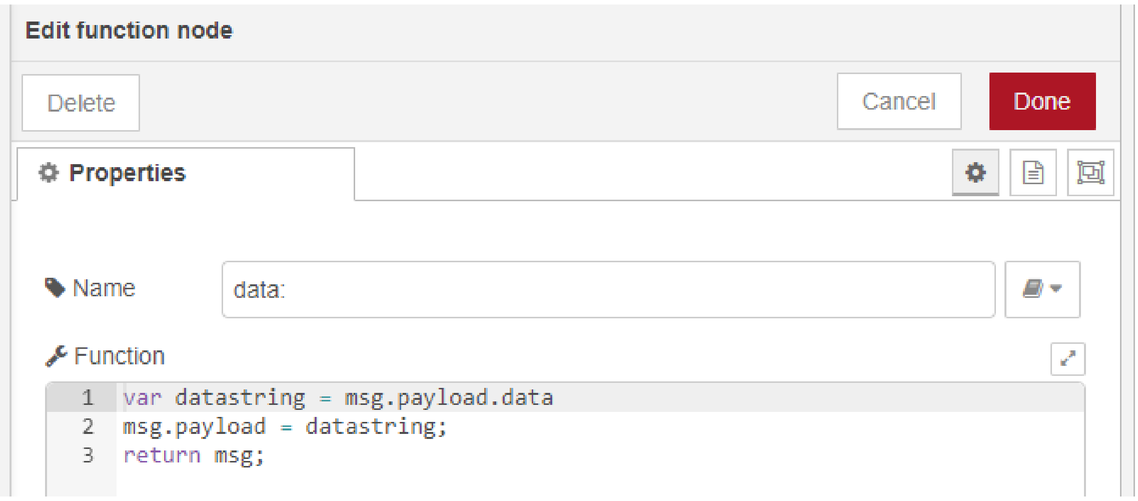


Edit json node

Action Always convert to JavaScript Object

Property msg. payload

Name Name

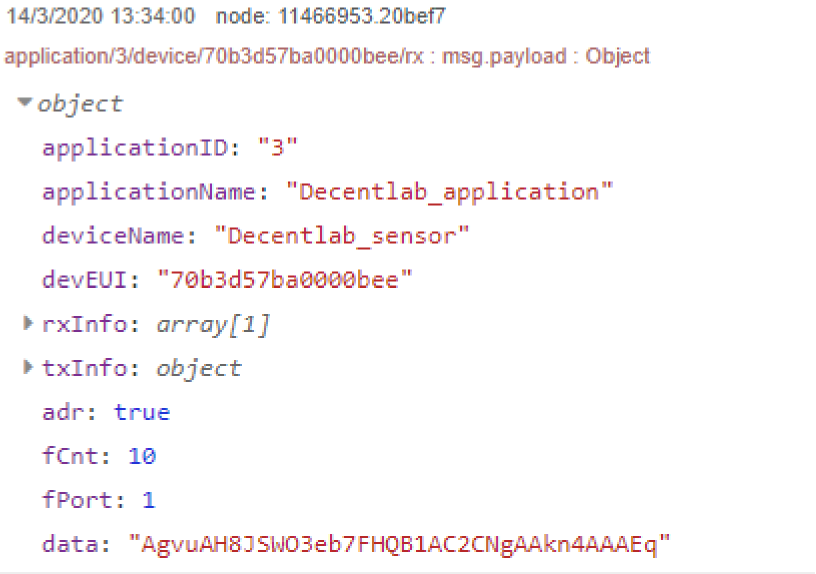


Name: data:

Function

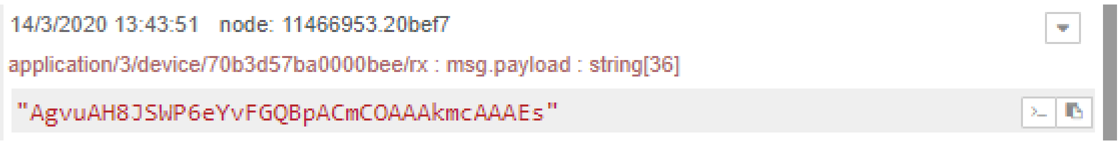
```
var datastring = msg.payload.data
msg.payload = datastring;
return msg;
```

So we get



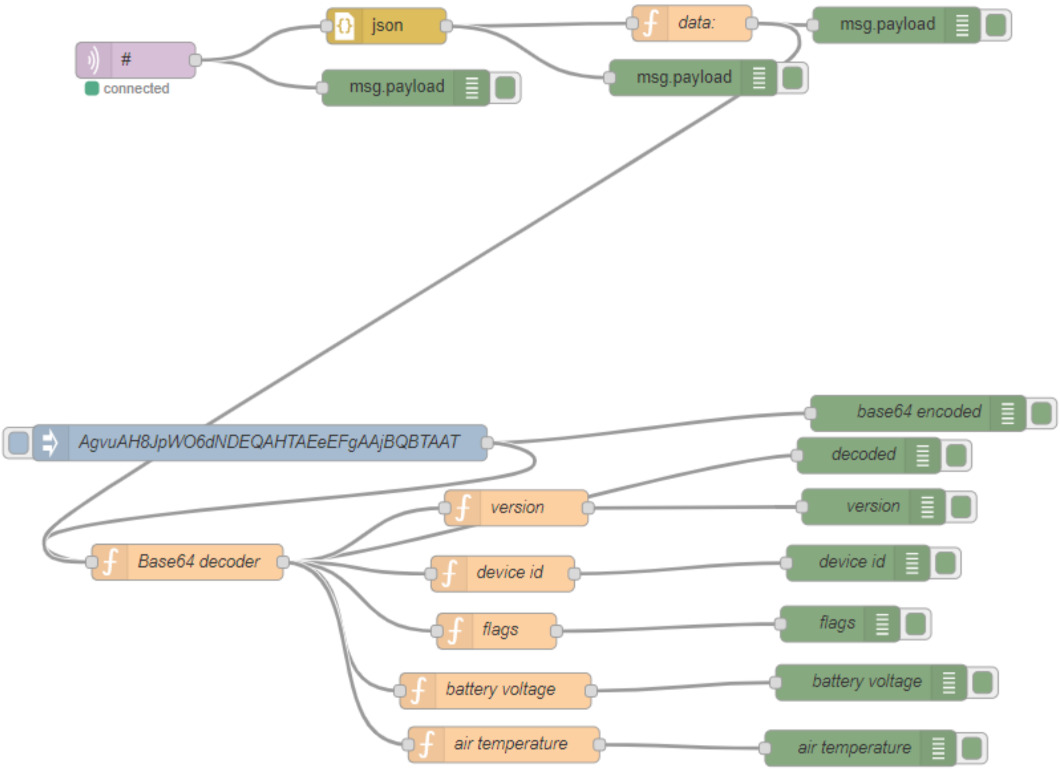
```
14/3/2020 13:34:00   node: 11466953.20bef7
application/3/device/70b3d57ba0000bee/rx : msg.payload : Object
▼object
  applicationID: "3"
  applicationName: "Decentlab_application"
  deviceName: "Decentlab_sensor"
  devEUI: "70b3d57ba0000bee"
 ▶rxInfo: array[1]
 ▶txInfo: object
  adr: true
  fCnt: 10
  fPort: 1
  data: "AgvuAH8JSWO3eb7FHQB1AC2CNgAAkn4AAAEq"
```

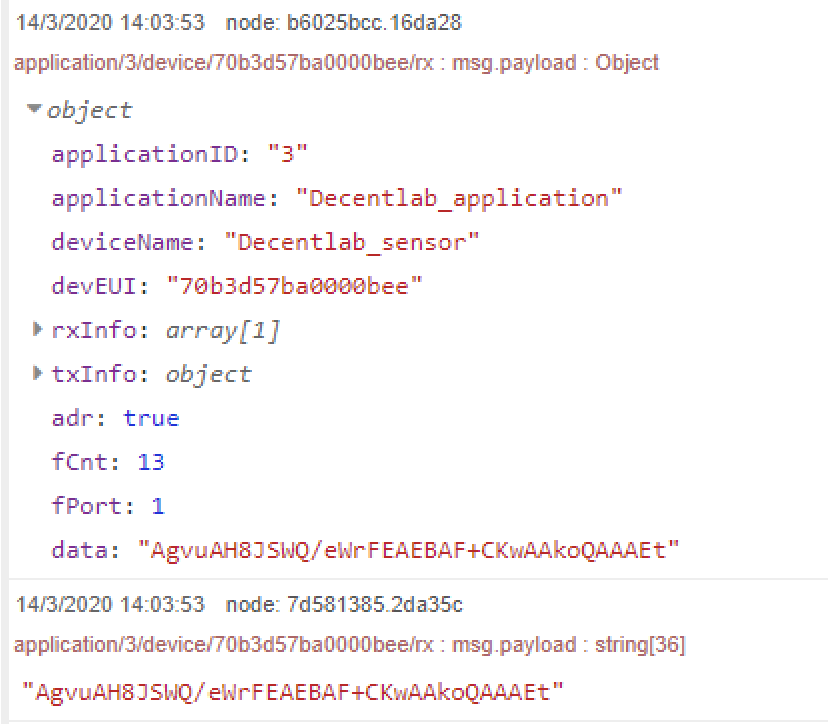
And after the data: function



```
14/3/2020 13:43:51   node: 11466953.20bef7
application/3/device/70b3d57ba0000bee/rx : msg.payload : string[36]
"AgvuAH8JSWP6eYvFGQBpACmCOAAAkmcAAAEs"
```

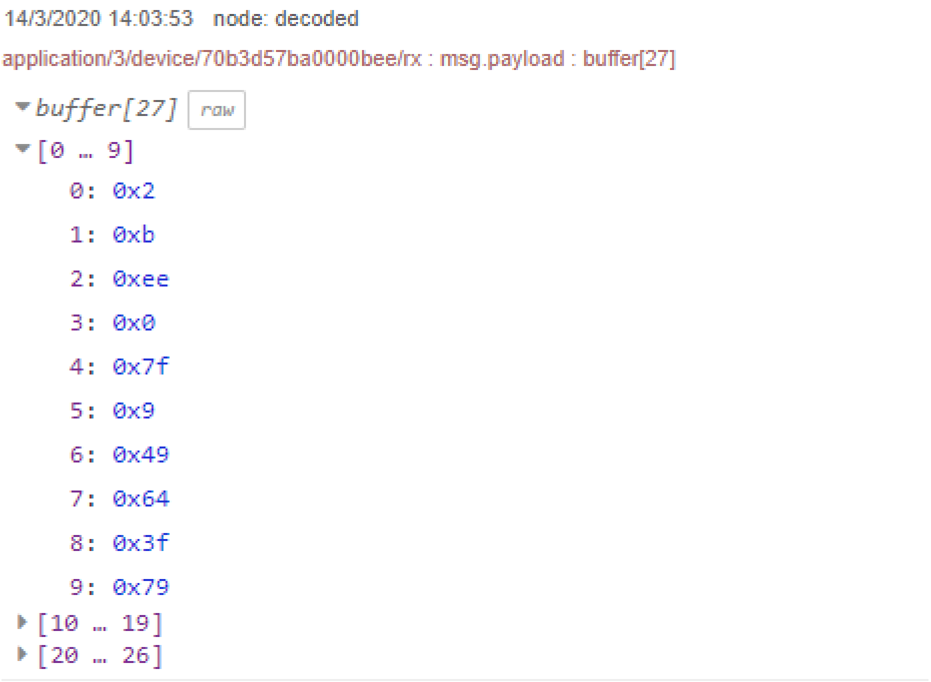
We test with real received data



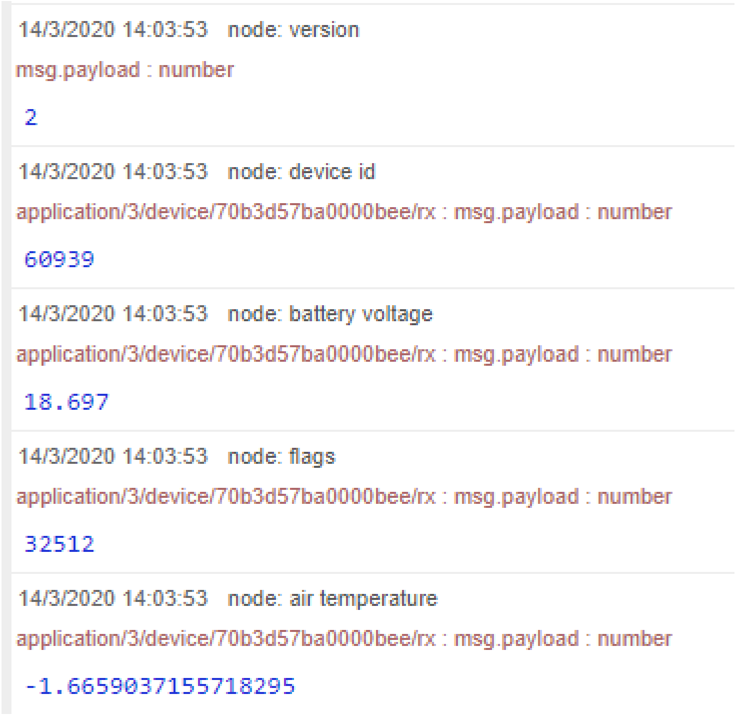


```
14/3/2020 14:03:53   node: b6025bcc.16da28
application/3/device/70b3d57ba0000bee/rx : msg.payload : Object
▼object
  applicationID: "3"
  applicationName: "Decentlab_application"
  deviceName: "Decentlab_sensor"
  devEUI: "70b3d57ba0000bee"
 ▶rxInfo: array[1]
 ▶txInfo: object
  adr: true
  fCnt: 13
  fPort: 1
  data: "AgvuAH8JSWQ/eWrFEAEBAF+CKwAAkoQAAAEt"
14/3/2020 14:03:53   node: 7d581385.2da35c
application/3/device/70b3d57ba0000bee/rx : msg.payload : string[36]
"AgvuAH8JSWQ/eWrFEAEBAF+CKwAAkoQAAAEt"
```

