

Temperature Monitoring with Raspberry Pi



add overview of all important files and services



Write down account names and passwords somewhere

The monitoring setup was developed by Étienne Wodey. It is explained in

this talk

by him. The main aspects on how to set it up are documented in

this email

.

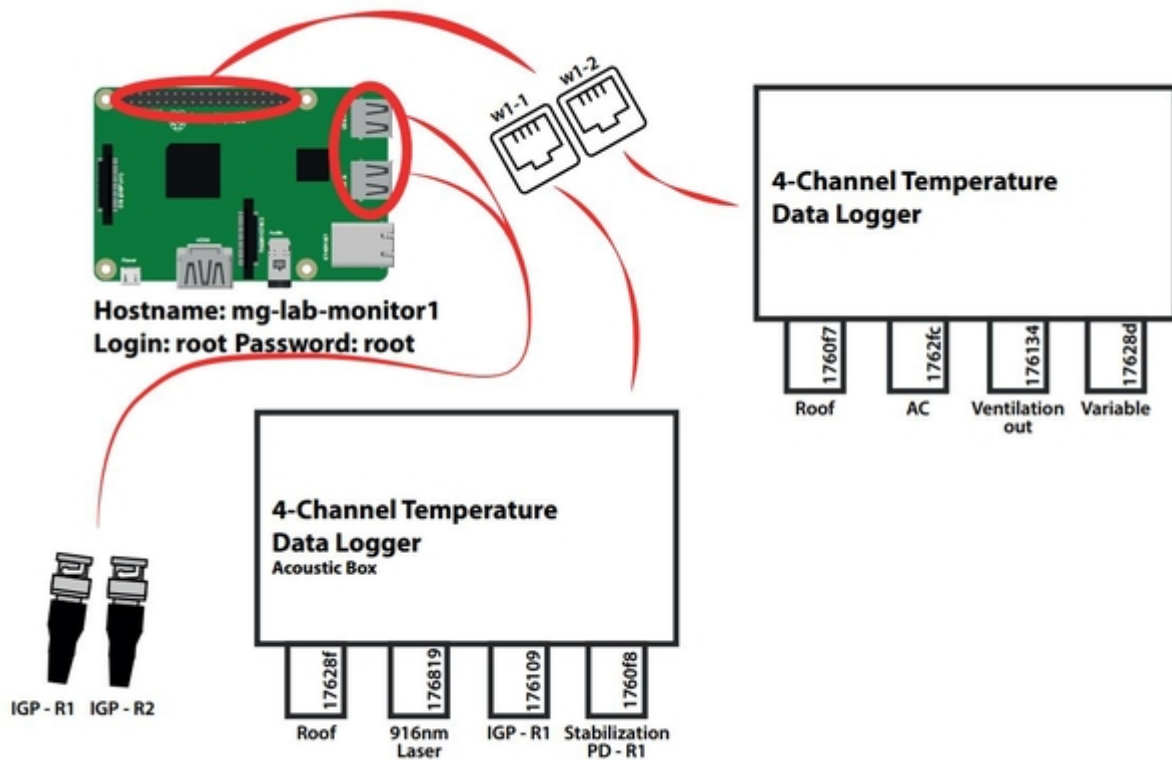
Short version: the raspberry pi reads out temperature sensors connected via one-wire bus, sends the data via LAN to an [InfluxDB](#) database located on the Magnesium Server. There the temperatures are stored and can be visualized in the browser using [Grafana](#), also running on the magnesium server. It can be accessed [here](#)

Magnesium Server

hostname thingol, runs Debian 9

Raspbery Pi

Basic principle



[rasptemp1.pdf](#)

Hardware setup



pictures and schematics

Firmware

A cloned image can be found at \\AFS\\iqo.uni-hannover.de\\projects\\magnesium\\Software\\Raspberry Temperature Control\\rasp_temp_control.img

This is the image for a basic setup. The operating system used is the minimal raspbian installation.

Enabling One-Wire-Bus

Edit `/boot/config.txt`:

```
sudo nano /boot/config.txt
```

and add the line

```
dtoverlay=w1-gpio
```

Edit /etc/modules:

```
sudo nano /etc/modules
```

and add the lines

```
w1-gpio  
w1-therm
```

Reboot the System:

```
sudo reboot
```

There should be folders w1_bus_master<N> in /sys/devices:

```
ls -l /sys/devices/
```

Check if there are devices connected:

```
ls -l /sys/devices/w1_bus_master1/
```

Replace w1_bus_master_1 with any of the folders listed previously.

