Raspberry Pi IoT Gateway

Note:

- This Program are tested only in Raspberry PI 4B model and Raspberry PI OS Bookworm
- This Setup already include SIMHAT, MODBUS, CANBUS, ADC setup and program for NePower Project (If you need this for another purpose/program please modify it by yourself)

Prerequites:

- Raspberry Pi
- SD card with Raspberry PI OS (Bookworm or newer)
- Internet connection
- SIM7600X-H Hat for Raspberry Pi (please make sure you buy the correct one depend on your country)
- RS-485 / CAN Hat for Raspberry Pi
- USB Flash Drives or other removable device for security key (**optional**)

Installation:

mkdir NIW #(from now on, please use this directory for all NIW project program that will be installed in the device)

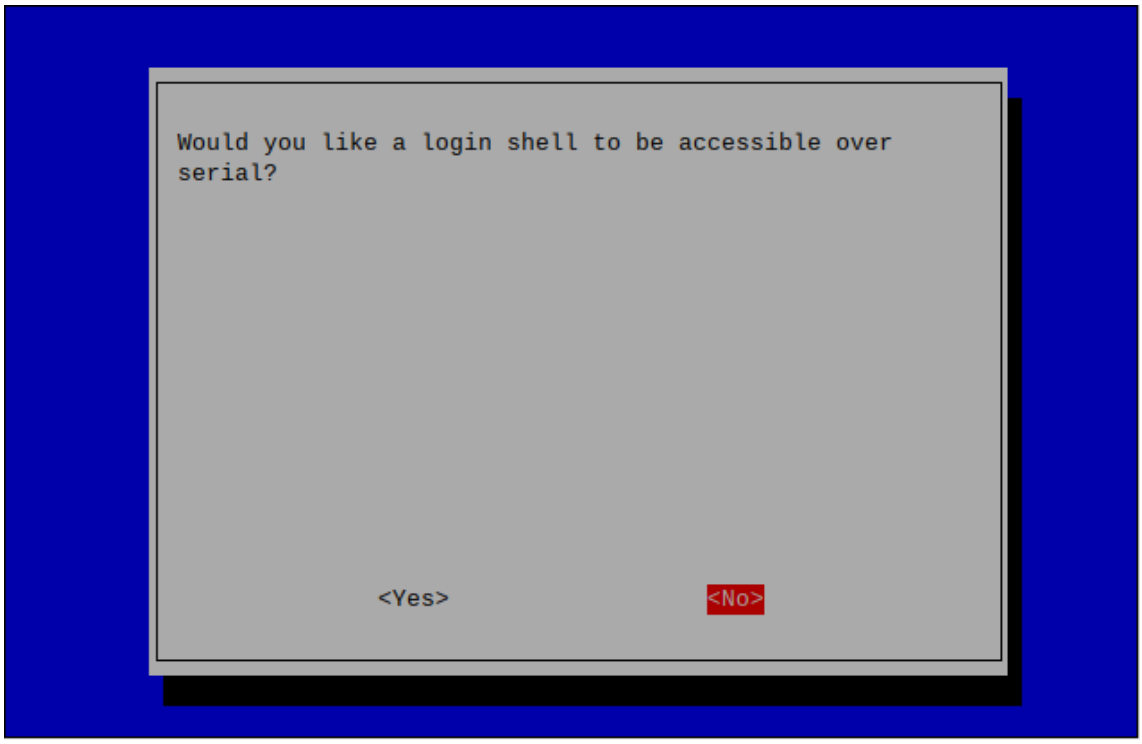
cd NIW

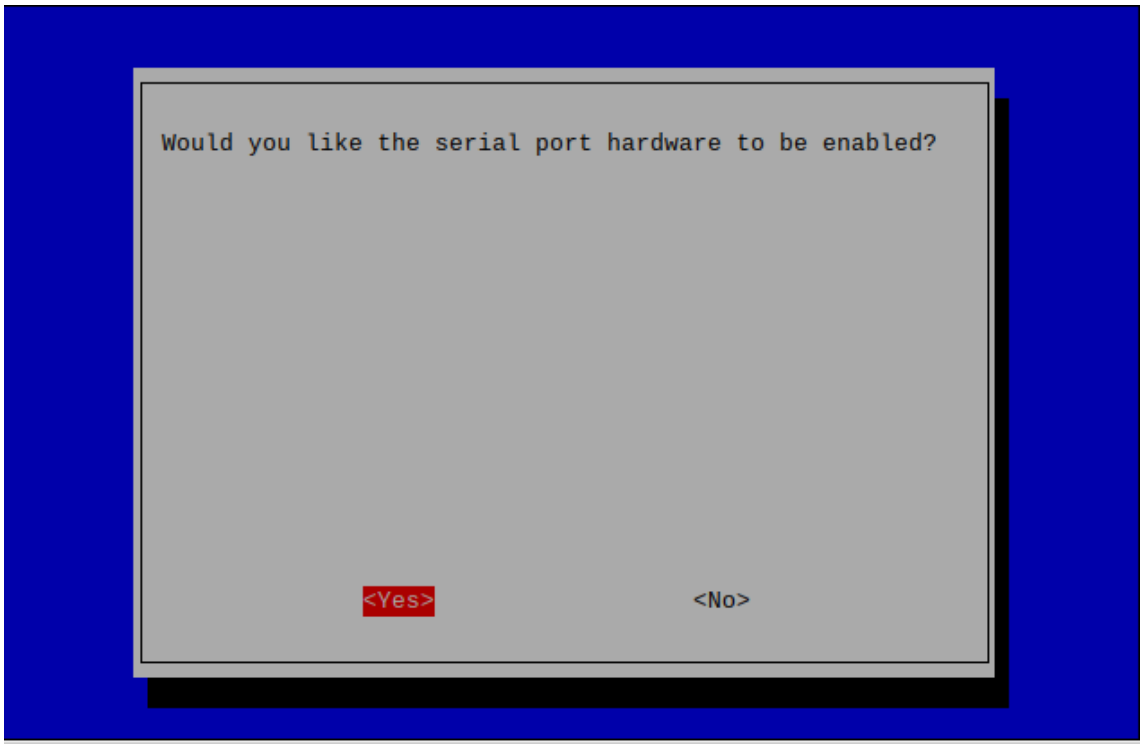
git clone https://github.com/itbdelaboprogramming/IoT-Simhat.git

sudo bash NIW/setup_nepower.bash (For NePower Project)

(Please wait during the setup process, you may need to fill some questions. These instructions may not be in the correct order, please read the instructions carefully)

- Serial Port Setup
  Choose <No> for login shell remote access and <Yes> for enable Serial Port





