Build your "Klimerko" Air Quality Monitoring Station

For all additional details, visit this project's GitHub at https://github.com/DesconBelgrade/Klimerko
After Descon 5.0, the newly built and connected devices will be visible on a map at vazduhgradjanima.rs

Parts

Hardware Required

You need to have the following components to follow this guide:
- NodeMCU Board (with CP2102 chip)
- Plantower PMS7003 Air Quality Sensor
  - Bridge board
  - Connector cable
- Bosch BME280 Temperature/Humidity/Pressure Sensor
- USB Power adapter (5V, minimum 250mA)
- MicroUSB Cable (5m preferred)
- 3D printed case for the device, which comprises of:
  - Components base
  - Weather-resistant cover
  - Flat stand
  - Wall-mount holder
- **5x** Screw (**7**x screws if you're going to wall-mount the device)
- **4x** Wire (each at least 13cm long)

Tools Required

You're going to need the following tools at minimum to complete the project:
- Soldering Iron

- Solder
- Scissors or a Wire Stripper
- Screwdriver

Hardware Assembly

Once you've got all the components and tools ready, it's time to begin the assembly process.

3D Case Preparation

Depending on your use case, you can use either the flat stand or the wall-mounted holder.
If you wish to wall-mount the device, use 2 screws to mount the holder to a wall.
You'll be able to easily attach and detach the device from the wall.

For now, disassemble the case and put away all the parts except for the components base, where you'll be placing all the components.
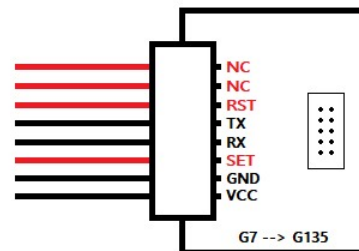
PMS7003 Sensor Preparation

- First, make sure not to remove the blue plastic cover from the PMS7003 sensor as it helps it fit into the 3D case better.
- Place the PMS7003 sensor into the components base of the 3D case with the connection port of PMS7003 facing outwards in upper right side.
- Plug in the connector cable into the bridge board.
- Because we don't need excess cabling, removal of the unnecessary wires from the connector cable is suggested. In order to know which wires to pull, make sure the connector cable is plugged into the bridge board so that you can see the markings on the board that correspond to the wires. To remove the wires, pull them with medium force until they're detached from the connector.
  These are the wires to pull (marked red):
  - **NC** (first one)
  - **NC** (second one)
  - **RST**
  - **SET**

  The only wires left attached should be **TX**, **RX**, **GND** and **VCC.**

- Measure ~13cm of all 4 remaining wires from the connector cable and cut the rest, so you're left with the connector at one end and cut wires on the other.
- Using scissors or a wire stripper, remove the insulation ~2mm from the end of each wire, so you're left with clear copper at the ends.
- Plug the bridge board (with the connector cable in) into the PMS7003 Sensor.
- Route the wires through the circular hole in the components base of the 3D case so it reaches the other side of the base.

BME280 Sensor Preparation

- Take the 4 wires you have prepared (not to be confused with the PMS7003 wires) and strip (remove insulation) ~2mm from each end of each wire so that you have 4 wires with all ends stripped.
- Solder those 4 wires to pins **SDA**, **SCL**, **GND**, **VCC/VIN** on the BME280
- Make sure the PMS7003 Sensor is seated properly (because BME280 goes above it), and only then proceed to the next step.
- Mount the BME280 sensor in place by screwing it to the hole in the upper right side of the 3D case (above the PMS7003).
- Route the wires through the circular hole in the components base of the 3D case so it reaches the other side of the base.

You have now completed the setup of the sensor side of the components base. Next up, the NodeMCU side.

NodeMCU Preparation

You should now have 8 wires coming through the circular hole leading to the NodeMCU side of the 3D case.

- Solder the wires to the NodeMCU board:

> *Please double check to make sure you're soldering the correct wires (coming from the sensors) to the NodeMCU board.*

Sensor	Sensor Wire	NodeMCU Pin
PMS7003	VCC	VIN
PMS7003	GND	GND (Any GND pin works)
PMS7003	RX	D6
PMS7003	TX	D5
BME280	VCC/VIN	3v3 (Any 3v3 pin works)
BME280	GND	GND (Any GND pin works)
BME280	SCL	D1
BME280	SDA	D2

You have now finished all steps that require soldering.

- Now use 4 screws to place the NodeMCU in its spot in the components base of the 3D case.
- Double check all the connections and if everything is as it should be.
- Put the weather-resistant cover of the 3D case over the components base

Congratulations, you've assembled the device! Now onto the software side.