There should be folders named something like 3b-0000001760f8/. These are the devices connected. Make sure there is a file named w1_slave for every device connected. This file is used to read from and write to the connected devices.

In case the folders or the files don't exist, make sure your devices are connected correctly, the steps above were done and/or reboot the system.

collectd

<https://collectd.org/index.shtml>

collectd is run on the raspberry pi to read out the temperature sensors and send the messages to the influxdb database located on another server.

install collectd:

```
sudo apt-get update  
sudo apt-get install collectd
```

check the status of the daemon:

```
sudo systemctl status collectd
```

if the status is running, stop the daemon:

```
sudo systemctl stop collectd
```

to view all systemlog messages by collectd:

```
journalctl -u collectd -b
```

The collectd configuration file is located at `/etc/collectd/collectd.conf`. Edit it:

```
sudo nano /etc/collectd/collectd.conf
```

Copy the contents of

this file

into there.

Make sure to adjust the name of the server in the network plugin section to your needs.

Python Plugin

The temperature sensors are read out by a python module using the python plugin for collectd. Place the script

`w1_therm_monitor.py`

in the folder `/home/pi/` or change the `ModulePath` option for the python plugin in `/etc/collectd/collectd.conf` if you want to place it in another folder.

The collectd module reads `w1_master_slaves`, takes all the serial numbers starting with 28 (DS18B20 family) or 3b (MAX31850 family) and reads the corresponding slave files (i.e. the temperatures).

Starting collectd

Start the collectd service using:

```
sudo systemctl start collectd
```

Check if it runs without errors by reading

```
sudo systemctl status collectd
```

or checking

```
journalctl -u collectd -b
```



The system automatically gets new slaves but doesn't support removing slaves while running

InfluxDB

<https://www.influxdata.com/time-series-platform/influxdb/>

Setup

set up as decribed in [getting started section](#)

Creating the database

Create a database in which you later wish to store the temperatures measured, for now we call it `collectd_test`.

In influxDB execute:

```
CREATE DATABASE collectd_test
```

Check if it was created properly using:

```
USE collectd_test
```

Exit using

```
EXIT
```

Configuring for collectd

Stop the influxdb server by running:

```
sudo systemctl stop influxd
```

The configuration file is `/etc/influxdb/influxdb.conf`. The documentation can be found here:

<https://docs.influxdata.com/influxdb/v1.6/administration/config/>

[The config file we use is](#)

this

The interesting part is:

```
[[collectd]]
  enabled = true
  bind-address = ":25826"
  database = "collectd_test"
  security-level = "none"
```

This enables the collectd plugin for influx and writes to the database we specify without any privileges required.

adjust the configuration file to be the same as above.

types.db

The collectd plugin for influx requires a types.db document. Copy this from /usr/share/collectd/ on the raspberry pi to /usr/local/share/collectd/ on the server running influxDB.

Restarting the server

Start the server by typing

```
influxd
```

and leave the terminal open. If there are any errors, these should be displayed now.

To check if there are values being written into the database, use another terminal or ssh to log into influx:

```
influx
```

and check for values in the database:

```
USE collectd_test
SHOW SERIES
```

If something is displayed, try listing those values by using

```
SELECT * FROM <name of the time series>
```

Grafana

The Grafana Server was pretty much set up as described in the getting started page on their website.

Further Modifications

Three w1-Busses

To have three one wire busses running at the same time use the modified device tree by Étienne and copy it to /boot. In /boot/config.txt add the line

```
device_tree=name_of_the_device_tree
```

replacing name_of_the_device_tree with the actual name of the file located in /boot.

Another option would be to do it like described [here](#). This hasn't been tested yet but promiese to be much easier.

Modify the python plugin section in /etc/collectd/collectd.conf to this:

```
<Plugin python>
    ModulePath "/home/pi/"

    Import w1_therm_monitor

    <Module w1_therm_monitor>
        Master "w1_bus_master1"
        MaxTemp 100
    </Module>

    <Module w1_therm_monitor>
        Master "w1_bus_master2"
        MaxTemp 100
    </Module>

    <Module w1_therm_monitor>
        Master "w1_bus_master3"
        MaxTemp 100
    </Module>

    LogTraces true

#    Interactive true
#    Import "spam"
#
#    <Module spam>
#        spam "wonderful" "lovely"
#    </Module>
```

</Plugin>

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