*Note: These questions may appear 2 or 3 times.

- Simhat Setup

(SIM7600X-H can use in Raspberry pi OS Bookworm directly, but you may need to set

APN based on your SIM card provider)
Please prepare for APN, username, and password
APN, username, password: (please check your provider information)

For Example:

APN : vmobile.jp
Pass : (empty)
User : (empty)

- Zerotier

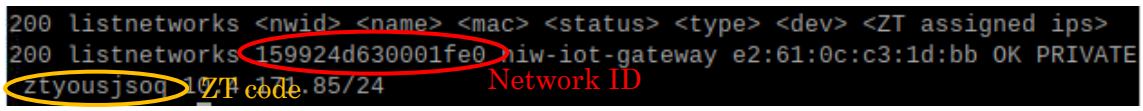
Make sure you already have target zerotier network. If you don't have one, you can follow below instruction link.
[Create a Network | ZeroTier Documentation]

You just need the network ID (16 Hexadecimal digits) as input for your Raspberry Pi
For example: 159924d630001fe0

- Router

If you set the Raspberry Pi as router you will need to set an unused subnet (**X.X.X**.0/24) and default gateway (default : **X.X.X.1**) for your router network. The input is an integer number between 2 and 254. You can see the used subnet if you scroll up little bit. Choose whatever number except in those list.

They also will asked you about Zerotier Connection code (you can check in above and it usually started with zt********)
For example: ztyousjsoq



