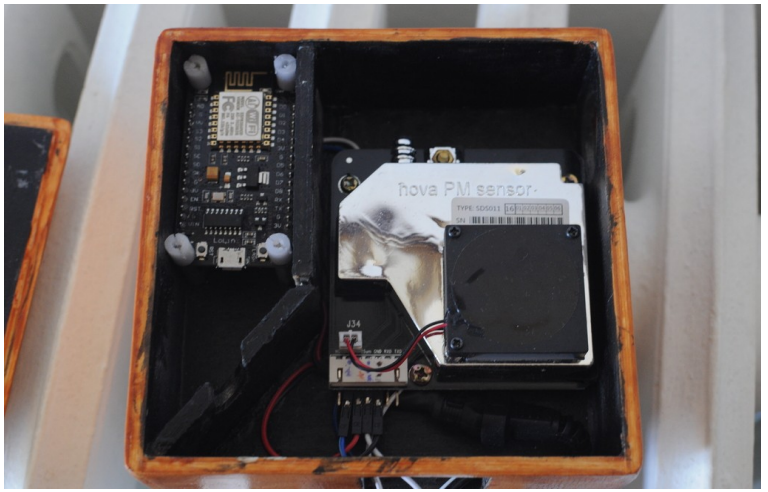
Progetto di Centralina PM con una RaspBerry

