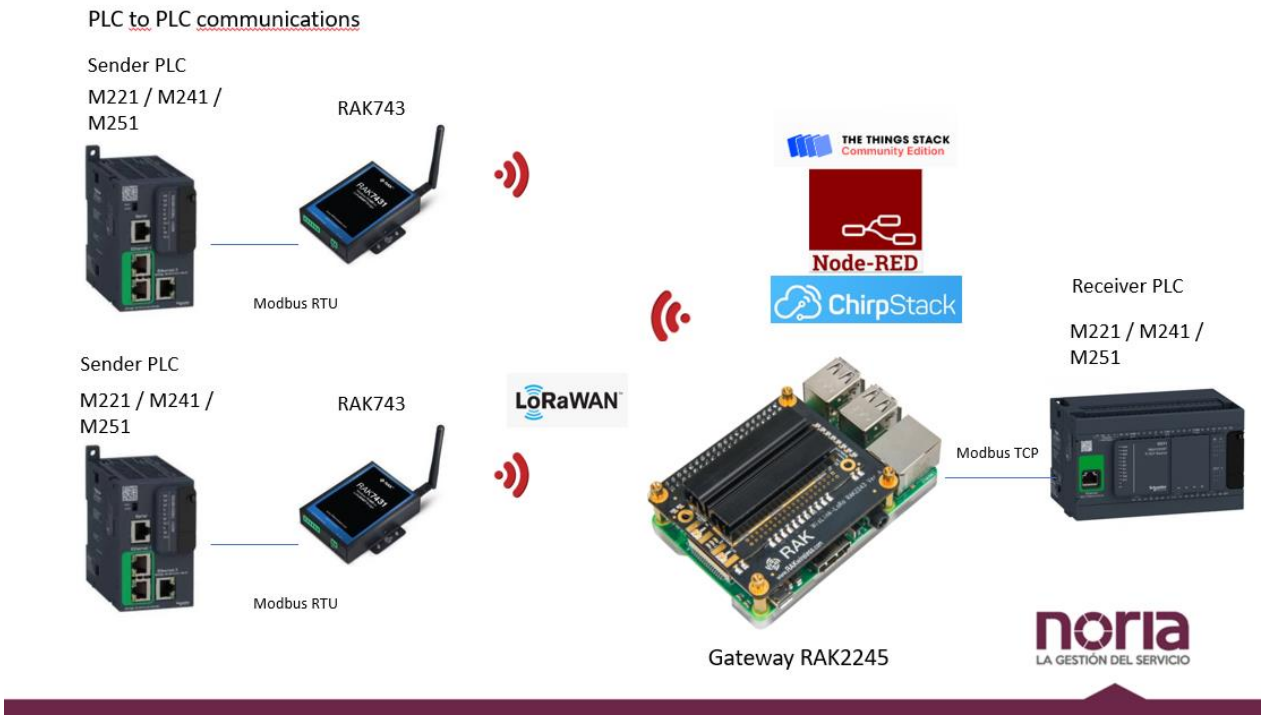
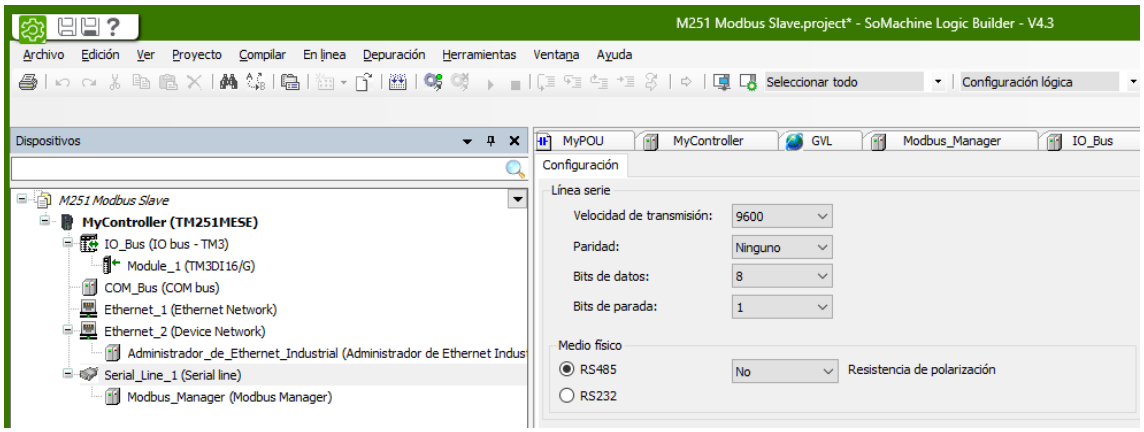
SCHNEIDER PLC to PLC communications with RAK7431 and LoRaWAN

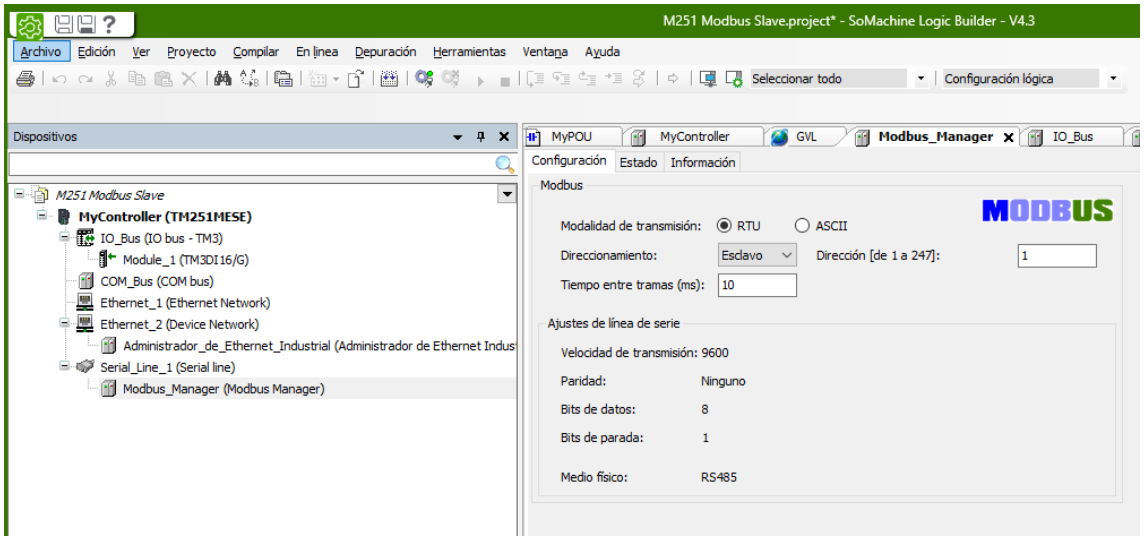
System Arquitecture



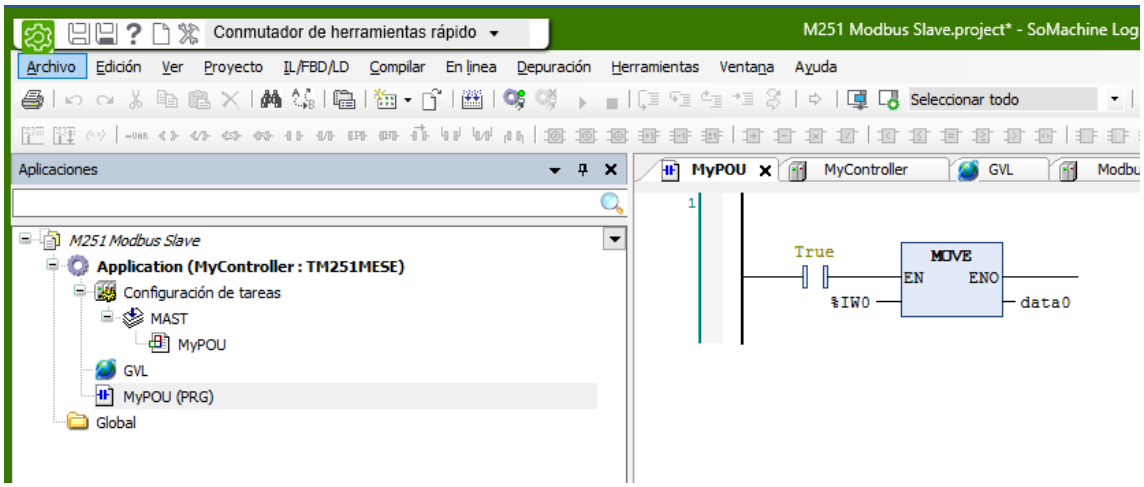
Sender PLC configuration

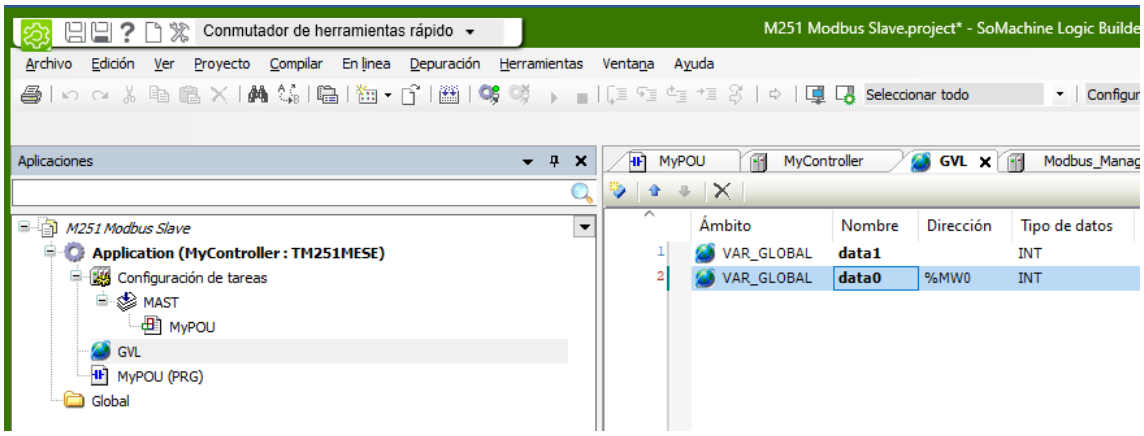
We configure the sender PLC as a Modbus RTU slave device with address 1 and register %MW0 to hold the status of the digital inputs of sender PLC.





We update the digital input state on every scan



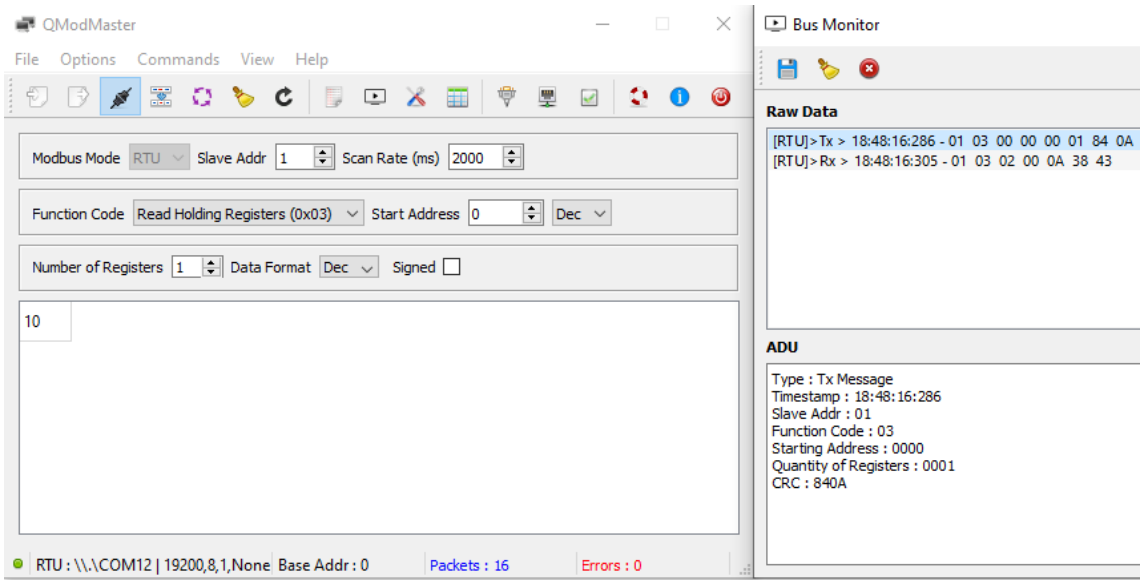


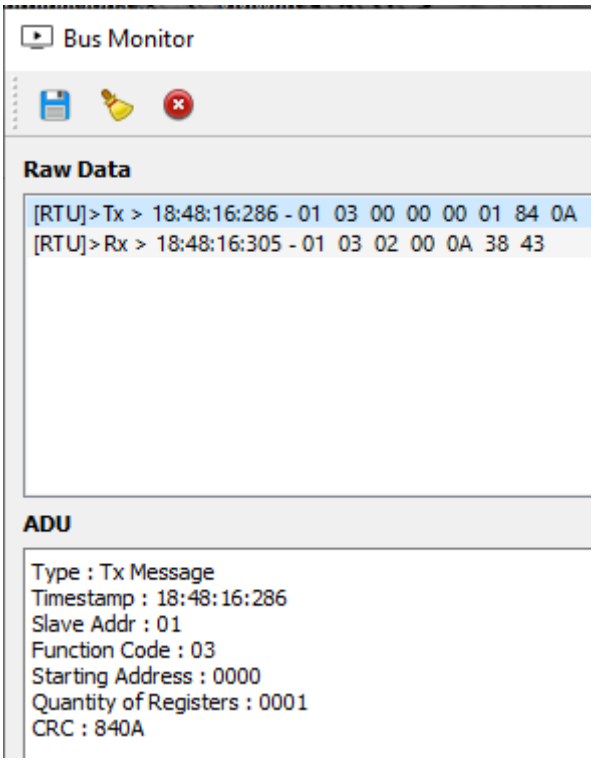
So we have such data available thru Modbus RTU