If we decode the data from Base 64



```
14/3/2020 14:03:53   node: decoded
application/3/device/70b3d57ba0000bee/rx : msg.payload : buffer[27]
▾buffer[27]  raw
▾[0 … 9]
    0: 0x2
    1: 0xb
    2: 0xee
    3: 0x0
    4: 0x7f
    5: 0x9
    6: 0x49
    7: 0x64
    8: 0x3f
    9: 0x79
▸[10 … 19]
▸[20 … 26]
```



```
14/3/2020 14:03:53   node: version
msg.payload : number
 2

14/3/2020 14:03:53   node: device id
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
 60939

14/3/2020 14:03:53   node: battery voltage
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
 18.697

14/3/2020 14:03:53   node: flags
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
 32512

14/3/2020 14:03:53   node: air temperature
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
 -1.6659037155718295
```

We are not doing on the right way

Device id is 3054, not 60939

So let’s change the decoding node

From

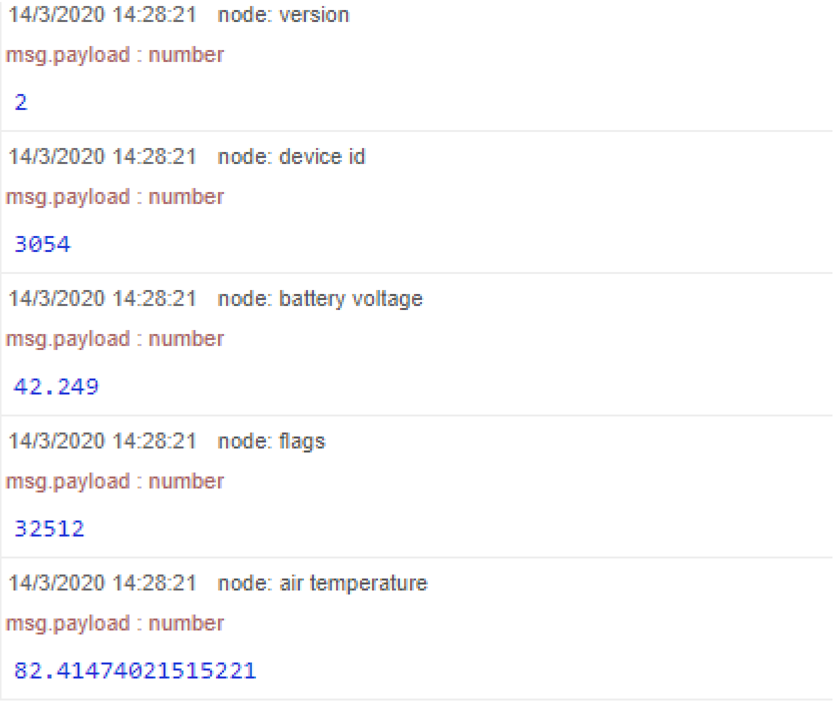
msg.payload = msg.payload.readUInt16LE(1)

```
return msg;
```

To

```
msg.payload = msg.payload.readUInt16BE(1)

return msg;
```

and it Works



```
14/3/2020 14:28:21   node: version
msg.payload : number
2

14/3/2020 14:28:21   node: device id
msg.payload : number
3054

14/3/2020 14:28:21   node: battery voltage
msg.payload : number
42.249

14/3/2020 14:28:21   node: flags
msg.payload : number
32512

14/3/2020 14:28:21   node: air temperature
msg.payload : number
82.41474021515221
```

What about the battery voltaje?

It is 2. volts, not 18.

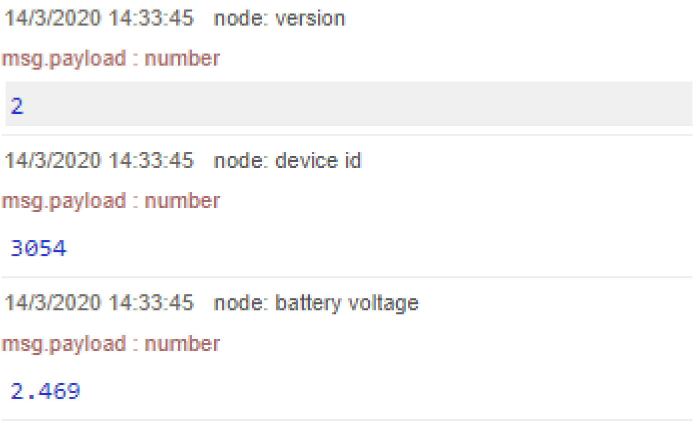
Yes

Changing

```
msg.payload = msg.payload.readUInt16LE(5)/1000

return msg;
```

to

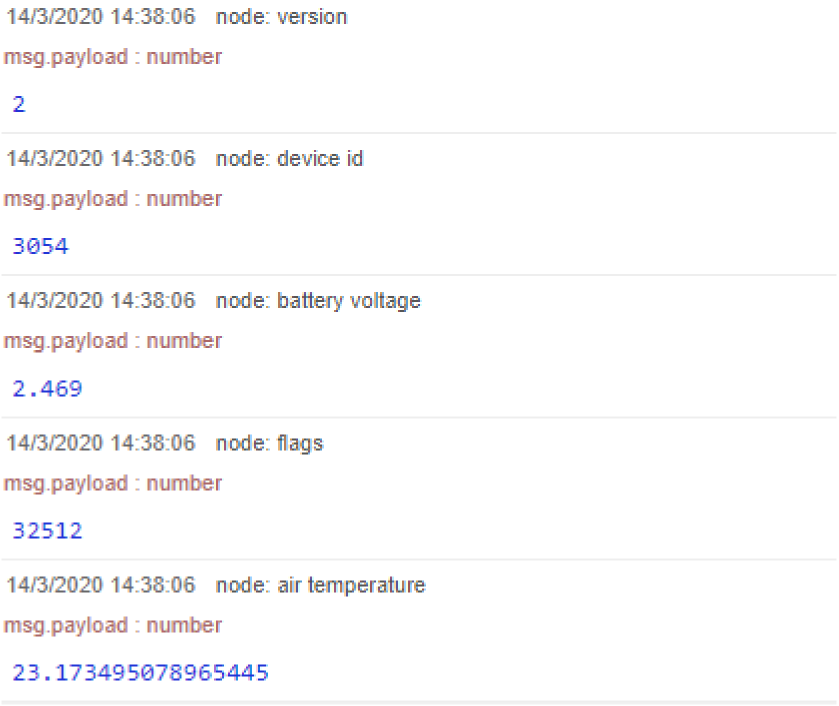
```
msg.payload = msg.payload.readUInt16BE(5)/1000

return msg;
```



```
14/3/2020 14:33:45   node: version
msg.payload : number
2
14/3/2020 14:33:45   node: device id
msg.payload : number
3054
14/3/2020 14:33:45   node: battery voltage
msg.payload : number
2.469
```

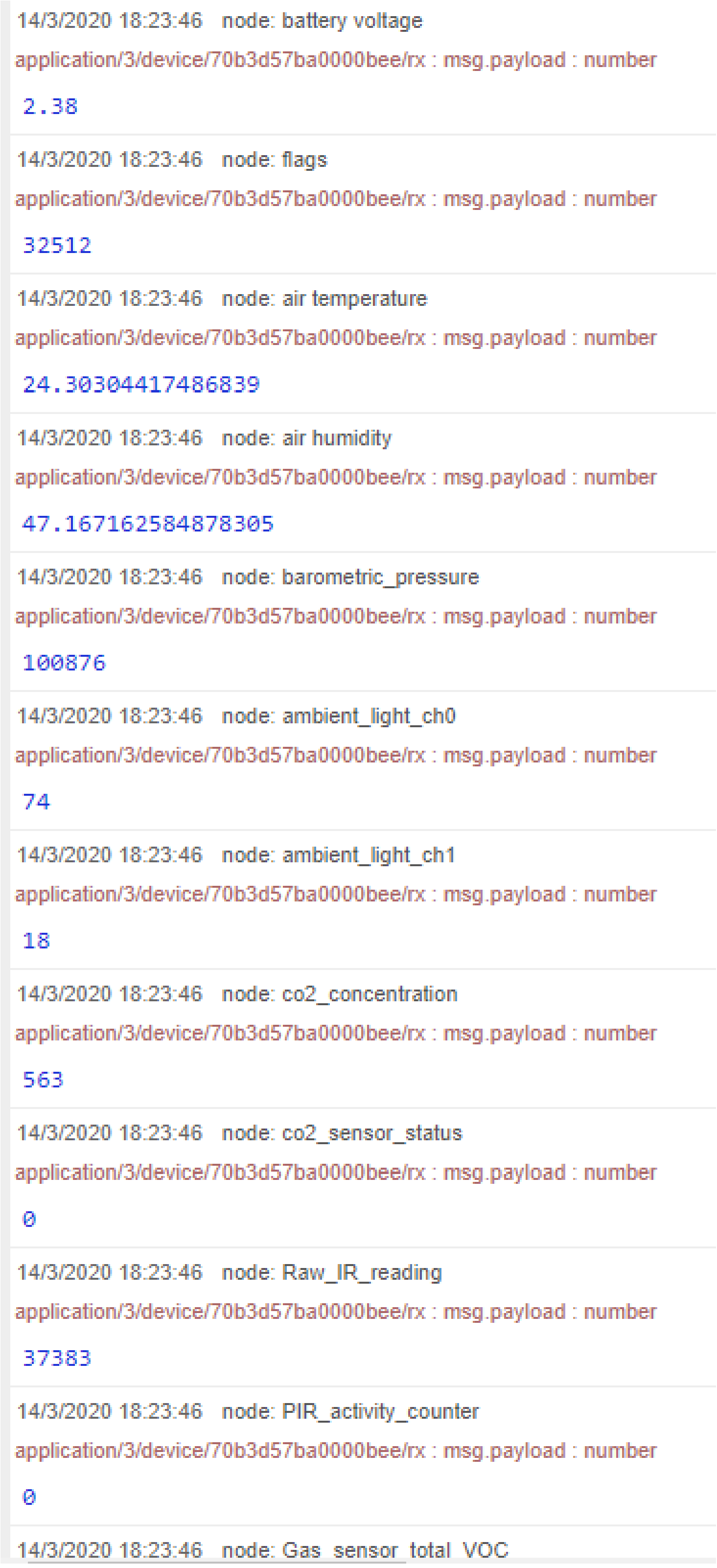
What about air temperature?

```
msg.payload = ((msg.payload.readUInt16BE(7))/65535)*175-45;

return msg;
```



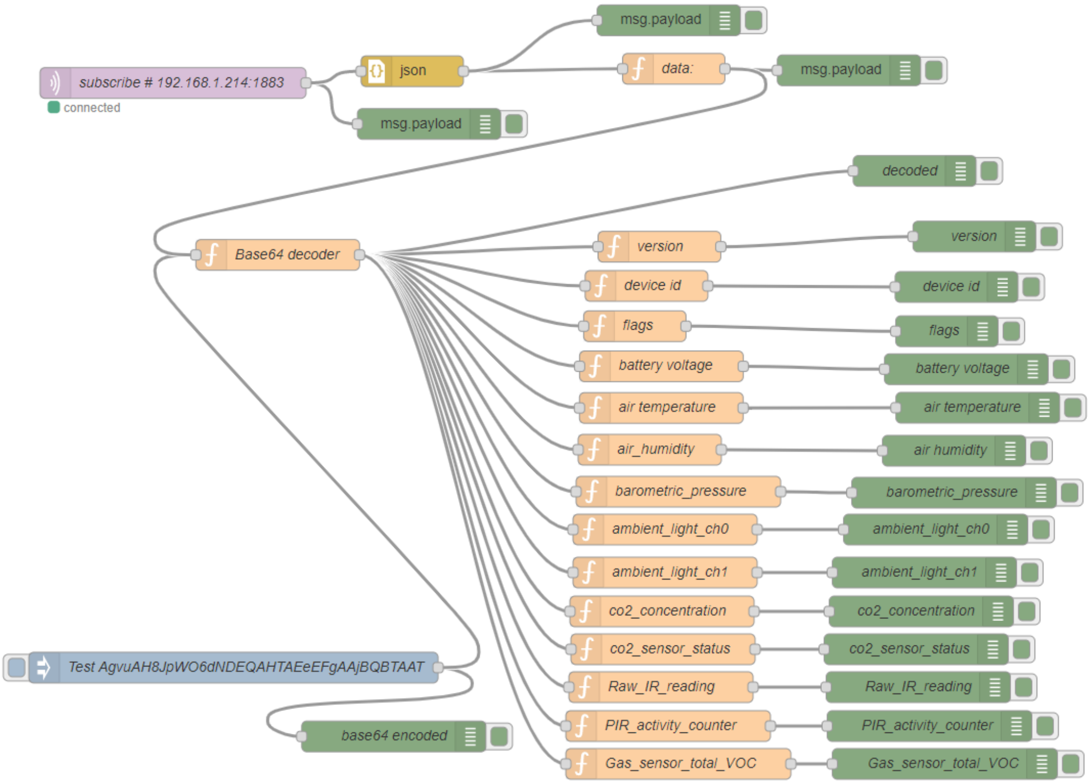
```
14/3/2020 14:38:06   node: version
msg.payload : number
2
14/3/2020 14:38:06   node: device id
msg.payload : number
3054
14/3/2020 14:38:06   node: battery voltage
msg.payload : number
2.469
14/3/2020 14:38:06   node: flags
msg.payload : number
32512
14/3/2020 14:38:06   node: air temperature
msg.payload : number
23.173495078965445
```

