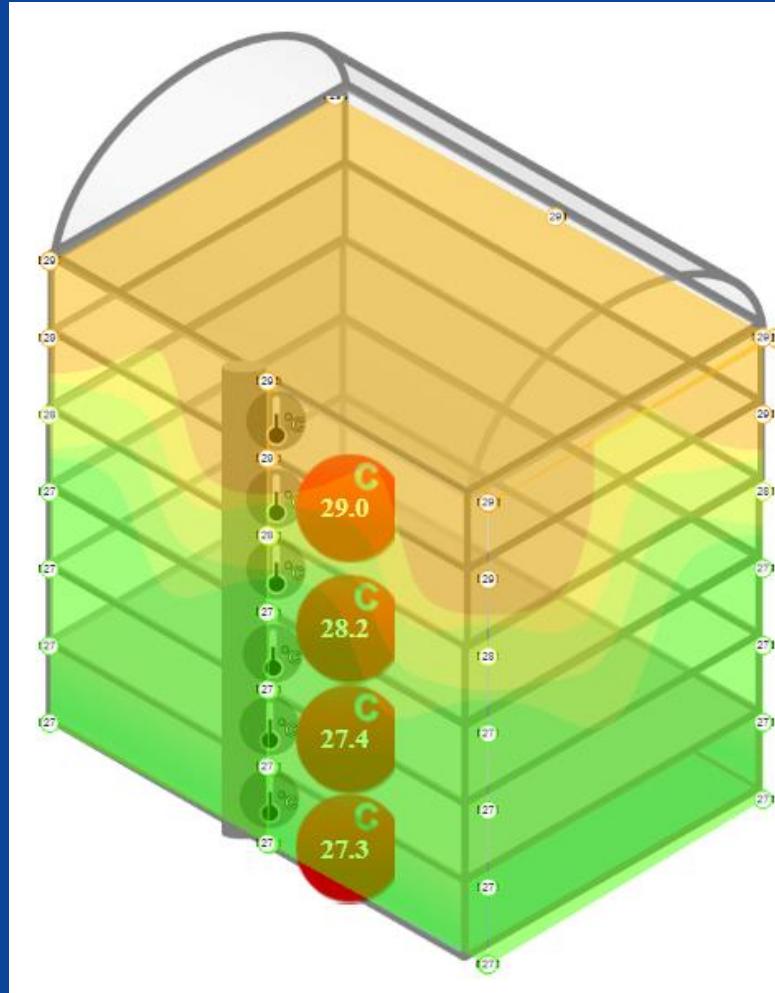


# WiMaRC System

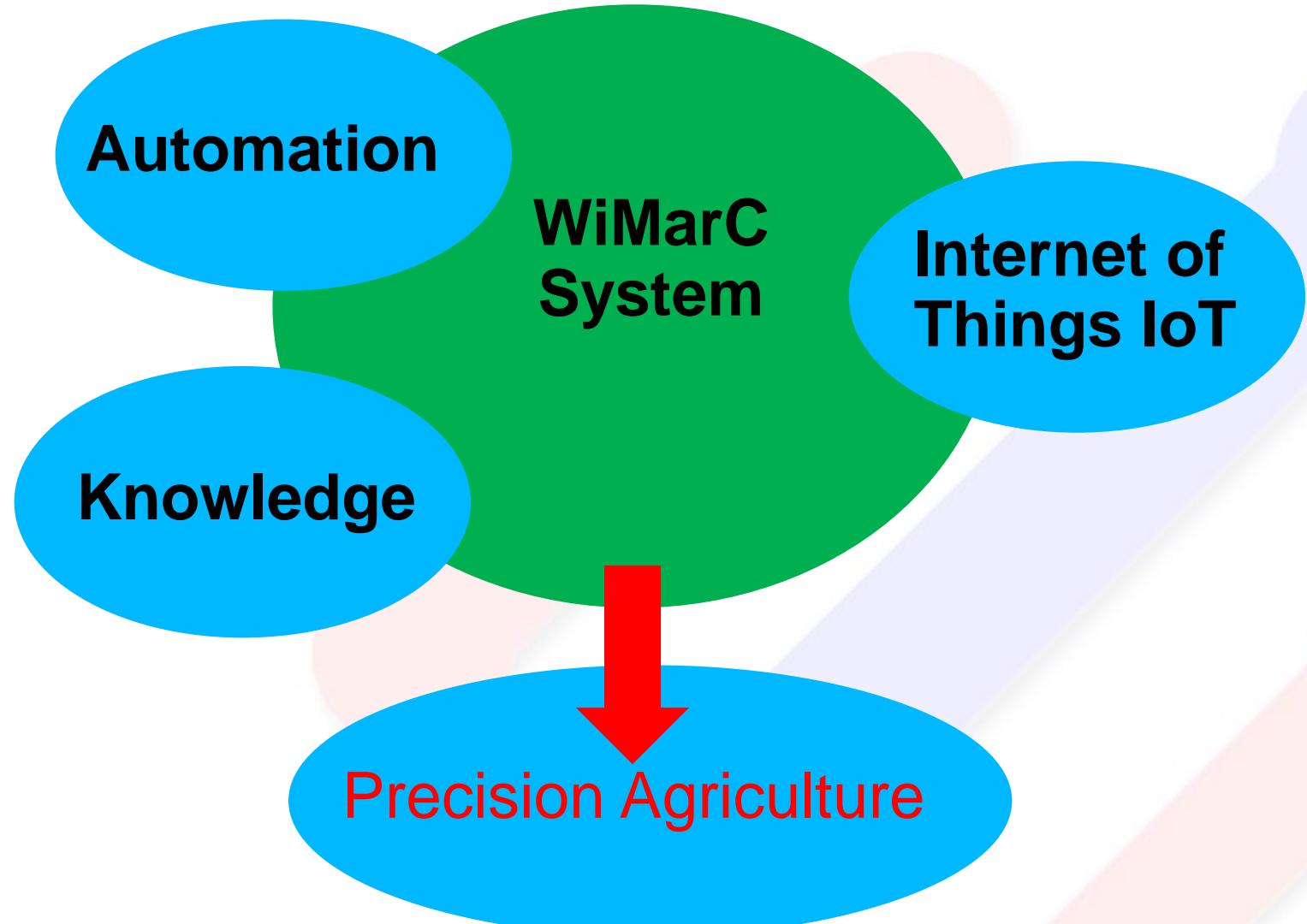
Wireless Sensor Network for  
Management and  
remote  
Control