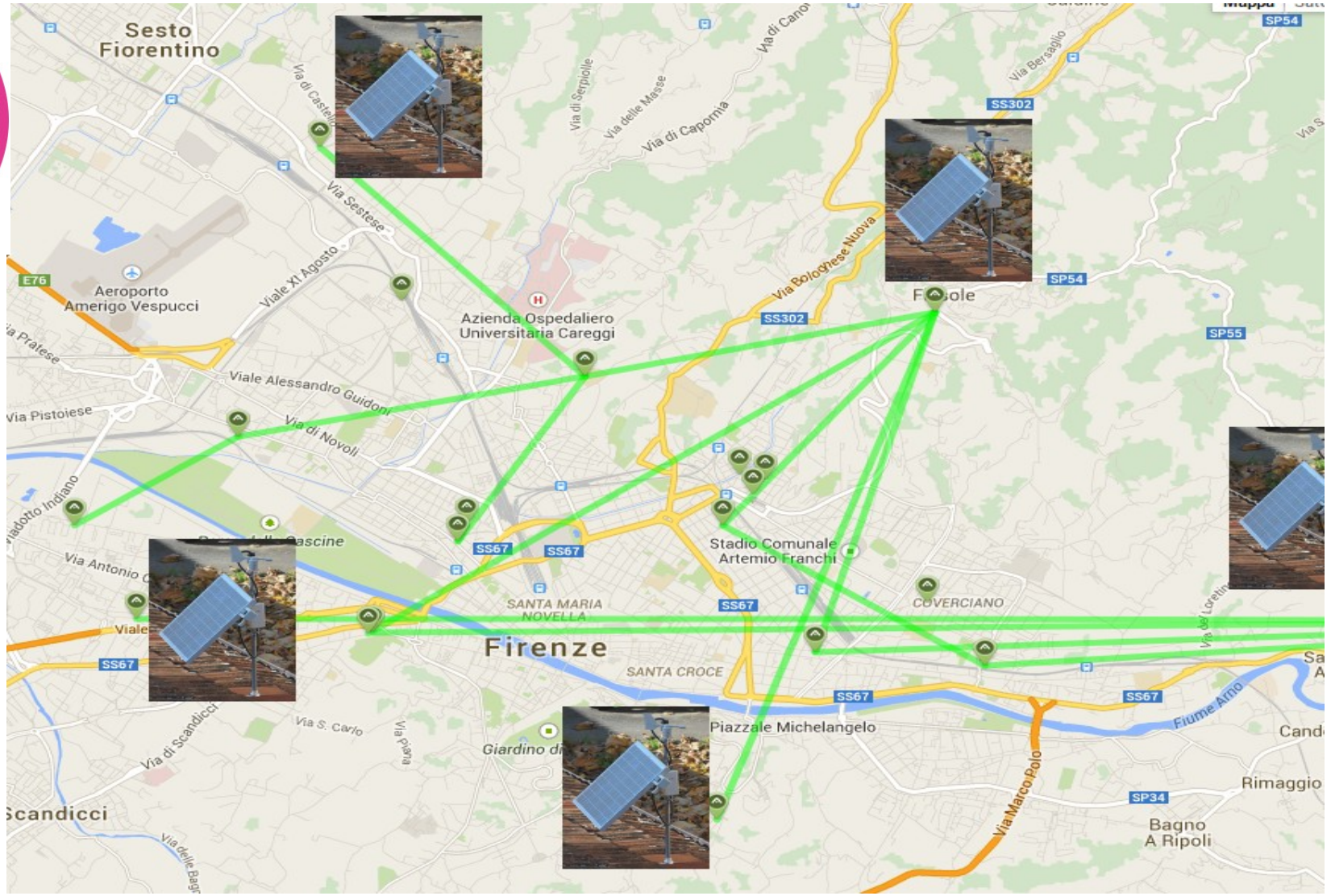
Firenze – 25 Maggio 2017

Salvatore Moretti

Gruppo Ninux Firenze

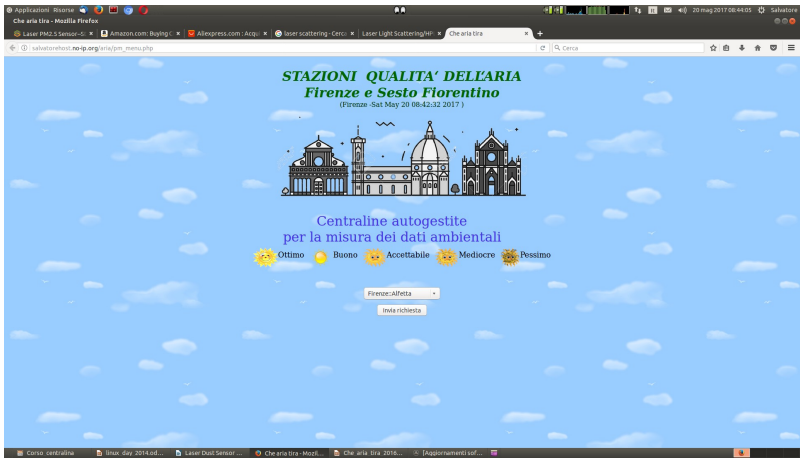
Benvenuti





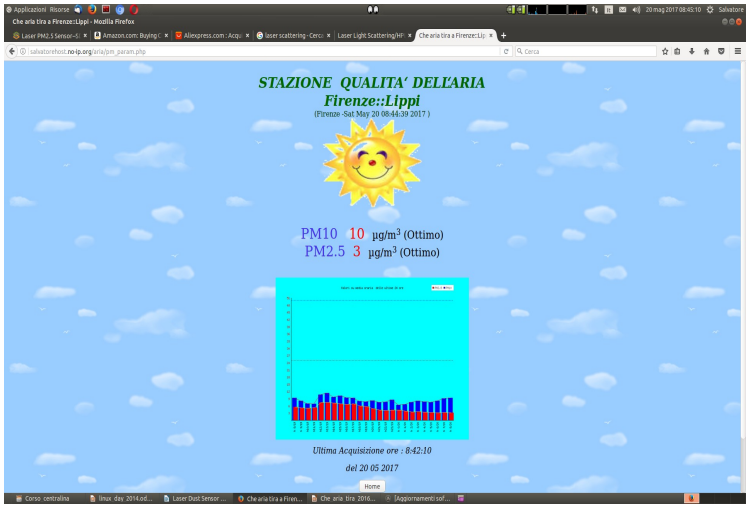
Si può associare ad ogni nodo Ninux una centralina con la quale rilevare i valori caratteristici ambientali

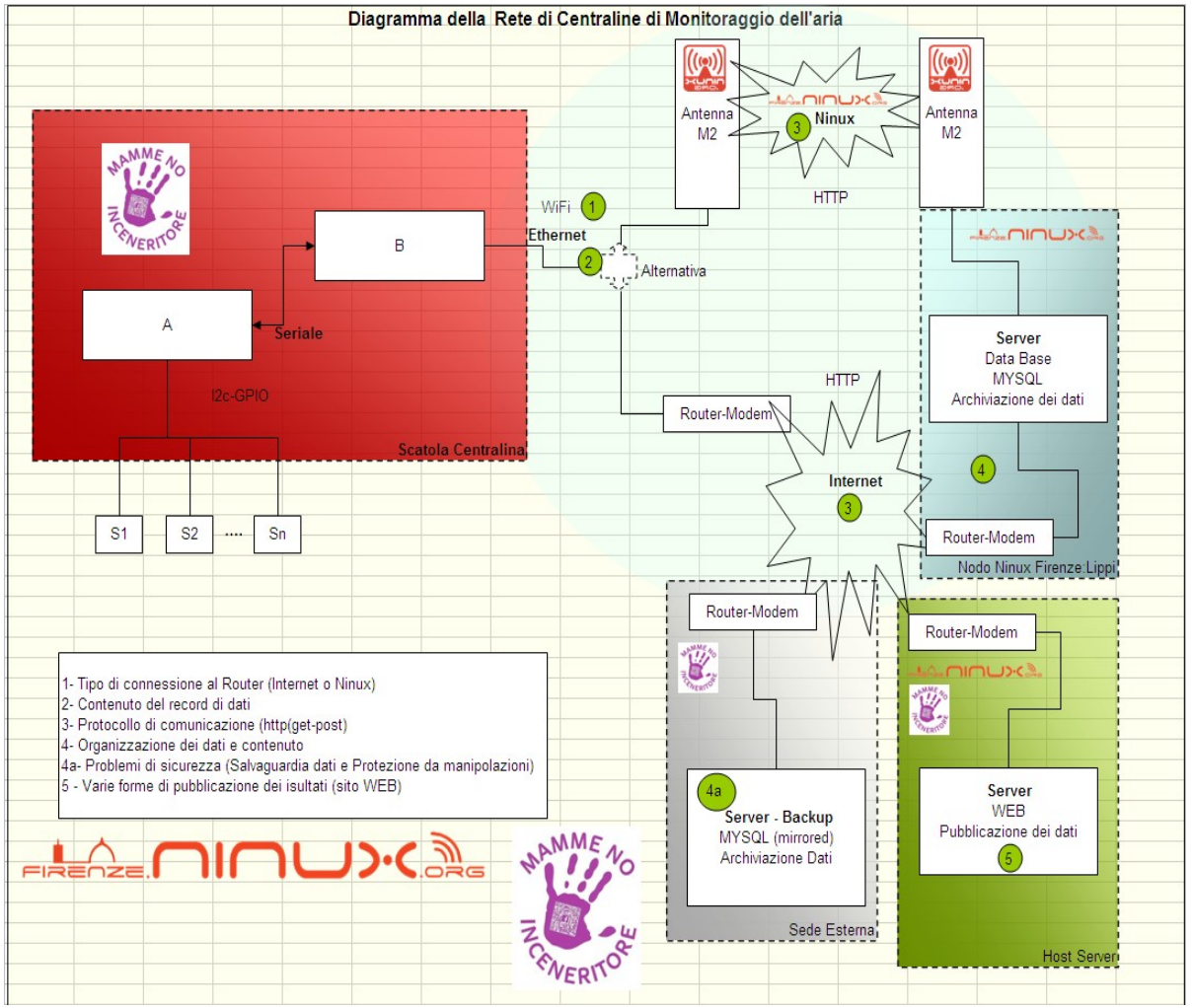
http://salvatorehost.no-ip.org/aria/pm_menu.php



I Possibili servizi Offerti

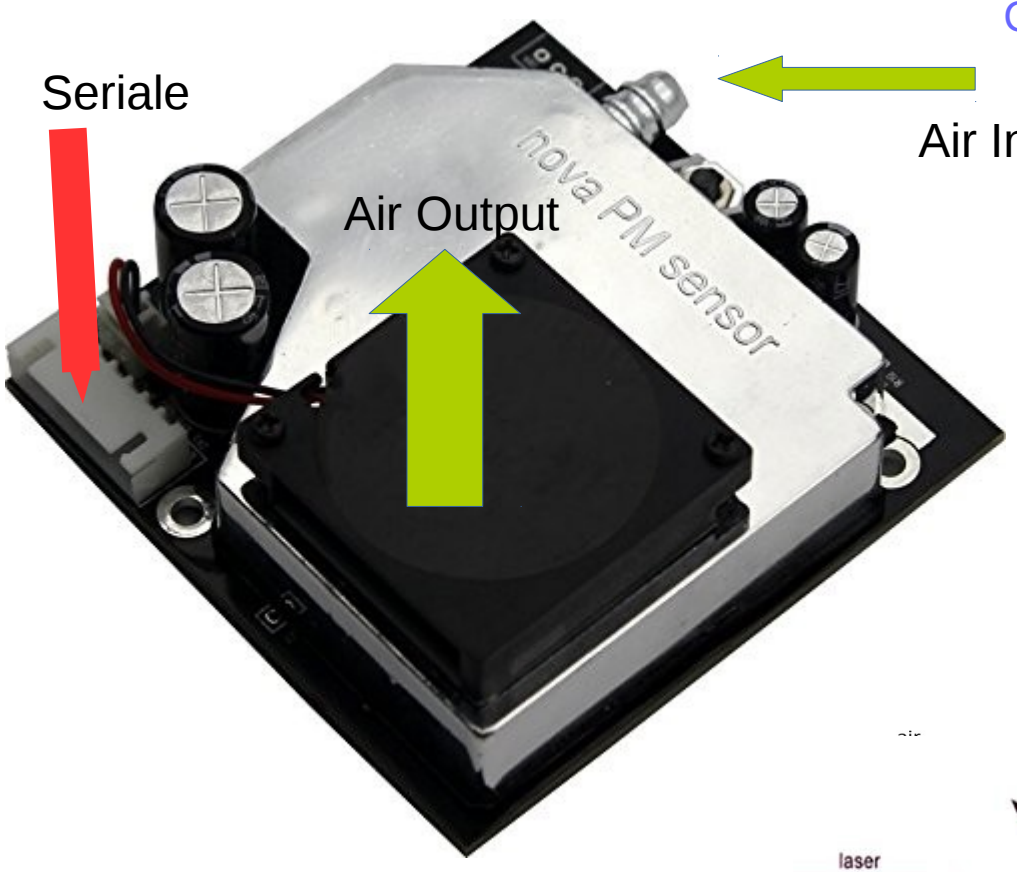
- Pagine Web per la lettura dei dati
- Accesso ai dati storici
- Registrazione Dati libera