- IP Rules

You may asked for IPv4 and IPv6 related option. Just Choose **<Yes>**

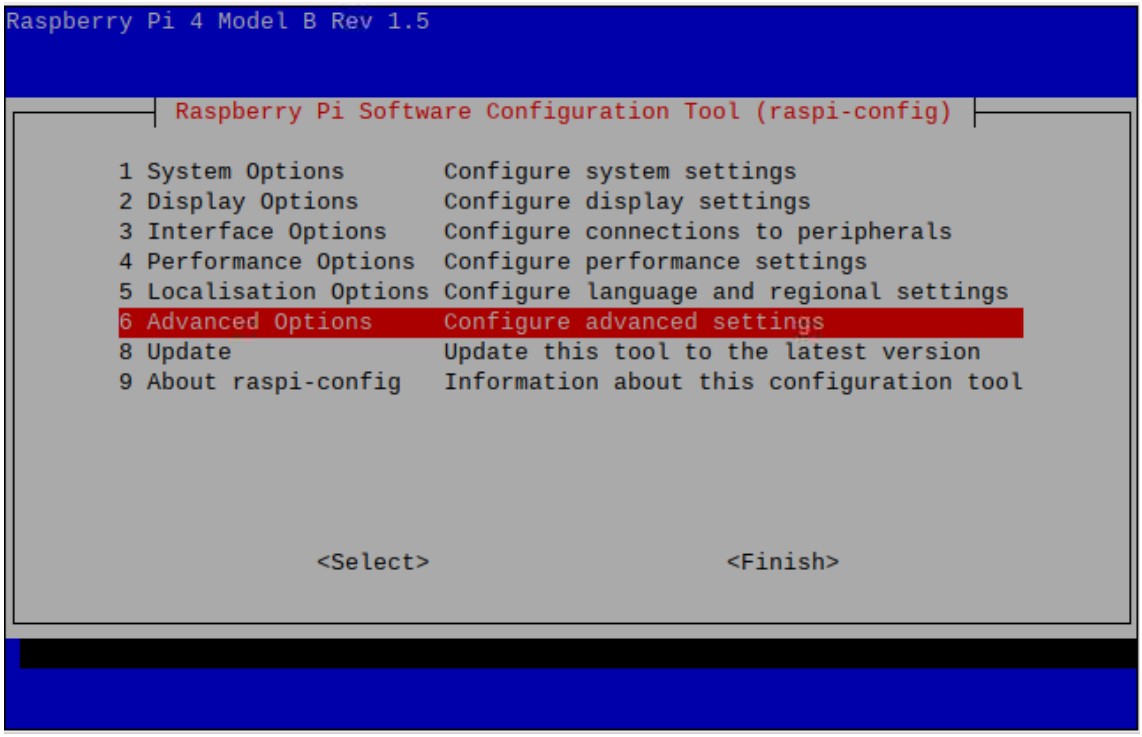
After Setup process is done, please reboot your Raspberry Pi. In the terminal, run this command
sudo reboot

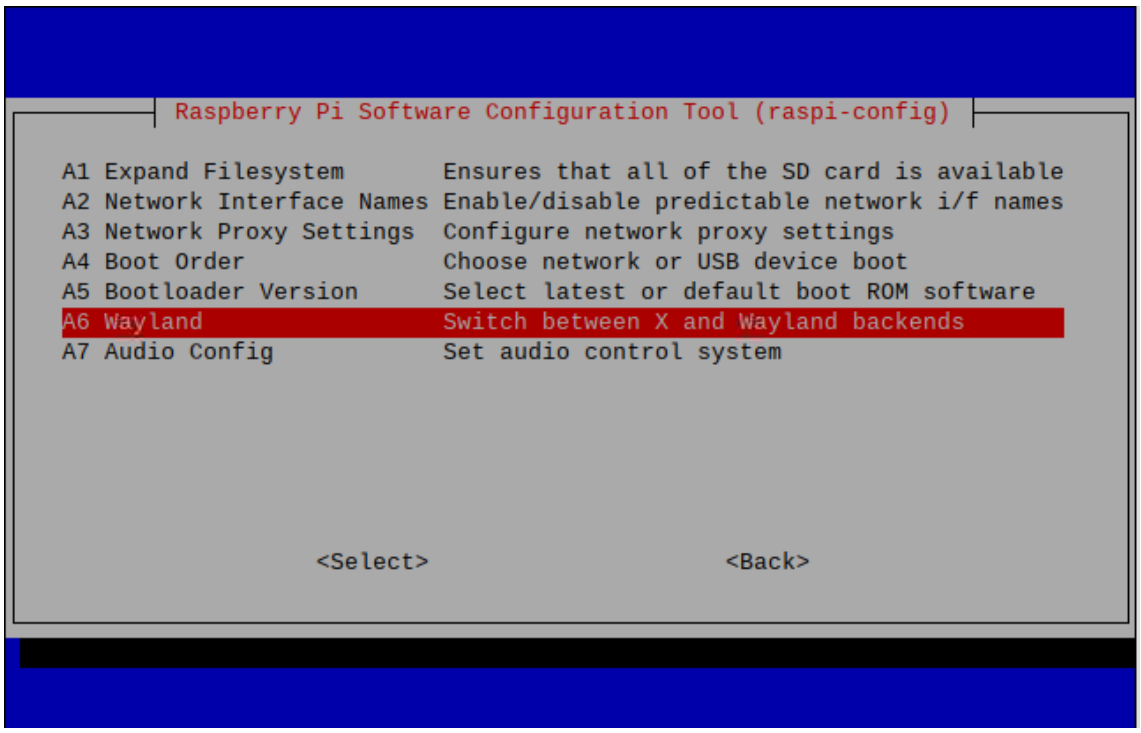
Remote Access:

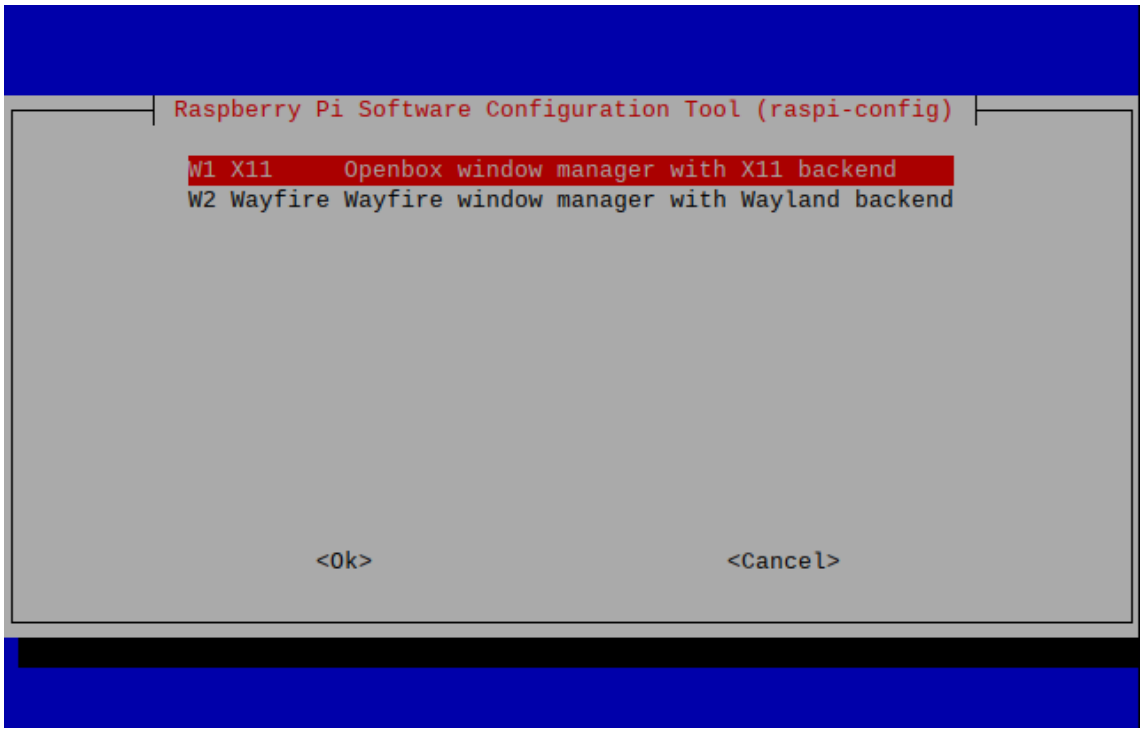
After reboot, please check if VNC icon is appears on top-right menu bar. If it's not appear then you should check your raspberry pi configuration. For now, RealVNC only can be used in X11 environment instead of Wayland, so please make sure you are using X11. To check the configuration, you can follow this instructions.

