Chapter 4

Software Description

4.1 User Manual

4.1.1 Connecting to the Demonstrator

To connect to the Demonstrator, open the WI-FI options of your device and connect to the "Demonstrator " SSID. After connecting, open `http://172.24.1.1` in a browser of your choice.

4.1.2 Powering off the device

Powering off the device can be done either with software (recommended) or hardware.

Software

To power off the device with software, press the power off button in the action bar. Confirm the dialog to shutdown the Demonstrator.

(If the power button is not shown, navigate to any settings view. After logging in, the button should be visible)

Figure 4.1: Powering off the device (1)

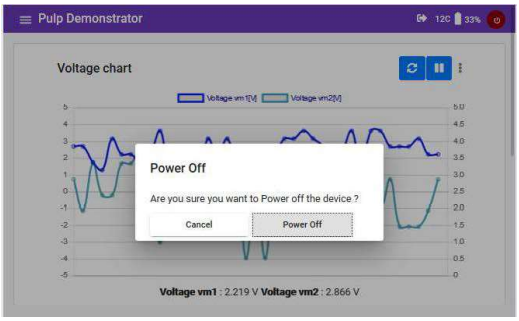

Figure 4.2: Powering off the device (2)

Hardware
To power off the device with hardware, simply press to power on/off button for approximately 20 s.
This will cut the power to the DEMONSTRATOR and it will shut down.
Only do this if you have no other option, as this could damage the device.

4.1.3 Creating or editing a chart

In order to create or edit a chart, open the sidebar and select "Settings - Chart ".

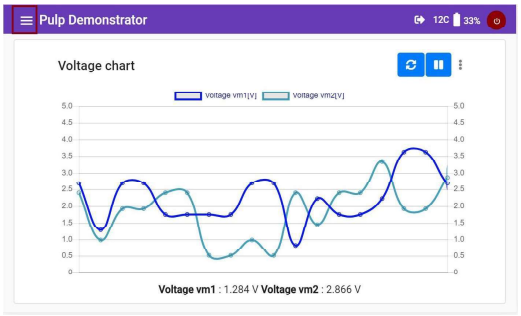

Figure 4.3: Opening the sidebar

Figure 4.4: Navigating to the charts view

In the following view, select the chart you want to edit using the drop-down or create a new one by pressing the "Add Chart" button.
Changes will be applied instantly but are lost when reloading the page or restarting the server.
To store the changes globally, be sure to press the "Store changes" button.

Every chart contains 3 parts:

1. General Chart information
   - **Chart Name**: Select a unique chart name for your chart. This will also be the title of the chart, which is shown in the dashboard.
   - **Values in Graph**: Defines the max amount of data points that will be shown in this chart. Whenever a chart exceeds this amount, adding a new point to the chart, will shift it to the left by one.
2. Axes [List]
   - **Axis ID**: Unique identifier for the axis. Can be chosen freely.
   - **Position**: Position of the Axis. Currently only "left" and "right" is supported. Note that you can have more than one axis per side.

3. Dataset [List]

   - **Name**: Name of the dataset. Will be used as label in the legend of the chart.
   - **Unit**: Unit of the dataset. Will be set automatically if auto label is selected.
   - **Axis**: Axis that belongs to this dataset.
   - **Auto Label**: If set, label will be generated automatically using name and unit of the current measurement
   - **Auto Range**: If set, automatically scales the axis to fit the current resolution of the measurement(e.g. 0 - 50mV).
   - **Neg. Range**: If set, also includes negative values(e.g. -50mV - 50mV).
   - **Measurement Device**: The device which delivers the data for the dataset. If you would like to create a custom dataset (e.g. power measurement) select a random one.
   - **Color**: The color of the dataset.
   - **Apply Function:** Select this, if you want to create a custom dataset which does not simply display measured values.
     This functions gets called every time the measurement devices delivers new data.
     For more information check Section 4.1.7