Let’s build the complete decoding

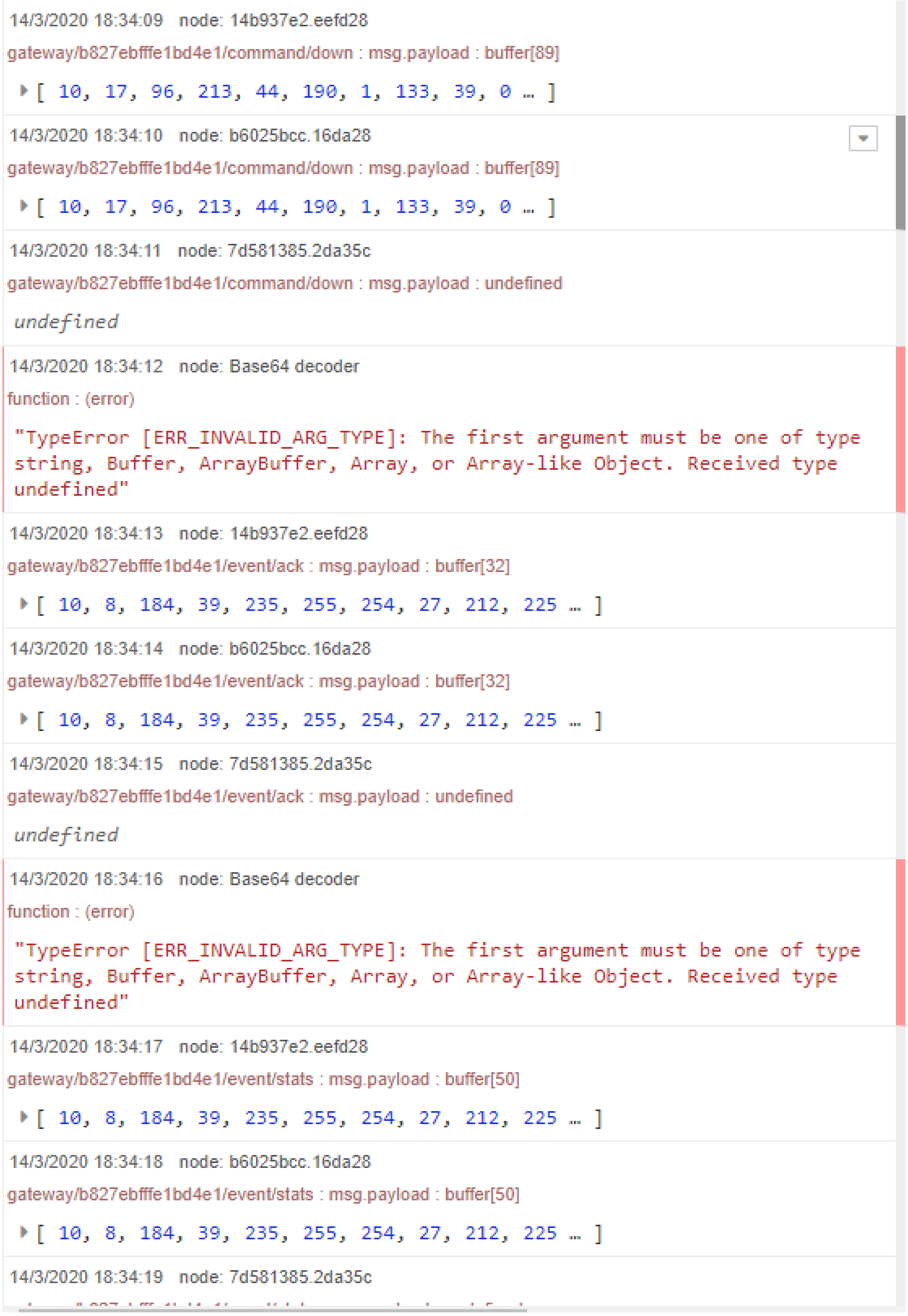


```
14/3/2020 18:23:46   node: battery voltage
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
2.38

14/3/2020 18:23:46   node: flags
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
32512

14/3/2020 18:23:46   node: air temperature
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
24.30304417486839

14/3/2020 18:23:46   node: air humidity
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
47.167162584878305

14/3/2020 18:23:46   node: barometric_pressure
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
100876

14/3/2020 18:23:46   node: ambient_light_ch0
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
74

14/3/2020 18:23:46   node: ambient_light_ch1
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
18

14/3/2020 18:23:46   node: co2_concentration
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
563

14/3/2020 18:23:46   node: co2_sensor_status
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
0

14/3/2020 18:23:46   node: Raw_IR_reading
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
37383

14/3/2020 18:23:46   node: PIR_activity_counter
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
0

14/3/2020 18:23:46   node: Gas_sensor_total_VOC
```

This is the receiver-decoder Flow

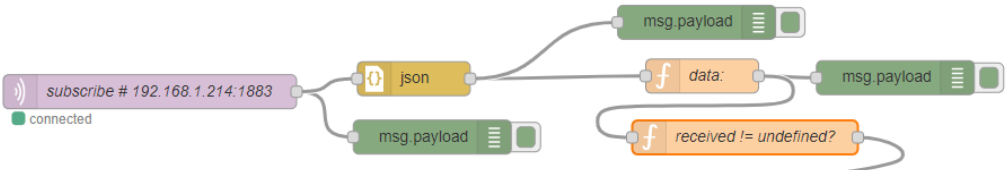


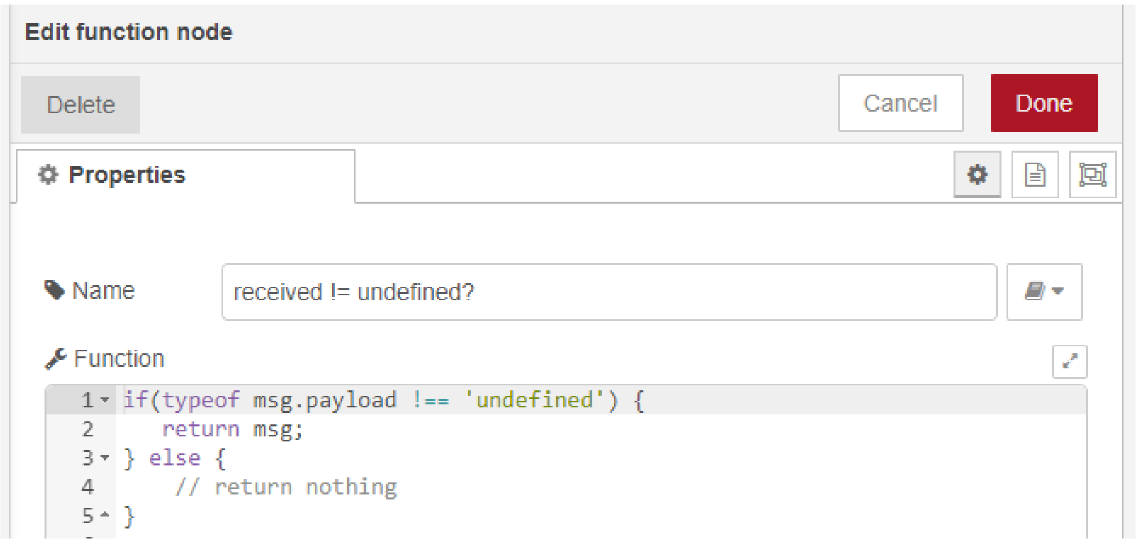
We are able t oread the sensor data, but we still receive a lot of undesired commnunication ping data like



```
14/3/2020 18:34:09   node: 14b937e2.eefd28
gateway/b827ebfffe1bd4e1/command/down : msg.payload : buffer[89]
 ▸[ 10, 17, 96, 213, 44, 190, 1, 133, 39, 0 … ]

14/3/2020 18:34:10   node: b6025bcc.16da28
gateway/b827ebfffe1bd4e1/command/down : msg.payload : buffer[89]
 ▸[ 10, 17, 96, 213, 44, 190, 1, 133, 39, 0 … ]

14/3/2020 18:34:11   node: 7d581385.2da35c
gateway/b827ebfffe1bd4e1/command/down : msg.payload : undefined
 undefined

14/3/2020 18:34:12   node: Base64 decoder
function : (error)
 "TypeError [ERR_INVALID_ARG_TYPE]: The first argument must be one of type
 string, Buffer, ArrayBuffer, Array, or Array-like Object. Received type
 undefined"

14/3/2020 18:34:13   node: 14b937e2.eefd28
gateway/b827ebfffe1bd4e1/event/ack : msg.payload : buffer[32]
 ▸[ 10, 8, 184, 39, 235, 255, 254, 27, 212, 225 … ]

14/3/2020 18:34:14   node: b6025bcc.16da28
gateway/b827ebfffe1bd4e1/event/ack : msg.payload : buffer[32]
 ▸[ 10, 8, 184, 39, 235, 255, 254, 27, 212, 225 … ]

14/3/2020 18:34:15   node: 7d581385.2da35c
gateway/b827ebfffe1bd4e1/event/ack : msg.payload : undefined
 undefined

14/3/2020 18:34:16   node: Base64 decoder
function : (error)
 "TypeError [ERR_INVALID_ARG_TYPE]: The first argument must be one of type
 string, Buffer, ArrayBuffer, Array, or Array-like Object. Received type
 undefined"

14/3/2020 18:34:17   node: 14b937e2.eefd28
gateway/b827ebfffe1bd4e1/event/stats : msg.payload : buffer[50]
 ▸[ 10, 8, 184, 39, 235, 255, 254, 27, 212, 225 … ]

14/3/2020 18:34:18   node: b6025bcc.16da28
gateway/b827ebfffe1bd4e1/event/stats : msg.payload : buffer[50]
 ▸[ 10, 8, 184, 39, 235, 255, 254, 27, 212, 225 … ]

14/3/2020 18:34:19   node: 7d581385.2da35c
```

We can filter the resukts only to decode the object



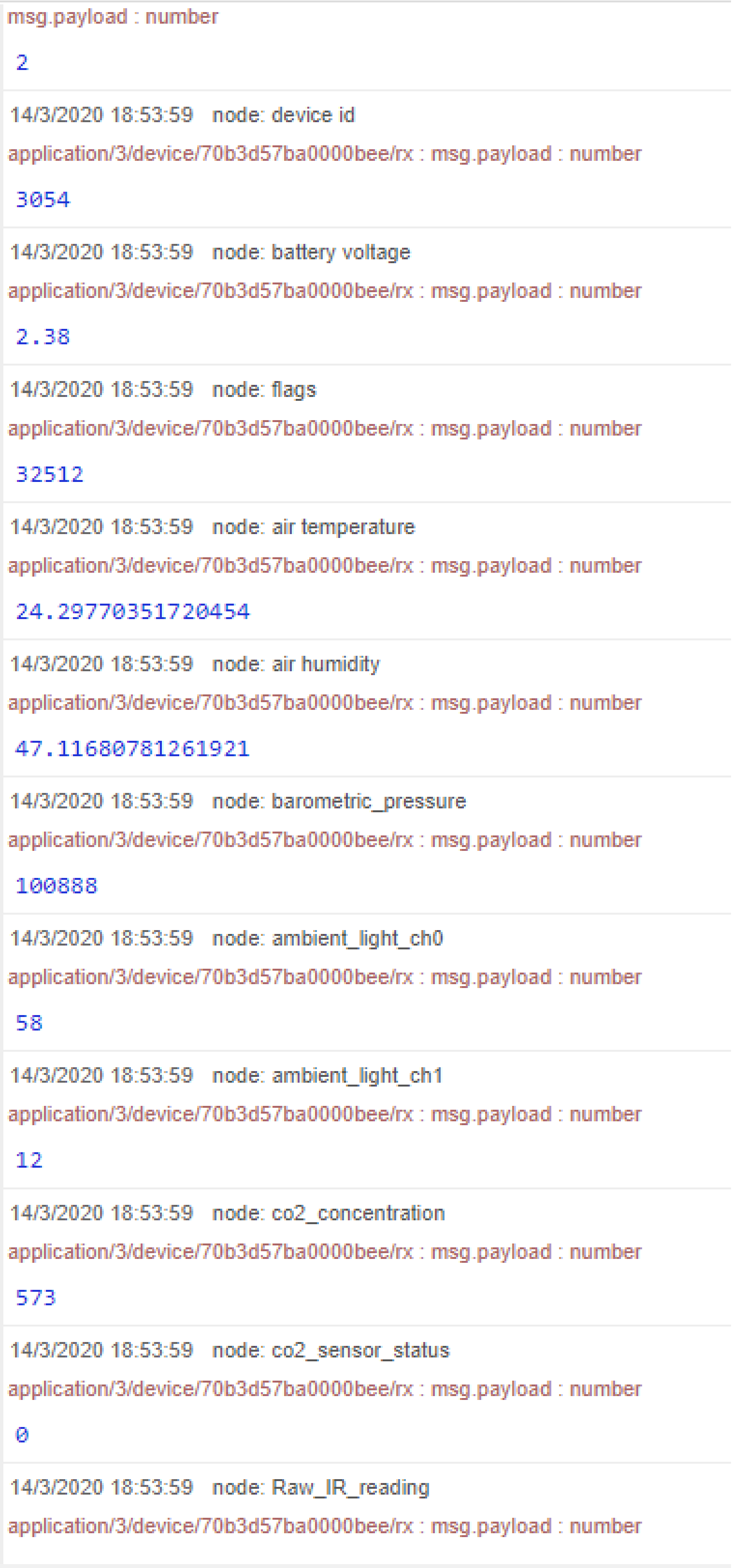


Name: received != undefined?