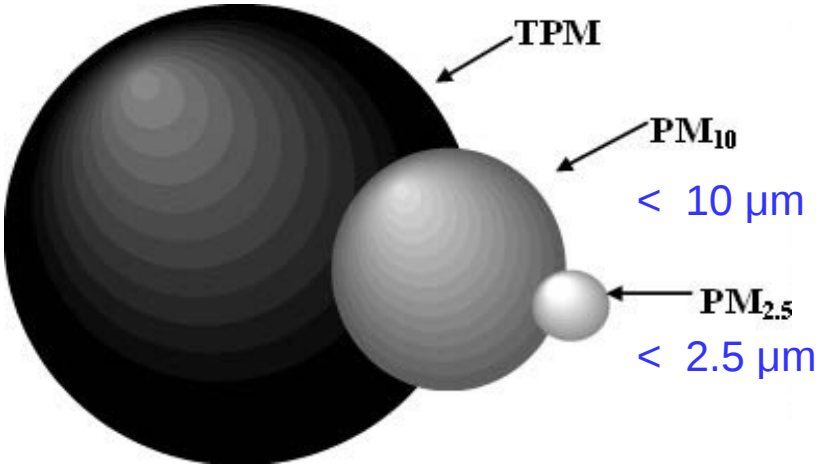




Architettura della centralina con sensore SDS011
Possono essere aggiunti anche sensori per il rilevamento delle condizioni di meteo

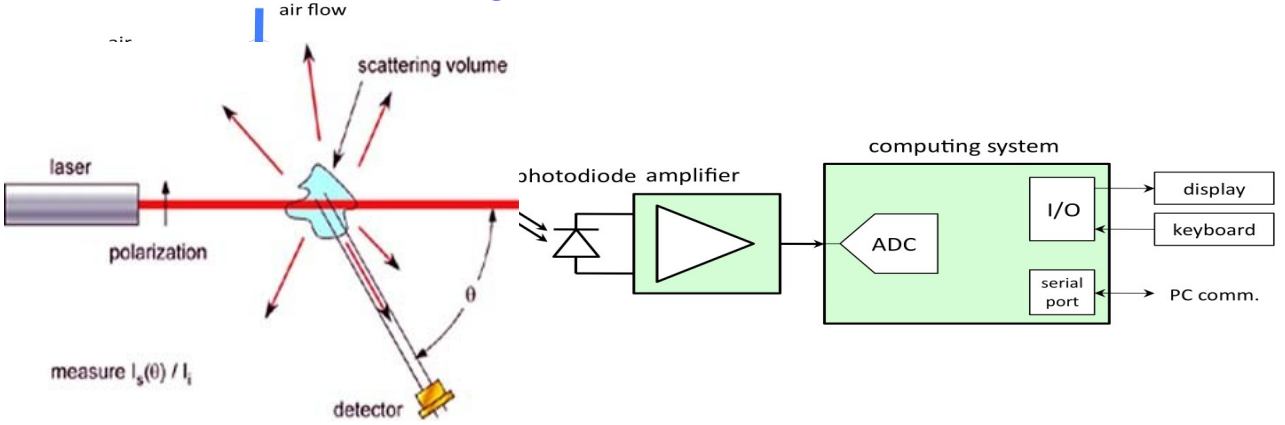
Concentrazione del Particolato PM10 – PM2.5 in µg/m^3

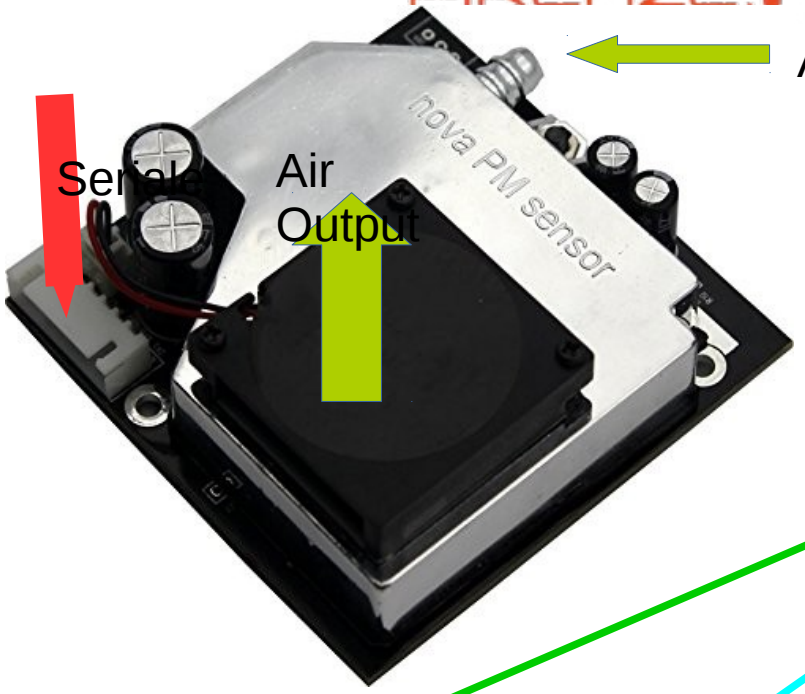




Il sensore SDS011 è la parte principale del progetto

Scattering





Air Input

Seriale

Air Output

Protocollo Seriale:
(Laser Dust Sensor Protocol V1.3)

[Libreria SDS011]

Query :