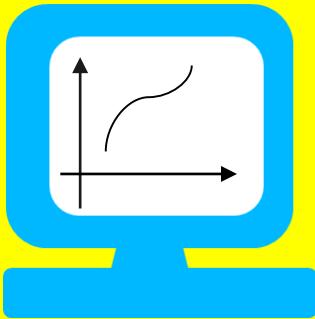
Opas Trithaveesak

<http://tmeconnect.or.th>  
email : opas.trithaveeak@nectec.or.th

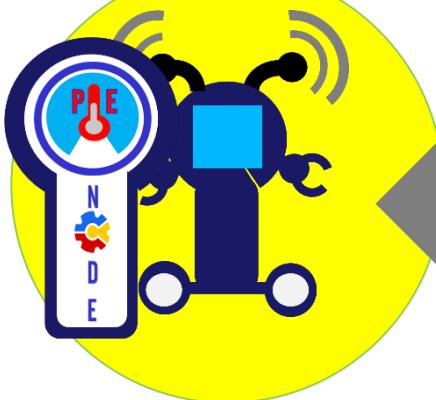
# WiMarC System based Technology



# Monitoring



# Remote Control



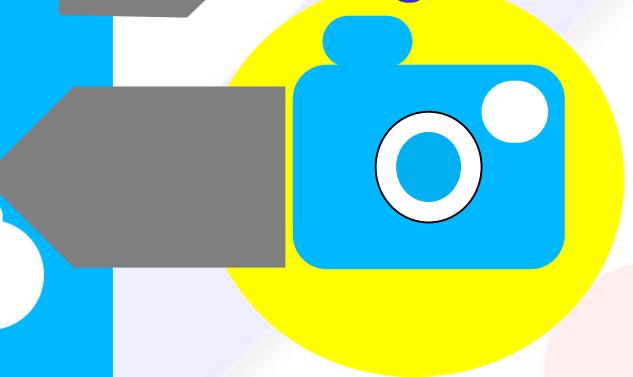
# Management



# Sensors



# Images



# Devices



# IoT

# WiMarC System based Components

## WiMarC System

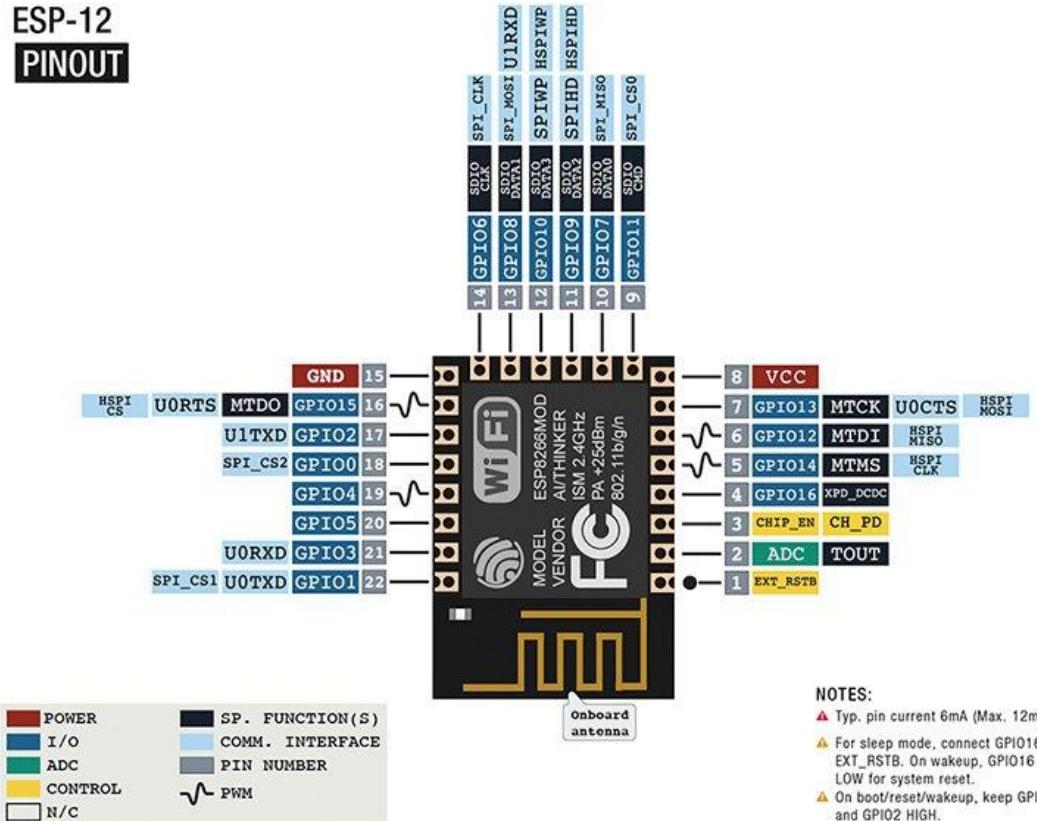
Hardware

- Sensors
- MCU
- Computer

Software

- C++
- python
- php
- html

## ESP-12 PINOUT

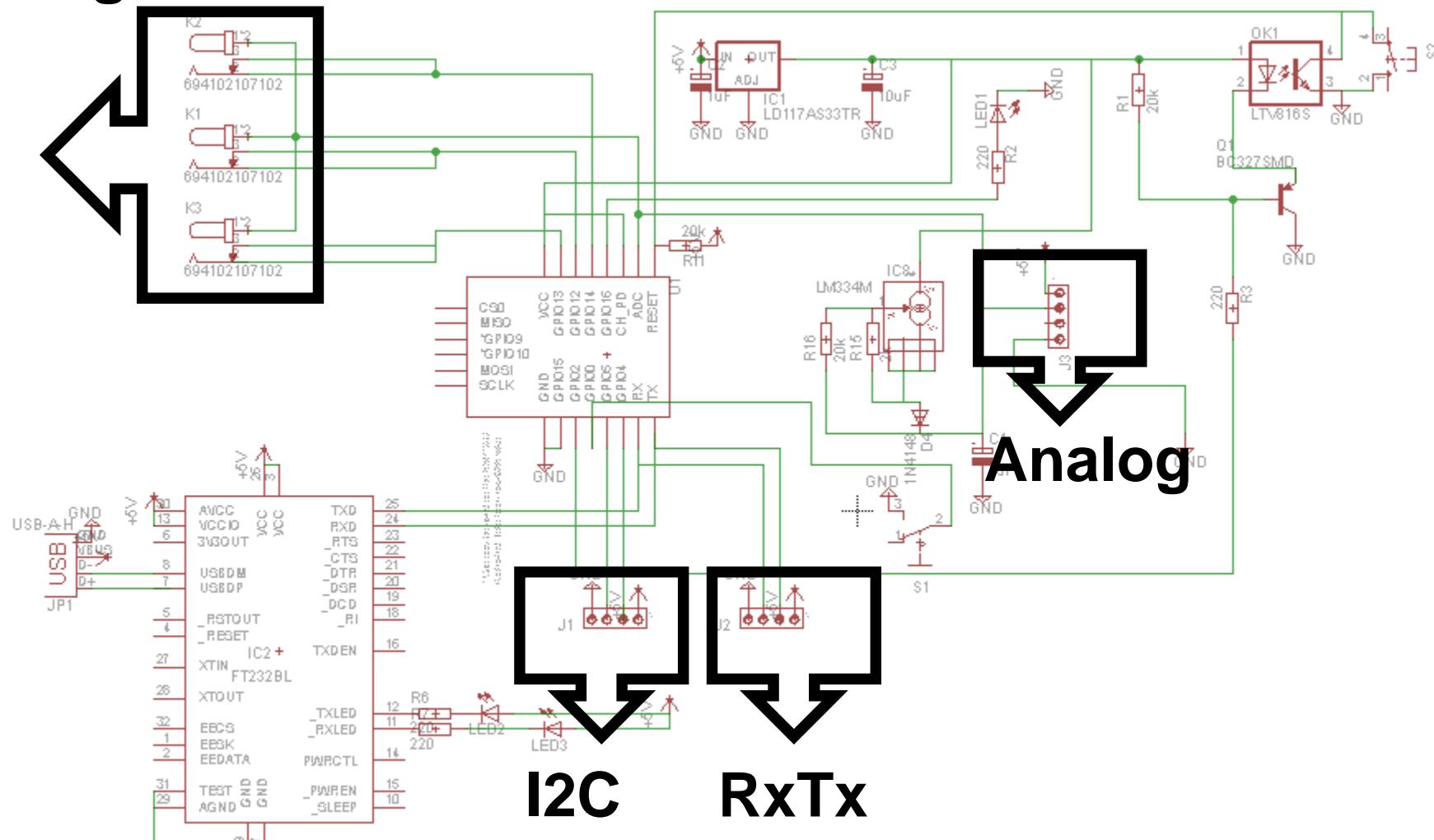


### NOTES:

- ⚠️ Typ. pin current 6mA (Max. 12mA)
- ⚠️ For sleep mode, connect GPIO16 and EXT\_RSTB. On wakeup, GPIO16 will output LOW for system reset.
- ⚠️ On boot/reset/wakeup, keep GPIO15 LOW and GPIO2 HIGH.

# PIENODE schematic

## Digital I/O



# Temp&Humidity Sensor

## Datasheet SHT3x-ARP

### Humidity and Temperature Sensor IC

- Fully calibrated, linearized, and temperature compensated analog output
- Wide supply voltage range, from 2.4 V to 5.5 V
- 10% to 90% ratiometric analog voltage output
- Typical accuracy of  $\pm 2\%$ RH and  $\pm 0.3^\circ\text{C}$
- Parallel measurement of temperature and humidity at separate pins
- Tiny 8-Pin DFN package

**SENSIRION**  
THE SENSOR COMPANY



## Datasheet SHT3x-DIS

### Humidity and Temperature Sensor

- Fully calibrated, linearized, and temperature compensated digital output
- Wide supply voltage range, from 2.4 V to 5.5 V
- I<sub>2</sub>C Interface with communication speeds up to 1 MHz and two user selectable addresses
- Typical accuracy of  $\pm 1.5\%$ RH and  $\pm 0.1^\circ\text{C}$  for SHT35
- Very fast start-up and measurement time
- Tiny 8-Pin DFN package

**SENSIRION**  
THE SENSOR COMPANY



## Product Summary

SHT3x-DIS is the next generation of Sensirion's temperature and humidity sensors. It builds on a new CMOSens® sensor chip that is at the heart of Sensirion's new humidity and temperature platform. The SHT3x-DIS has increased intelligence, reliability and improved accuracy specifications compared to its predecessor. Its functionality includes enhanced signal processing, two distinctive and user selectable I<sub>2</sub>C addresses and communication speeds of up to 1 MHz. The DFN

package has a footprint of  $2.5 \times 2.5 \text{ mm}^2$  while keeping a height of 0.9 mm. This allows for integration of the SHT3x-DIS into a great variety of applications. Additionally, the wide supply voltage range of 2.4 V to 5.5 V guarantees compatibility with diverse assembly situations. All in all, the SHT3x-DIS incorporates 15 years of knowledge of Sensirion, the leader in the humidity sensor industry.

## Humidity Sensor Specification

Parameter	Conditions	Value	Units
SHT30 Accuracy tolerance <sup>1</sup>	Typ.	$\pm 3$	%RH
	Max.	Figure 2	-
SHT31 Accuracy tolerance <sup>1</sup>	Typ.	$\pm 2$	%RH
	Max.	Figure 3	-
Repeatability <sup>2</sup>		0.1	%RH
Resolution	Typ.	0.01	%RH
Integrated Non-Linearity <sup>3</sup>	Typ.	0.2	%RH
Hysteresis	at 25°C	+0.8	%RH
Specified range <sup>4</sup>	extended <sup>5</sup>	0 to 100	%RH
Response time <sup>6</sup>	$t_{63\%}$	8	s
Long-term drift	Typ. <sup>7</sup>	<0.25	%RH/yr
	$V_{DD}=2.4 \text{ V}$	19.2	mV/%RH
Sensitivity	$V_{DD}=3.3 \text{ V}$	26.4	mV/%RH
	$V_{DD}=5.5 \text{ V}$	44.0	mV/%RH

Table 1 Humidity sensor specification

## Temperature Sensor Specification

Parameter	Condition	Value	Units
SHT30 Accuracy tolerance <sup>1</sup>	Typ., 0°C to 65°C	$\pm 0.3$	°C
SHT31 Accuracy tolerance <sup>1</sup>	Typ., -40°C to 90°C	$\pm 0.3$	°C
Repeatability <sup>2</sup>		0.06	°C
Resolution	Typ.	0.015	°C
Specified Range	-	-40 to 125	°C
Response time <sup>8</sup>	$t_{63\%}$	>2	s
Long Term Drift	Max.	<0.03	°C/yr
	$V_{DD}=2.4 \text{ V}$	11.0	mV/°C
Sensitivity	$V_{DD}=3.3 \text{ V}$	15.1	mV/°C
	$V_{DD}=5.5 \text{ V}$	25.1	mV/°C

Table 2 Temperature sensor specification

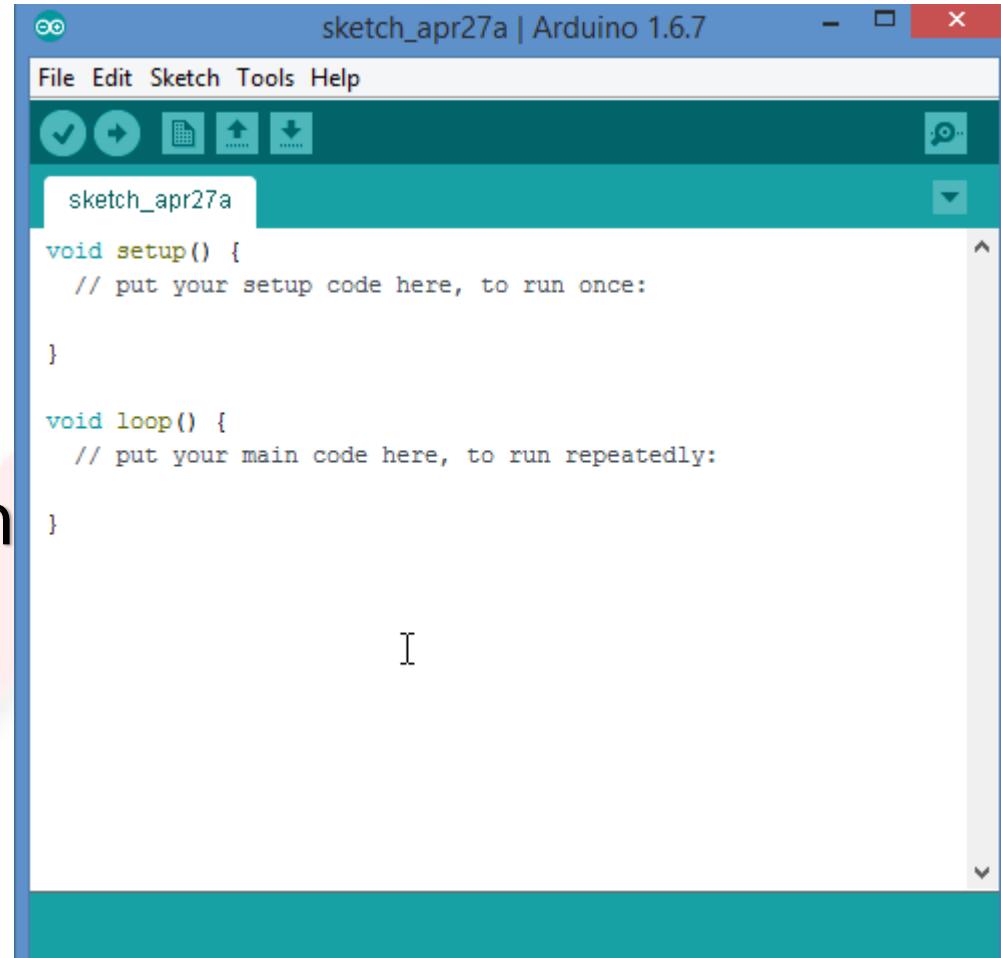
# Compiler Preparation

- Download Arduino IDE 1.6.9 or later from <https://www.arduino.cc/en/Main/Software>
- After installation, open Preferences
- Enter `http://arduino.esp8266.com/stable/package_esp8266com_index.json` in the field Additional Board Manager URLs
- Open Boards Manager menu Tools. Search for esp8266 and click install
- In the menu Tools, there will be several ESP8266 boards. Choose the one you use.