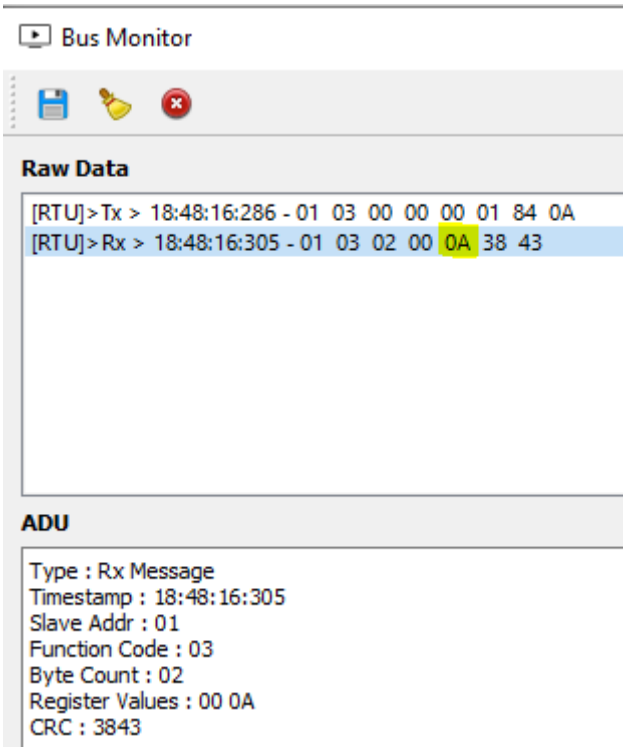
Modbus test

Let's see the Modbus response from PLC with the PC and qModMaster tool

Let's read from Modbus slave 1 (PLC) and address %MW0 (0) wich value is 10 for instance.



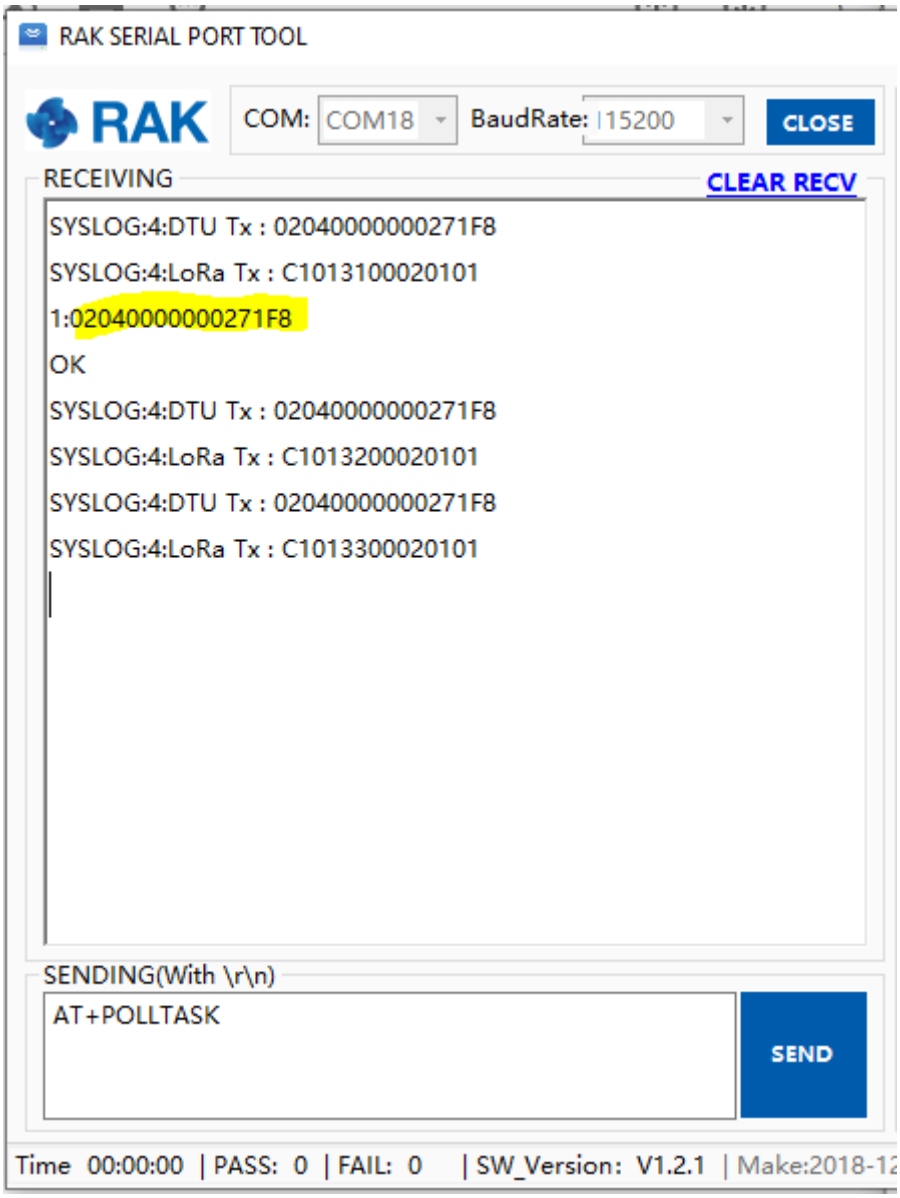




RAK7431 configuration

Let’s monitor the RAK7431 with RAK serial tool, wether there is a poll task scheduled

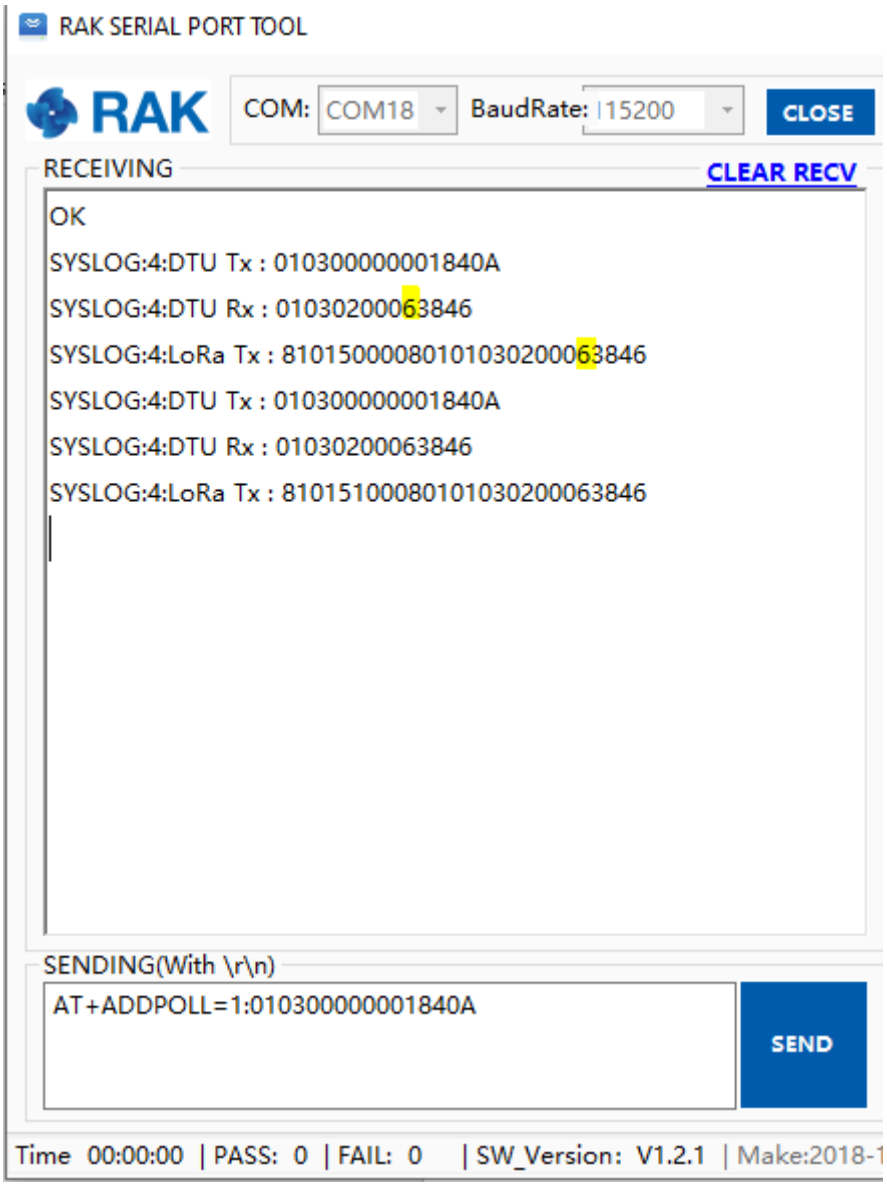
Yes, there is one



We have to change this since we want to point to Modbus address 01 and message type 03 as we have seen on Modbus Test

Let's remove it
AT+RMPOLL=1

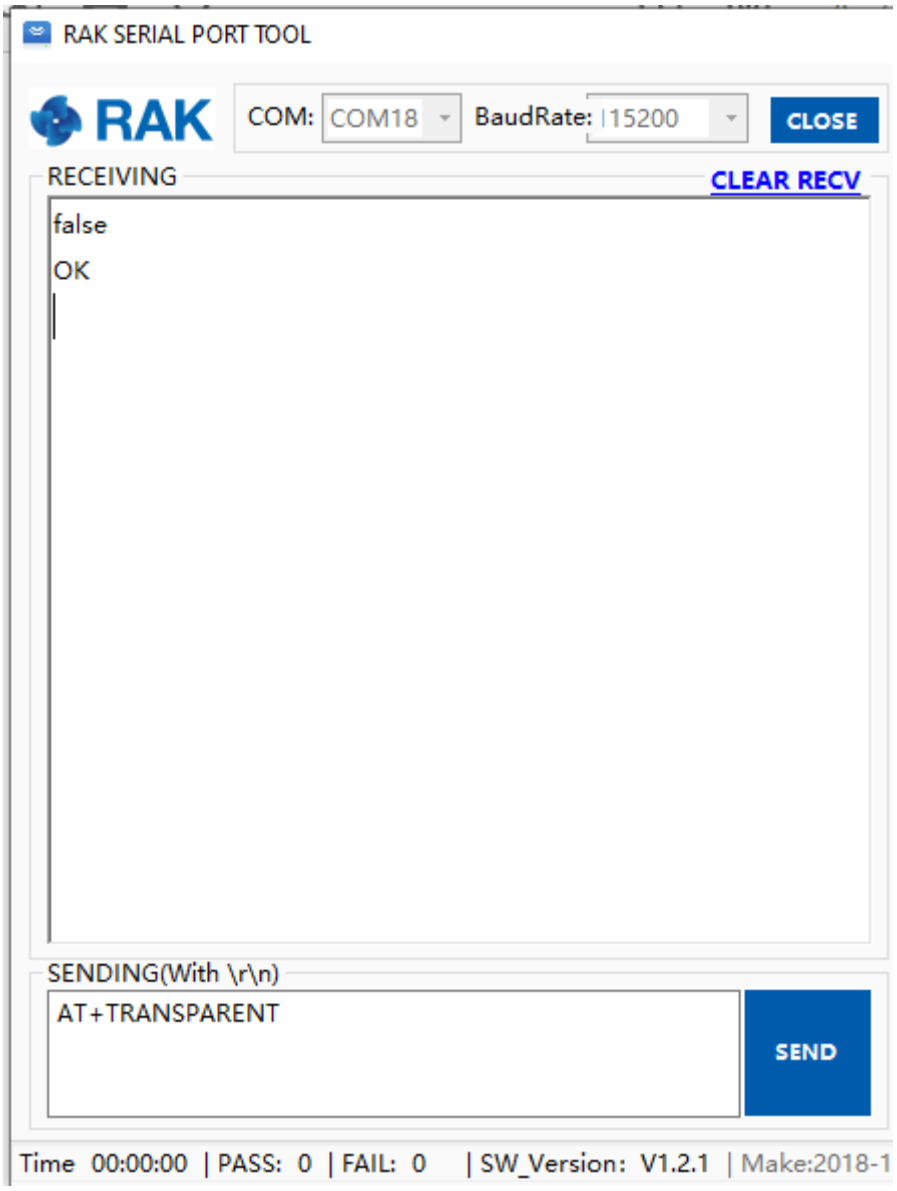
Now we add a new POLL task to measure Voltage
And this will be the right poll task according to the previous chapter
AT+ADDPOLL=1:010300000001840A