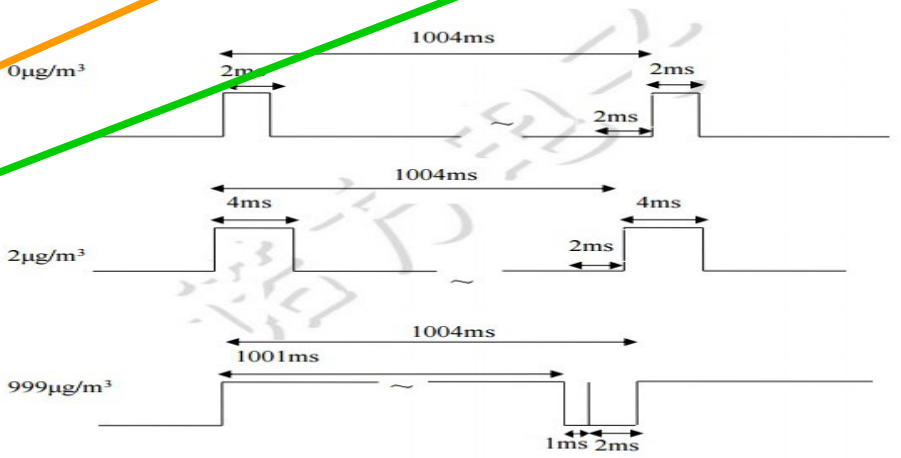
AA B4 04 00 00 00 00 00 00 00 00 00 00 00 00 FF FF 02 AB

Head	Comand ID	Data	CheckSum	Tail

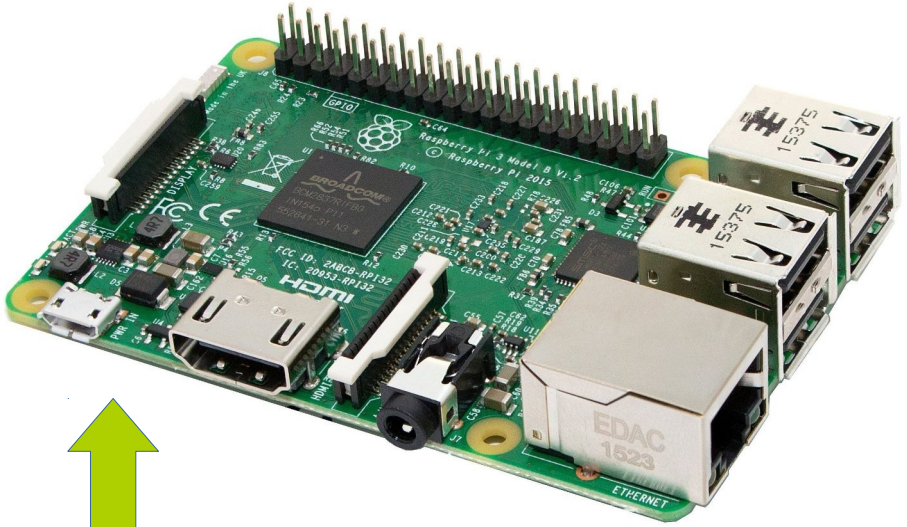
Replay:

AA C0 D4 04 3A 0A A1 60 1D AB

PM2.5	PM10	SensID
123.6	261.8	



Raspberry Pi 3 Model B



CPU 1.2 GHz 64-bit quad-core ARM Cortex-A53

MEMORIA 1 GB (condivisa con la GPU) LPDDR2 (900 MHz)

Sistemi Operativi :

Debian GNU/Linux,

Fedora, Arch Linux

Gentoo, FreeBSD

RISC OS (shared source),

Windows 10 IoT (dal Pi 2 Model B)

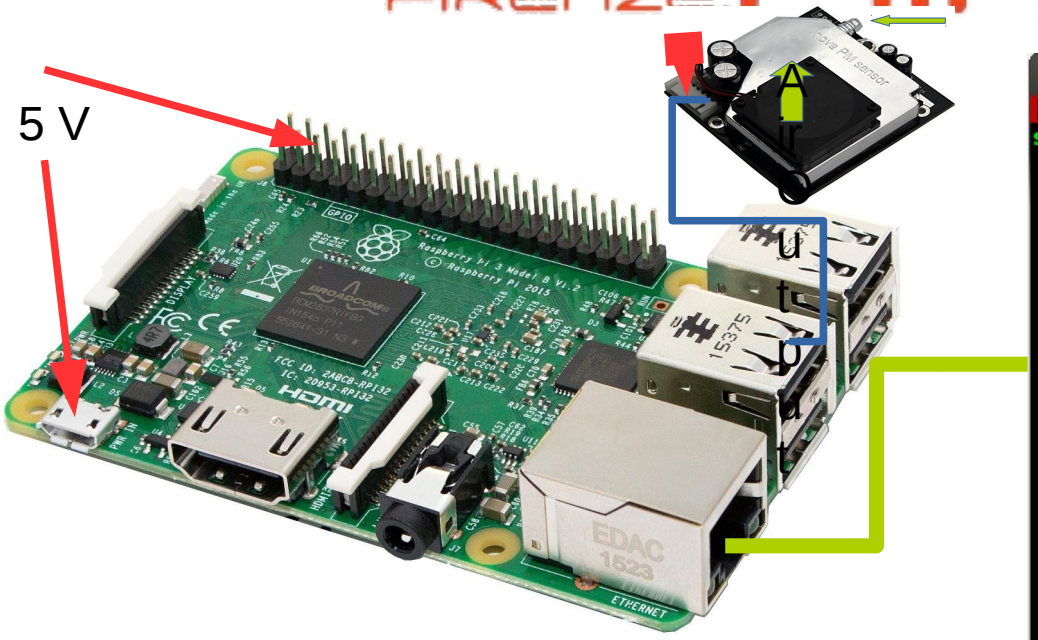
Android Nougat (Pi 3 Model B)[53]