-Definitions  
Include  
function

-Setup  
Input/Output declaration

-loop  
Working steps



The screenshot shows the Arduino IDE interface with a blue header bar. The title bar reads "sketch\_apr27a | Arduino 1.6.7". Below the header is a menu bar with "File", "Edit", "Sketch", "Tools", and "Help". A toolbar with various icons follows. The main area is a code editor with a teal background. It contains the standard Arduino setup and loop functions:

```
void setup() {
  // put your setup code here, to run once:

}

void loop() {
  // put your main code here, to run repeatedly:
}
```

# PIENODE setup

I/O port declaration

WIFI-connect

NO

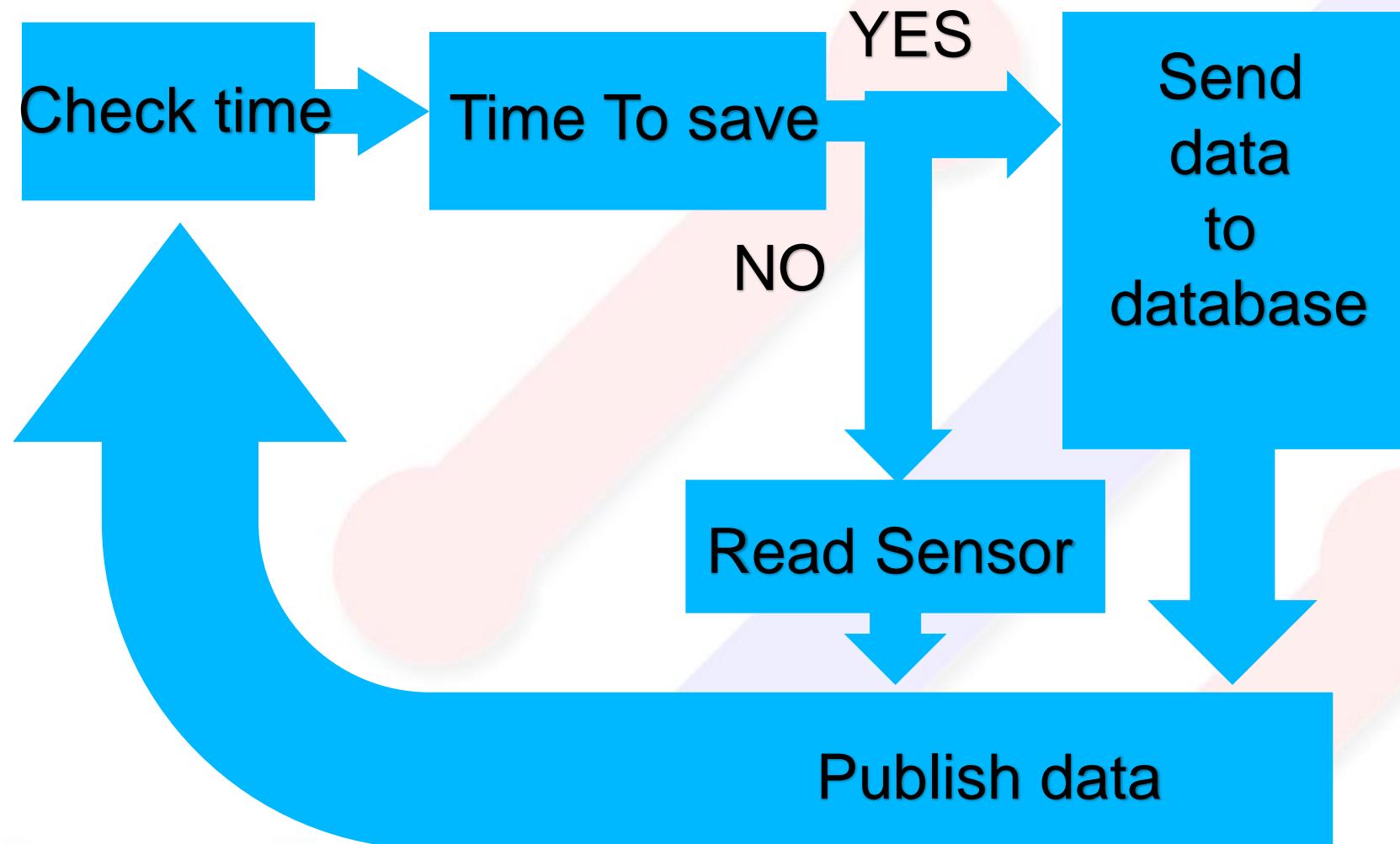
AP-Mode

YES

Sensor,  
Time,  
NETPIE  
init

loop

```
pinMode(pinOn,OUTPUT);
digitalWrite(pinOn,HIGH);
if (! sht31.begin(0x44)) { // Set to 0x45 for alternate i2c addr
    Serial.println("Couldn't find SHT31");
    while (1) delay(1);
}
```



# Server, Database



Server

Database : MySQL  
Web site :html5,php  
File  
Etc.

Client

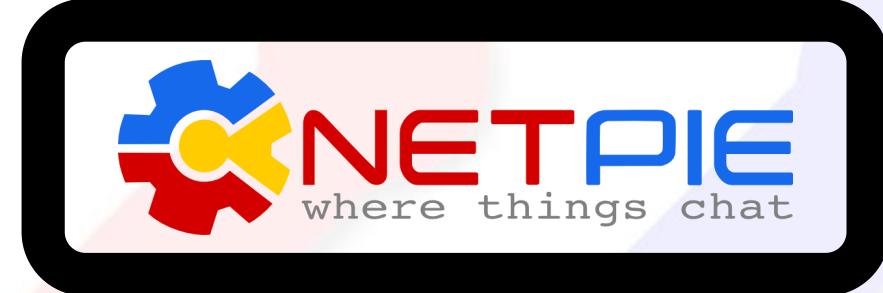
IoT platform



## DB Server

- slow
- long header

- + DB flexible



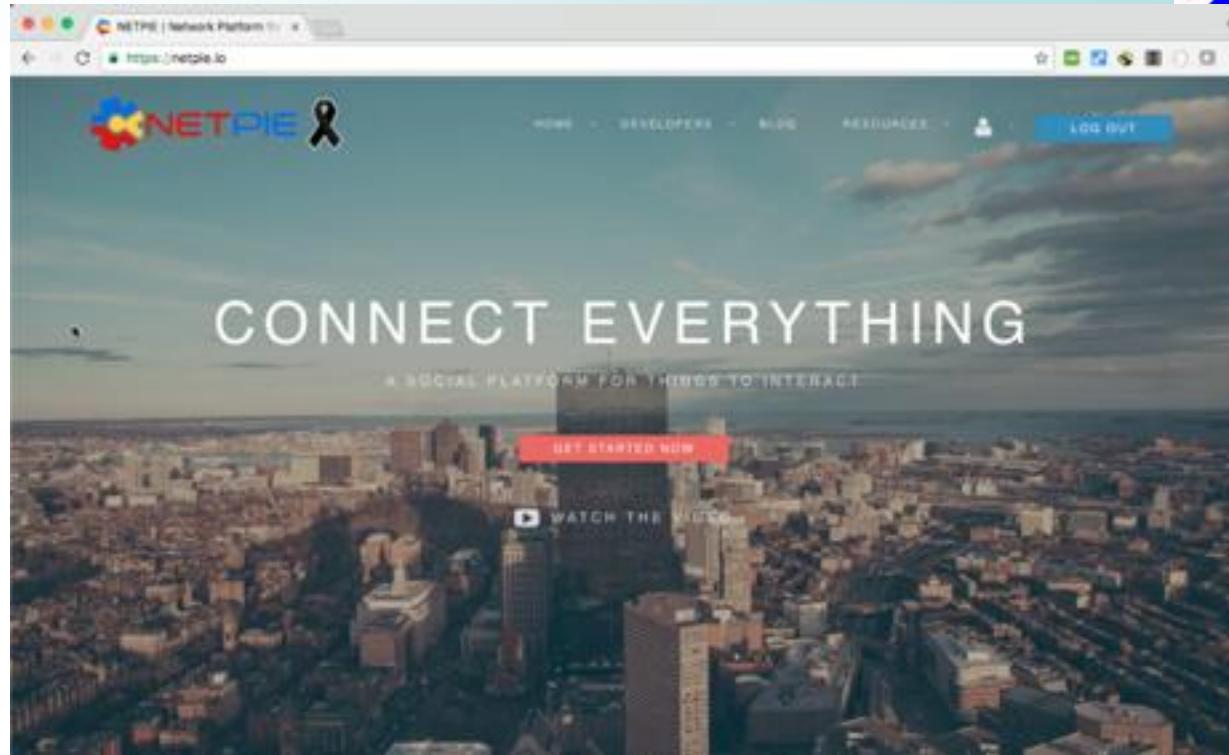
- + realtime

- DB not configurable

# Download Source Code Freehost+Netpie register

The image shows a desktop environment with three open browser windows:

- Top Window:** A GitHub repository page for "FarmWiMarC / 20180327workshop". The repository has 0 stars, 0 forks, and 0 pull requests. It includes tabs for Code, Issues, Pull requests, Projects, Wiki, Insights, and Settings.
- Middle Window:** A web browser displaying the "FREE WEB HOSTING" page for "Freehost.in.th". The page features a banner with the text "สร้างเว็บไซต์ของคุณ เองได้ฟรี!", a brief description about sub-domain hosting, and a "สมัครใช้งาน" (Sign up) button.
- Bottom Window:** A web browser displaying the "NETPIE" homepage. The page has a large banner with the text "CONNECT EVERYTHING" and "A SOCIAL PLATFORM FOR THINGS TO INTERACT". It includes a "GET STARTED NOW" button and a "WATCH THIS" video thumbnail.