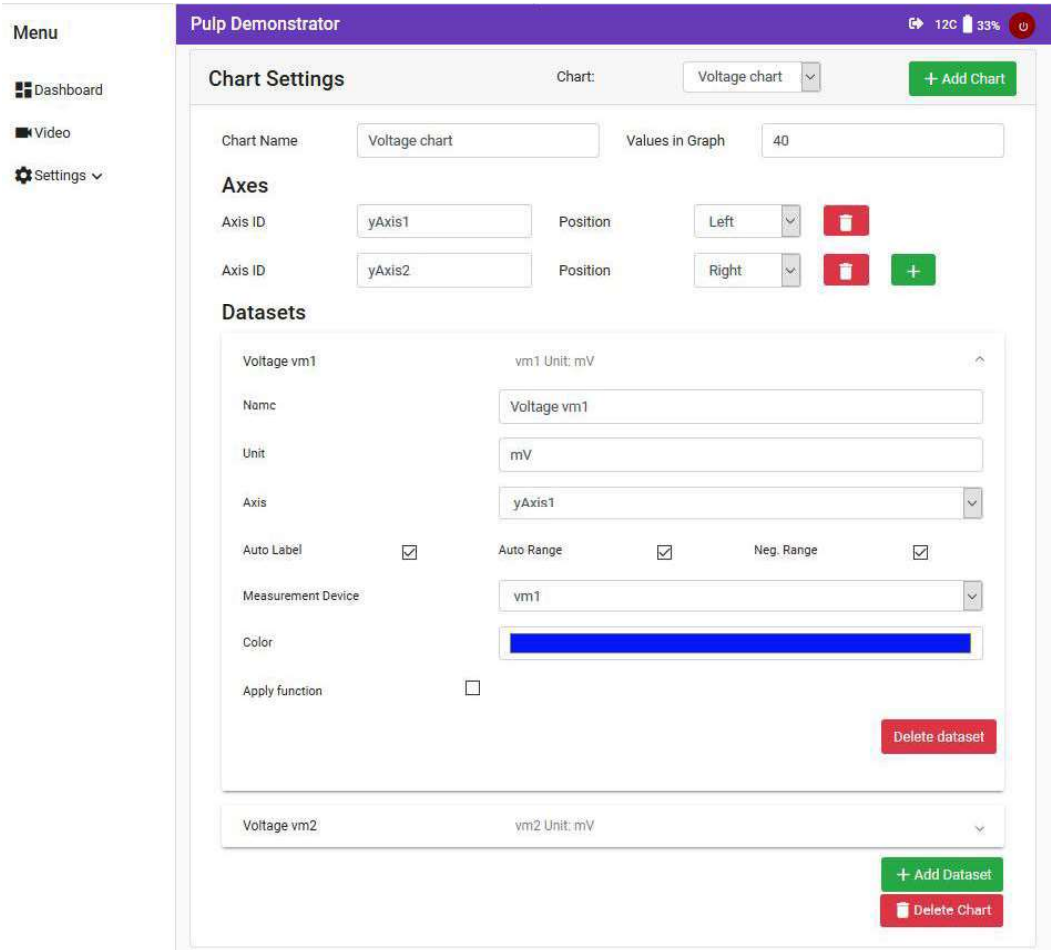

Figure 4.5: Example configuration

4.1.4 Changing the supply voltages

To change the supply voltages, navigate to "Settings - Supply Voltages".
In this view, seven different supply voltages can be configured. Use the slider or type inside the text field to change the current values.
Once you selected the desired voltages, press submit and confirm your changes.