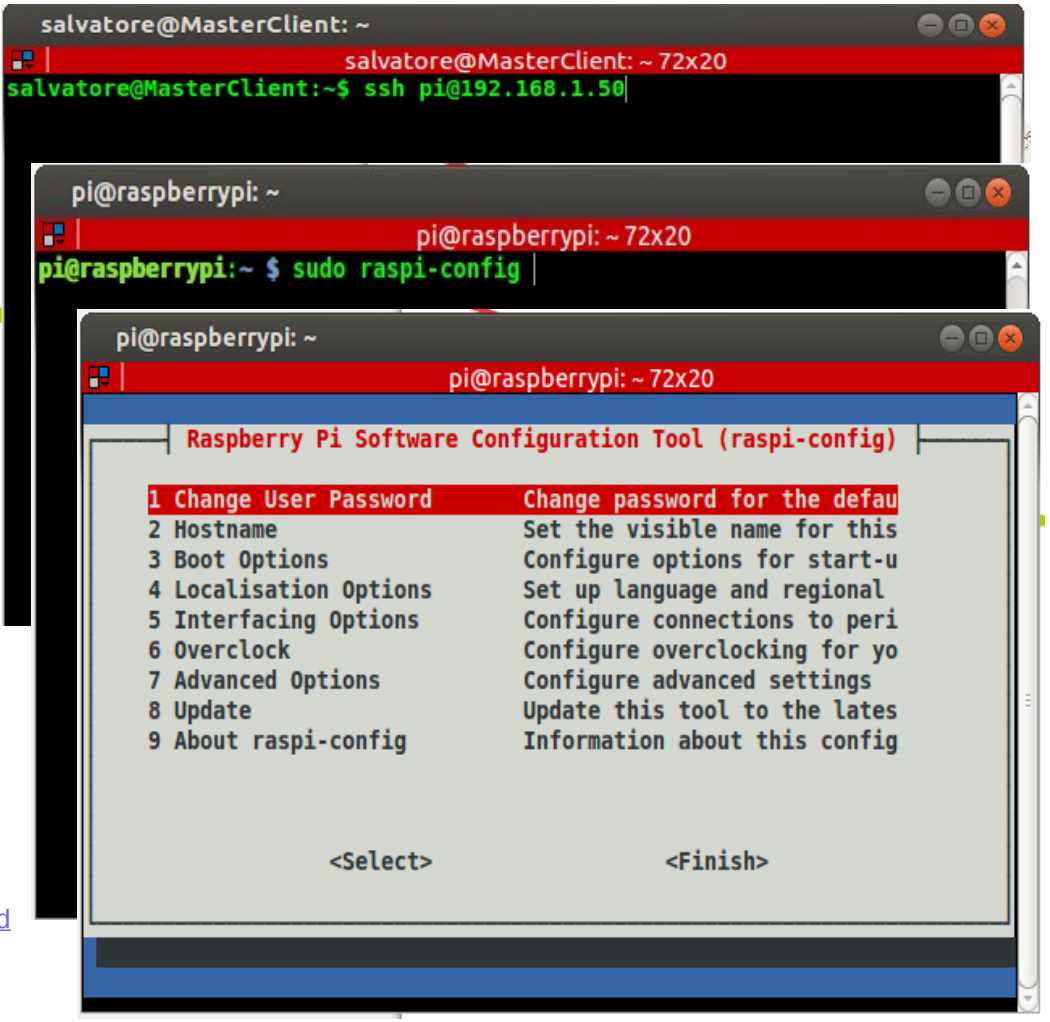
Dimesioni : 65 mm × 30 mm × 5 mm

Raspbian Jessie Lite

https://www.raspberrypi.org/downloads/

https://www.raspberrypi.org/documentation/installation/installing-images/linux.md





Preparazione Ambiente Operativo:

- ntpd per sincronizzazione data-orologio
- Apache2 – PHP – libapche2..

https://www.raspberrypi.org/documentation/remote-access/web-server/apache.md

- python-serial con apt-get
- curl
- INCRON (apt-get) (inotify)

<path> <mask> <command>

Configurazione – (index.php)

Connesso alla rete ZyXEL

SSID	ZyXEL
Password:	

Connetti

wpa_supplicant.conf

Dati Necessari

Host DataBase(url/ip)	Server Ninux Server MnI
Nome(Zona::IDName)	Firenze::Lippi
User	salvatore
Codice ID (una o due cifre)	1
Latitudine(+/-dd.ddd)	+43.8048075
Longitudine(+/-dd.ddd)	+11.2321748
Correzione PM10	1.0 * Y + 0.0
Correzione PM2.5	1.0 * Y + 0.0
Sensore	SDS011 OPC-N2 Alphasense Qbit

Salva

alfetta.conf

Dati Facoltativi

NicKName	Salvatore
Indirizzo	Via Giuseppe Rigutini 3
Città	Firenze
Provincia	Firenze
CAP	50127
Responsabile	Salvatore Moretti
Telefono	055675120
email	salvatoremoretti@tiscali.it

Salva Anagrafica

anagrafica.conf

Rapporto Giornaliero

Invia Rapporto	Si / No
SMTP Server	out.alice.it
Account	salvatore.moretti740@alice.it
Password	••••••••••••••
Inviare a	centraline@googlegroups.com
Inviata da	salvatore.moretti740@alice.it

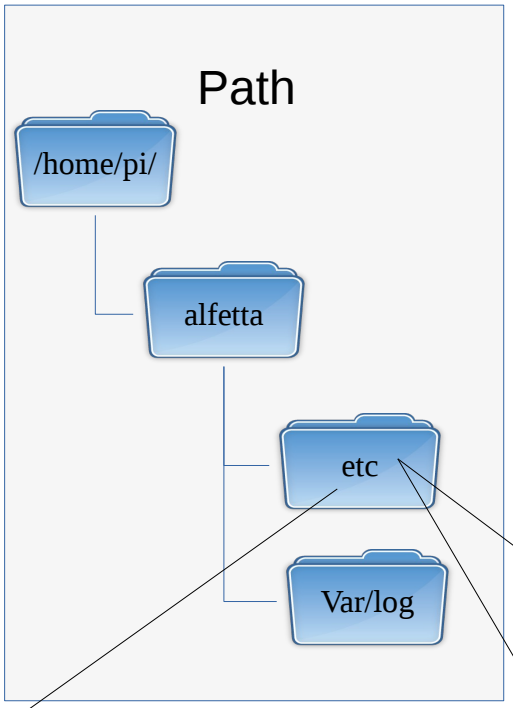
Salva

Refresh

mail_account

Files di Configurazione

nome=Firenze::Lippi
lat=+43.8048075
lon=+11.2321748
k1=1.0
q1=0.0
k2=1.0
q2=0.0
sensore=SDS011
user=salvatore
id=1
host=salvatorehost.no-ip.org,InfluxDB
host=92.223.147.77/nodered,CrateDB



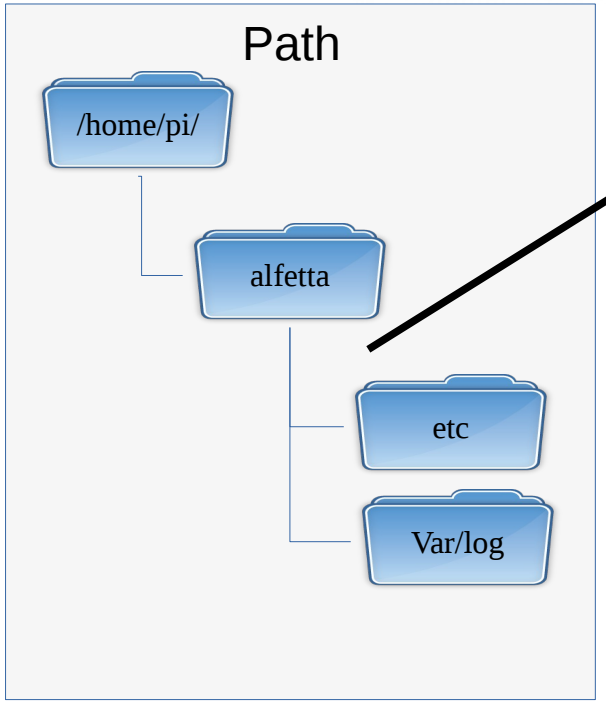
nick=Salvatore
indirizzo=Via Giuseppe Rigutini 3
city=Firenze
provincia=Firenze
cap=50127
telefono=055675120
responsabile=Salvatore Moretti
email=salvatoremoretti@tiscali.it

anagrafica.conf

alfetta.conf

emailsend#yes
smtp#out.alice.it
account#salvatore.moretti740@alice.it
passwd#Z2FsaWxlb2dhbGlsZWk=
sentfrom#salvatore.moretti740@alice.it
sendto#centraline@googlegroups.com

mail_account



sds011_v2.py

class logger:

- event_log (message)
- archive()
- send_report()
- eval_report(pm10,pm25)
- save_report ()
- recover_report ()

class db_client :

- dbserver_add(host,dbserver)
- to_db (pm10,pm25)
- db_ready (host)

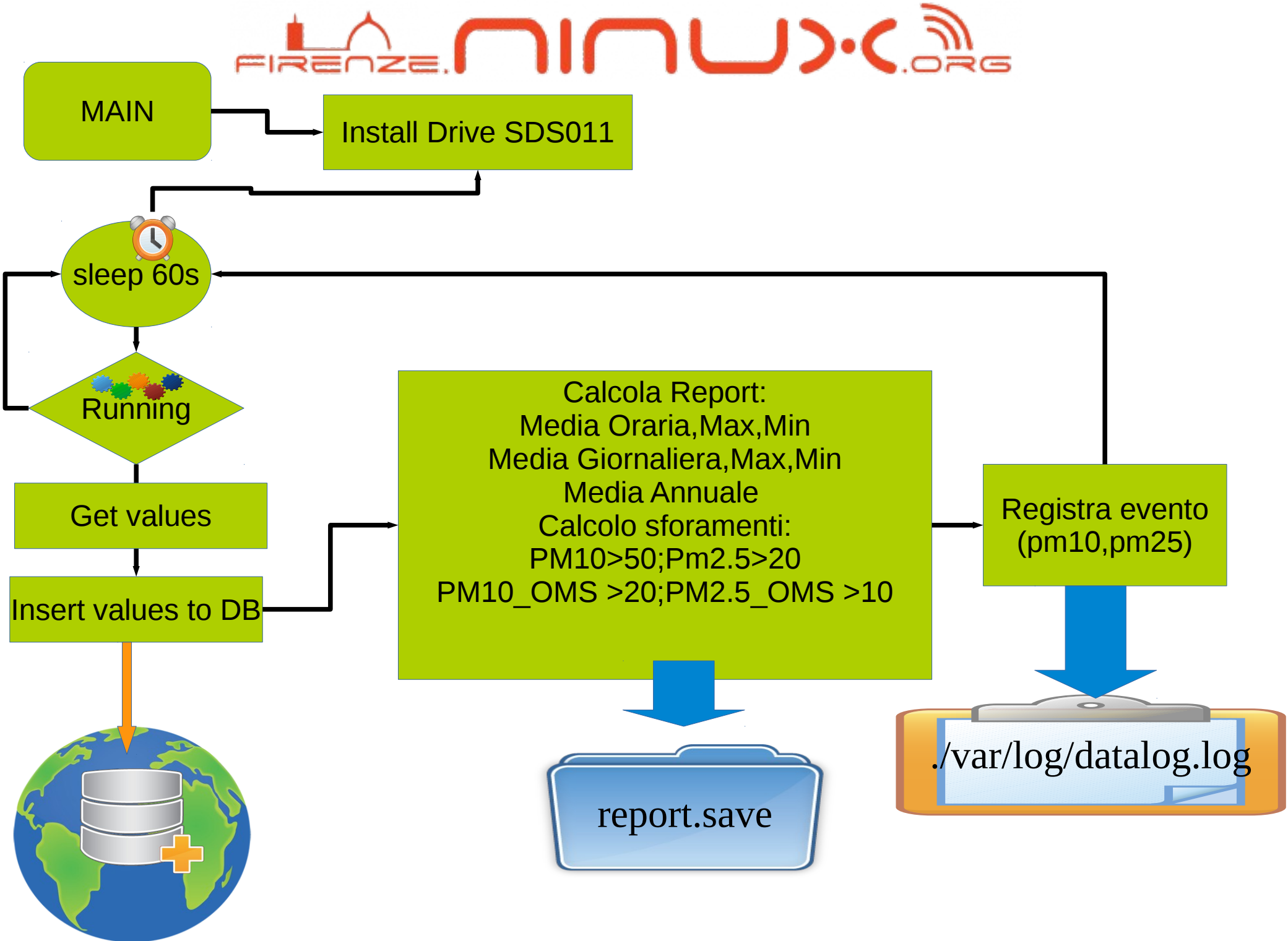
class sds011_sensor :