<https://netpie.io>

<https://github.com/netpiemaker/netpie-training>

ให้บริการฟรี 100 credits ตลอดไป

# Application ID

APPID

APPLICATION (APPID)

iotdemo

DELETE

5

APPLICATION KEY

APPLICATION (APPID)

IOT Hardwares

Key : o5CD0GvWSiYxtGY

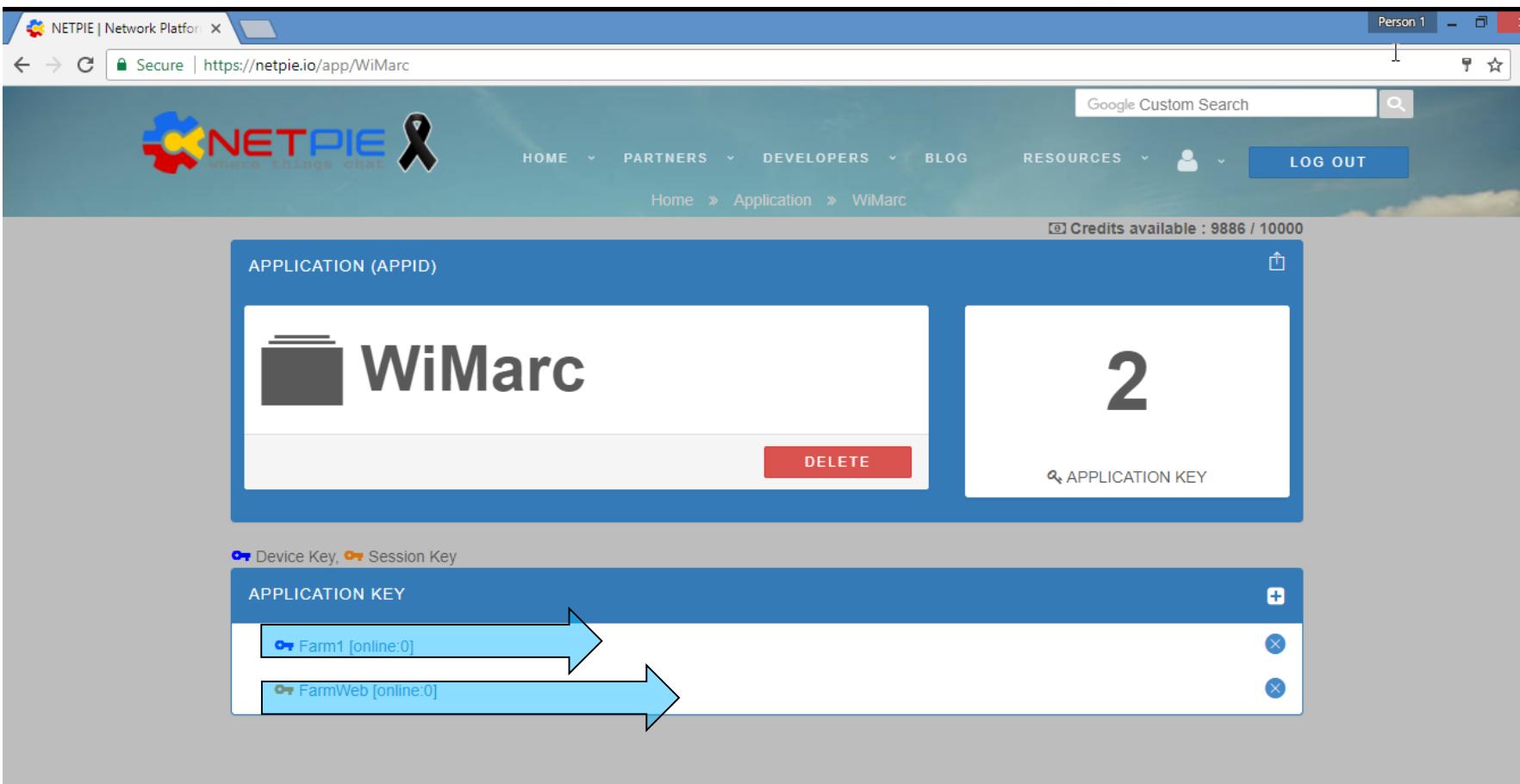
Secret : SqXX8tOnUsbxtaTMAIU8DYgbx

REST API auth : o5CD0GvWSiYxtGY.SqXX8tOnUsbxtaTMAIU8DYgbx

NAME CANCEL

Key , Secret

Integrate Ideas Into Reality



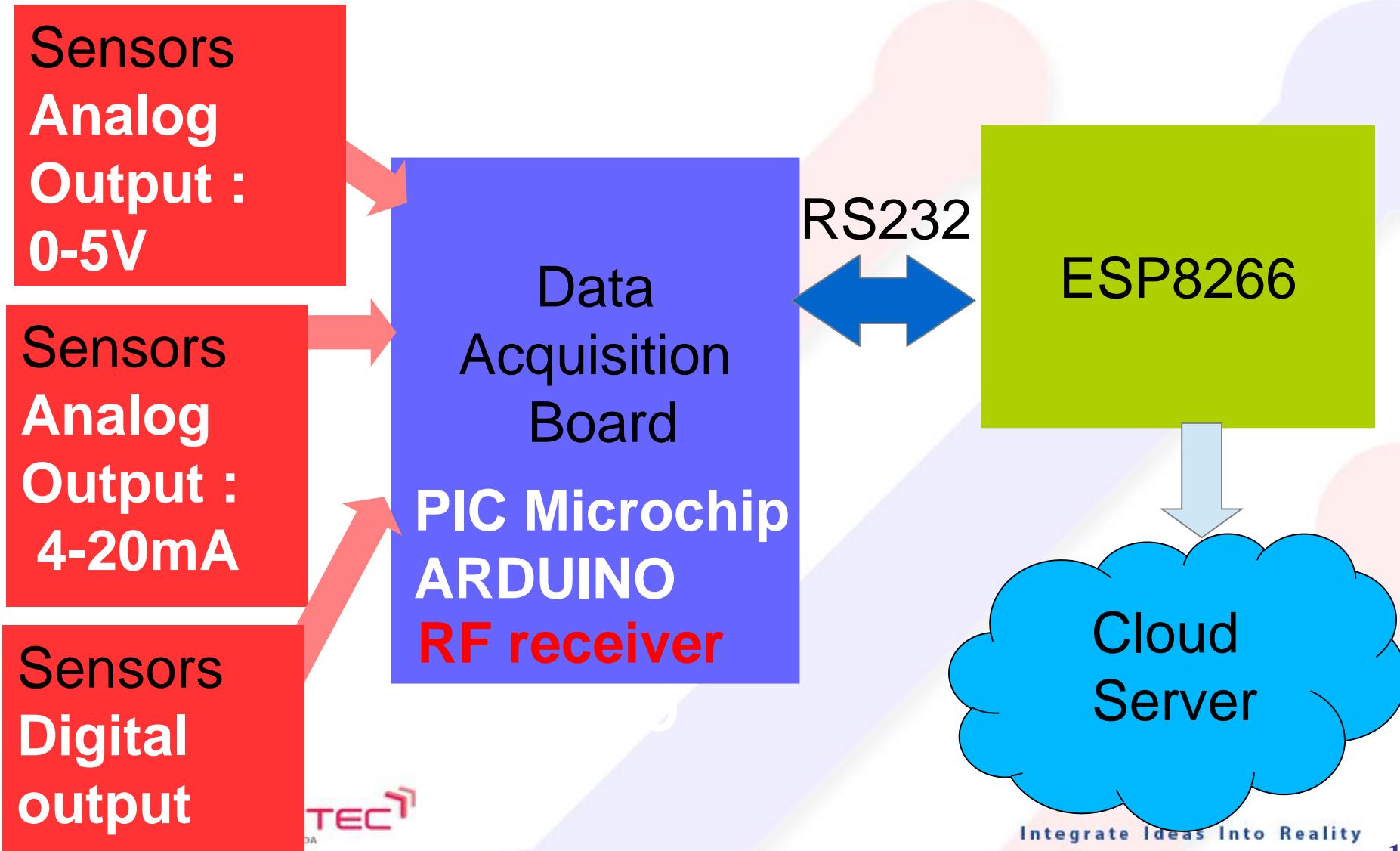
The screenshot shows the NETPIE Network Platform application management interface. At the top, there is a navigation bar with links for HOME, PARTNERS, DEVELOPERS, BLOG, and RESOURCES. A user profile icon and a LOG OUT button are also present. Below the navigation bar, the URL https://netpie.io/app/WiMarc is displayed in the address bar.

The main content area displays the "APPLICATION (APPID)" for "WiMarc". It shows a folder icon and the name "WiMarc". A red "DELETE" button is located below the folder icon. To the right, there is a box containing the number "2" and a search bar labeled "APPLICATION KEY".

Below this, a section titled "APPLICATION KEY" lists two entries: "Farm1 [online:0]" and "FarmWeb [online:0]". Each entry has a blue arrow pointing to it from the left, and a small "X" icon to its right.

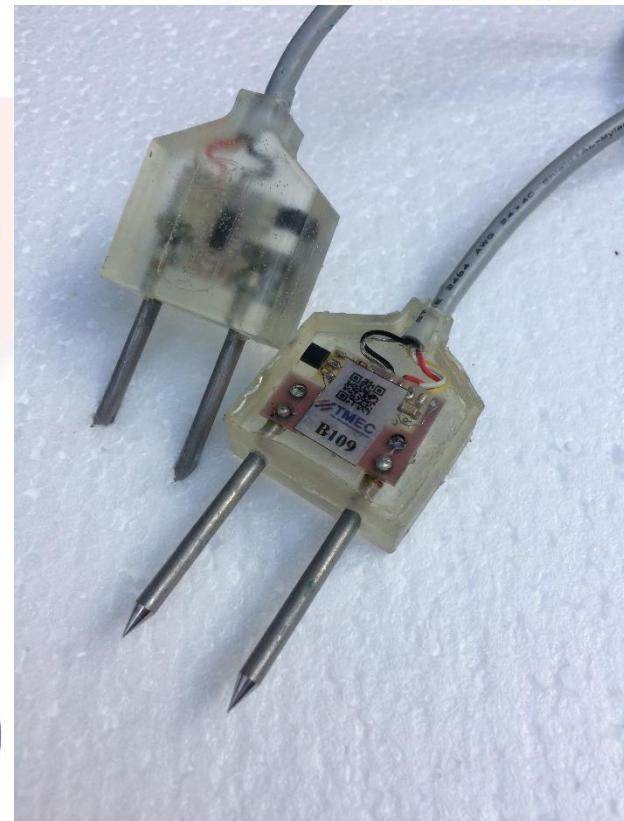
Credits available: 9886 / 10000

# Sensor Network System



# Sensors for Agricultural Research

- Temperature Sensor
- Humidity Sensor
- Soil Moisture Sensor
- Light Intensity Sensor
- Pressure Sensor



# Light Intensity Sensor

**NECTEC**  
a member of NSTDA

เซ็นเซอร์วัดความเข้มแสง รุ่น T17-1



คุณสมบัติทางด้านเทคนิค

ช่วงคลื่นแสงที่ตอบสนอง : 400-1000nm

ช่วงการวัด : 0-1000W/m<sup>2</sup>

ค่าความถูกต้อง : +/- 5%

ความแม่นยำ : +/- 5 W/m<sup>2</sup>

ช่วงอุณหภูมิการใช้งาน : 20-60 C

สัญญาณที่ให้出來ของเซ็นเซอร์ : แรงดันไฟฟ้าในช่วง 0 - 4.4V (แรงดันไฟฟ้าต้อง 5 V)

สอบถามเพิ่มเติมการใช้งาน:

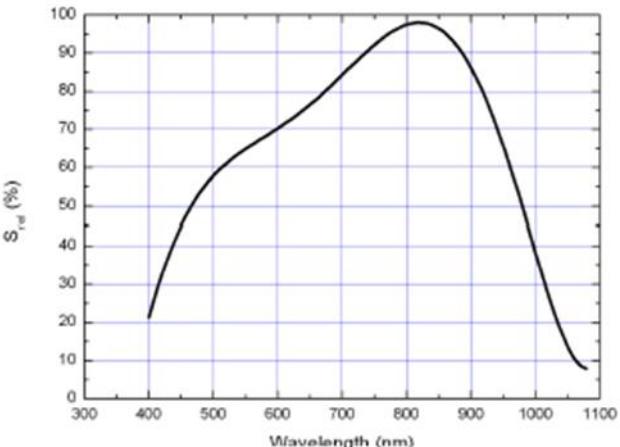
ศูนย์เทคโนโลยีโลหะและวัสดุศาสตร์

51/4 หมู่ 1 ต.วังตะเคียน อ.เมือง จ.ฉะเชิงเทรา 24000

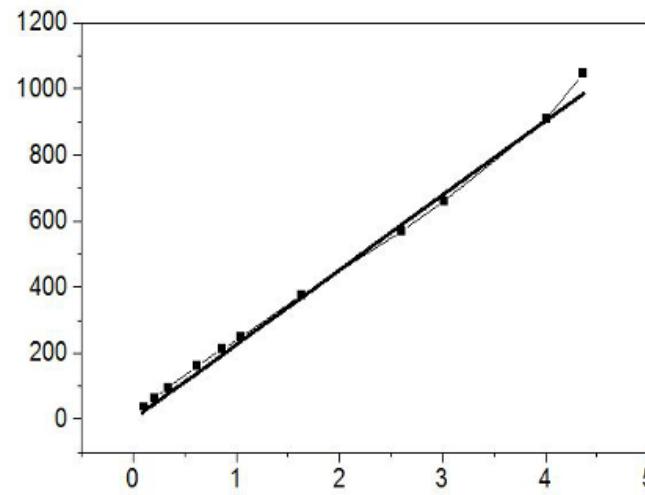
โทร 038-857100-9

## Rel. Spectral Sensitivity

$$S_{\text{rel}} = f(\lambda)$$



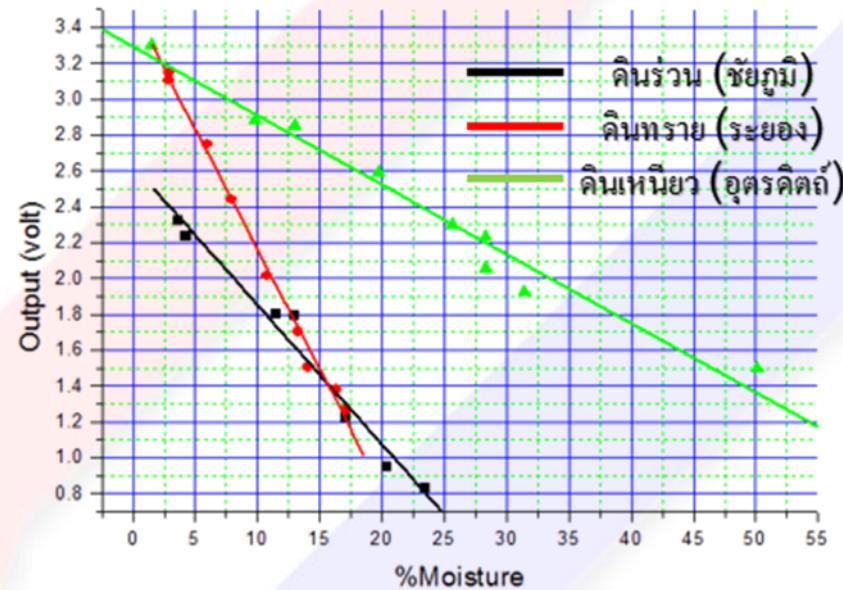
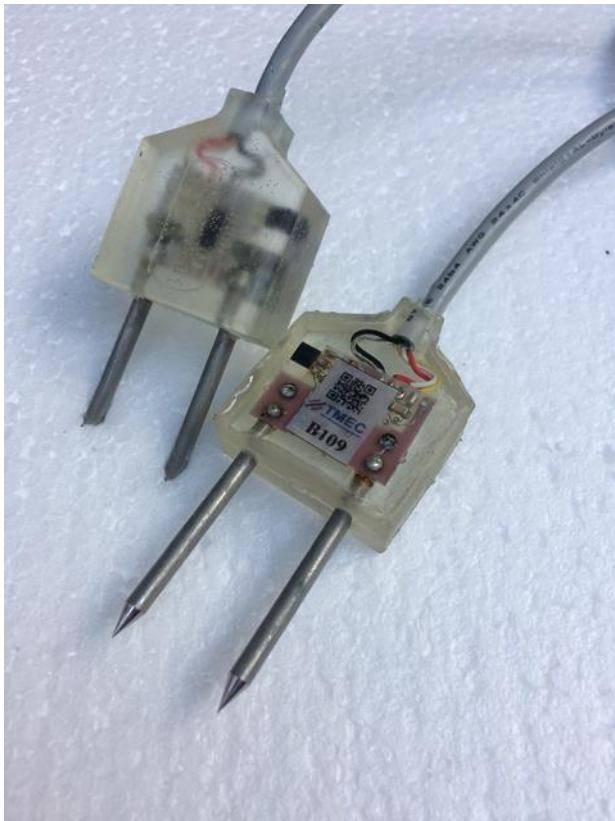
ค่าความเข้มแสง (W/m<sup>2</sup>)



แรงดันไฟฟ้า (โวลท์)

Integrate Ideas Into Reality

# Soil Moisture Sensor

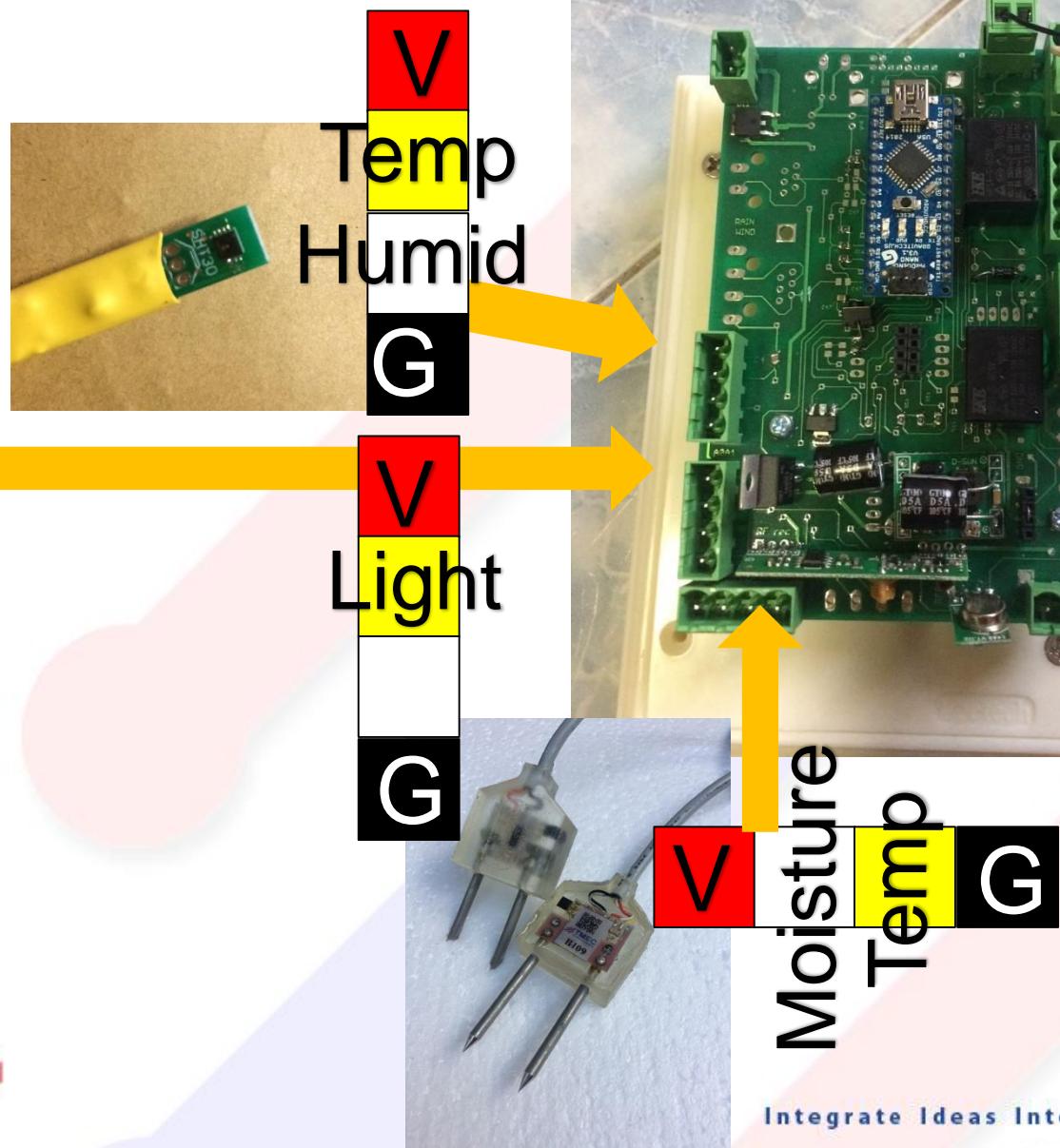


# Conductivity Sensor

- Water quality monitoring
- Aquaculture
- Hydroponic & Aquaponic
- Fertilizer control