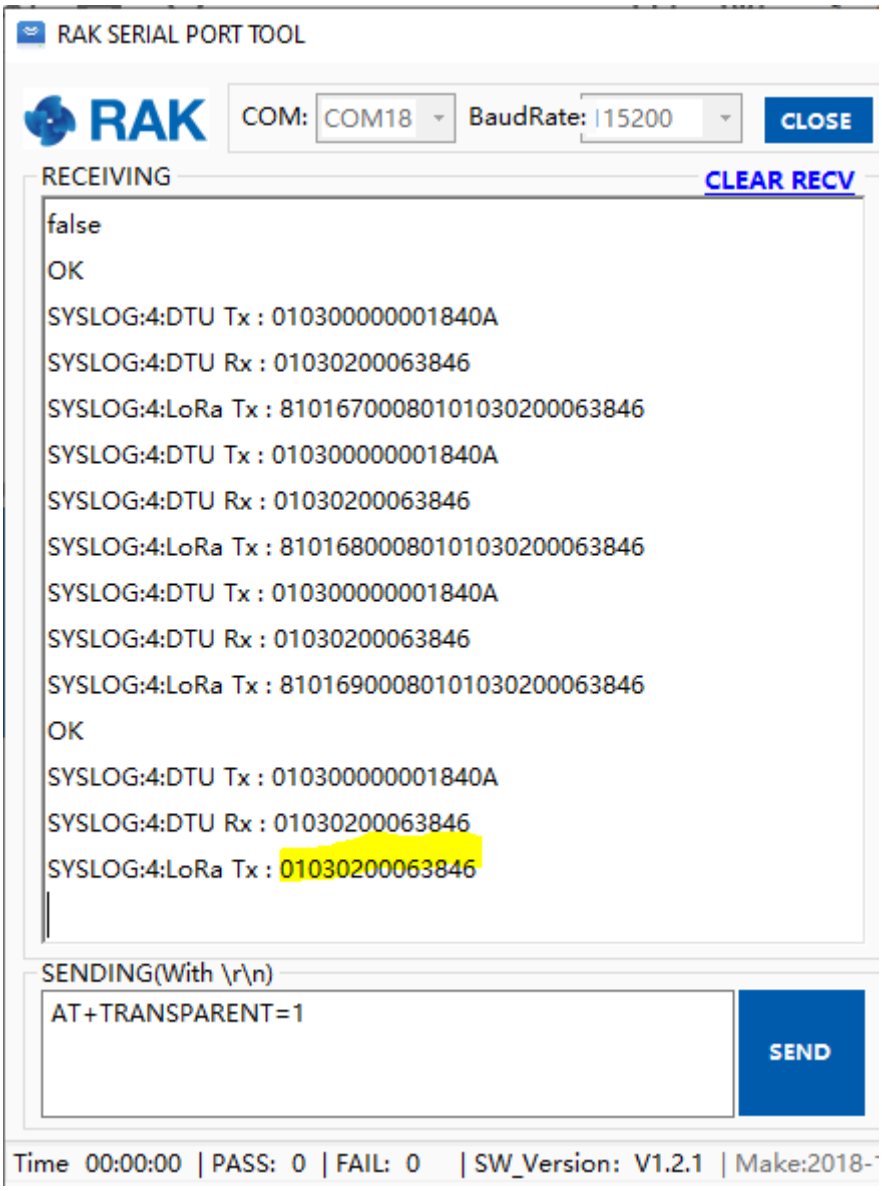
And we receive the response from PLC register %MW0 that in this case is 6

Bit 1 and Bit 2 to ON state so this is 6

But we receive a long payload, Since we are in non transparent mode.

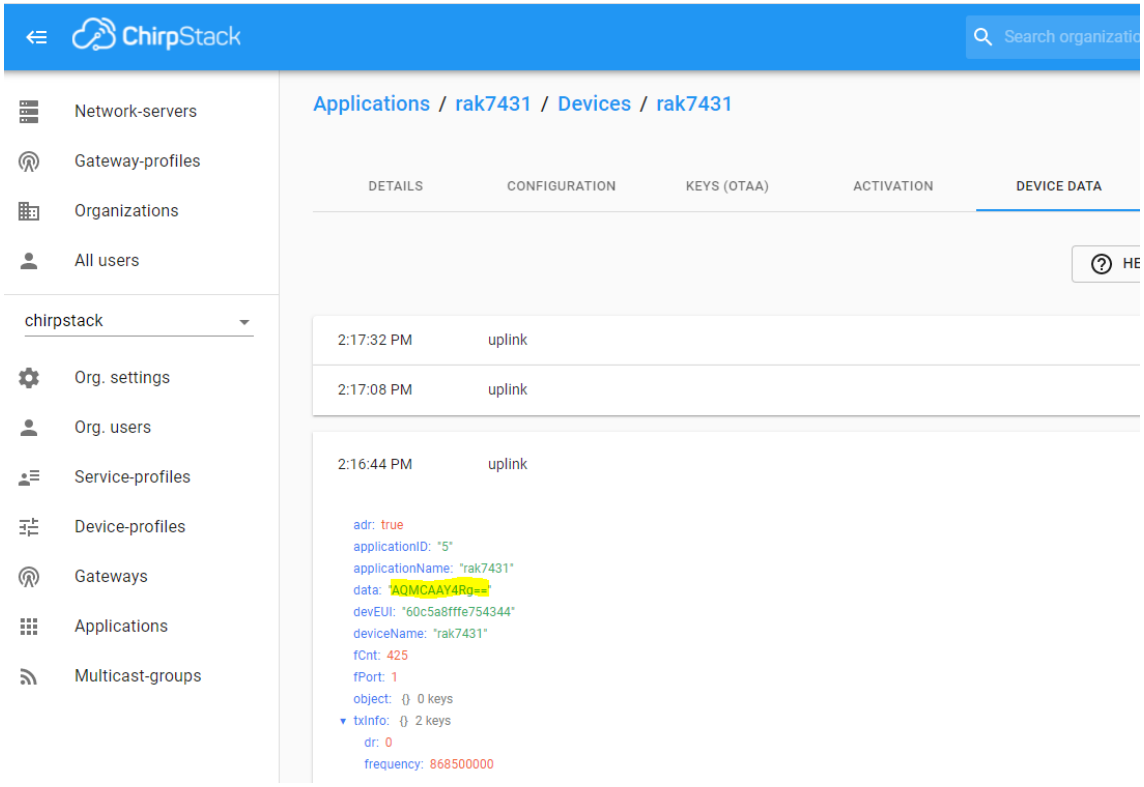


Let’s change to transparent mode to reduce payload



Chirpstack console

This is the view on Chirpstack console.

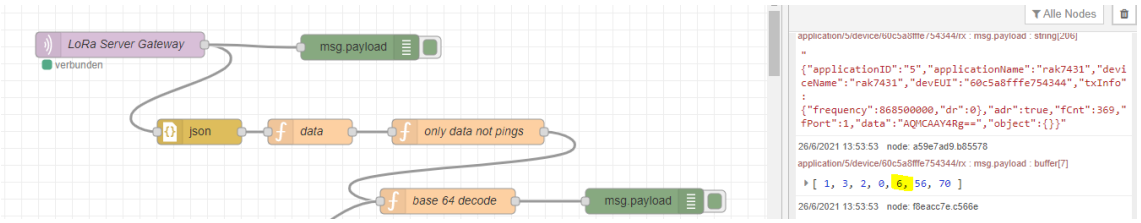


Now we see that we have the value of %MW0 on bytes 3 and 4

Node-RED

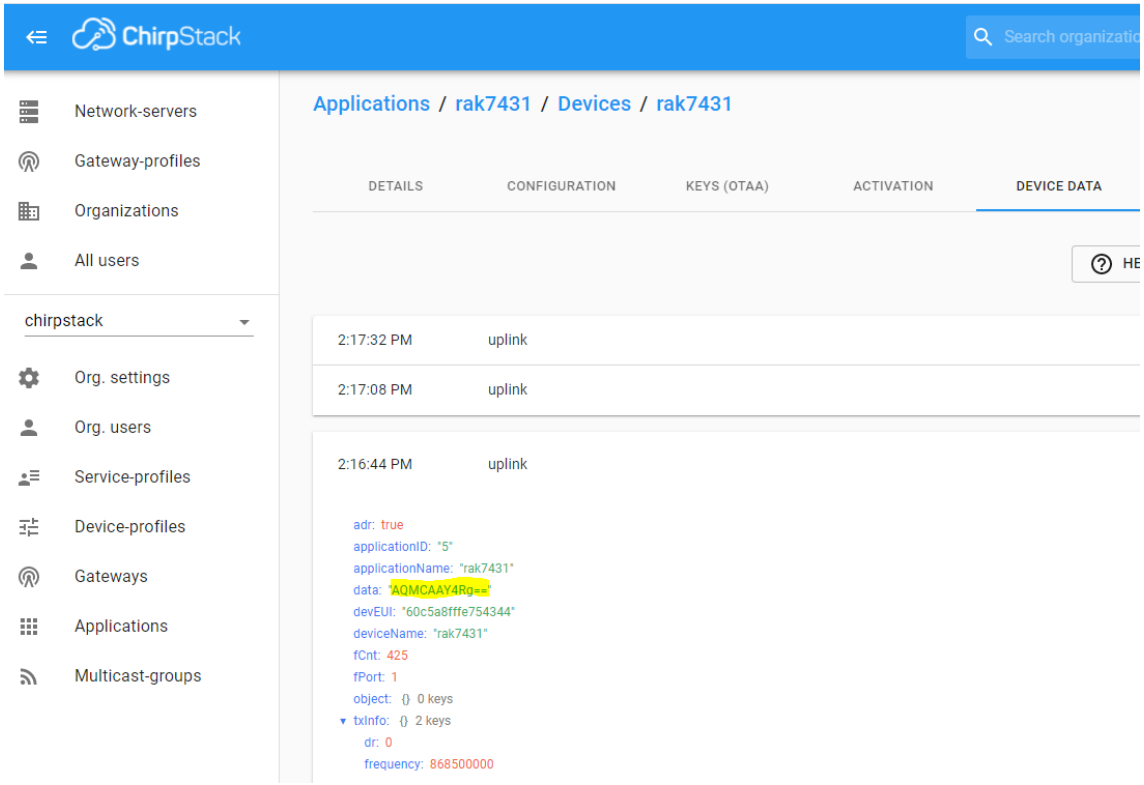
Node-RED is running on the same RAK 2245 gateway Raspberry Pi. Just install Node-RED after burning the Gateway operating system SD with the image from RAK Wireless web page.