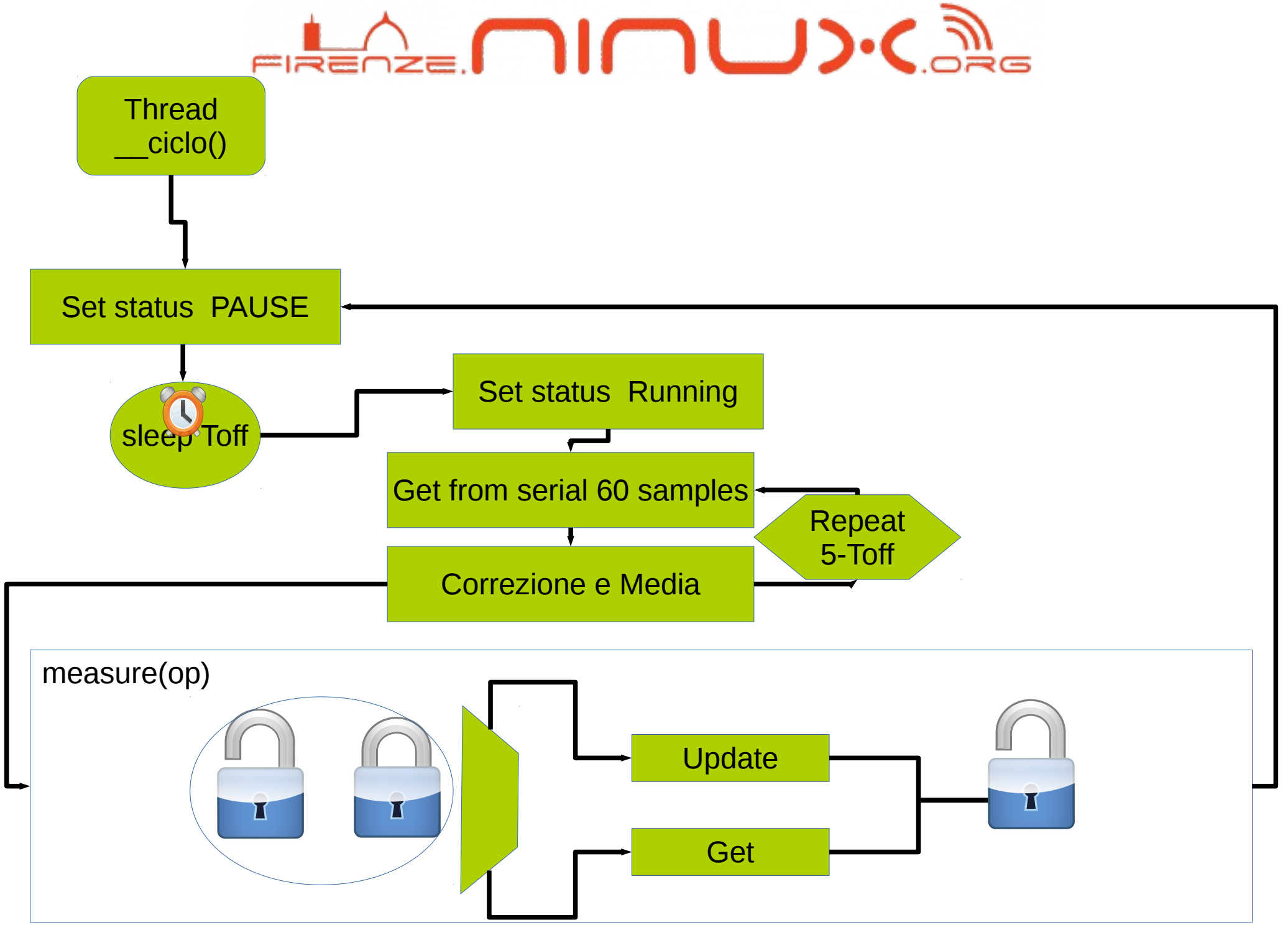
DEBUG = 0
CMD_MODE = 2
CMD_QUERY_DATA = 4
CMD_DEVICE_ID = 5
CMD_SLEEP = 6
CMD_FIRMWARE = 7
CMD_WORKING_PERIOD = 8
MODE_ACTIVE = 0
MODE_QUERY = 1

- switch_on()
- switch_off()
- measure(operation)
- __cilclo()
- cmd_query_data()
- elaborate()

MAIN

- pausa (60)
- measure(GET)
- log.eval-report()
- log.event_log()
- db.to_db()

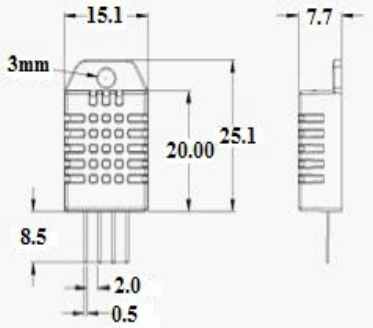

MAIN
Install Drive SDS011
sleep 60s
Running
Get values
Insert values to DB
Calcola Report:
Media Oraria,Max,Min
Media Giornaliera,Max,Min
Media Annuale
Calcolo sforamenti:
PM10>50;Pm2.5>20
PM10_OMS >20;PM2.5_OMS >10
Registra evento
(pm10,pm25)
report.save
./var/log/datalog.log


Thread
__ciclo()
Set status PAUSE
sleep Toff
Set status Running
Get from serial 60 samples
Repeat
5-Toff
Correzione e Media
measure(op)
Update
Get

Anemometro e Banderuola

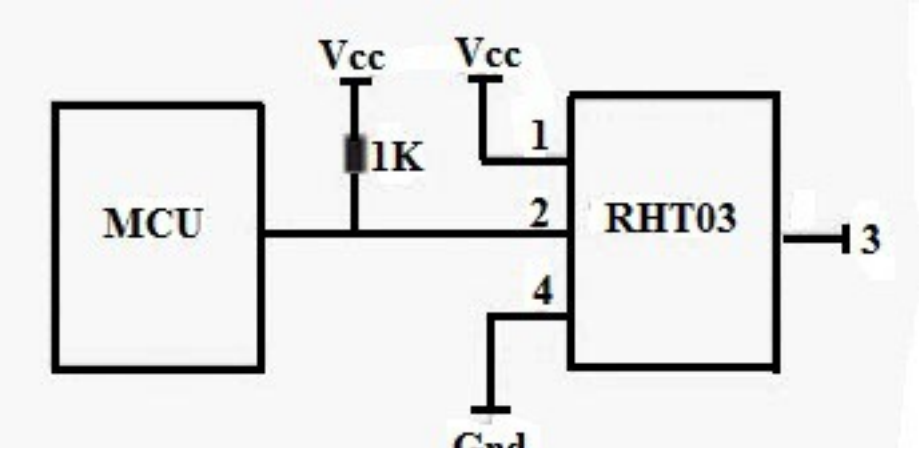
Pin	*Colore*	*Descrizione*
1	Brown TxD	Trasmissione seriale
2	Red Vcc	3,3-5 V
3	Green DTR	Enable
4	Yellow GND	

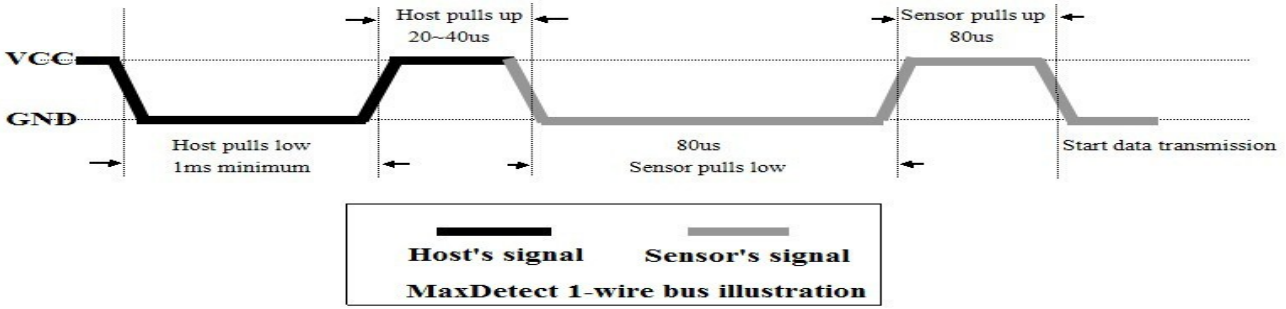
1-5 5 bit di **Start** sempre 11011
6-9 4 bit **Direzione** (0000 → Nord , 1111 → Nord/Nord/Ovest)
10-21 12 bit (di cui i primi 3 sempre a zero) **Velocità**
(Vmax = 511 → 183.96 Km/h)
22-25 4 bit **Checksum** (OR esclusivo)
26-29 4 bit negati **Direzione** (è lo stesso valore di 6-9)
30-41 12 bit negati di **Velocità** (è lo stesso valore di 10-21)