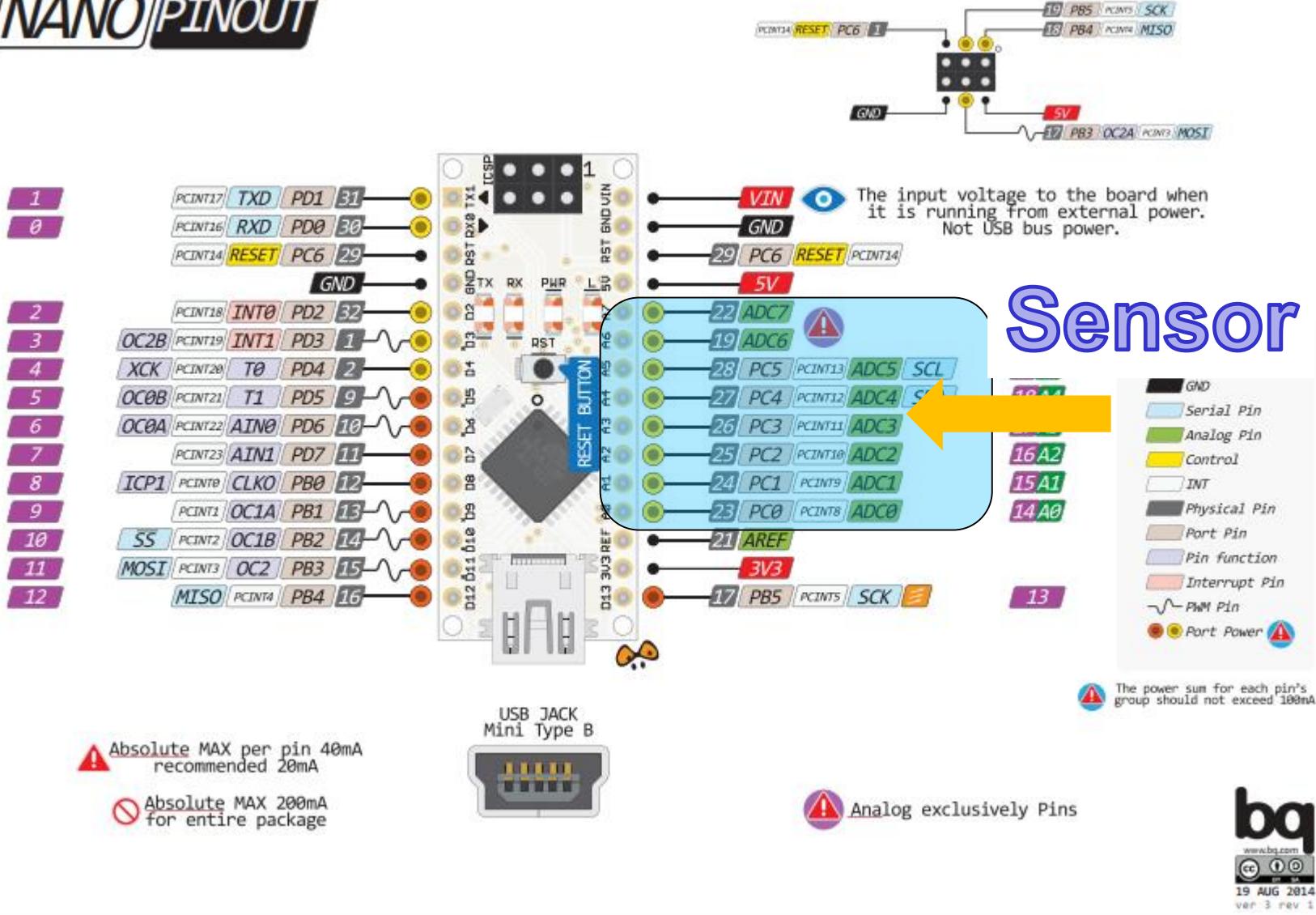


# Sensors

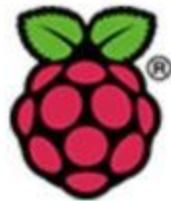


# Arduino NANO

## NANO PINOUT

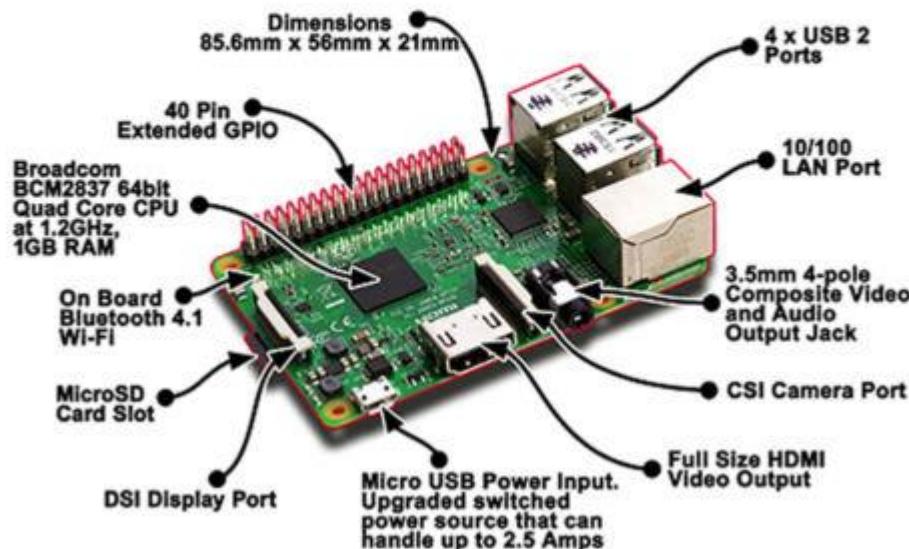


# Raspberry Pi



## Raspberry Pi 3 Model B

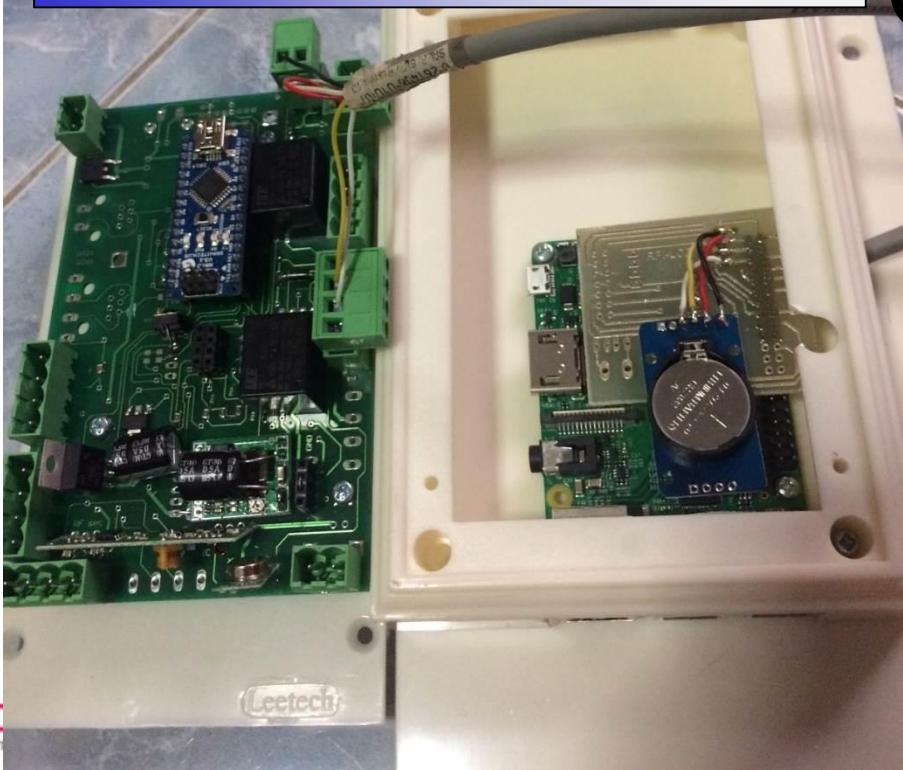
1.2GHz Quad-Core CPU , 1GB RAM , WiFi & BlueTooth



SD card : 16GB

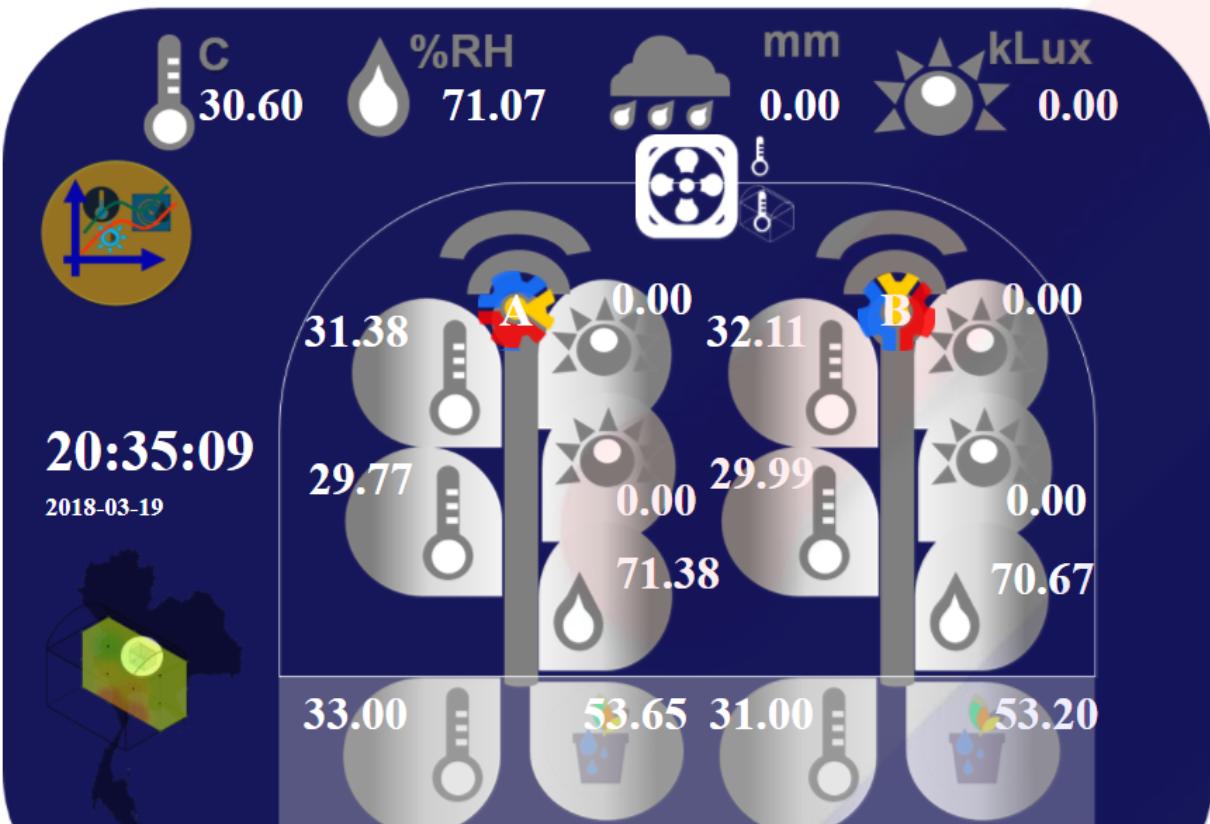
OS: Linux Jessie  
Php Server  
phpMyadmin :MySQL  
Python 2.7  
FTP