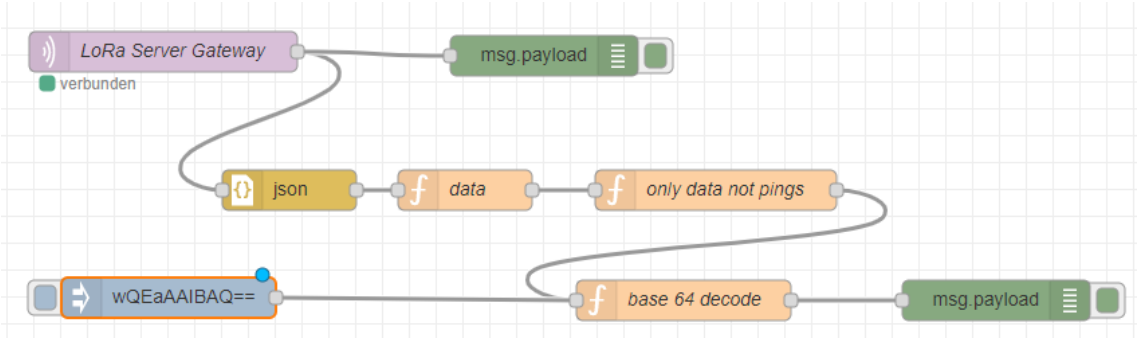
Let's decode this with Node-RED

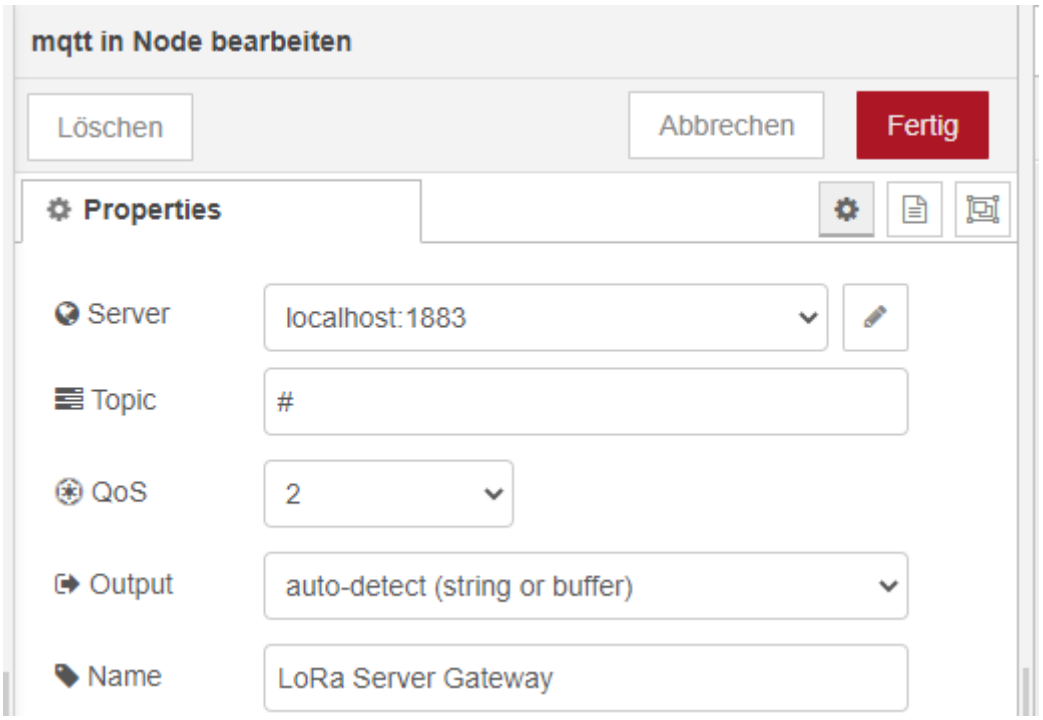


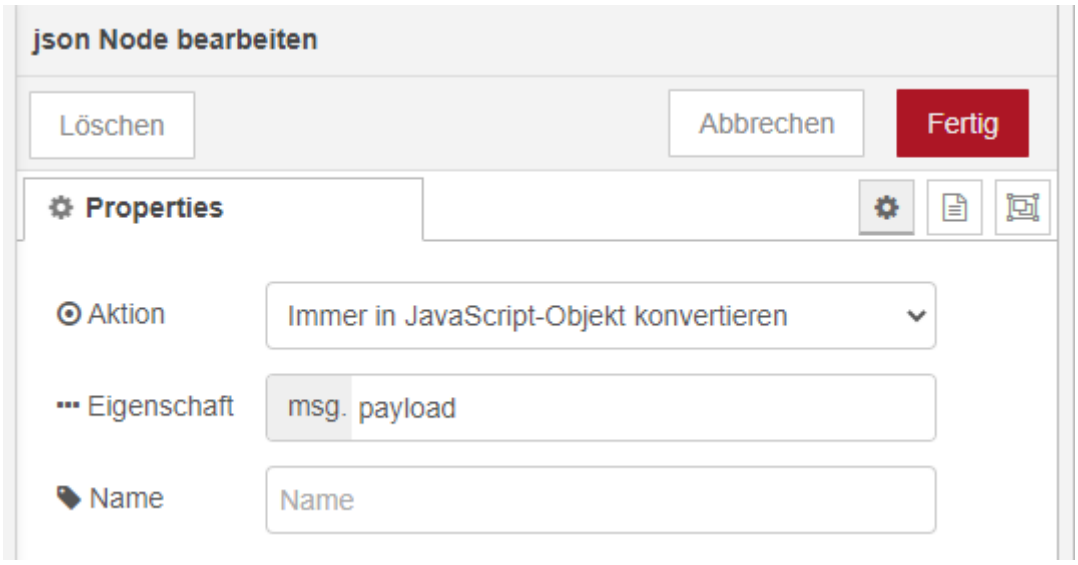
With this Flow

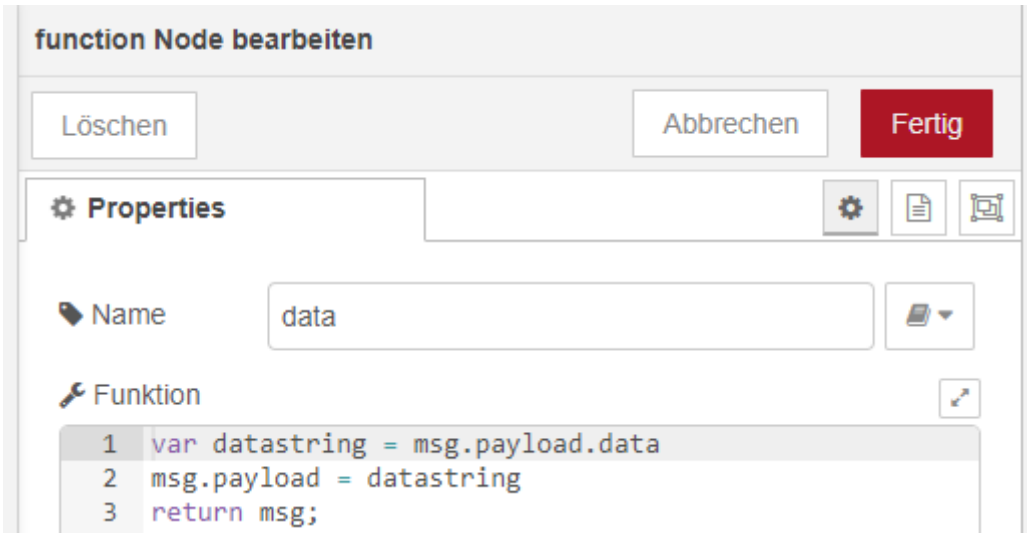
Take into account that payload is base 64 encoded

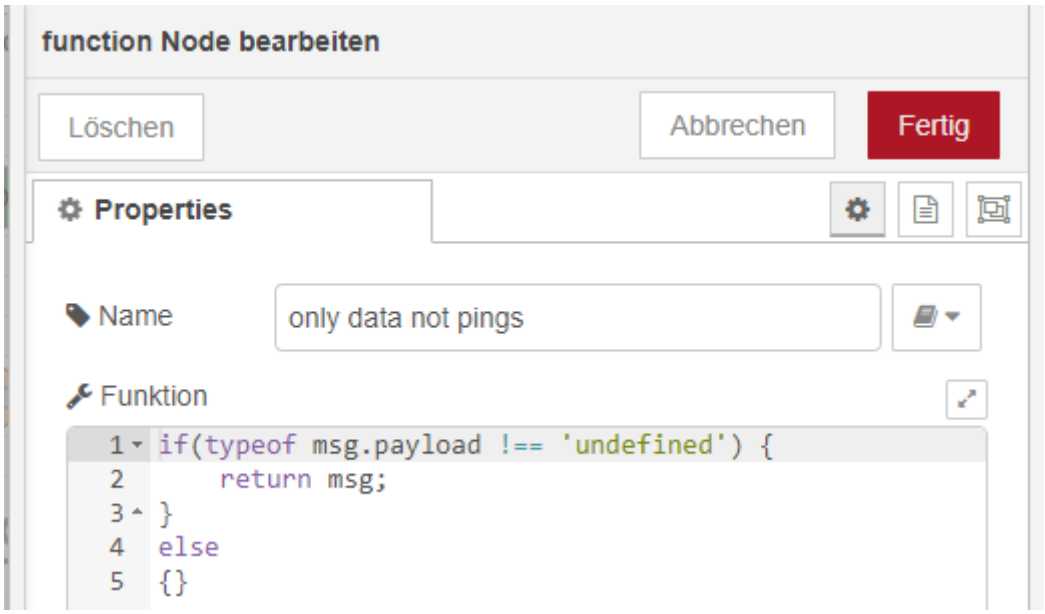


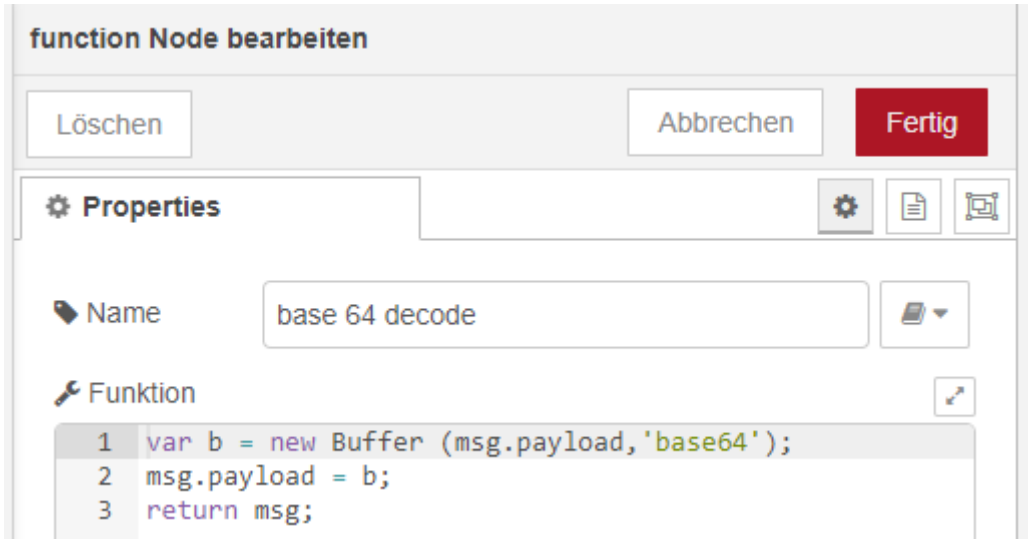



mqtt in Node bearbeiten
Löschen
Abbrechen
Fertig
Properties
Server
localhost:1883
Topic
#
QoS
2
Output
auto-detect (string or buffer)
Name
LoRa Server Gateway


json Node bearbeiten
Löschen
Abbrechen
Fertig
Properties
Aktion
Immer in JavaScript-Objekt konvertieren
Eigenschaft
msg. payload
Name
Name

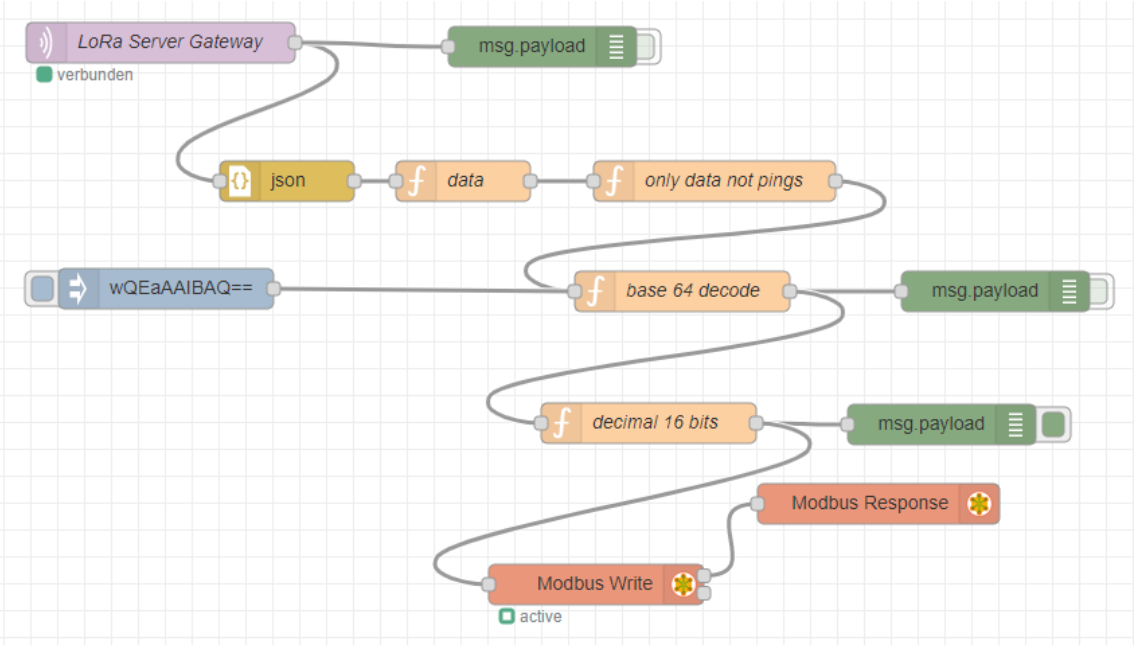

function Node bearbeiten
Löschen
Abbrechen
Fertig
Properties
Name
data
Funktion
1 var datastring = msg.payload.data
2 msg.payload = datastring
3 return msg;