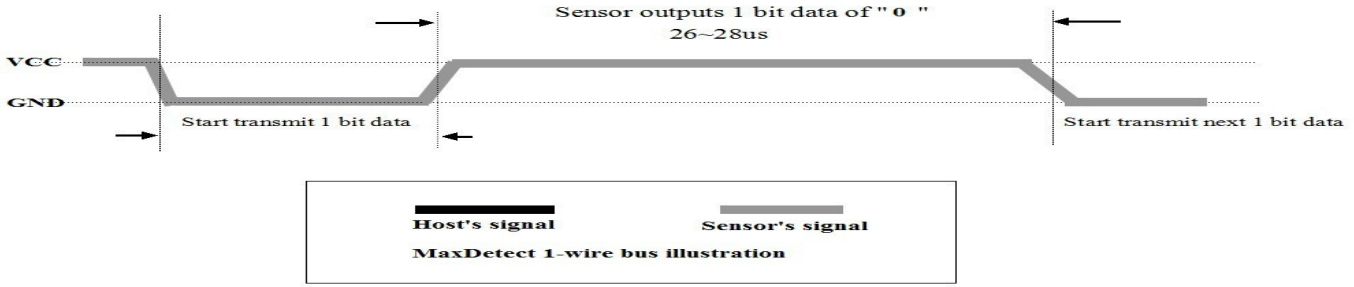


Pin sequence number: 1 2 3 4 (from left to right direction).

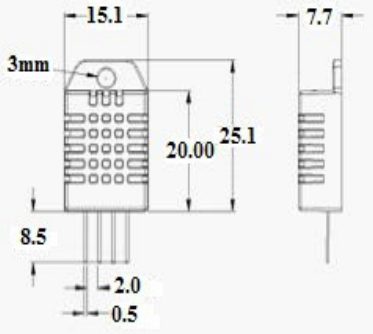
Pin	Function
1	VDD—power supply
2	DATA–signal
3	NULL
4	GND







Il Sensore Temperatura Umidità



Pin sequence number: 1 2 3 4 (from left to right direction).

Pin	Function
1	VDD—power supply
2	DATA–signal
3	NULL
4	GND

0000 0010 1000 1100 **0000 0001 0101 1111** **1110 1110**

16 bit RH data 16 bit T data 8 bit ccsum

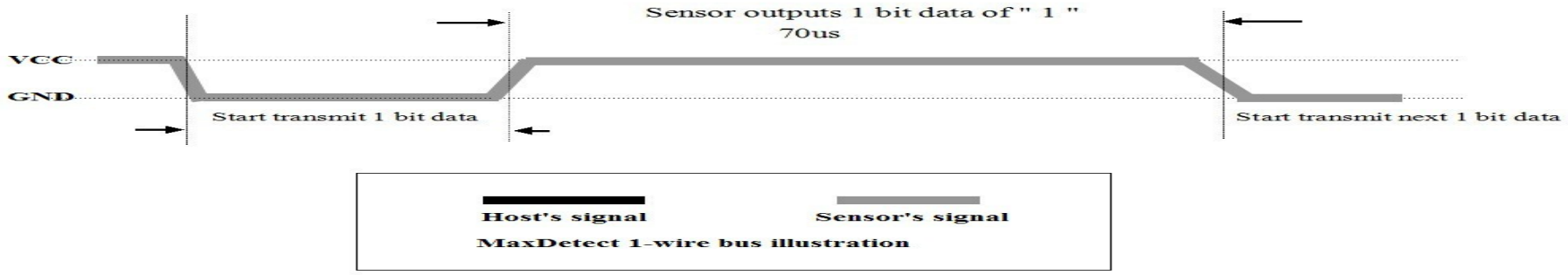
ovvero:

check sum=0000 0010 + 1000 1100 + 0000 0001 + 0101 1111 = 1110 1110

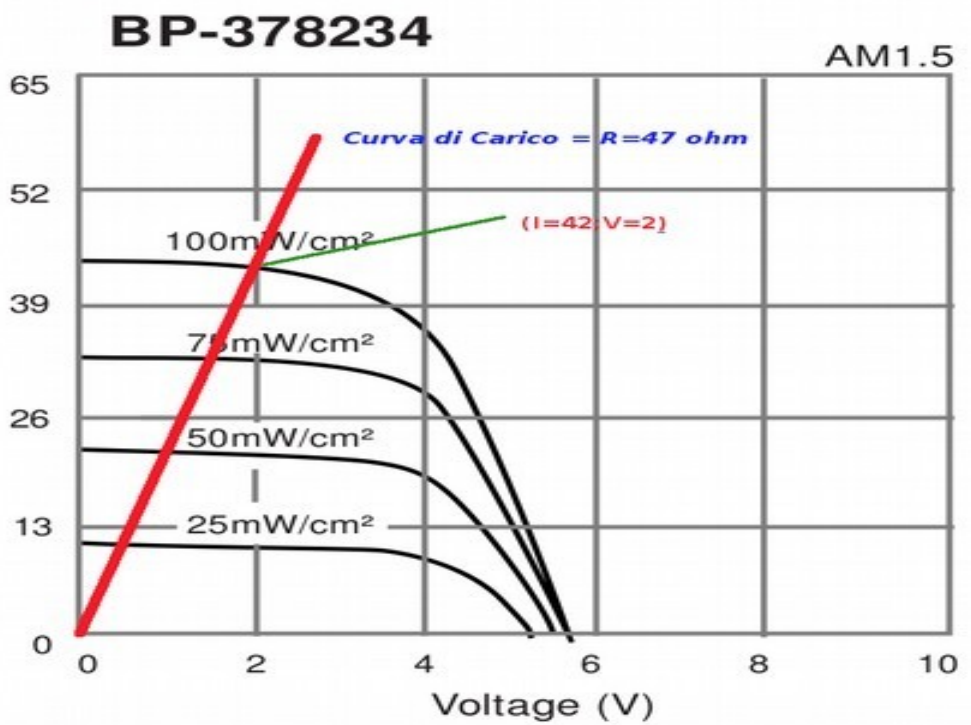
\+ significa OR EXCLUSIVO (0+0=1+1 0 1+0=0+1=1)

RH = bin (0000 0010 1000 1100)/10 = 65.2%RH

T = bin (0000 0001 0101 1111) /10 = 35.1?



Solarimetro Autocostruito



Progetto di Centralina PM con una RaspBerry

Firenze – 25 Maggio 2017

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Gruppo Ninux Firenze

https://github.com/SalvatoreM/centralinaPM/tree/master

Grazie