sudo raspi-config

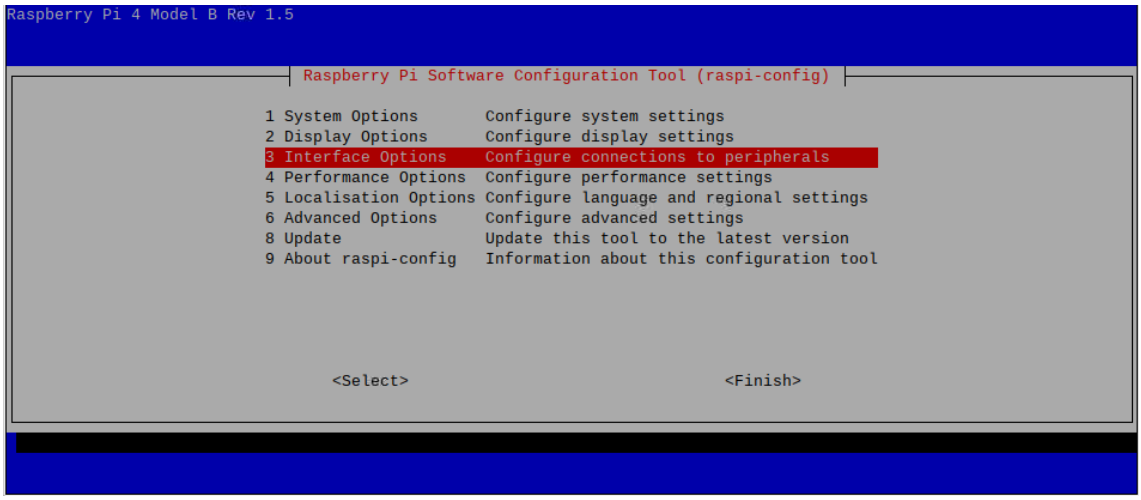
Go to **'Advanced Option'** > **'Wayland'** > **'X11'** then enter **'<OK>'**.