Now we decode such buffer

With bytes 3 and 4 to get a 16bit integer



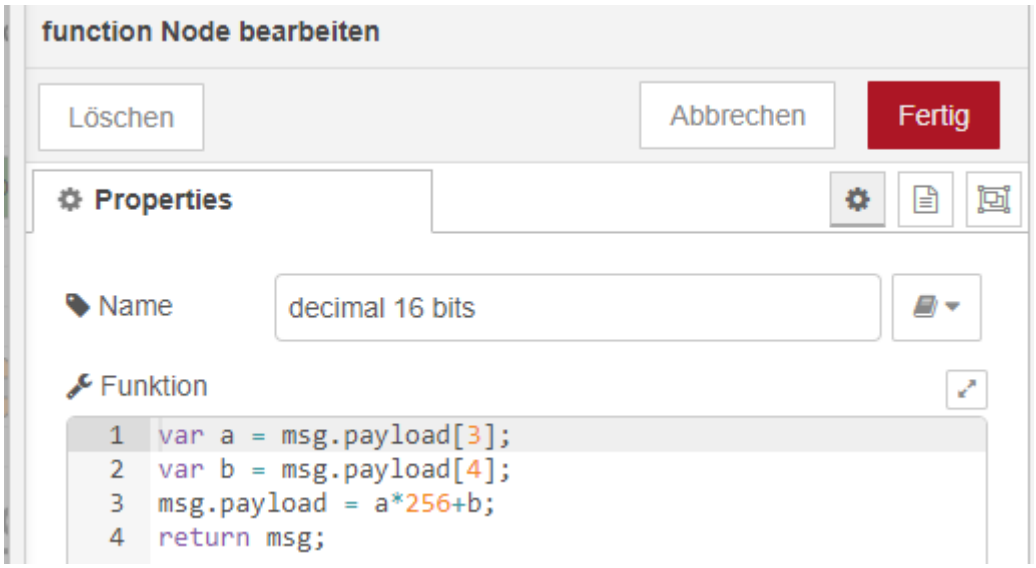
You can find the code here

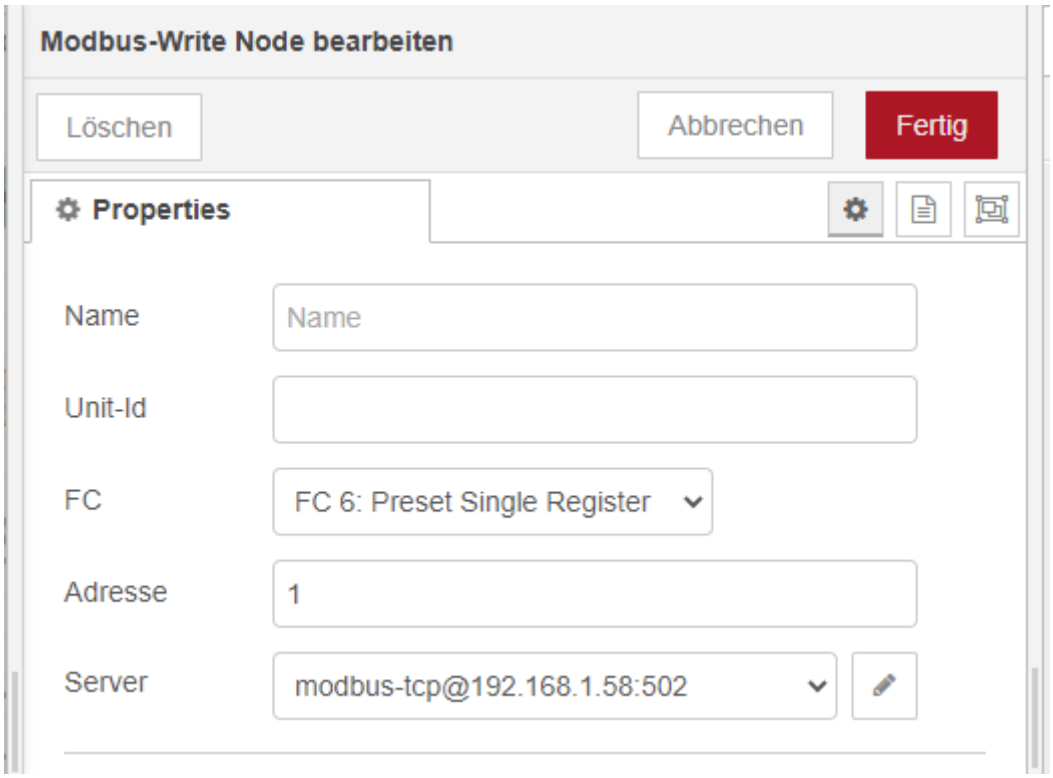
https://github.com/xavierflorensa/Schneider-PLC-to-PLC-comms-with-RAK-wireless

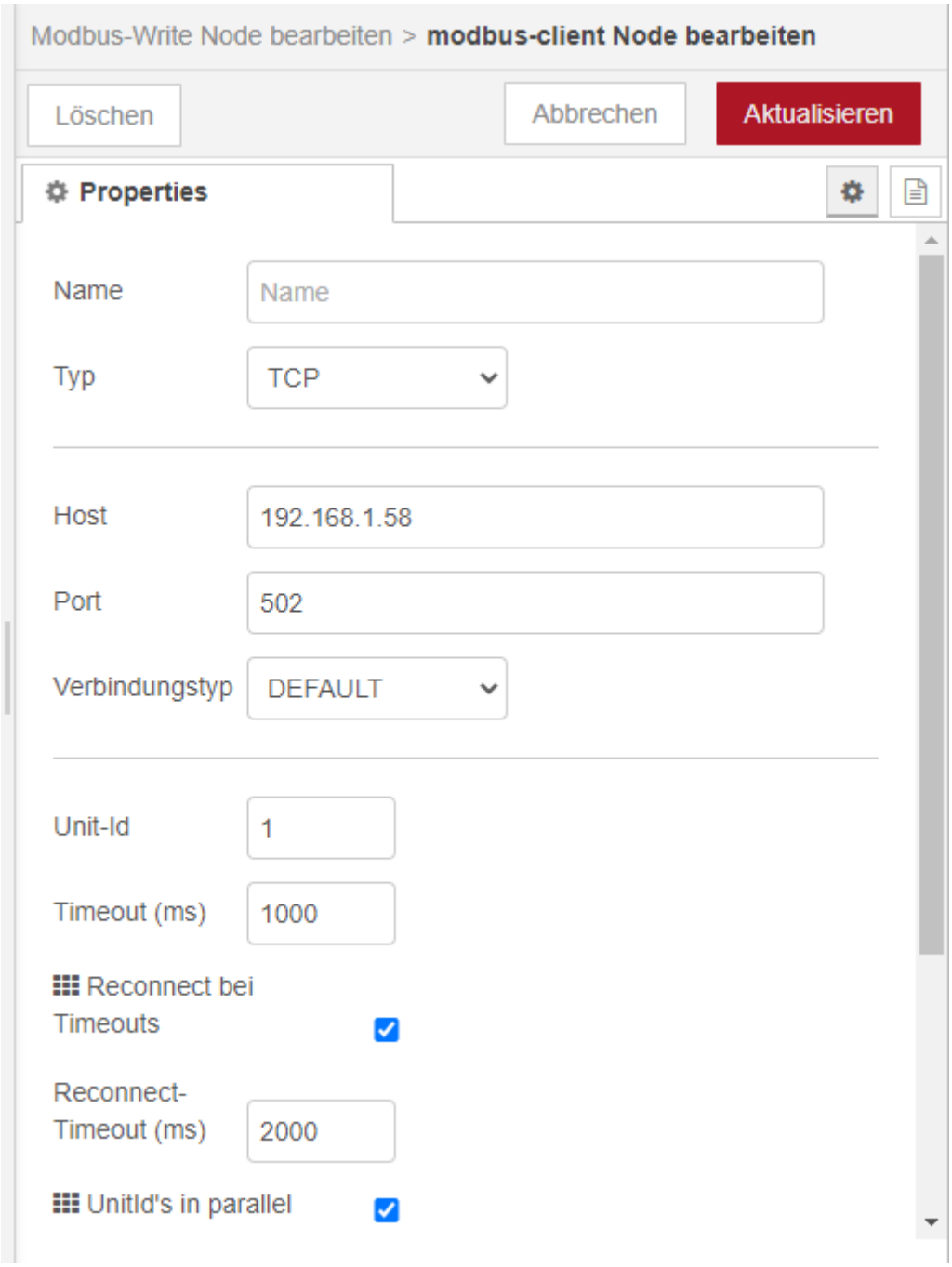
And here is te video

https://www.youtube.com/watch?v=Zf8wNpf23Z8&ab_channel=XavierFlorensaBerenguer

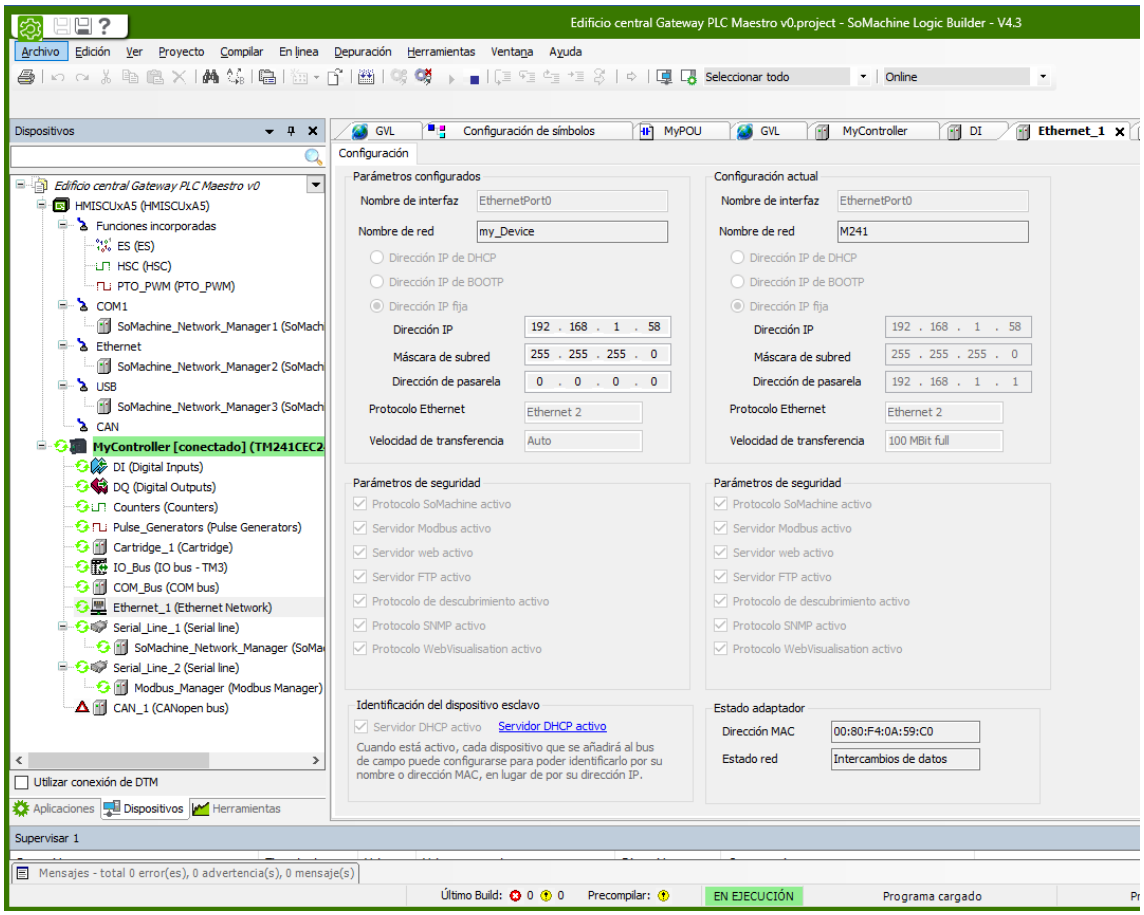
And inject to the receiver PLC thru Modbus TCP on PLC register %MW1

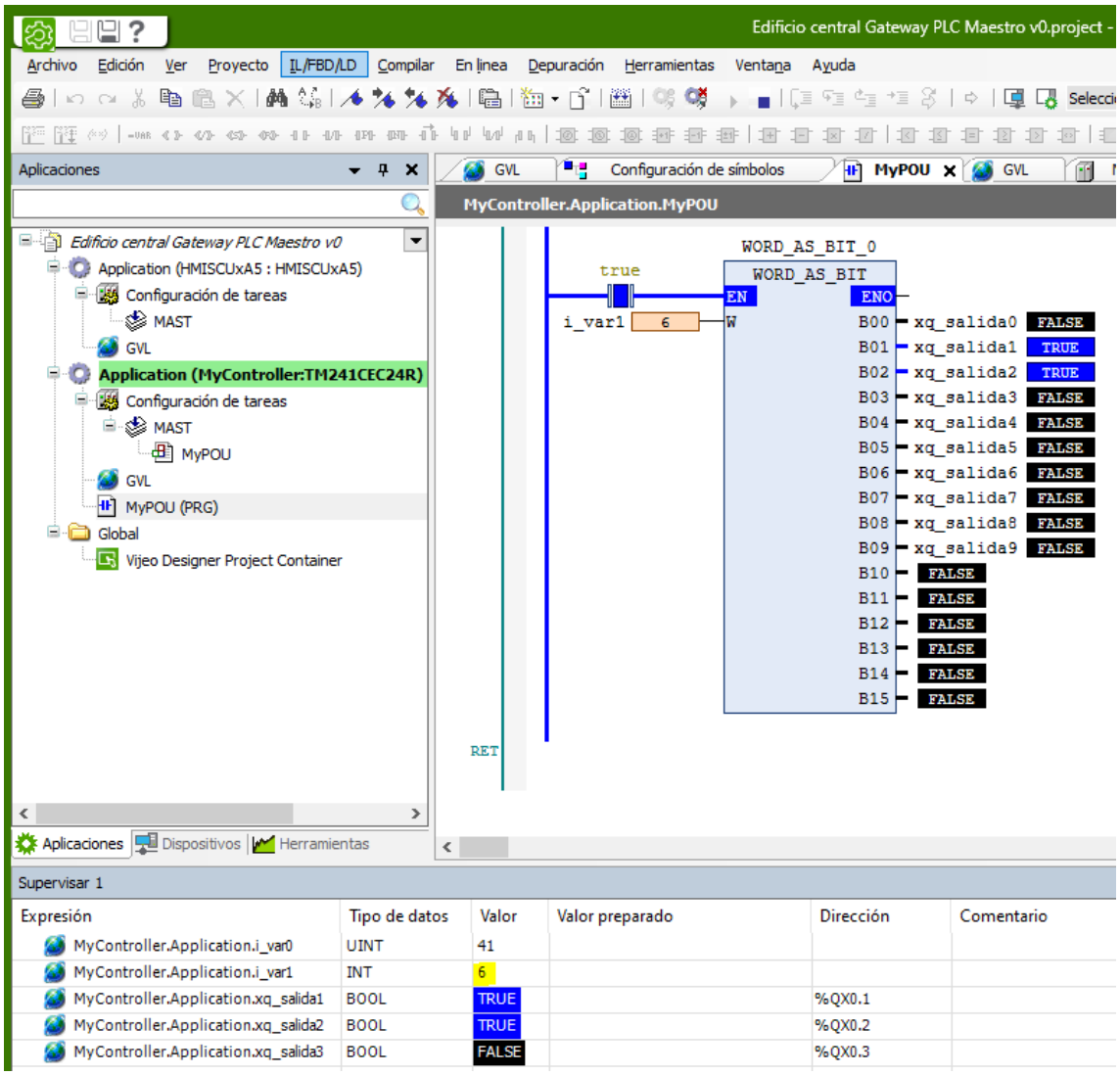

function Node bearbeiten
Löschen
Abbrechen
Fertig
Properties
Name
decimal 16 bits
Funktion
1 var a = msg.payload[3];
2 var b = msg.payload[4];
3 msg.payload = a*256+b;
4 return msg;