# Serial Port (Rx, Tx)



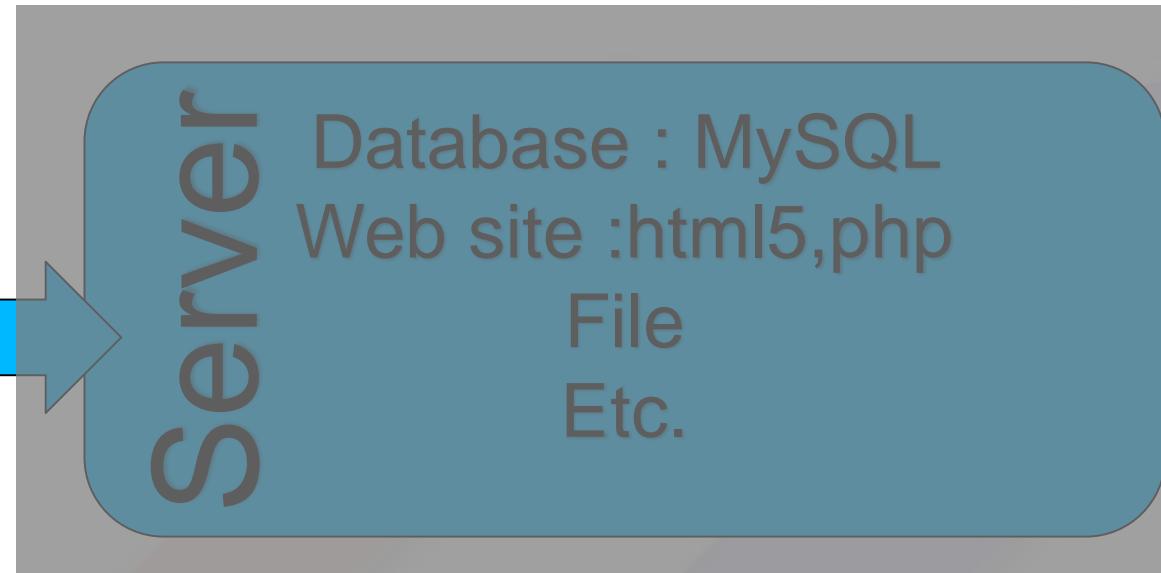
## IoT Wi MarC Farm

NECTEC  TMEC  
a member of NSTDA





Client  
Device Key



## IoT platform

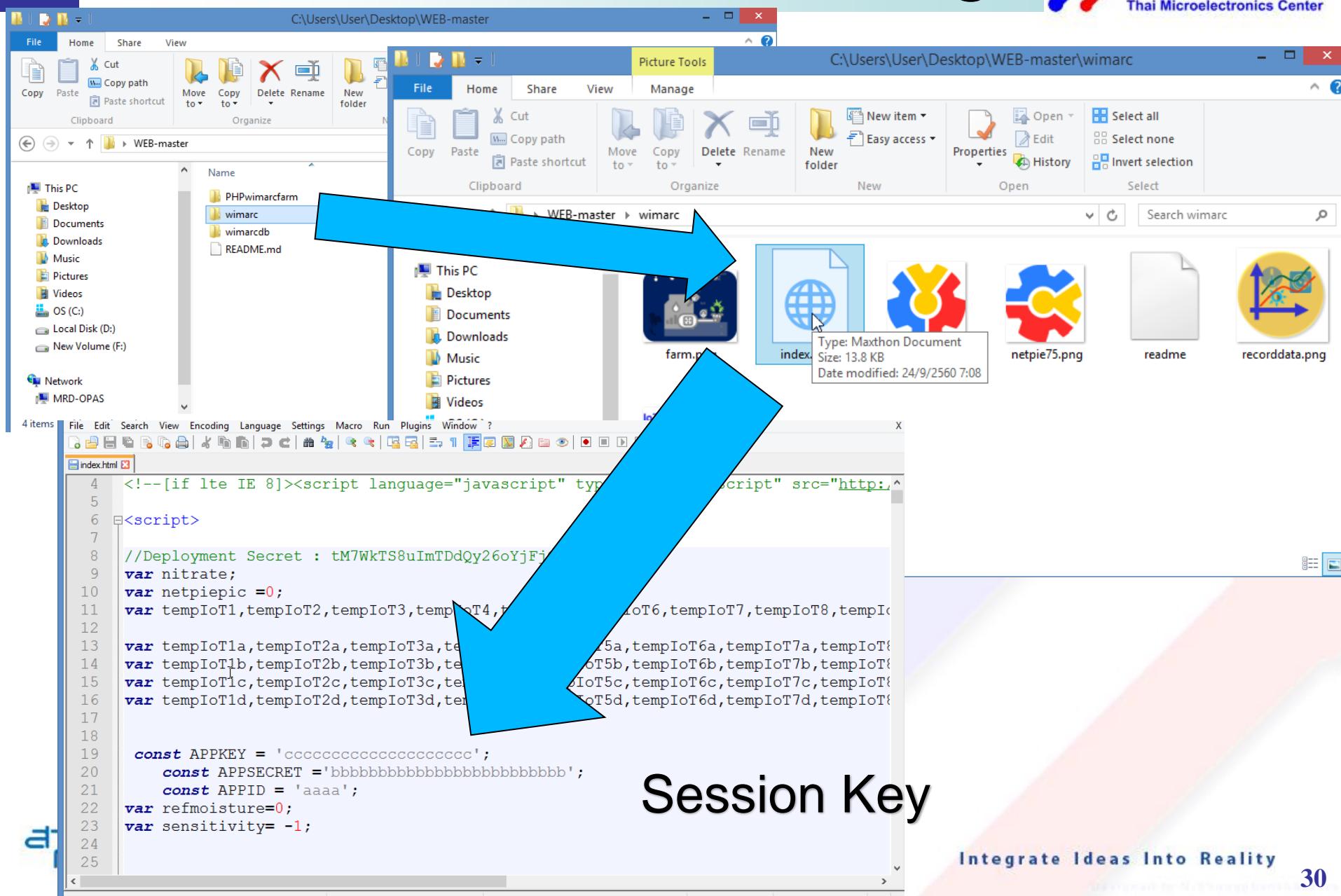


# NETPIE on Python

```
Wimarcfarm.py - D:\OPAS-2008DEC\0-2015weatherstation\002017WiMarcFarm\Wimarcfarm.py (2.7.11) - □ ×  
File Edit Format Run Options Window Help  
import datetime  
import time  
import pycurl  
import os  
import paramiko,sys  
import pysftp  
import RPi.GPIO as GPIO  
import httplib  
  
writepath = '/media/usb0/data.txt'  
  
writepathlocal = '/home/pi/data.txt'  
  
from time import strftime  
rcvH=strftime("%Y-%m-%d ")  
rcvS=strftime("%H:%M:%S ")  
lastTime = datetime.datetime.now()  
recordLastTime = lastTime.minute  
  
#-----php-----  
host = 'wimarcfarm.000webhostapp.com' #insert your hostname  
  
#-----NETPIE-----  
import microgear.client as client  
  
gearkey = 'aaaaaaaaaaaaaaaaaa' #insert your key  
gearsecret = 'bbbbbbbbbbbbbbbbbbbbbbbbbb' #insert your secret  
appid = 'cccc' # insert your appid  
  
headers = {  
    'User-Agent': 'python',  
    'Content-Type': 'application/x-www-form-urlencoded',  
}  
  
#-----Connect to SerialPort-----  
  
try :  
    ser = serial.Serial('/dev/ttyS0', baudrate=9600, timeout=2000)  
    ser.close()  
except:      print "ERROR: Port not found!"  
Ln: 42 Col: 0
```

## Device Key

# Local Monitoring



The image shows a Windows desktop environment with several open windows:

- A File Explorer window titled "C:\Users\User\Desktop\WEB-master" showing a folder structure with "wimarc" as the current directory.
- A second File Explorer window titled "C:\Users\User\Desktop\WEB-master\wimarc" showing files like "index", "farm.p", "netpie75.png", "readme", and "recorddata.png".
- A code editor window showing a portion of an HTML file named "index.html". The code includes JavaScript and some configuration variables.

A large blue arrow points from the second File Explorer window towards the code editor window, indicating a connection between the file system and the code being executed.

```
<!--[if lte IE 8]><script language="javascript" type="text/javascript" src="http://...</script>
<script>
//Deployment Secret : tM7WkTS8uImTDdQy26oYjFj
var nitrate;
var netpiepic =0;
var tempIoT1,tempIoT2,tempIoT3,tempIoT4,tempIoT5,tempIoT6,tempIoT7,tempIoT8,tempIoT9,tempIoT10;
var tempIoT1a,tempIoT2a,tempIoT3a,tempIoT4a,tempIoT5a,tempIoT6a,tempIoT7a,tempIoT8a,tempIoT9a,tempIoT10a;
var tempIoT1b,tempIoT2b,tempIoT3b,tempIoT4b,tempIoT5b,tempIoT6b,tempIoT7b,tempIoT8b,tempIoT9b,tempIoT10b;
var tempIoT1c,tempIoT2c,tempIoT3c,tempIoT4c,tempIoT5c,tempIoT6c,tempIoT7c,tempIoT8c,tempIoT9c,tempIoT10c;
var tempIoT1d,tempIoT2d,tempIoT3d,tempIoT4d,tempIoT5d,tempIoT6d,tempIoT7d,tempIoT8d,tempIoT9d,tempIoT10d;
const APPKEY = 'cccccccccccccccccc';
const APPSECRET ='bbbbbbbbbbbbbbbbbbbbbb';
const APPID = 'aaaa';
var refmoisture=0;
var sensitivty= -1;
```

Session Key

Integrate Ideas Into Reality

30

# Free DB webserver

The screenshot shows the homepage of 000webhost. At the top, there's a navigation bar with tabs for "Free Web Hosting with PHP", "Premium Web Hosting", "Earn Money", and "Website Builder". Below the navigation is a banner featuring a woman wearing red glasses and the text "Free Web Hosting". A call-to-action button says "Sign Up for FREE! Yes, it's absolutely free!". To the right, a review box shows a rating of 4.9/5 from 2208 reviews. The bottom of the page lists features: "No ads & no hidden costs", "Feature-rich Cpanel with PHP & MySQL", and "Free domain hosting & Easy Website builder".

The taskbar at the bottom of the screen displays icons for various applications including File Explorer, Control Panel, Task View, Google Chrome, Internet Explorer, Mozilla Firefox, Amazon, Microsoft Edge, Microsoft Word, Microsoft Excel, Google Sheets, and a red application icon. On the right side, there are system status icons for battery, signal strength, volume, and language (ENG). The date and time are shown as 20/8/2560 13:55. Logos for NSTDA and NECTEC are visible on the left, and the text "Integrate Ideas Into Reality" is on the right.

# Build your website



# Free DB webserver



## FTP details

Use these details to access and manage your website files. When FTP is disabled you can still use web file manager.

### FTP transfer

OFF  ON

Host Name:

files.000webhost.com

Username:

nectecwimarcfarm

Password:

same as your website password

Need more? Increase database size & quantity simply by upgrading to PRO!

## Create & manage databases

Create new MySQL databases or manage your current databases using advanced PhpMyAdmin panel. You're also able to change passwords for your DB or completely remove DB.

Database is limited to: 1 GB of data and 150 tables.

Default database engine: InnoDB on MariaDB 10.1

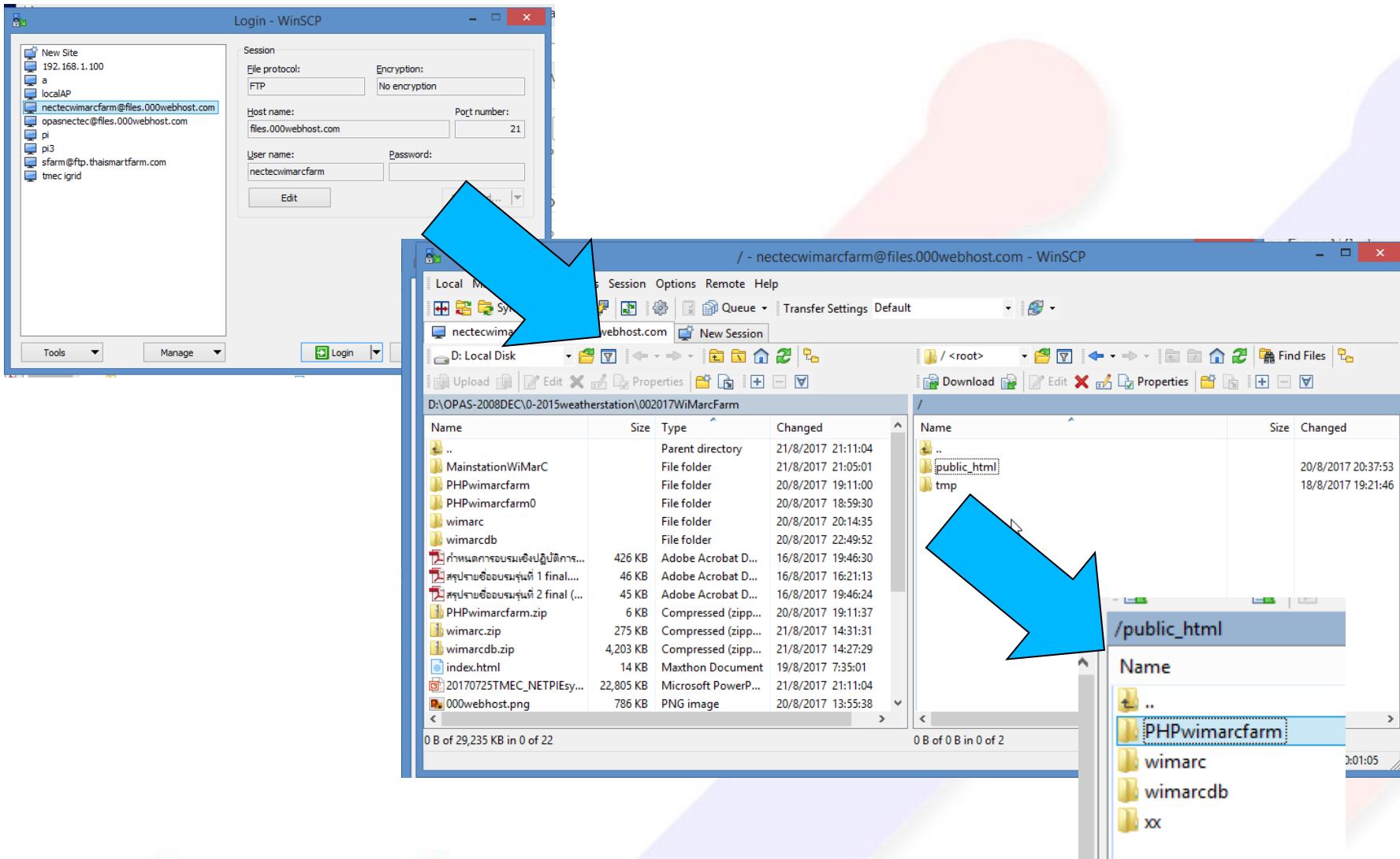
Manage databases at [databases.000webhost.com](http://databases.000webhost.com)

Use localhost as connection hostname

DB Name	DB User	DB Host	
id2613481_sensora	id2613481_wimarcfarm	localhost	<a href="#">Manage</a>

[New Database](#)

# Upload file to server



# MySQL database

Screenshot of the phpMyAdmin interface showing the database structure for 'id2613481\_sensora'.