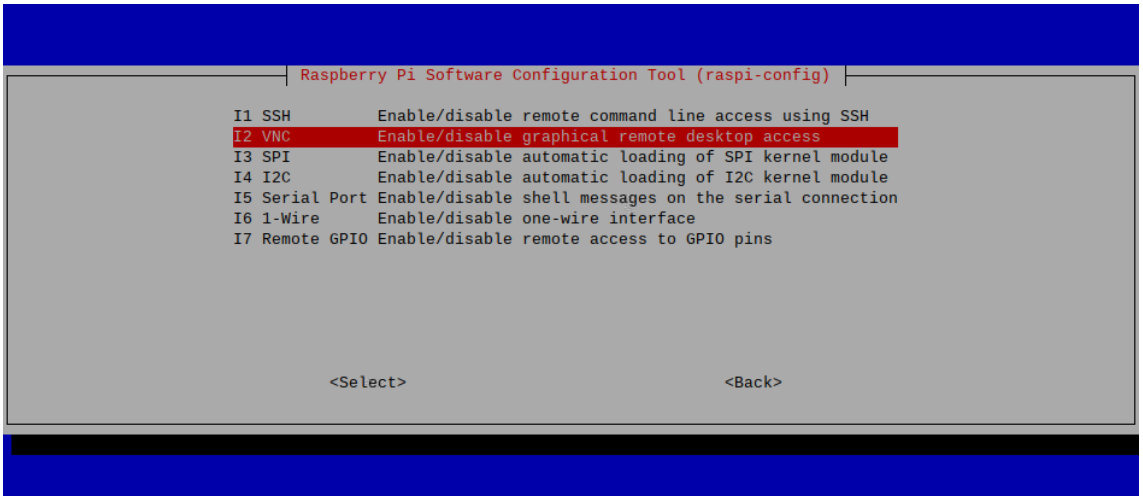


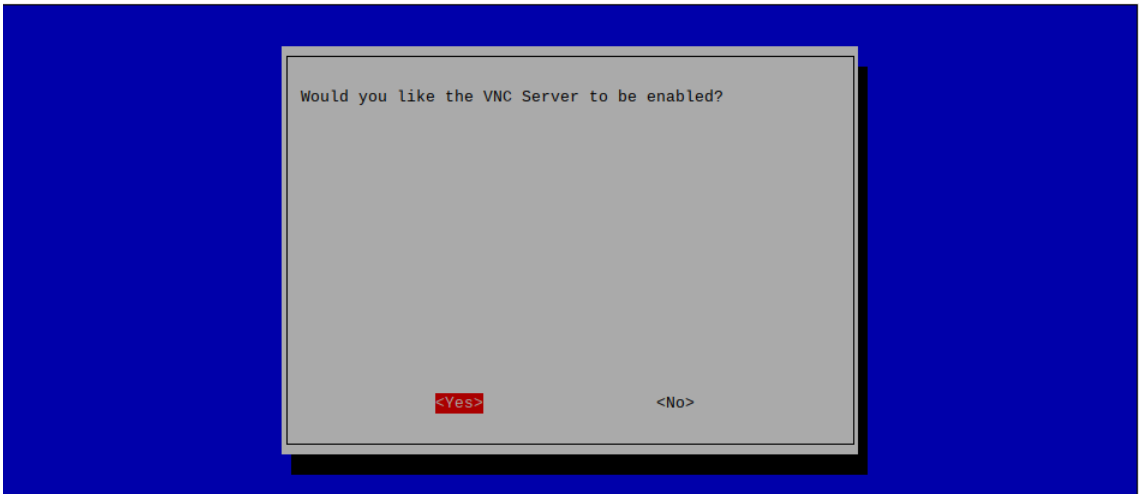


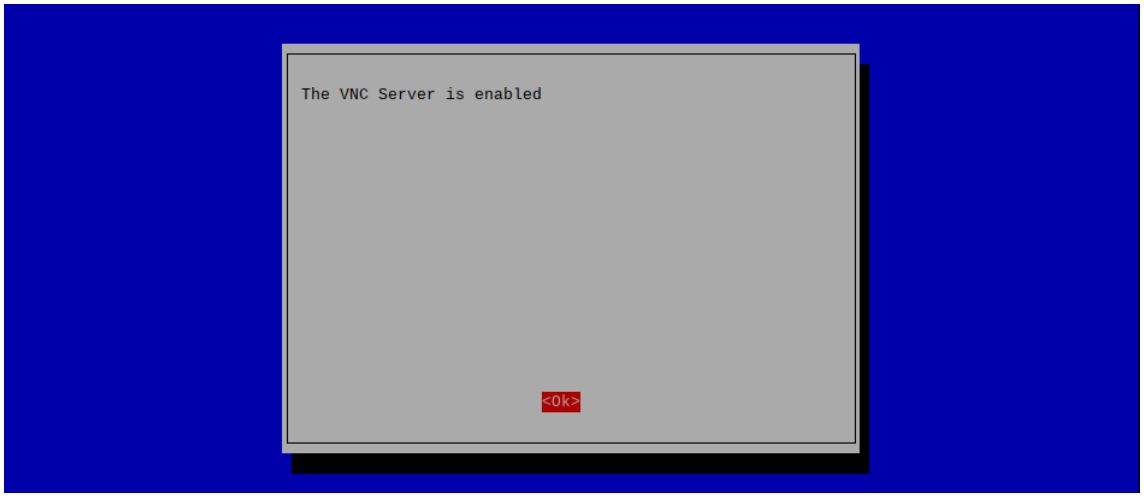


Now enable the VNC with go **'Interface Options' > 'VNC' > 'Yes' > 'OK'**. Reboot once again.


Raspberry Pi 4 Model B Rev 1.5
Raspberry Pi Software Configuration Tool (raspi-config)
1 System Options Configure system settings
2 Display Options Configure display settings
3 Interface Options Configure connections to peripherals
4 Performance Options Configure performance settings
5 Localisation Options Configure language and regional settings
6 Advanced Options Configure advanced settings
8 Update Update this tool to the latest version
9 About raspi-config Information about this configuration tool
<Select>
<Finish>


Raspberry Pi Software Configuration Tool (raspi-config)
I1 SSH Enable/disable remote command line access using SSH
I2 VNC Enable/disable graphical remote desktop access
I3 SPI Enable/disable automatic loading of SPI kernel module
I4 I2C Enable/disable automatic loading of I2C kernel module
I5 Serial Port Enable/disable shell messages on the serial connection
I6 1-Wire Enable/disable one-wire interface
I7 Remote GPIO Enable/disable remote access to GPIO pins
<Select>
<Back>


Would you like the VNC Server to be enabled?
<Yes>
<No>



Now you should see the VNC icon in the menu bar, if it still doesn't then there is something wrong with it and you need to troubleshoot to check if VNC can be used or not.

Now you should have all required tools to run the program. Now we are going to setup the program.