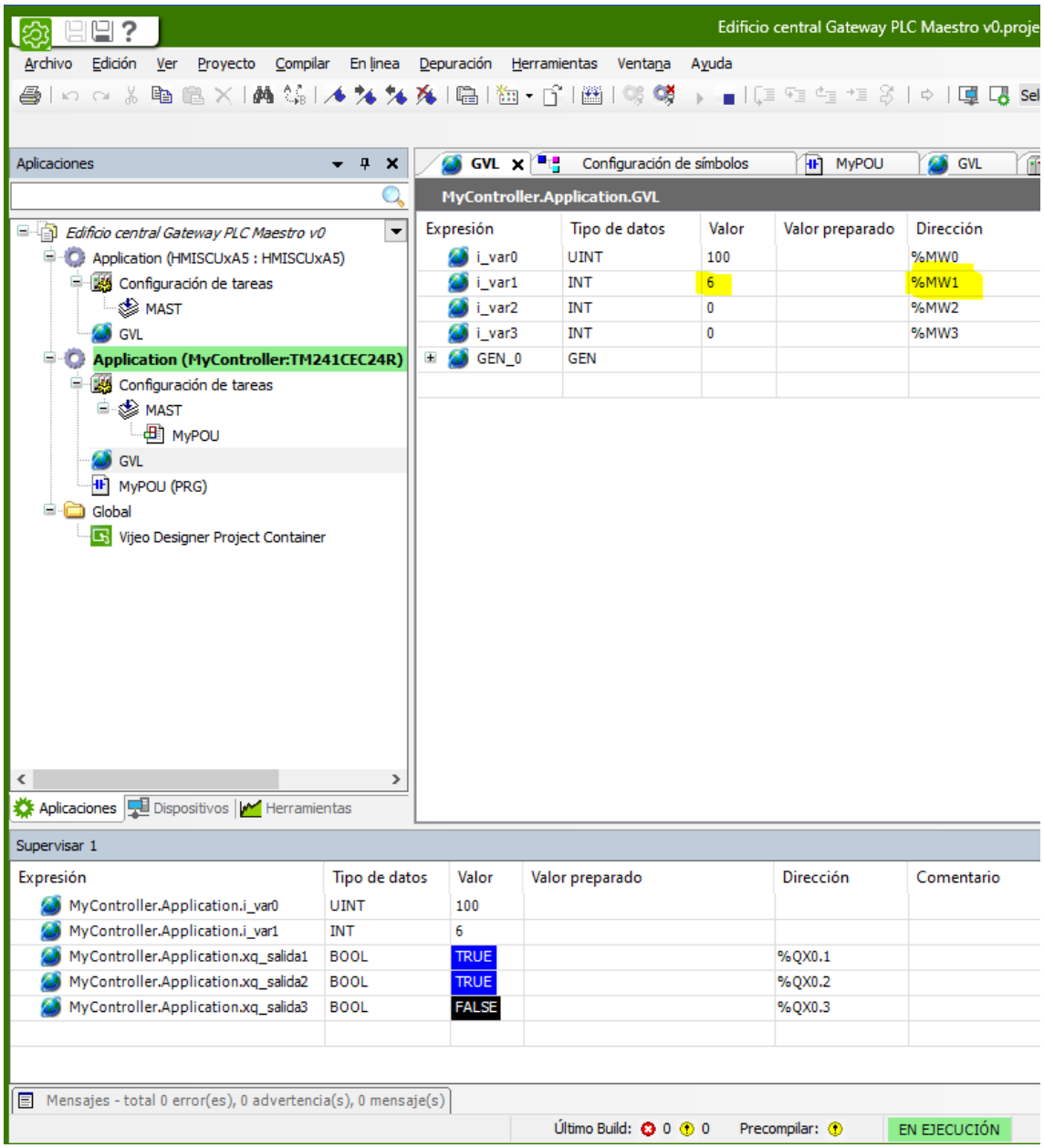

Modbus-Write Node bearbeiten
Löschen
Abbrechen
Fertig
Properties
Name
Name
Unit-Id
FC
FC 6: Preset Single Register
Adresse
1
Server
modbus-tcp@192.168.1.58:502



Now let’s take a look at the receiver PLC, where you only have to set an IP address, allocate a global memory register for instance on %MW1 and create a program t osee the PLC digital outpus as an image of the sender PLC inputs.

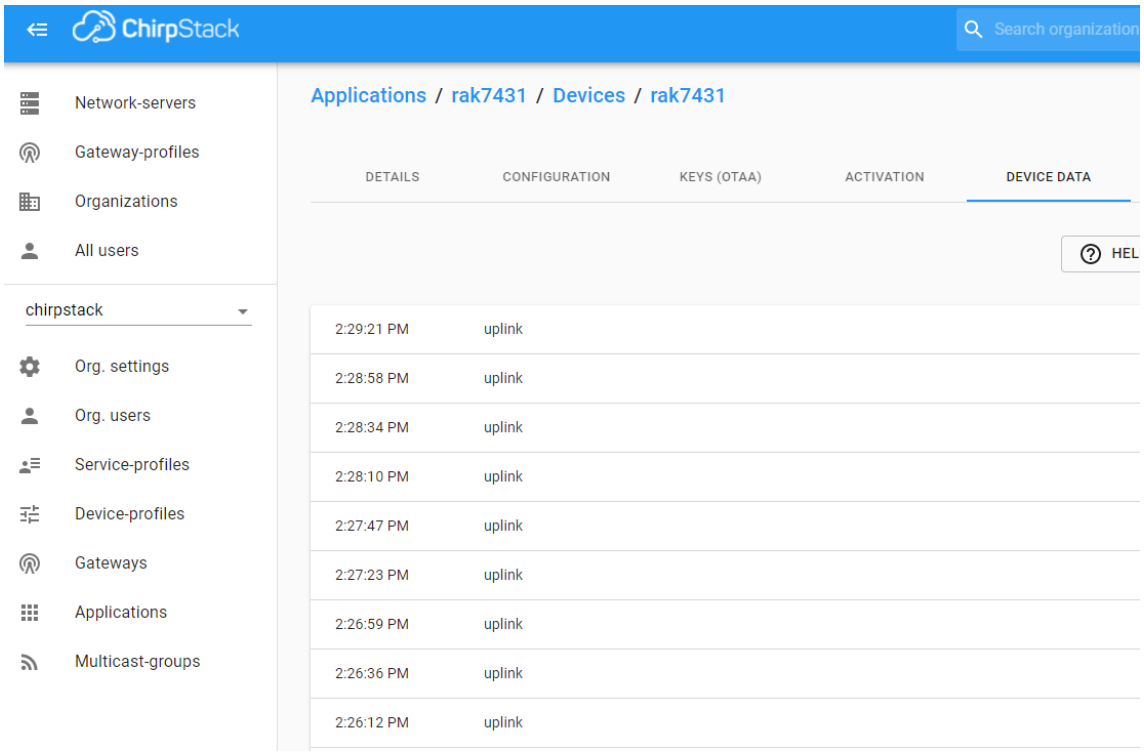

Edificio central Gateway PLC Maestro v0.project - SoMachine Logic Builder - V4.3
Archivo Edición Ver Proyecto Compilar En línea Depuración Herramientas Ventana Ayuda
Seleccionar todo
Online
Dispositivos
Edificio central Gateway PLC Maestro v0
HMISCUxA5 (HMISCUxA5)
Funciones incorporadas
ES (ES)
HSC (HSC)
PTO_PWM (PTO_PWM)
COM1
SoMachine_Network_Manager 1 (SoMach
Ethernet
SoMachine_Network_Manager 2 (SoMach
USB
SoMachine_Network_Manager 3 (SoMach
CAN
MyController [conectado] (TM241CEC2
DI (Digital Inputs)
DQ (Digital Outputs)
Counters (Counters)
Pulse_Generators (Pulse Generators)
Cartridge_1 (Cartridge)
IO_Bus (IO bus - TM3)
COM_Bus (COM bus)
Ethernet_1 (Ethernet Network)
Serial_Line_1 (Serial line)
SoMachine_Network_Manager (SoMa
Serial_Line_2 (Serial line)
Modbus_Manager (Modbus Manager)
CAN_1 (CANopen bus)
Utilizar conexión de DTM
Aplicaciones
Dispositivos
Herramientas
GVL
Configuración de símbolos
MyPOU
GVL
MyController
DI
Ethernet_1
Configuración
Parámetros configurados
Nombre de interfaz EthernetPort0
Nombre de red my_Device
Dirección IP de DHCP
Dirección IP de BOOTP
Dirección IP fija
Dirección IP 192 . 168 . 1 . 58
Máscara de subred 255 . 255 . 255 . 0
Dirección de pasarela 0 . 0 . 0 . 0
Protocolo Ethernet Ethernet 2
Velocidad de transferencia Auto
Configuración actual
Nombre de interfaz EthernetPort0
Nombre de red M241
Dirección IP de DHCP
Dirección IP de BOOTP
Dirección IP fija
Dirección IP 192 . 168 . 1 . 58
Máscara de subred 255 . 255 . 255 . 0
Dirección de pasarela 192 . 168 . 1 . 1
Protocolo Ethernet Ethernet 2
Velocidad de transferencia 100 MBit full
Parámetros de seguridad
Protocolo SoMachine activo
Servidor Modbus activo
Servidor web activo
Servidor FTP activo
Protocolo de descubrimiento activo
Protocolo SNMP activo
Protocolo WebVisualisation activo
Parámetros de seguridad
Protocolo SoMachine activo
Servidor Modbus activo
Servidor web activo
Servidor FTP activo
Protocolo de descubrimiento activo
Protocolo SNMP activo
Protocolo WebVisualisation activo
Identificación del dispositivo esclavo
Servidor DHCP activo
Servidor DHCP activo
Cuando está activo, cada dispositivo que se añadirá al bus de campo puede configurarse para poder identificarlo por su nombre o dirección MAC, en lugar de por su dirección IP.
Estado adaptador
Dirección MAC 00:80:F4:0A:59:C0
Estado red Intercambios de datos
Supervisar 1
Mensajes - total 0 error(es), 0 advertencia(s), 0 mensaje(s)
Último Build: 0 0
Precompilar:
EN EJECUCIÓN
Programa cargado


Edificio central Gateway PLC Maestro v0.project -
Archivo Edición Ver Proyecto IL/FBD/LD Compilar En línea Depuración Herramientas Ventana Ayuda
Aplicaciones
Edificio central Gateway PLC Maestro v0
Application (HMISCUxA5 : HMISCUxA5)
Configuración de tareas
MAST
GVL
Application (MyController:TM241CEC24R)
Configuración de tareas
MAST
MyPOU
GVL
MyPOU (PRG)
Global
Vijeo Designer Project Container
Aplicaciones Dispositivos Herramientas
GVL Configuración de símbolos MyPOU GVL
MyController.Application.MyPOU
WORD_AS_BIT_0
WORD_AS_BIT
true
EN
ENO
i_var1 6
W
B00 xq_salida0 FALSE
B01 xq_salida1 TRUE
B02 xq_salida2 TRUE
B03 xq_salida3 FALSE
B04 xq_salida4 FALSE
B05 xq_salida5 FALSE
B06 xq_salida6 FALSE
B07 xq_salida7 FALSE
B08 xq_salida8 FALSE
B09 xq_salida9 FALSE
B10 FALSE
B11 FALSE
B12 FALSE
B13 FALSE
B14 FALSE
B15 FALSE
RET
Supervisar 1
Expresión Tipo de datos Valor Valor preparado Dirección Comentario
MyController.Application.i_var0 UINT 41
MyController.Application.i_var1 INT 6
MyController.Application.xq_salida1 BOOL TRUE %QX0.1
MyController.Application.xq_salida2 BOOL TRUE %QX0.2
MyController.Application.xq_salida3 BOOL FALSE %QX0.3