Function

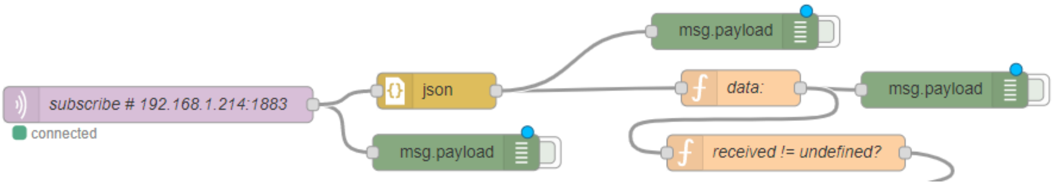
```
if(typeof msg.payload !== 'undefined') {
    return msg;
} else {
     // return nothing
}
```

It Works!

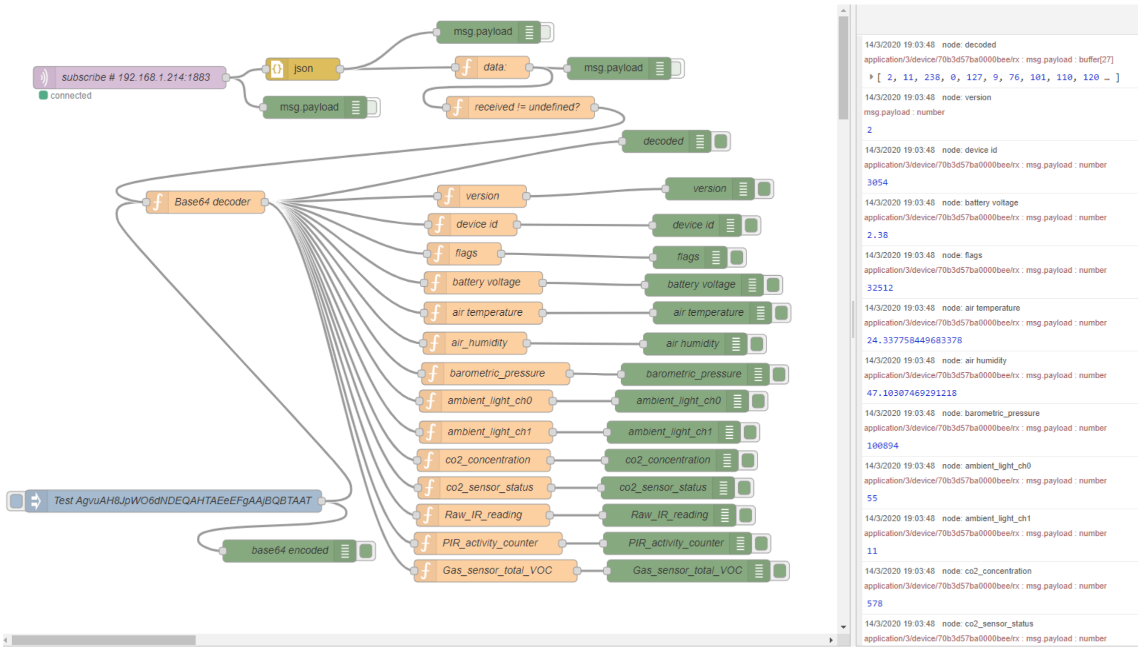


```
msg.payload : number
2
14/3/2020 18:53:59   node: device id
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
3054
14/3/2020 18:53:59   node: battery voltage
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
2.38
14/3/2020 18:53:59   node: flags
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
32512
14/3/2020 18:53:59   node: air temperature
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
24.29770351720454
14/3/2020 18:53:59   node: air humidity
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
47.11680781261921
14/3/2020 18:53:59   node: barometric_pressure
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
100888
14/3/2020 18:53:59   node: ambient_light_ch0
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
58
14/3/2020 18:53:59   node: ambient_light_ch1
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
12
14/3/2020 18:53:59   node: co2_concentration
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
573
14/3/2020 18:53:59   node: co2_sensor_status
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
0
14/3/2020 18:53:59   node: Raw_IR_reading
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
```

Now we deselect the debug nodes so we get rid off all unnecesary messages



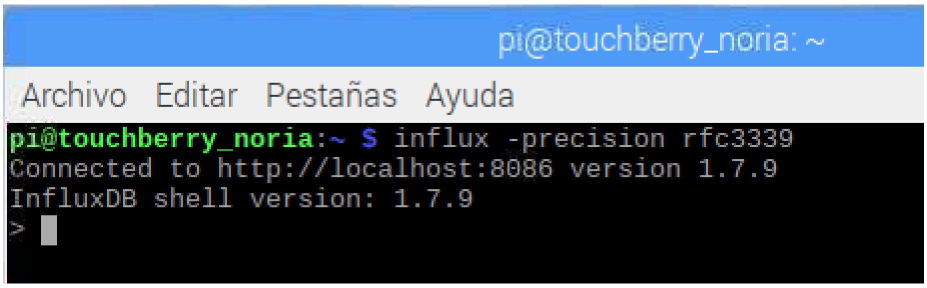
So now we get only the desired data each 10 minutes



```
14/3/2020 19:03:48   node: decoded
application/3/device/70b3d57ba0000bee/rx : msg.payload : buffer[27]
 ▸[ 2, 11, 238, 0, 127, 9, 76, 101, 110, 120 … ]
14/3/2020 19:03:48   node: version
msg.payload : number
 2
14/3/2020 19:03:48   node: device id
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
 3054
14/3/2020 19:03:48   node: battery voltage
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
 2.38
14/3/2020 19:03:48   node: flags
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
 32512
14/3/2020 19:03:48   node: air temperature
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
 24.337758449683378
14/3/2020 19:03:48   node: air humidity
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
 47.10307469291218
14/3/2020 19:03:48   node: barometric_pressure
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
 100894
14/3/2020 19:03:48   node: ambient_light_ch0
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
 55
14/3/2020 19:03:48   node: ambient_light_ch1
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
 11
14/3/2020 19:03:48   node: co2_concentration
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
 578
14/3/2020 19:03:48   node: co2_sensor_status
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
```

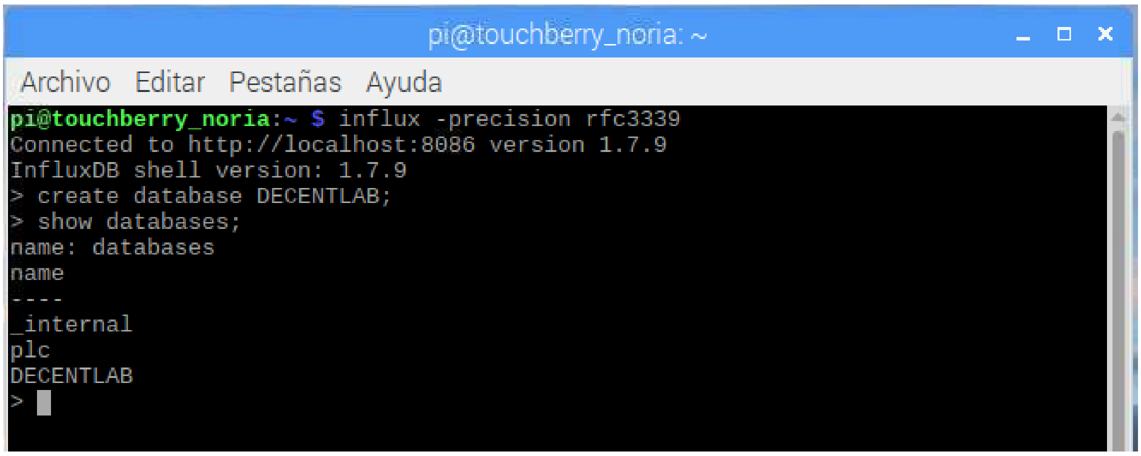
Storing the sensor data on a batabase

Install and start InfluxDB on Raspberry



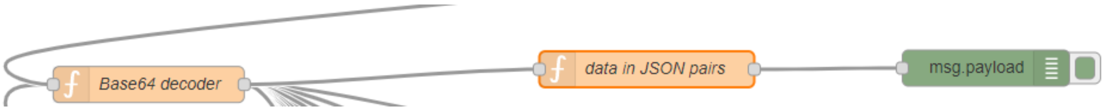
```
pi@touchberry_noria:~ $ influx -precision rfc3339
Connected to http://localhost:8086 version 1.7.9
InfluxDB shell version: 1.7.9
> 
```

We create the database DECENTLAB

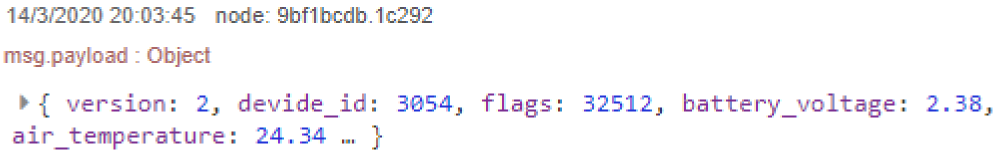


```
pi@touchberry_noria:~ $ influx -precision rfc3339
Connected to http://localhost:8086 version 1.7.9
InfluxDB shell version: 1.7.9
> create database DECENTLAB;
> show databases;
name: databases
name
----
_internal
plc
DECENTLAB
> 
```

Now we have to prepare the data on JSON pairs

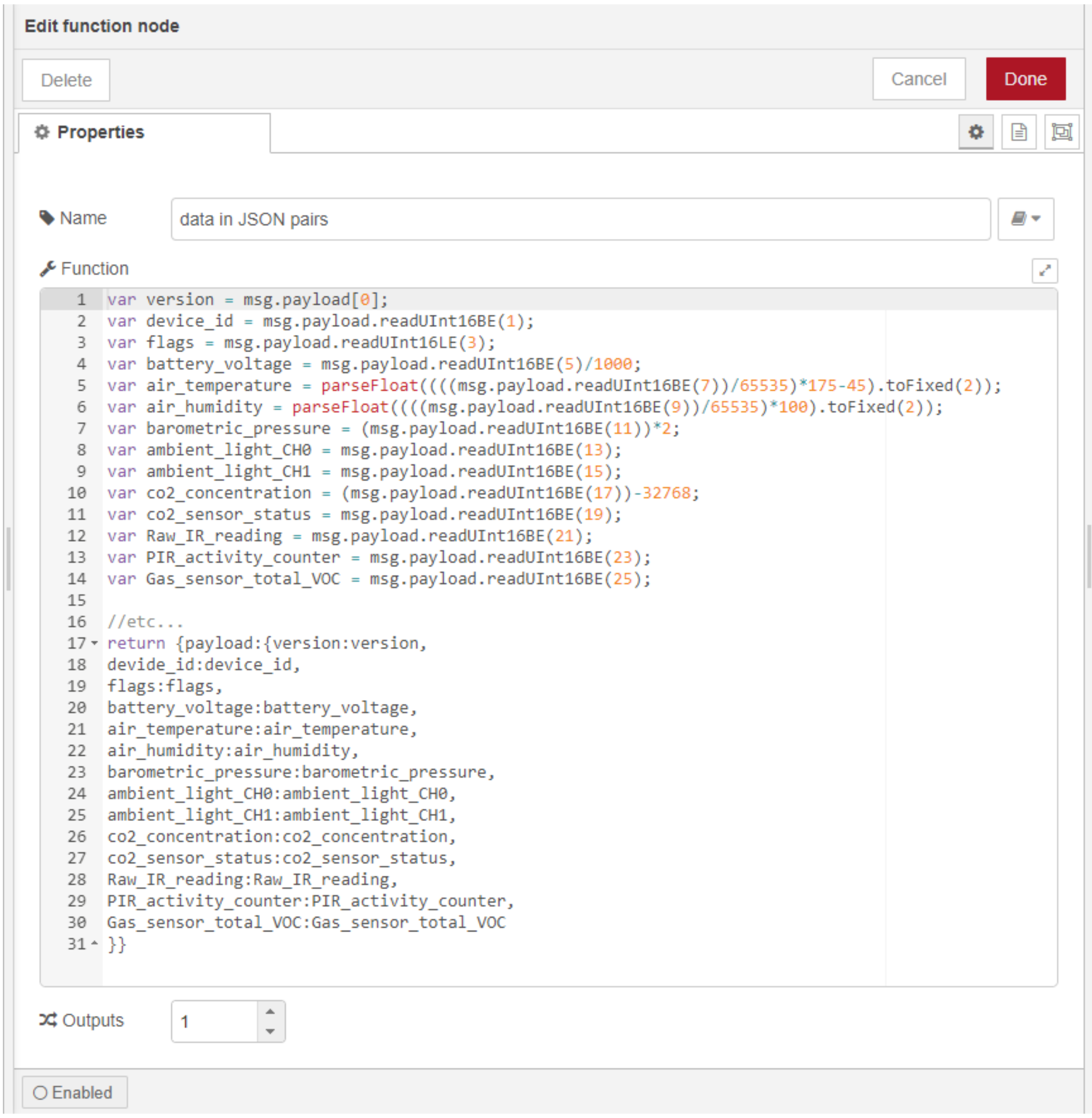


To get this output



```
14/3/2020 20:03:45   node: 9bf1bcdb.1c292
msg.payload : Object
▸{ version: 2, devide_id: 3054, flags: 32512, battery_voltage: 2.38,
air_temperature: 24.34 … }
```