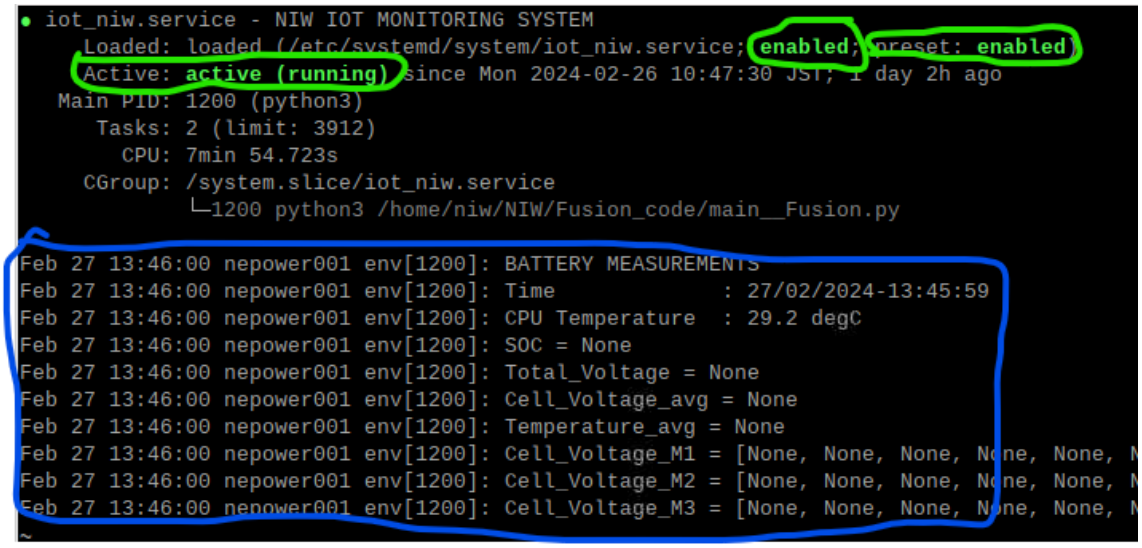
Running Program:

Please check if the devices you are connected by MODBUS, CANBUS, or ADC is already has its own python script as library. You can check it inside **'Fusion_code/lib'** directory and you will find directories to store the libraries based on the communication protocol. Please make sure those libraries already imported in the **main code.**

If you cannot find the python library for your devices, you can check it in ITB de Labo Github Repositories or you can make it on your own according to the existing template.

Once you run **setup_nepower.bash** it should be set the script to be automatically ran every time the raspberry pi is booted up. To check if the scripts is running or not, you can do this command

systemctl status iot_niw.service



'Enabled' means that the scripts is on autorun mode

'Active (running)' means the scripts is running now.

You can check the logging in the blue area.

Make sure there are no error that makes the scripts is stopped.

These are command to run and stop the program

- Enter the script to autorun mode

  sudo systemctl enable iot_niw.service

- Disable the autorun mode

  sudo systemctl disable iot_niw.service

- Start the autorun mode for once

  sudo systemctl start iot_niw.service

- Stop the autorun mode for once

  sudo systemctl stop iot_niw.service

- To run the script manually

  python3 /home/$(logname)/NIW/Fusion_code/main__Fusion.py

FQA:

- Why I cannot set Parity bit in Modbus to 'E' even or 'O' odd?

If you are using /dev/ttyS0 connection then its normal, you should use /dev/ttyAMA0 instead.

- Why there is no /dev/ttyAMA0 in my raspberry pi?

it means ‘init_modbus.bash’ or the other .bash that contains modification to ‘config.txt’ inside /boot or /boot/firmware is not applied correctly.
Please check for Symlinks by running this command
ls -l /boot
you will see ‘config.txt’, ‘cmdline.txt’ and ‘overlays’ referred to the true files. Please change the path in your .bash that contain modification to ‘config.txt’ to the true files path.

- Why the Network is not work correctly?

Check by command ‘**ifconfig**’, if ‘**wwan0**’ doesn’t appear it means the SIM not setup correctly. If ‘**eth0**’ doesn’t appear it means the LAN not setup correctly.

- Make sure the SIM has data package and the service is valid
- Sometimes for unknown reason, the LAN / eth0 setup for router function is only setup correctly on the first time setup. So make sure you set the correct subnet and default gateway.

- FTP already enabled?

The FTP is already enable, you can read the instructions here.