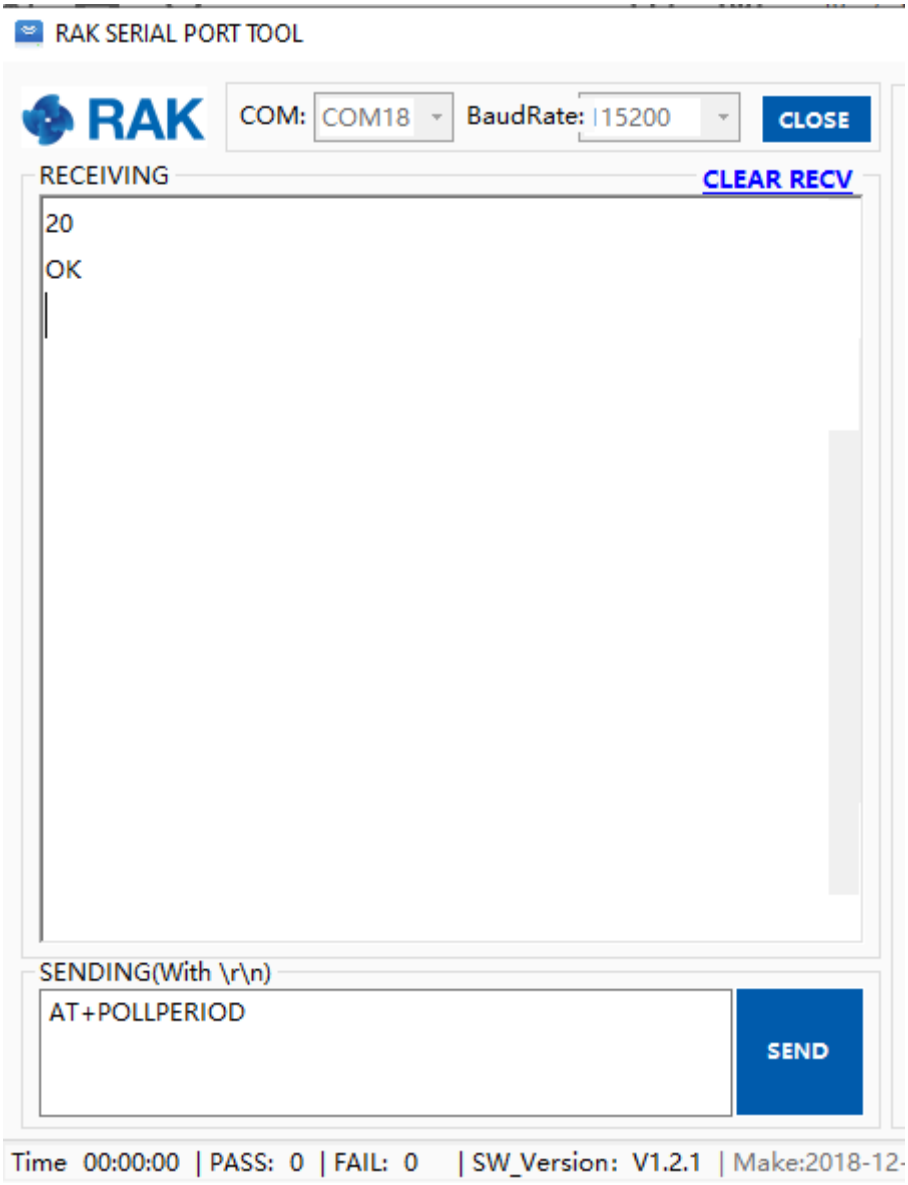


So it Works!

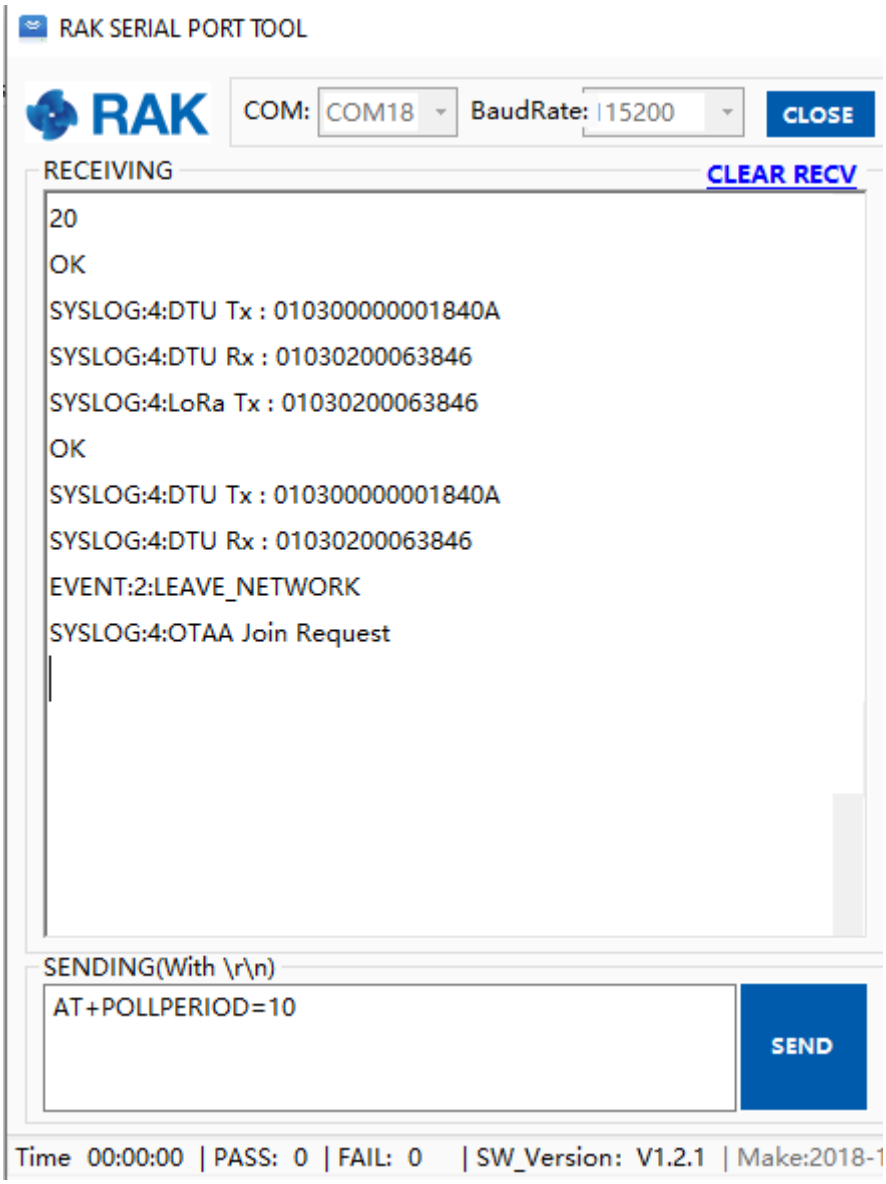
Now let’s decrease the sending period since we are transmitting each 24 seconds