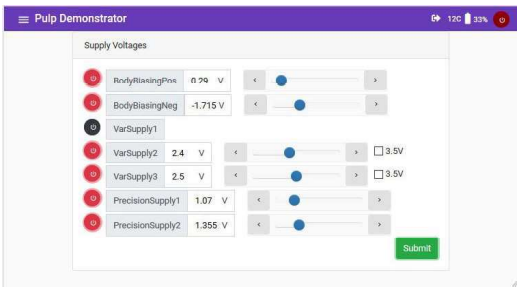

Figure 4.6: Changing the supply voltages

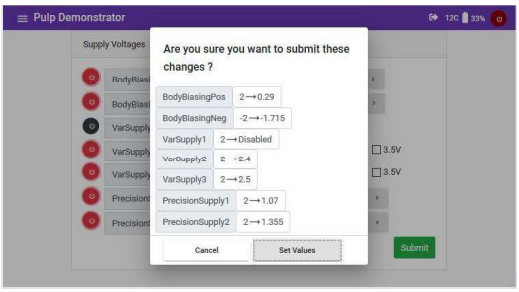

Figure 4.7: Confirming the changes

4.1.5 Changing the resolution

To change the resolution of a measurement, navigate to "Settings - Measurement".
In this view, you can adjust the resolution range of every measurement device.
If "Auto" is selected, the device tries to adjust the resolution in realtime whenever a measurement exceeds the current range.

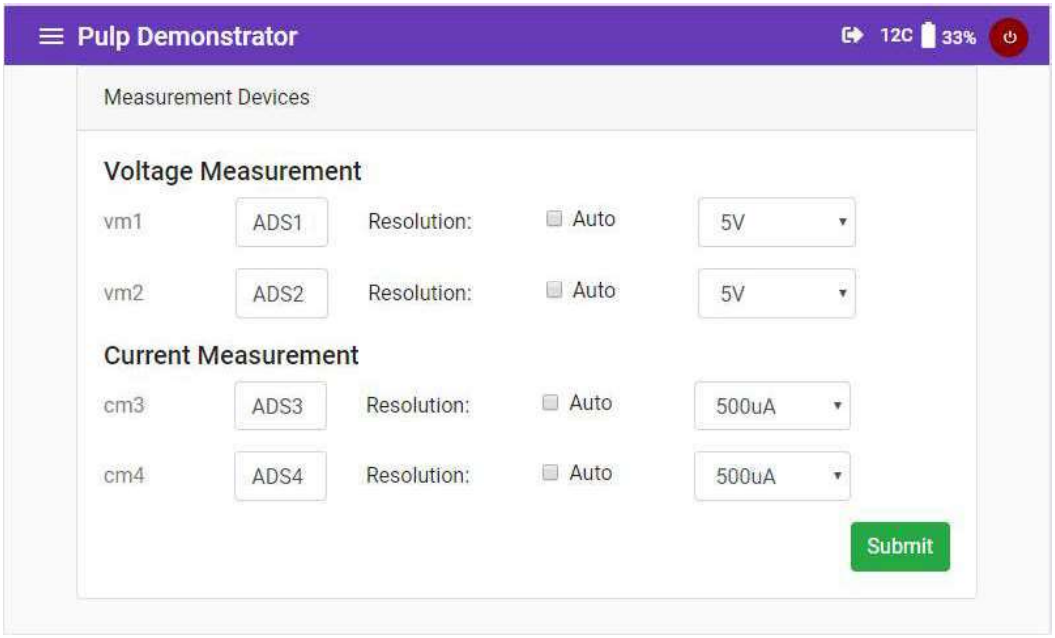

Figure 4.8: Changing the resolution of a measurement

4.1.6 Exporting a chart

Charts can be exported either as .CSV or .PNG files.
In order to export a chart, press the pause button to stop it from updating.
By pressing the three dots next to the pause button a menu providing different export actions can be opened
The exported data will be stored locally on the DEMONSTRATOR.

4.1.6.1 Obtaining the exported files using SSH

To obtain the exported files using SSH, simply connect to the DEMONSTRATOR using the SSH credentials and a SSH client of your choice.
Once connected, navigate to `/home/pi/pulp-demonstrator/Server/backend/export` to see all the files that have been exported.
The files can be downloaded using scp or can be copied to a USB stick that is plugged into the DEMONSTRATOR.