The left sidebar shows the database structure:

- New
- id2613481\_sensora
  - New
  - a
  - b
  - c
  - d
  - device
  - e
  - f
  - g
  - h
  - humid
  - i
  - j
  - level
  - lux
  - moisture
  - rain
  - sensor
  - temp
  - volt

The main area displays the table list for the 'id2613481\_sensora' database:

Table	Action	Rows	Type	Collation	Size	Overhead
a	<a href="#">Browse</a> <a href="#">Structure</a> <a href="#">Search</a> <a href="#">Insert</a> <a href="#">Empty</a> <a href="#">Drop</a>	63	InnoDB	utf8_unicode_ci	32 KiB	-
b	<a href="#">Browse</a> <a href="#">Structure</a> <a href="#">Search</a> <a href="#">Insert</a> <a href="#">Empty</a> <a href="#">Drop</a>	49	InnoDB	latin1_swedish_ci	16 KiB	-
c	<a href="#">Browse</a> <a href="#">Structure</a> <a href="#">Search</a> <a href="#">Insert</a> <a href="#">Empty</a> <a href="#">Drop</a>	39	InnoDB	latin1_swedish_ci	16 KiB	-
d	<a href="#">Browse</a> <a href="#">Structure</a> <a href="#">Search</a> <a href="#">Insert</a> <a href="#">Empty</a> <a href="#">Drop</a>	39	InnoDB	latin1_swedish_ci	16 KiB	-
device	<a href="#">Browse</a> <a href="#">Structure</a> <a href="#">Search</a> <a href="#">Insert</a> <a href="#">Empty</a> <a href="#">Drop</a>	0	InnoDB	latin1_swedish_ci	16 KiB	-
e	<a href="#">Browse</a> <a href="#">Structure</a> <a href="#">Search</a> <a href="#">Insert</a> <a href="#">Empty</a> <a href="#">Drop</a>	39	InnoDB	latin1_swedish_ci	16 KiB	-
f	<a href="#">Browse</a> <a href="#">Structure</a> <a href="#">Search</a> <a href="#">Insert</a> <a href="#">Empty</a> <a href="#">Drop</a>	0	InnoDB	latin1_swedish_ci	16 KiB	-
g	<a href="#">Browse</a> <a href="#">Structure</a> <a href="#">Search</a> <a href="#">Insert</a> <a href="#">Empty</a> <a href="#">Drop</a>	0	InnoDB	latin1_swedish_ci	16 KiB	-
h	<a href="#">Browse</a> <a href="#">Structure</a> <a href="#">Search</a> <a href="#">Insert</a> <a href="#">Empty</a> <a href="#">Drop</a>	0	InnoDB	latin1_swedish_ci	16 KiB	-
humid	<a href="#">Browse</a> <a href="#">Structure</a> <a href="#">Search</a> <a href="#">Insert</a> <a href="#">Empty</a> <a href="#">Drop</a>	0	InnoDB	latin1_swedish_ci	16 KiB	-
i	<a href="#">Browse</a> <a href="#">Structure</a> <a href="#">Search</a> <a href="#">Insert</a> <a href="#">Empty</a> <a href="#">Drop</a>	0	InnoDB	latin1_swedish_ci	16 KiB	-
j	<a href="#">Browse</a> <a href="#">Structure</a> <a href="#">Search</a> <a href="#">Insert</a> <a href="#">Empty</a> <a href="#">Drop</a>	0	InnoDB	latin1_swedish_ci	16 KiB	-
level	<a href="#">Browse</a> <a href="#">Structure</a> <a href="#">Search</a> <a href="#">Insert</a> <a href="#">Empty</a> <a href="#">Drop</a>	0	InnoDB	latin1_swedish_ci	16 KiB	-
lux	<a href="#">Browse</a> <a href="#">Structure</a> <a href="#">Search</a> <a href="#">Insert</a> <a href="#">Empty</a> <a href="#">Drop</a>	0	InnoDB	latin1_swedish_ci	16 KiB	-
moisture	<a href="#">Browse</a> <a href="#">Structure</a> <a href="#">Search</a> <a href="#">Insert</a> <a href="#">Empty</a> <a href="#">Drop</a>	0	InnoDB	latin1_swedish_ci	16 KiB	-
rain	<a href="#">Browse</a> <a href="#">Structure</a> <a href="#">Search</a> <a href="#">Insert</a> <a href="#">Empty</a> <a href="#">Drop</a>	0	InnoDB	latin1_swedish_ci	16 KiB	-
sensor	<a href="#">Browse</a> <a href="#">Structure</a> <a href="#">Search</a> <a href="#">Insert</a> <a href="#">Empty</a> <a href="#">Drop</a>	39	InnoDB	latin1_swedish_ci	16 KiB	-
temp	<a href="#">Browse</a> <a href="#">Structure</a> <a href="#">Search</a> <a href="#">Insert</a> <a href="#">Empty</a> <a href="#">Drop</a>	0	InnoDB	latin1_swedish_ci	16 KiB	-
volt	<a href="#">Browse</a> <a href="#">Structure</a> <a href="#">Search</a> <a href="#">Insert</a> <a href="#">Empty</a> <a href="#">Drop</a>	0	InnoDB	latin1_swedish_ci	16 KiB	-
Console	<a href="#">Browse</a> <a href="#">Structure</a> <a href="#">Search</a> <a href="#">Insert</a> <a href="#">Empty</a> <a href="#">Drop</a>	0	InnoDB	latin1_swedish_ci	16 KiB	-

Bottom navigation bar:

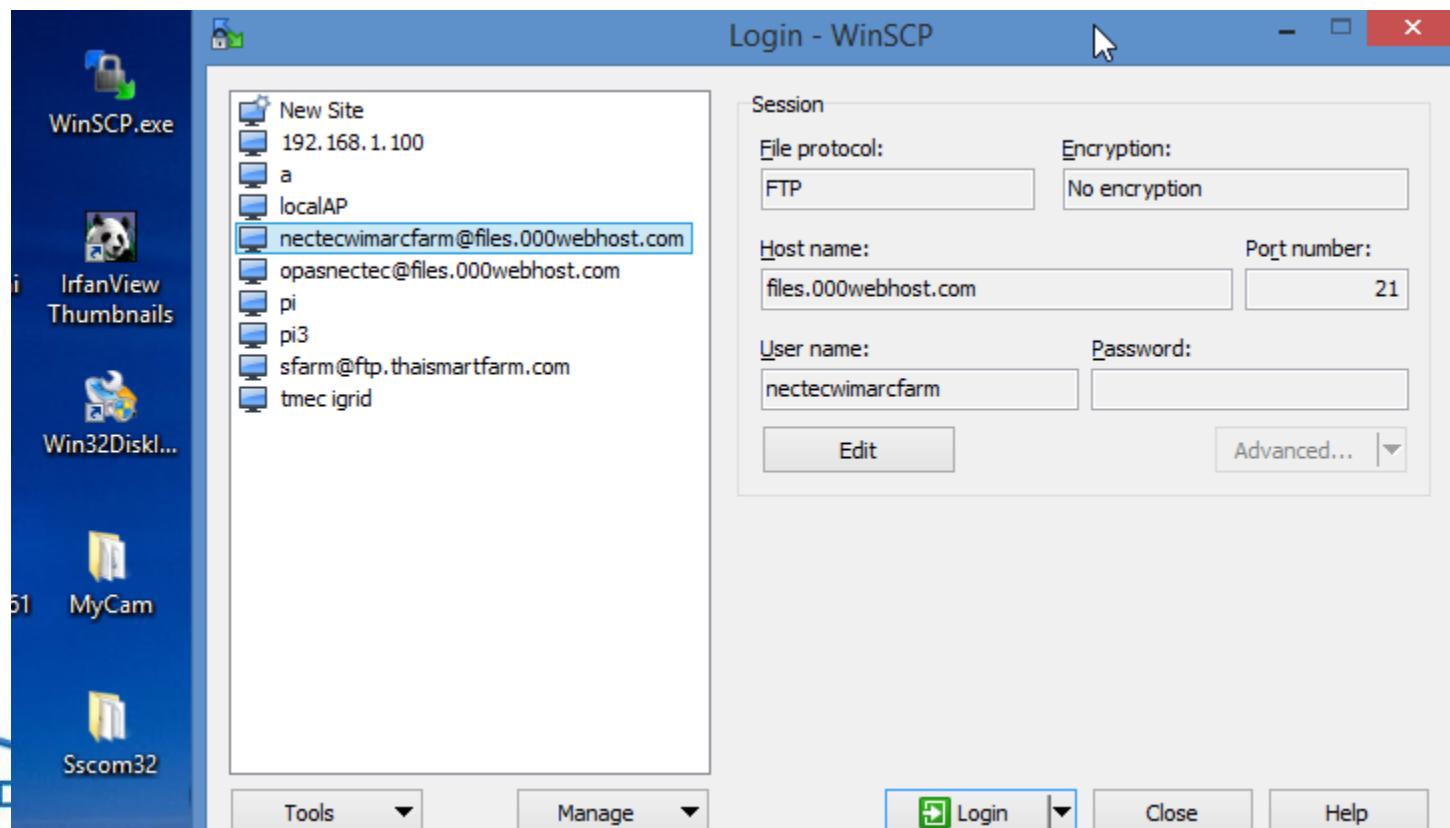
- Conductivity - pH ...pdf
- Conductivity - pH ...pdf
- Show all

# Free DB webserver

## FTP details

Use these details to access and manage your website files. When FTP is disabled you can still use web file manager.

FTP transfer  ON  
Host Name: **files.000webhost.com**  
Username: **nectecwimarcfarm**  
Password: *same as your website password*





# Th a n K s

<http://tmeconnect.or.th>  
opas.trithaveesak@nectec.or.th