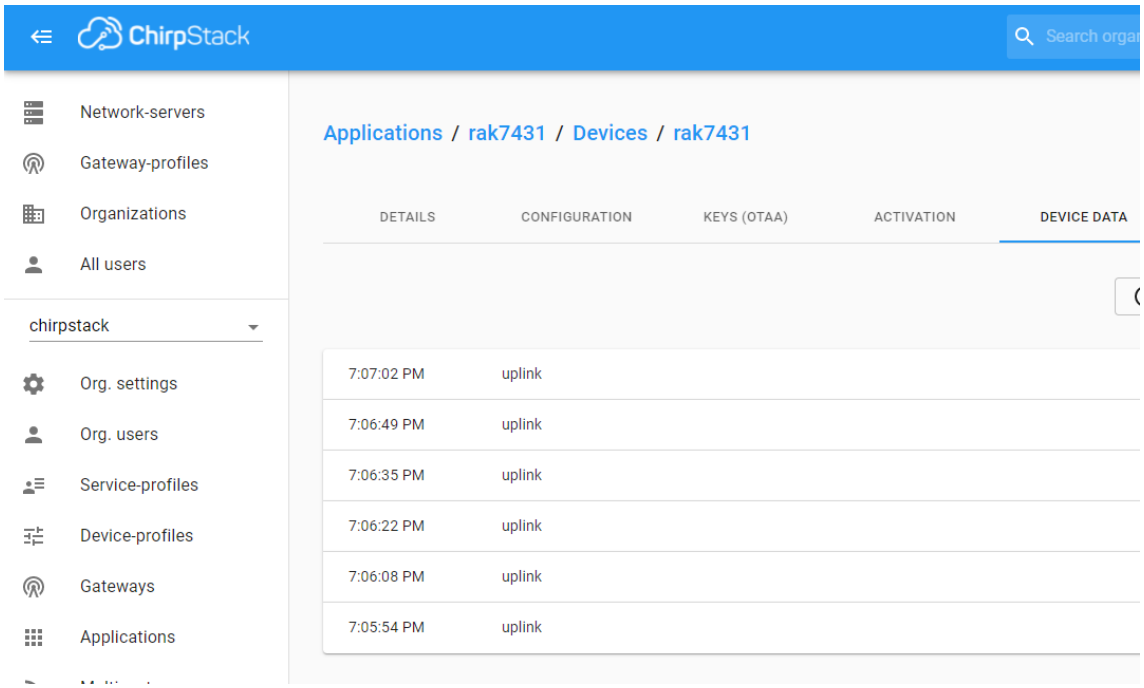
AT+POLLPERIOD



Let’s change to 10 seconds

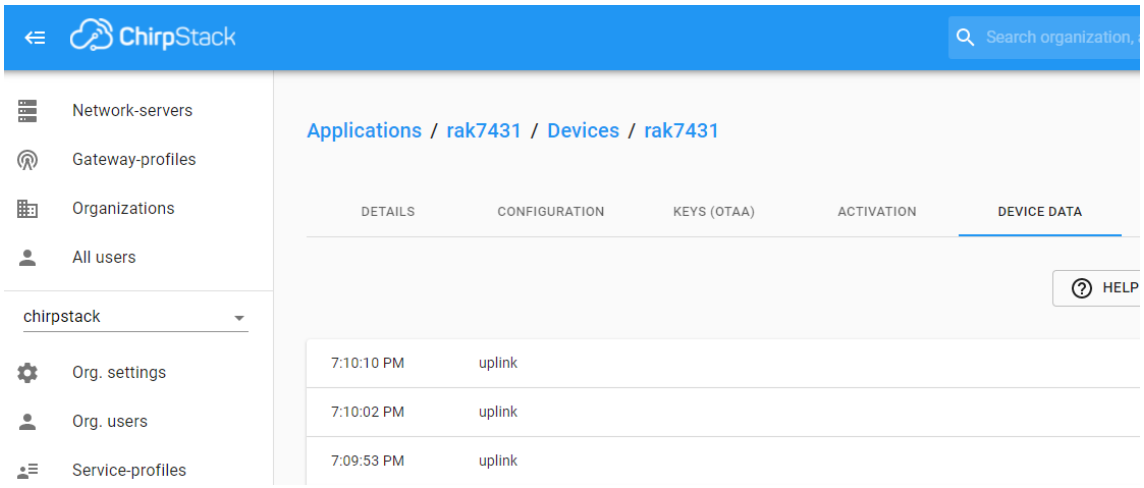


Now it is transmitting each 14 seconds

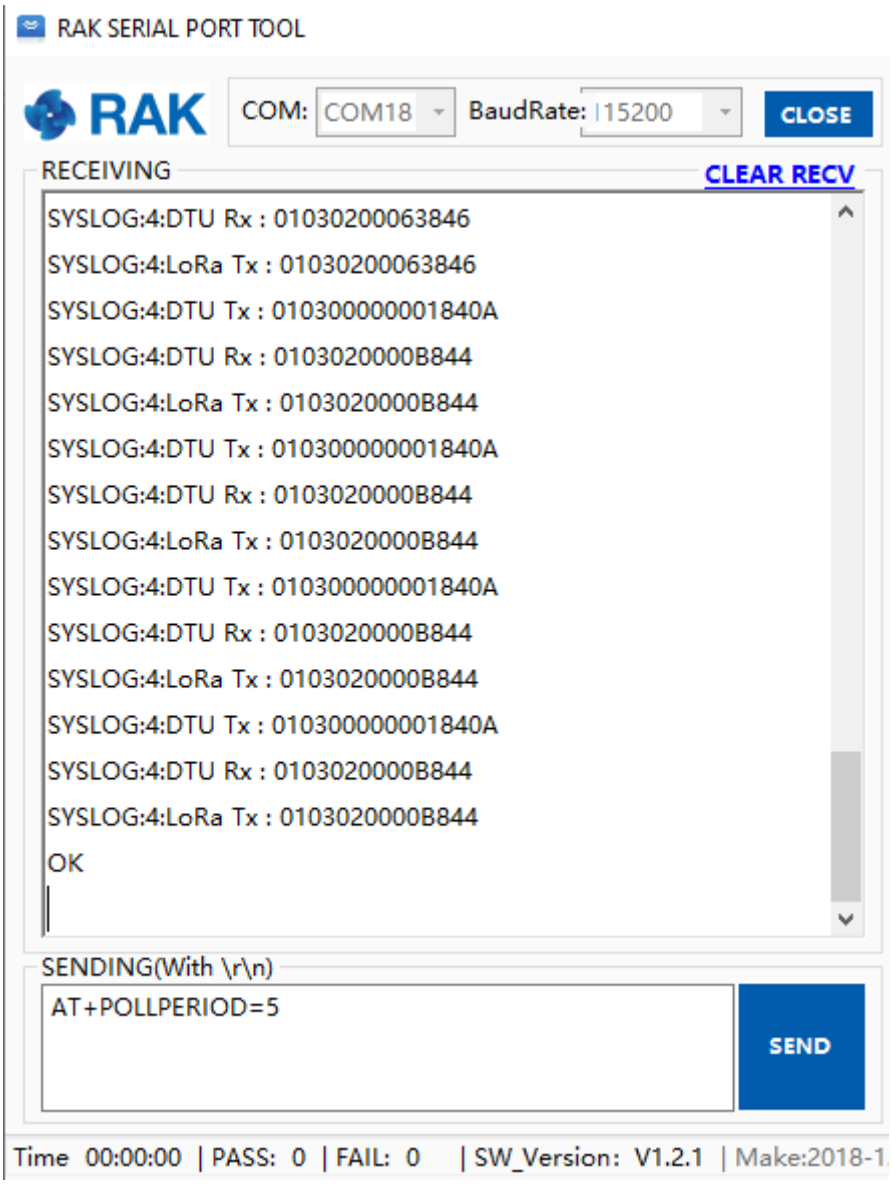


Let’s try to find the lower period

Let’s try with 5 seconds

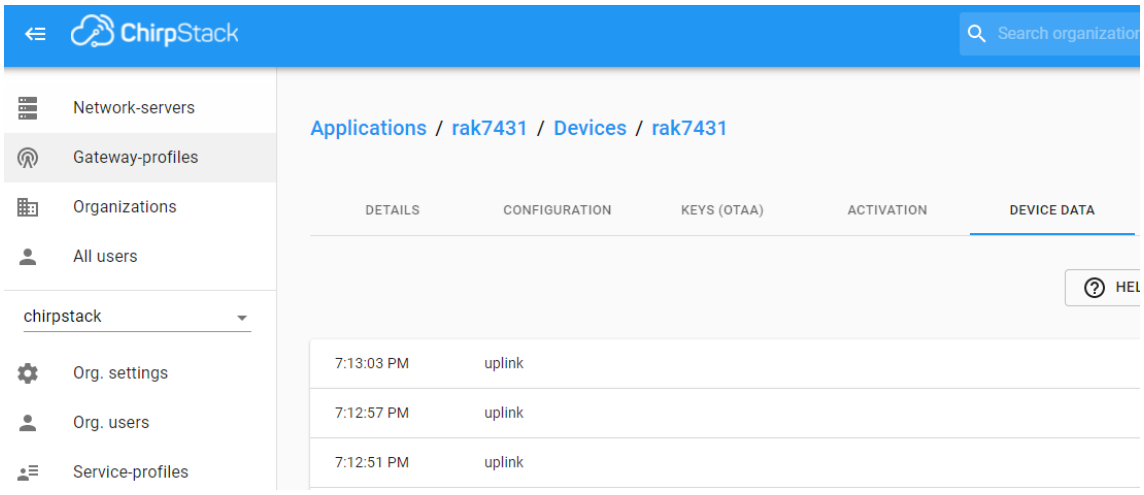


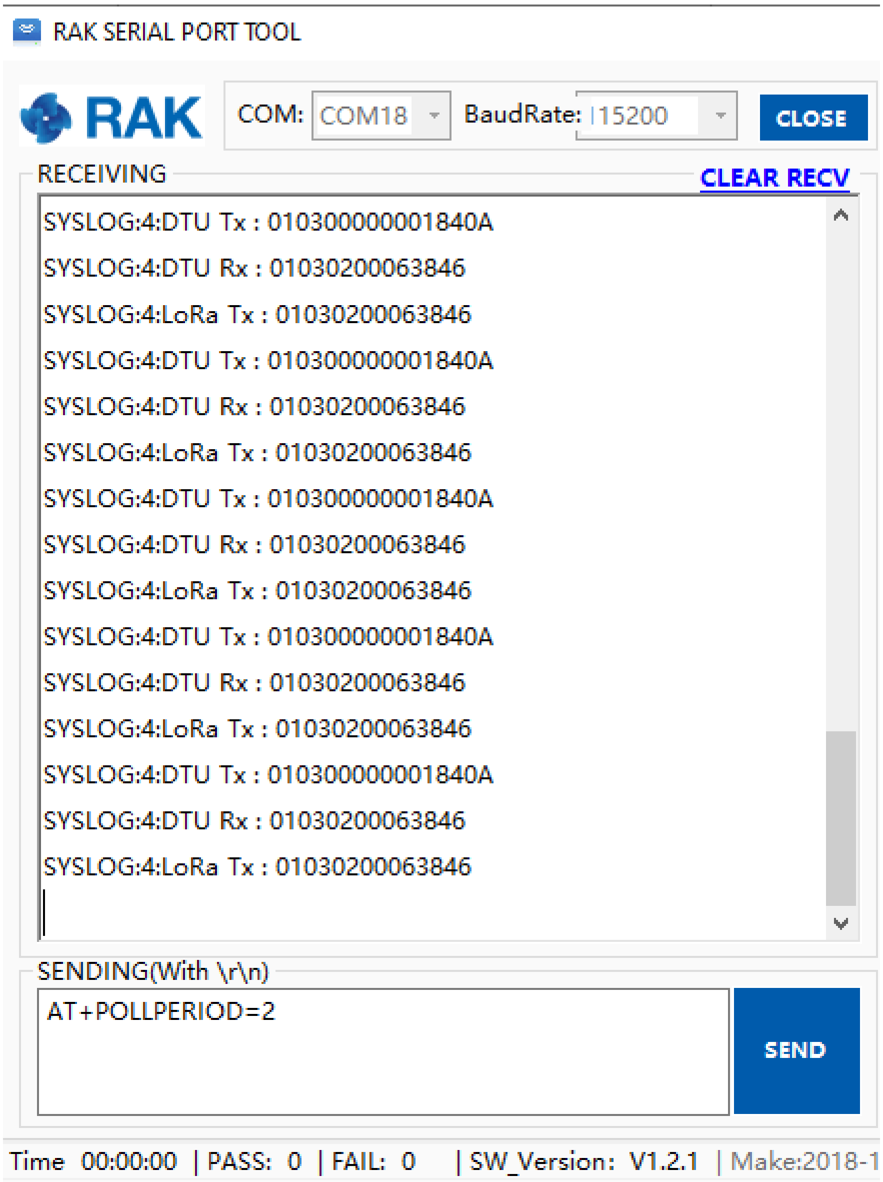
We are transmitting each 8 seconds



Let's try to go Lower

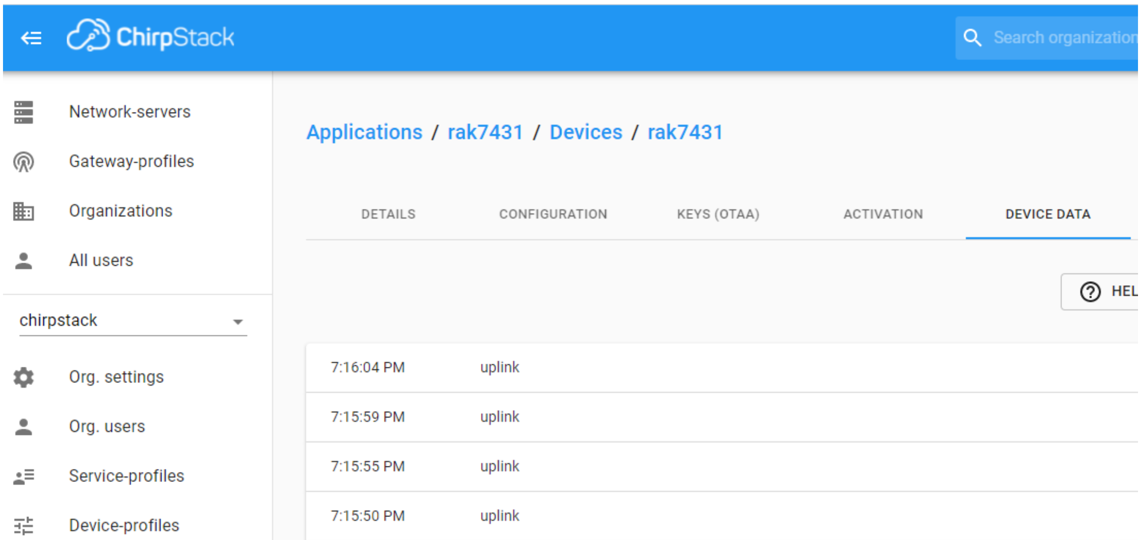
We are transmitting each 6 seconds

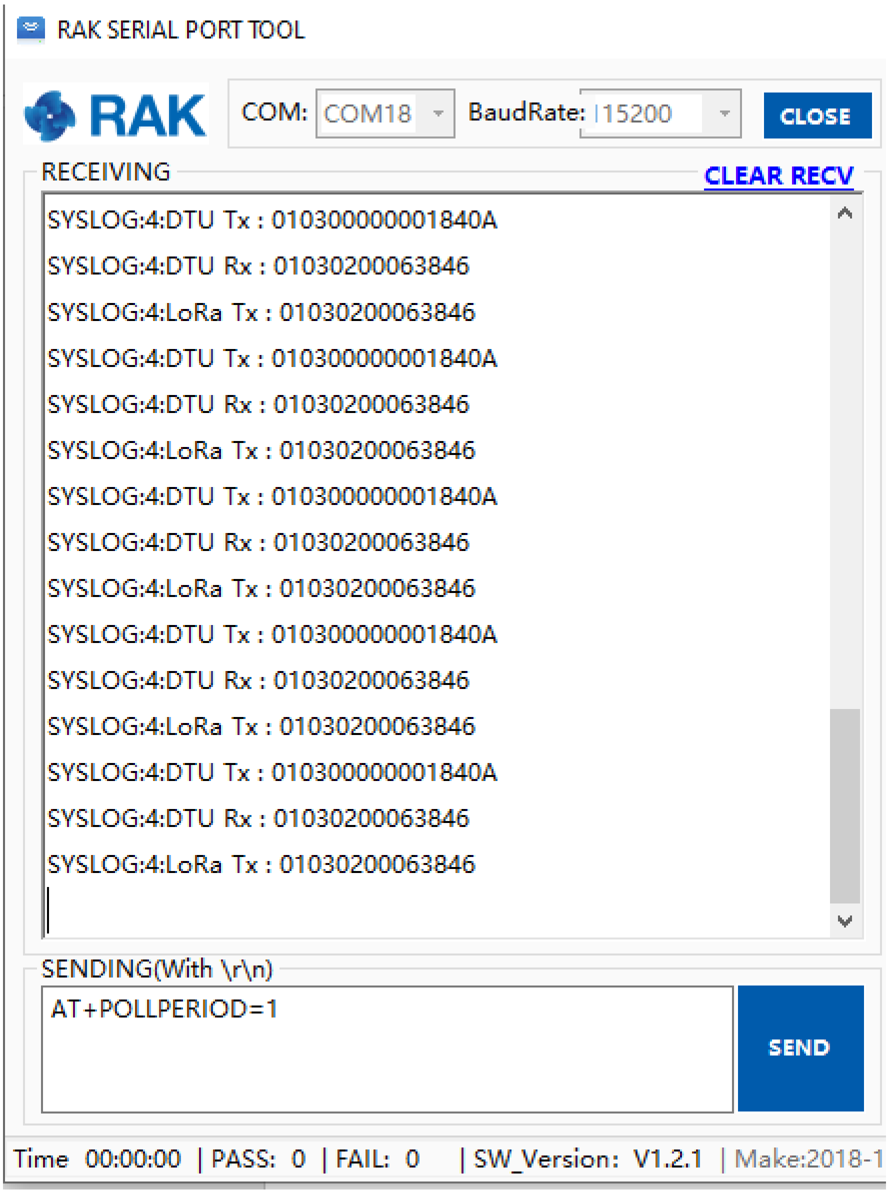




Let’s find the mínimum value POLL period 1 second

We are transmitting each 4-5 seconds




RAK SERIAL PORT TOOL
RAK
COM: COM18
BaudRate: 115200
CLOSE
RECEIVING
CLEAR RECV
SYSLOG:4:DTU Tx : 010300000001840A
SYSLOG:4:DTU Rx : 01030200063846
SYSLOG:4:LoRa Tx : 01030200063846
SYSLOG:4:DTU Tx : 010300000001840A
SYSLOG:4:DTU Rx : 01030200063846
SYSLOG:4:LoRa Tx : 01030200063846
SYSLOG:4:DTU Tx : 010300000001840A
SYSLOG:4:DTU Rx : 01030200063846
SYSLOG:4:LoRa Tx : 01030200063846
SYSLOG:4:DTU Tx : 010300000001840A
SYSLOG:4:DTU Rx : 01030200063846
SYSLOG:4:LoRa Tx : 01030200063846
SYSLOG:4:DTU Tx : 010300000001840A
SYSLOG:4:DTU Rx : 01030200063846
SYSLOG:4:LoRa Tx : 01030200063846
SENDING(With \r\n)
AT+POLLPERIOD=1
SEND
Time 00:00:00 | PASS: 0 | FAIL: 0 | SW_Version: V1.2.1 | Make:2018-1

Not bad!