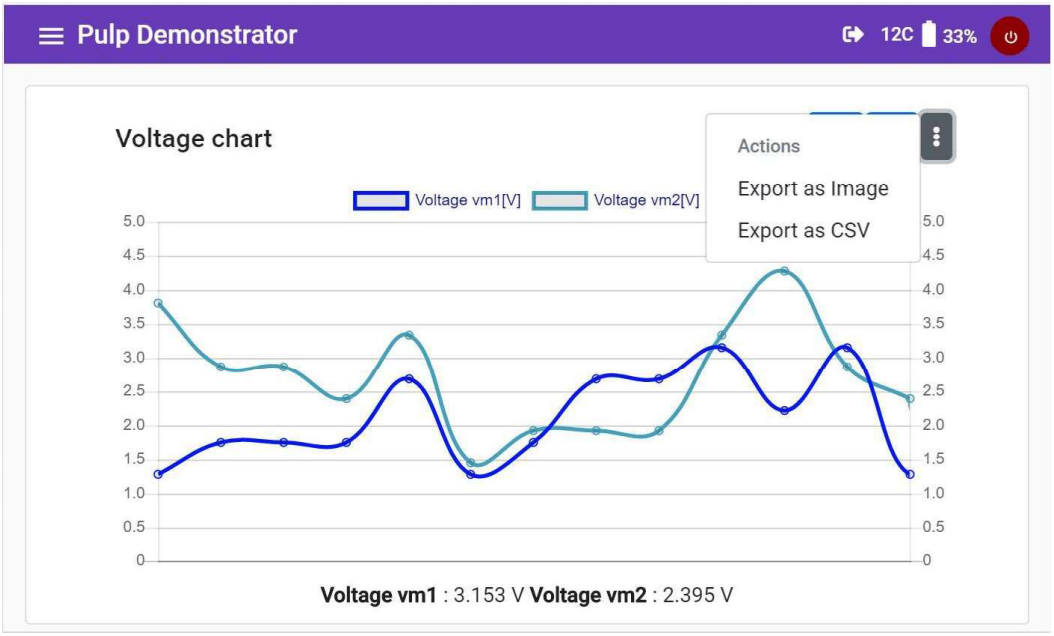

Figure 4.9: Export the data of a chart

4.1.6.2 Obtaining the exported files without remote access

To collect the exported files without remote access, plug a keyboard and a USB-Stick into the DEMONSTRATOR.
Pressing `ALT + F4` will close the GUI and opens a Linux Terminal.
Mount the USB Device using the linux `mount` [1] command.

[1] https://linuxconfig.org/howto-mount-usb-drive-in-linux

After mounting the USB Device, navigate to `/home/pi/pulp-demonstrator/Server/backend/export` and copy the files, you would like to export, to the USB device.

4.1.7 Creating a custom dataset

Sometimes it is desirable to create a custom dataset that does not simply show measured data. For example, one might be interested in the power consumption of a chip, given by the multiplication of the voltage measured on the vm1 channel and the current measured on the cm3 channel.
To be able to plot datasets like these, the DEMONSTRATOR offers the possibility to apply a custom function on any dataset. This function can access any measurement and perform any operation supported by JavaScript.
To simplify development, the DEMONSTRATOR offers the function `scaleToSiUnit(DataEntry)` which takes a measurement and returns its value as an SI-Unit ([V], [A]).
All measurements are stored in the `data` object, and can be obtained using the device ID.
The following custom function plots the power consumption of the vm1 and cm3 channel in mW:

```
1 (scaleToSiUnit(data['vm1']) * scaleToSiUnit(data['cm3'])) * 1000;
```

Note that for security purposes, the function can only consist of one line. If you need to perform more complex operation, create a public function as specified in the developer manual section 4.2.