Like this



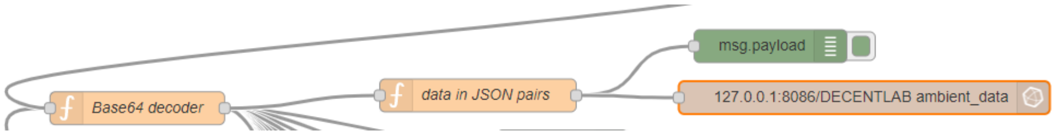
Name: data in JSON pairs

Function

```
var version = msg.payload[0];
var device_id = msg.payload.readUInt16BE(1);
var flags = msg.payload.readUInt16LE(3);
var battery_voltage = msg.payload.readUInt16BE(5)/1000;
var air_temperature = parseFloat((((msg.payload.readUInt16BE(7))/65535)*175-45).toFixed(2));
var air_humidity = parseFloat((((msg.payload.readUInt16BE(9))/65535)*100).toFixed(2));
var barometric_pressure = (msg.payload.readUInt16BE(11))*2;
var ambient_light_CH0 = msg.payload.readUInt16BE(13);
var ambient_light_CH1 = msg.payload.readUInt16BE(15);
var co2_concentration = (msg.payload.readUInt16BE(17))-32768;
var co2_sensor_status = msg.payload.readUInt16BE(19);
var Raw_IR_reading = msg.payload.readUInt16BE(21);
var PIR_activity_counter = msg.payload.readUInt16BE(23);
var Gas_sensor_total_VOC = msg.payload.readUInt16BE(25);

//etc...
return {payload:{version:version,
devide_id:device_id,
flags:flags,
battery_voltage:battery_voltage,
air_temperature:air_temperature,
air_humidity:air_humidity,
barometric_pressure:barometric_pressure,
ambient_light_CH0:ambient_light_CH0,
ambient_light_CH1:ambient_light_CH1,
co2_concentration:co2_concentration,
co2_sensor_status:co2_sensor_status,
Raw_IR_reading:Raw_IR_reading,
PIR_activity_counter:PIR_activity_counter,
Gas_sensor_total_VOC:Gas_sensor_total_VOC
}}
```

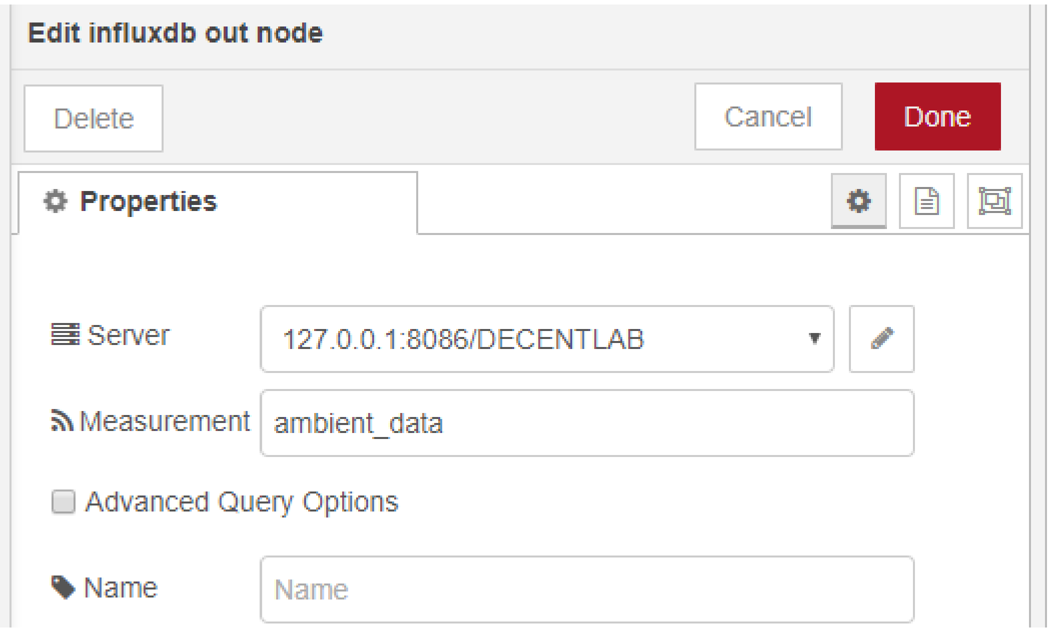
Outputs: 1

And we inject this object to the batabase



A new measurements table "ambient_data" will be created by node-red fo rus on a snap, with the right fields, and the right data type (int, float, etc)

This is how we configure the database node



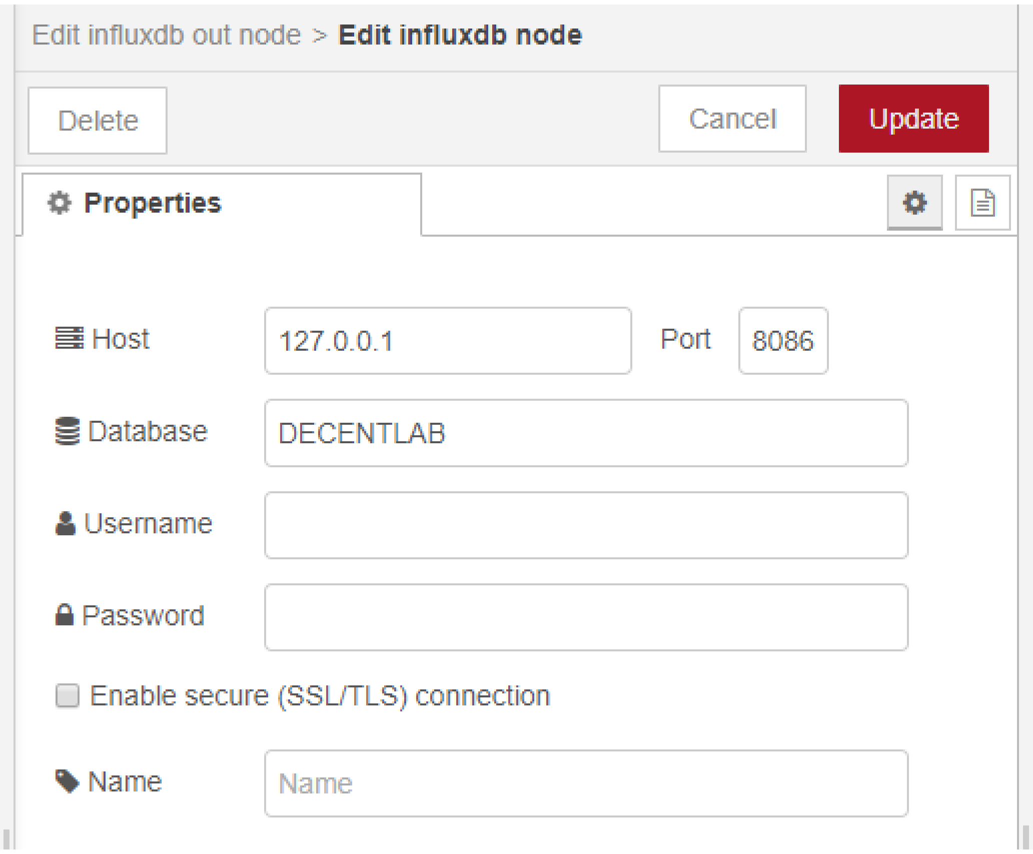
Edit influxdb out node

Server: 127.0.0.1:8086/DECENTLAB

Measurement: ambient_data

□ Advanced Query Options

Name: Name



Edit influxdb out node > Edit influxdb node

Host: 127.0.0.1 Port: 8086

Database: DECENTLAB

Username:

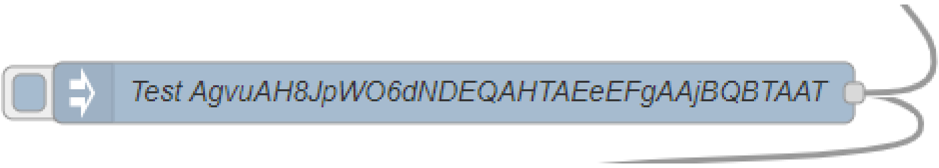
Password:

□ Enable secure (SSL/TLS) connection

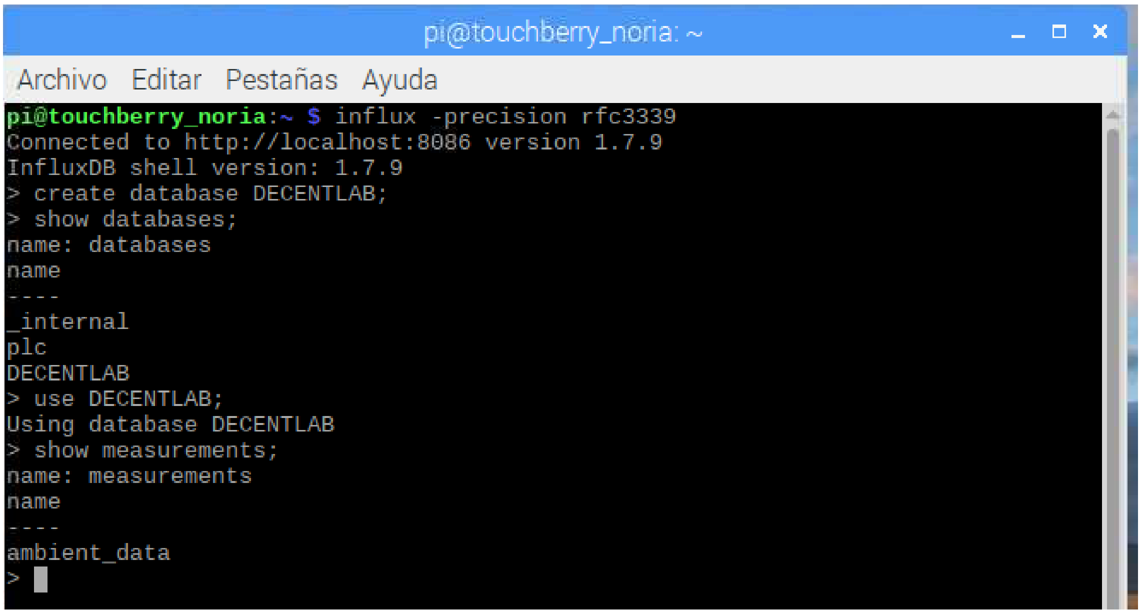
Name: Name

We test the injection on the database with the inject test node

And we get no errors

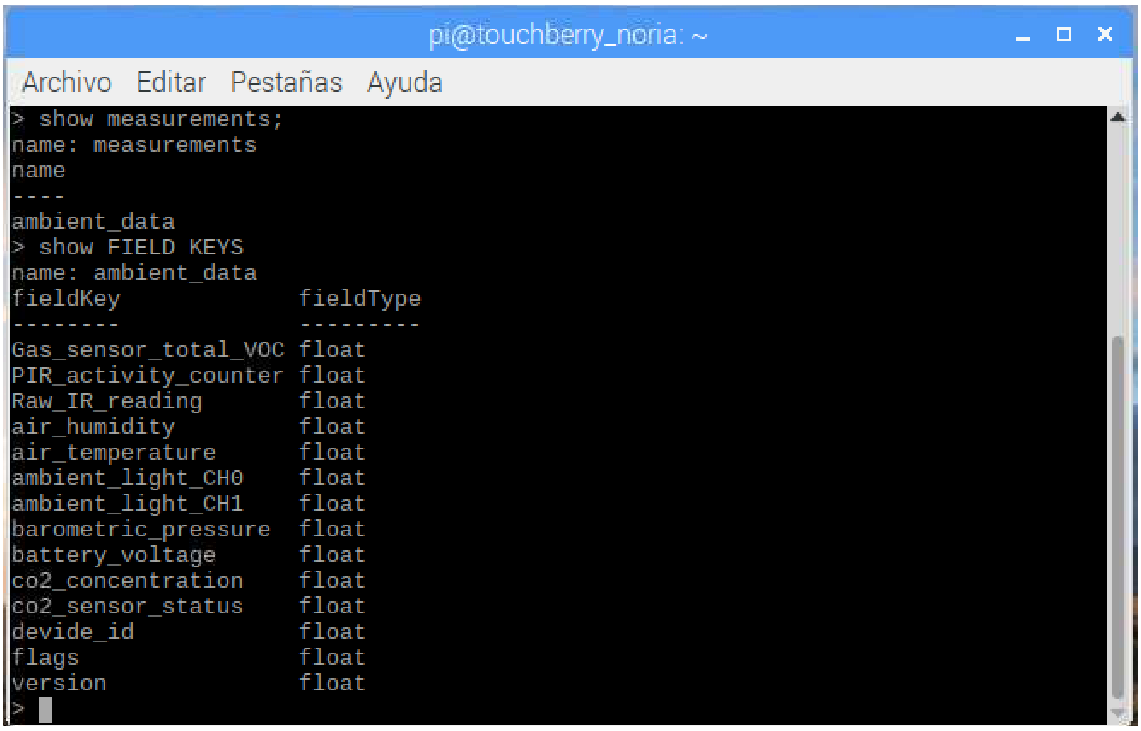


We check on the influxDB terminal



```
pi@touchberry_noria:~ $ influx -precision rfc3339
Connected to http://localhost:8086 version 1.7.9
InfluxDB shell version: 1.7.9
> create database DECENTLAB;
> show databases;
name: databases
name
----
_internal
plc
DECENTLAB
> use DECENTLAB;
Using database DECENTLAB
> show measurements;
name: measurements
name
----
ambient_data
> 
```