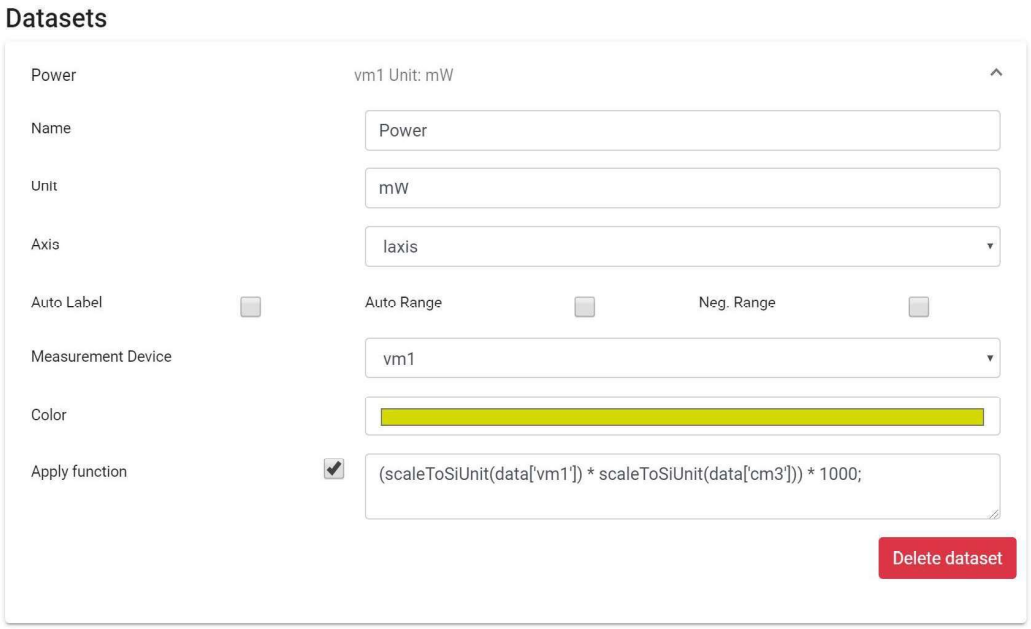

Figure 4.10: Example of a custom dataset that calculates the power consumption

4.1.8 Using the Demonstrator as logger

To use the Demonstrator as a logger, connect to the Demonstrator using SSH or by connecting a keyboard to it.
Open the Terminal and close the server task by typing:

```
# get process id of server task
ps -A | grep python
sudo kill <processId>
```

Once the server stopped, navigate to the skripts folder `pulp-demonstrator/Server/skripts/` and execute the file `perf_logger.py`:

```
cd /home/pi/pulp-demonstrator/Server/skripts
sudo python3 -d <deviceIdList> -o <outFile.csv> -t <timeDelay> -n <
    numberOfMeasurements>
```

After starting, the script will ask which resolution should be set for each measurement device specified in the deviceIdList.
As soon as the last range was specified the logger starts measuring and logging `n` values to the outputfile. The output file can then be copied on to a USB stick. The logger also creates a `<outFile.csv.info>` file which contains information about the measurement.
Examples

```
# Log the output of the vm1 and cm3 channel, waiting 0.1s between
    measurements, collecting 100 measurements.
sudo python3 -d "vm1,cm3" -o vm1_cm3.csv -t 0.1 -n 100
# Log all channels to output file. Log as fast as possible and measure
    until ctrl+c is pressed
sudo python3 -d "vm1,vm2,cm3,cm4" -o all.csv
```

4.1.9 Changing the pin-code

To change the pin-code, connect to the Demonstrator using either SSH or a keyboard.
Once connected, navigate to the file `/home/pi/pulp-demonstrator/Server/backend/flask_app` and edit the `config.py` file.
Change the line `PIN_CODE = "pincode"` to any pin-code you would like to use.
To apply the changes, restart the Demonstrator by typing: `sudo reboot now`