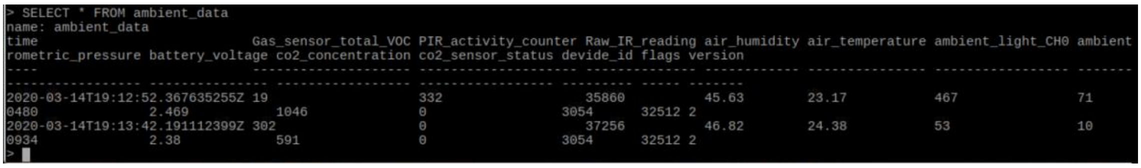
Yes, “ambient_data” measurements table has been created



```
> show measurements;
name: measurements
name
----
ambient_data
> show FIELD KEYS
name: ambient_data
fieldKey             fieldType
--------             ---------
Gas_sensor_total_VOC float
PIR_activity_counter float
Raw_IR_reading       float
air_humidity         float
air_temperature      float
ambient_light_CH0    float
ambient_light_CH1    float
barometric_pressure  float
battery_voltage      float
co2_concentration    float
co2_sensor_status    float
devide_id            float
flags                float
version              float
> 
```

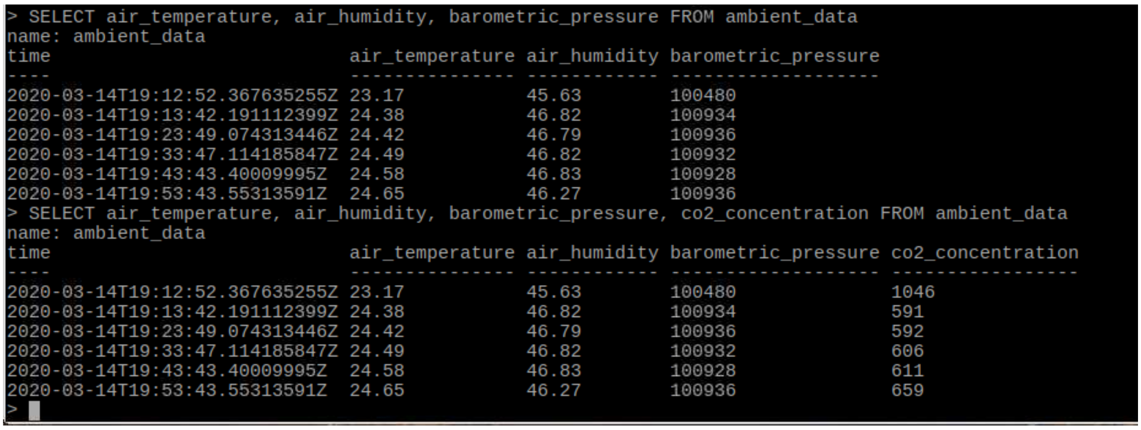
And let’s see what is stored on the database

All the data



```
> SELECT * FROM ambient_data
name: ambient_data
time                           Gas_sensor_total_VOC PIR_activity_counter Raw_IR_reading air_humidity air_temperature ambient_light_CH0 ambient
rometric_pressure battery_voltage co2_concentration co2_sensor_status devide_id flags version
----                           -------------------- -------------------- -------------- ------------ --------------- ----------------- -------
----------------- --------------- ----------------- ----------------- --------- ----- -------
2020-03-14T19:12:52.367635255Z 19                   332                  35860          45.63        23.17           467               71
0480              2.469           1046              0                 3054      32512 2
2020-03-14T19:13:42.191112399Z 302                  0                    37256          46.82        24.38           53                10
0934              2.38            591               0                 3054      32512 2
> 
```

Or a selection



```
> SELECT air_temperature, air_humidity, barometric_pressure FROM ambient_data
name: ambient_data
time                           air_temperature air_humidity barometric_pressure
----                           --------------- ------------ -------------------
2020-03-14T19:12:52.367635255Z 23.17           45.63        100480
2020-03-14T19:13:42.191112399Z 24.38           46.82        100934
2020-03-14T19:23:49.074313446Z 24.42           46.79        100936
2020-03-14T19:33:47.114185847Z 24.49           46.82        100932
2020-03-14T19:43:43.40009995Z  24.58           46.83        100928
2020-03-14T19:53:43.55313591Z  24.65           46.27        100936
> SELECT air_temperature, air_humidity, barometric_pressure, co2_concentration FROM ambient_data
name: ambient_data
time                           air_temperature air_humidity barometric_pressure co2_concentration
----                           --------------- ------------ ------------------- -----------------
2020-03-14T19:12:52.367635255Z 23.17           45.63        100480              1046
2020-03-14T19:13:42.191112399Z 24.38           46.82        100934              591
2020-03-14T19:23:49.074313446Z 24.42           46.79        100936              592
2020-03-14T19:33:47.114185847Z 24.49           46.82        100932              606
2020-03-14T19:43:43.40009995Z  24.58           46.83        100928              611
2020-03-14T19:53:43.55313591Z  24.65           46.27        100936              659
> █
```

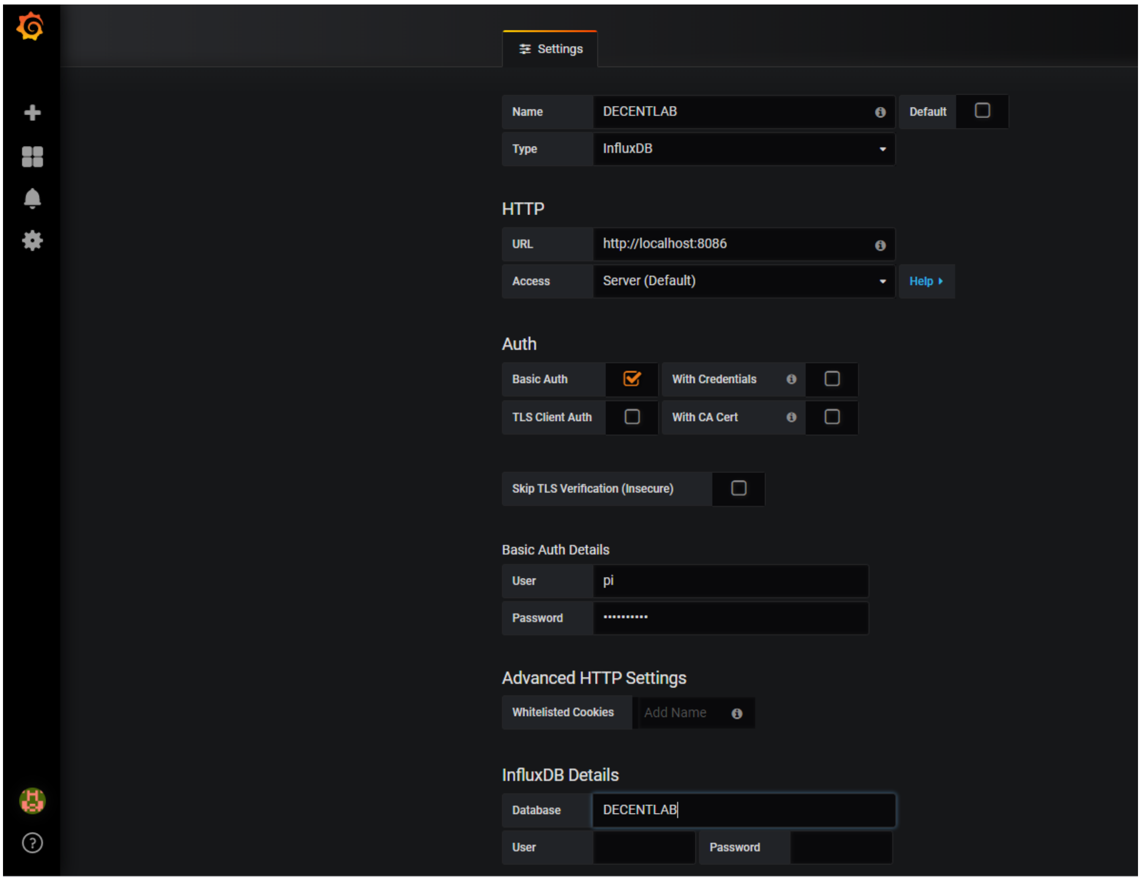
We see that the order of the fields is inverse

Now let's visualize the data on grafana

We enter grafana

Localhost:3000

We create a new datasource



Settings

Name: DECENTLAB Default □

Type: InfluxDB

HTTP

URL: http://localhost:8086

Access: Server (Default) Help ▸

Auth

Basic Auth ☑ With Credentials □

TLS Client Auth □ With CA Cert □

Skip TLS Verification (Insecure) □

Basic Auth Details

User: pi

Password: ••••••••••

Advanced HTTP Settings

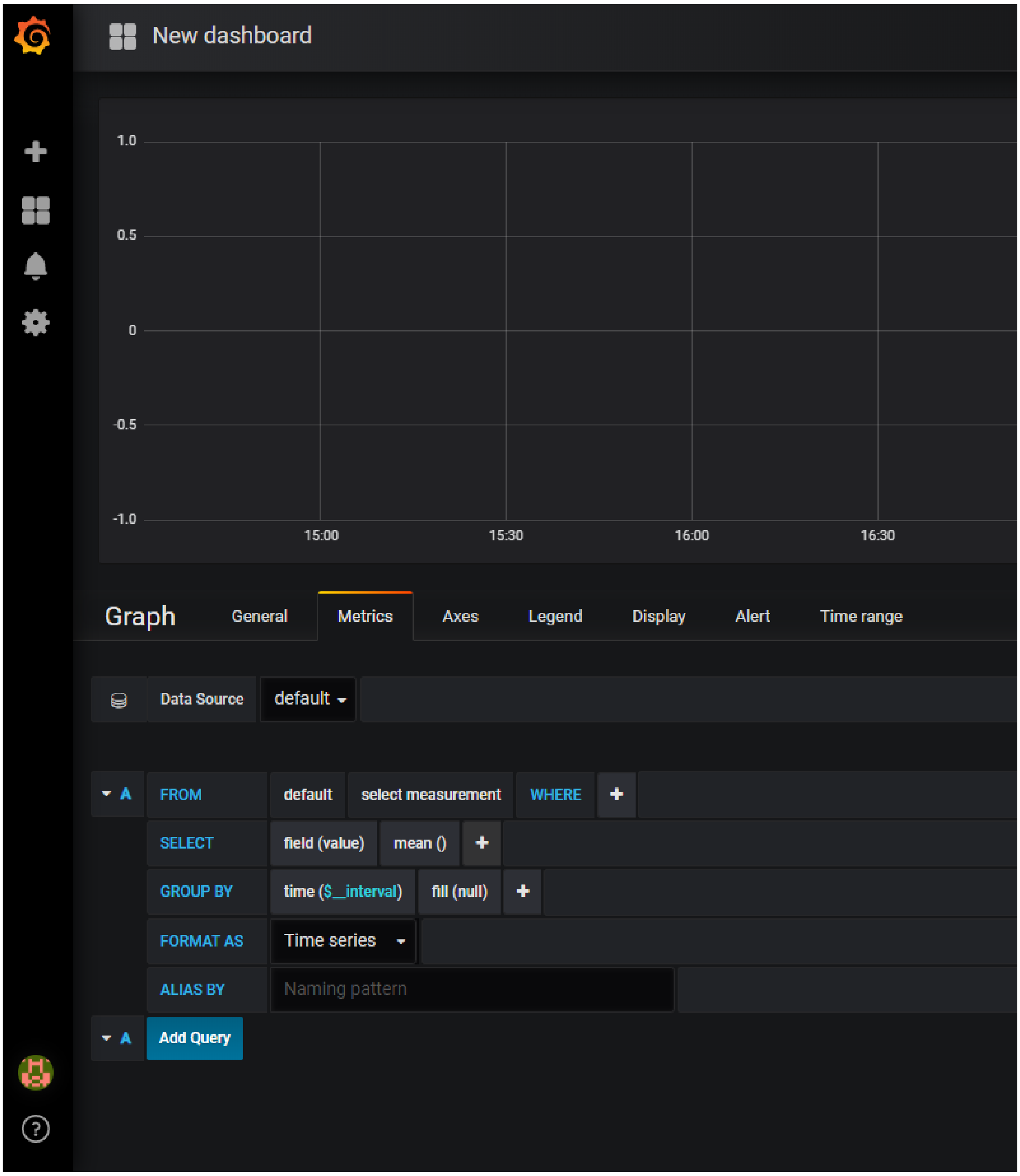
Whitelisted Cookies: Add Name

InfluxDB Details

Database: DECENTLAB

User: Password:

We create our dashboard



Data Source default

A FROM default select measurement WHERE +

SELECT field (value) mean () +

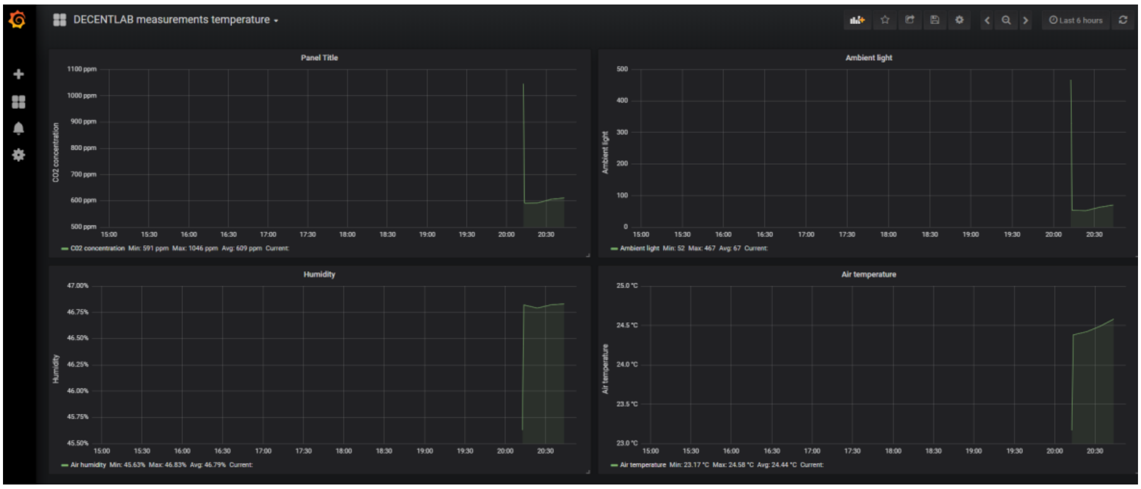
GROUP BY time ($__interval) fill (null) +

FORMAT AS Time series

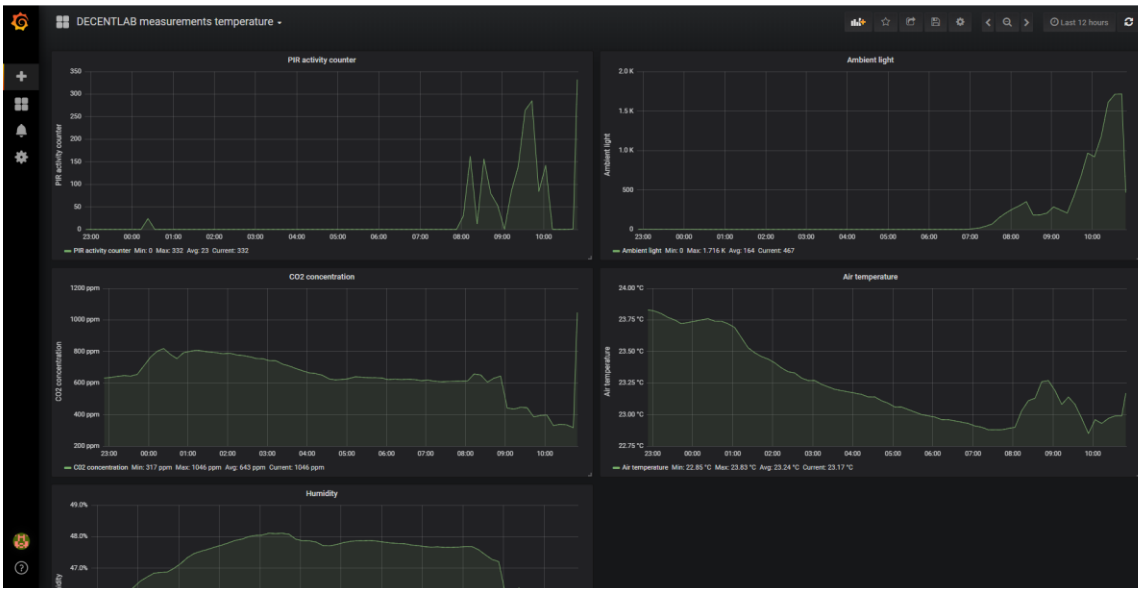
ALIAS BY Naming pattern

Select the data source

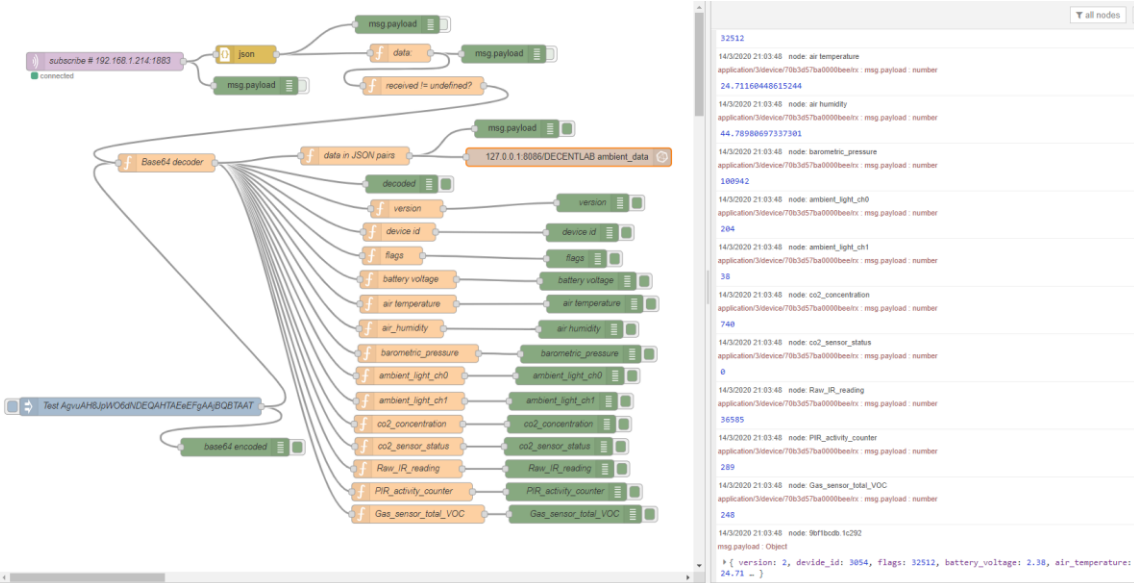
So we have


DECENTLAB measurements temperature
Last 6 hours
Panel Title
C02 concentration
Ambient light
Humidity
Air temperature
— C02 concentration Min: 591 ppm Max: 1046 ppm Avg: 609 ppm Current:
— Ambient light Min: 52 Max: 467 Avg: 67 Current:
— Air humidity Min: 45.63% Max: 46.83% Avg: 46.79% Current:
— Air temperature Min: 23.17 °C Max: 24.58 °C Avg: 24.44 °C Current:

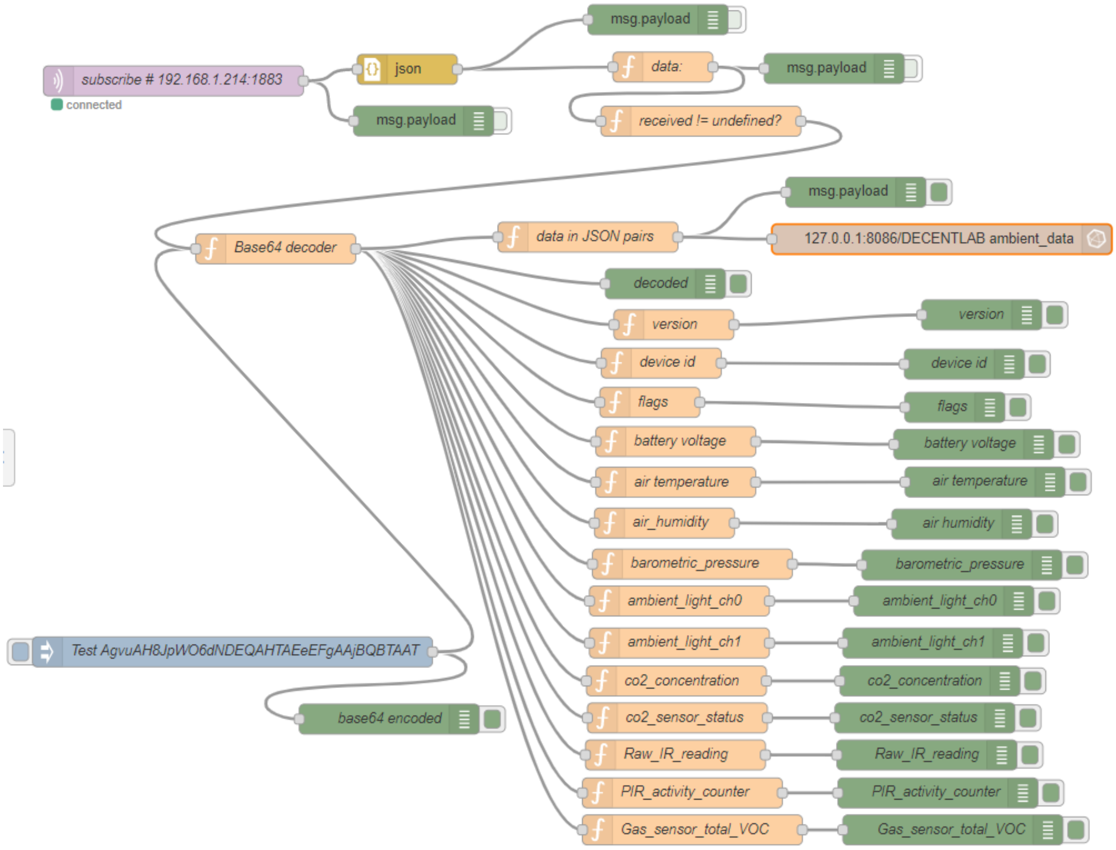
And 12 hours later

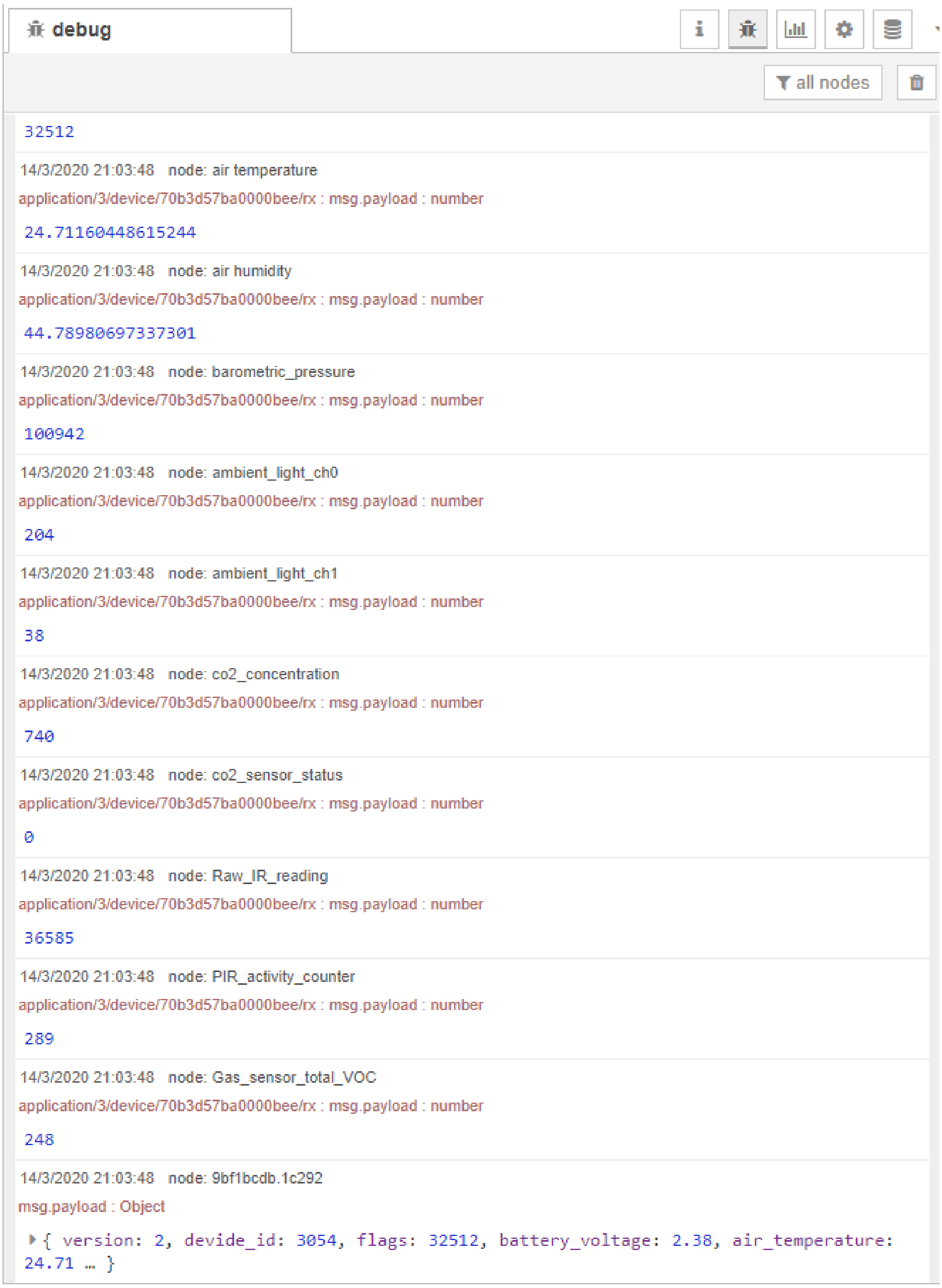

DECENTLAB measurements temperature
Last 12 hours
PIR activity counter
Ambient light
CO2 concentration
Air temperature
Humidity
— PIR activity counter Min: 0 Max: 332 Avg: 23 Current: 332
— Ambient light Min: 0 Max: 1.716 K Avg: 164 Current: 467
— C02 concentration Min: 317 ppm Max: 1046 ppm Avg: 643 ppm Current: 1046 ppm
— Air temperature Min: 22.85 °C Max: 23.83 °C Avg: 23.24 °C Current: 23.17 °C

So

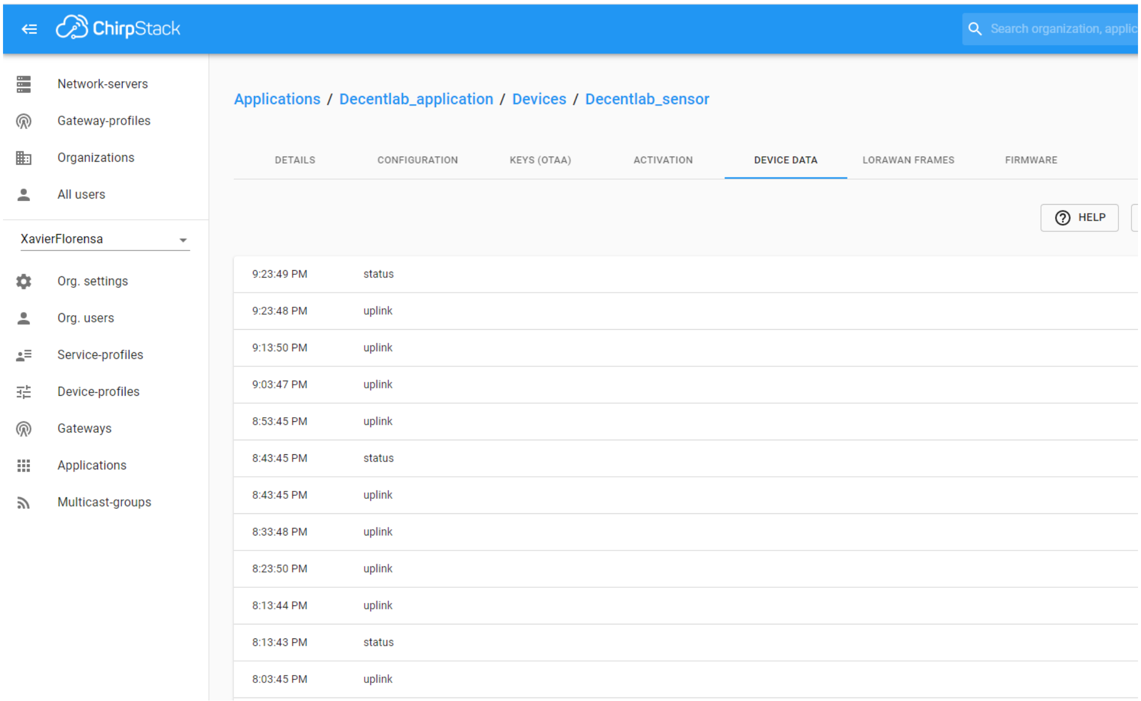


```
32512
14/3/2020 21:03:48   node: air temperature
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
24.71160448615244
14/3/2020 21:03:48   node: air humidity
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
44.78980697337301
14/3/2020 21:03:48   node: barometric_pressure
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
100942
14/3/2020 21:03:48   node: ambient_light_ch0
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
204
14/3/2020 21:03:48   node: ambient_light_ch1
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
38
14/3/2020 21:03:48   node: co2_concentration
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
740
14/3/2020 21:03:48   node: co2_sensor_status
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
0
14/3/2020 21:03:48   node: Raw_IR_reading
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
36585
14/3/2020 21:03:48   node: PIR_activity_counter
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
289
14/3/2020 21:03:48   node: Gas_sensor_total_VOC
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
248
14/3/2020 21:03:48   node: 9bf1bcdb.1c292
msg.payload : Object
▸{ version: 2, devide_id: 3054, flags: 32512, battery_voltage: 2.38, air_temperature:
24.71 … }
```


msg.payload
subscribe # 192.168.1.214:1883
connected
json
data:
msg.payload
msg.payload
received != undefined?
msg.payload
Base64 decoder
data in JSON pairs
127.0.0.1:8086/DECENTLAB ambient_data
decoded
version
version
device id
device id
flags
flags
battery voltage
battery voltage
air temperature
air temperature
air_humidity
air humidity
barometric_pressure
barometric_pressure
ambient_light_ch0
ambient_light_ch0
ambient_light_ch1
ambient_light_ch1
Test AgvuAH8JpWO6dNDEQAHTAEeEFgAAjBQBTAAT
co2_concentration
co2_concentration
co2_sensor_status
co2_sensor_status
base64 encoded
Raw_IR_reading
Raw_IR_reading
PIR_activity_counter
PIR_activity_counter
Gas_sensor_total_VOC
Gas_sensor_total_VOC

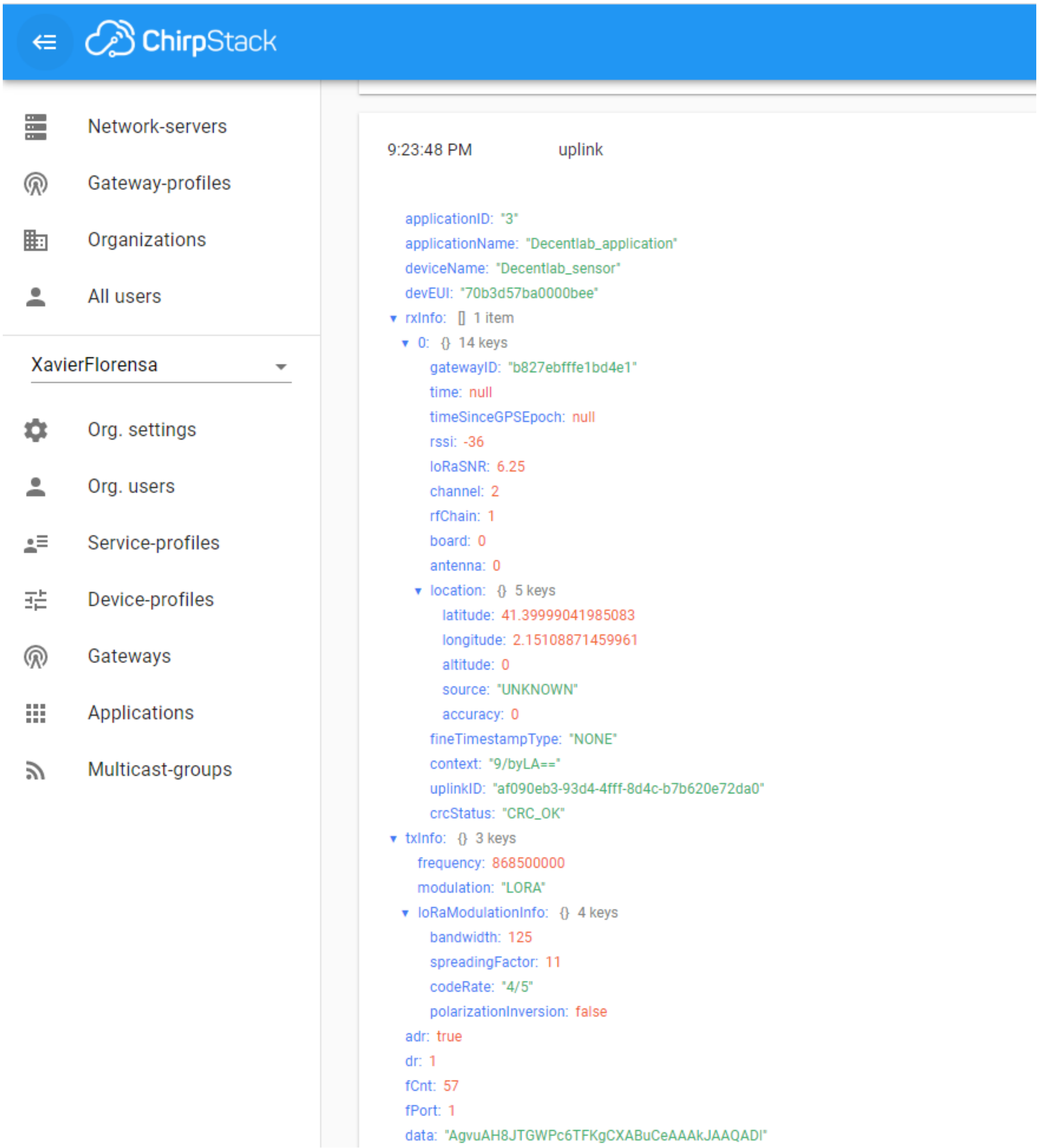


```
32512

14/3/2020 21:03:48   node: air temperature
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
24.71160448615244

14/3/2020 21:03:48   node: air humidity
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
44.78980697337301

14/3/2020 21:03:48   node: barometric_pressure
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
100942

14/3/2020 21:03:48   node: ambient_light_ch0
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
204

14/3/2020 21:03:48   node: ambient_light_ch1
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
38

14/3/2020 21:03:48   node: co2_concentration
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
740

14/3/2020 21:03:48   node: co2_sensor_status
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
0

14/3/2020 21:03:48   node: Raw_IR_reading
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
36585

14/3/2020 21:03:48   node: PIR_activity_counter
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
289

14/3/2020 21:03:48   node: Gas_sensor_total_VOC
application/3/device/70b3d57ba0000bee/rx : msg.payload : number
248

14/3/2020 21:03:48   node: 9bf1bcdb.1c292
msg.payload : Object
▸{ version: 2, devide_id: 3054, flags: 32512, battery_voltage: 2.38, air_temperature:
24.71 … }
```



Applications / Decentlab_application / Devices / Decentlab_sensor

```
9:23:49 PM   status
9:23:48 PM   uplink
9:13:50 PM   uplink
9:03:47 PM   uplink
8:53:45 PM   uplink
8:43:45 PM   status
8:43:45 PM   uplink
8:33:48 PM   uplink
8:23:50 PM   uplink
8:13:44 PM   uplink
8:13:43 PM   status
8:03:45 PM   uplink
```



```
9:23:48 PM          uplink

  applicationID: "3"
  applicationName: "Decentlab_application"
  deviceName: "Decentlab_sensor"
  devEUI: "70b3d57ba0000bee"
▾ rxInfo: [] 1 item
  ▾ 0: {} 14 keys
      gatewayID: "b827ebfffe1bd4e1"
      time: null
      timeSinceGPSEpoch: null
      rssi: -36
      loRaSNR: 6.25
      channel: 2
      rfChain: 1
      board: 0
      antenna: 0
    ▾ location: {} 5 keys
        latitude: 41.39999041985083
        longitude: 2.15108871459961
        altitude: 0
        source: "UNKNOWN"
        accuracy: 0
      fineTimestampType: "NONE"
      context: "9/byLA=="
      uplinkID: "af090eb3-93d4-4fff-8d4c-b7b620e72da0"
      crcStatus: "CRC_OK"
▾ txInfo: {} 3 keys
    frequency: 868500000
    modulation: "LORA"
  ▾ loRaModulationInfo: {} 4 keys
      bandwidth: 125
      spreadingFactor: 11
      codeRate: "4/5"
      polarizationInversion: false
  adr: true
  dr: 1
  fCnt: 57
  fPort: 1
  data: "AgvuAH8JTGWPc6TFKgCXABuCeAAAkJAAQADI"
```

You can find the node-red code on github

https://github.com/xavierflorensa/Decentlab-ambient-sensor-DL-IAM-decoder/blob/master/Decentlab%20ambient%20sensor%20DL-IAM%20decoding%20%2B%20grafana.txt