Cloud Platform

- Head over to https://maker.allthingstalk.com/signup and create an account

- Sign in
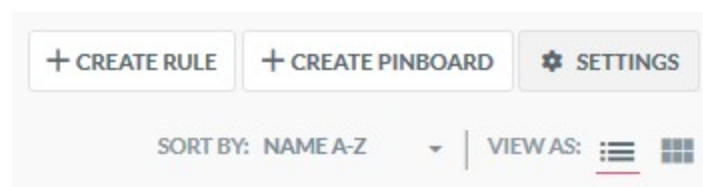- Click "Playground"

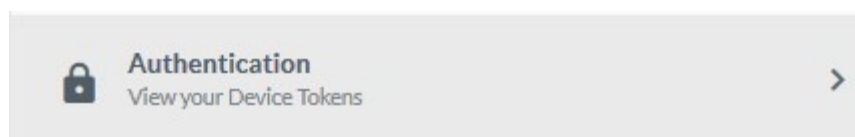- In *Devices,* click *+ New Device*
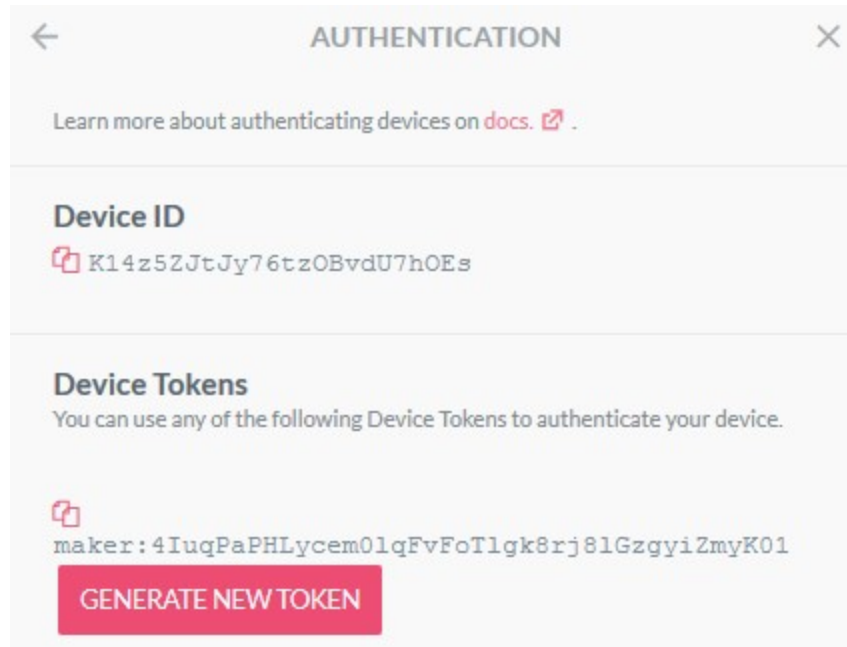

- Choose "Descon Klimerko"

- Click "Settings" in the upper right corner

- Click "Authentication"

- Write down your **Device ID** and **Device Token**

Software

- Download and install https://www.arduino.cc/en/Main/software (choose "Windows installer, for Windows XP and up" if you're on Windows)
- Open Arduino IDE
- Go to *File > Preferences*
- In the *Additional Boards Manager URLs*, enter `http://arduino.esp8266.com /stable/package_esp8266com_index.json` and click *OK*
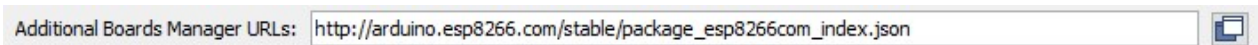
- Go to *Tools > Board > Boards Manager*
- Search for and install "*esp8266*" by *ESP8266 Community*
- Once done, close Arduino IDE
- Plug in the USB cable into your Klimerko device and your computer
- Download https://github.com/DesconBelgrade/Klimerko/archive/master.zip
- Unzip the file, open it and go to "Klimerko_Firmware" folder
- Open "Klimerko_Firmware.ino" with Arudino IDE
- Now go to *Tools > Board* and choose "*NodeMCU 1.0 (ESP-12E Module)*"
- Go to *Tools > Upload Speed* and choose *115200*
- Go to *Tools > Port* and you should see a single port there. Select it.

- Now, in the code, replace "WIFI_SSID" and "WIFI_PASSWORD" with your WiFi Credentials, and replace "YOUR_DEVICE_ID" and "YOUR_DEVICE_TOKEN" with your Authentication credentials you noted earlier from AllThingsTalk

```
// ----------- CUSTOMIZABLE PART BEGIN -----------

// Your WiFi and Device Credentials here
auto wifiCreds = WifiCredentials("WIFI_SSID","WIFI_PASSWORD");
auto deviceCreds = DeviceConfig("YOUR_DEVICE_ID","YOUR_DEVICE_TOKEN");
auto device = Device(wifiCreds, deviceCreds);

// ----------- CUSTOMIZABLE PART END -------------
```

- Go to "Sketch" > "Upload" and wait for the firmware to be uploaded to your Klimerko device
- Once done, go to "Tools" > "Serial Monitor" to see diagnostic output from Klimerko. If you don't see any data, restart Klimerko (either press the RST button on NodeMCU or unplug and plug it back it) because it's currently not reading/publishing data, thus not outputting diagnostic info.
- Once you see "Your device is up and running!" in Serial Monitor, you're good to go!
- Feel free to unplug the device from your computer and plug it into a wall USB Power adapter with your 5m USB cable.

> Note: There's a blue LED light on the device that automatically starts "breathing/fading" when a connection to either WiFi or AllThingsTalk is being established or is dropped. If the LED isn't "breathing/fading" (if it's off), the device should be connected successfully and uploading data.

Cloud Platform

You can now open AllThingsTalk Maker (maker.allthingstalk.com), go to devices and select your new "Descon Klimerko" to see your Assets and data.

Now feel free to go to "Pinboards", create a new one and add assets from your Descon Klimerko device. You play around with your pinboard and make it look like this:
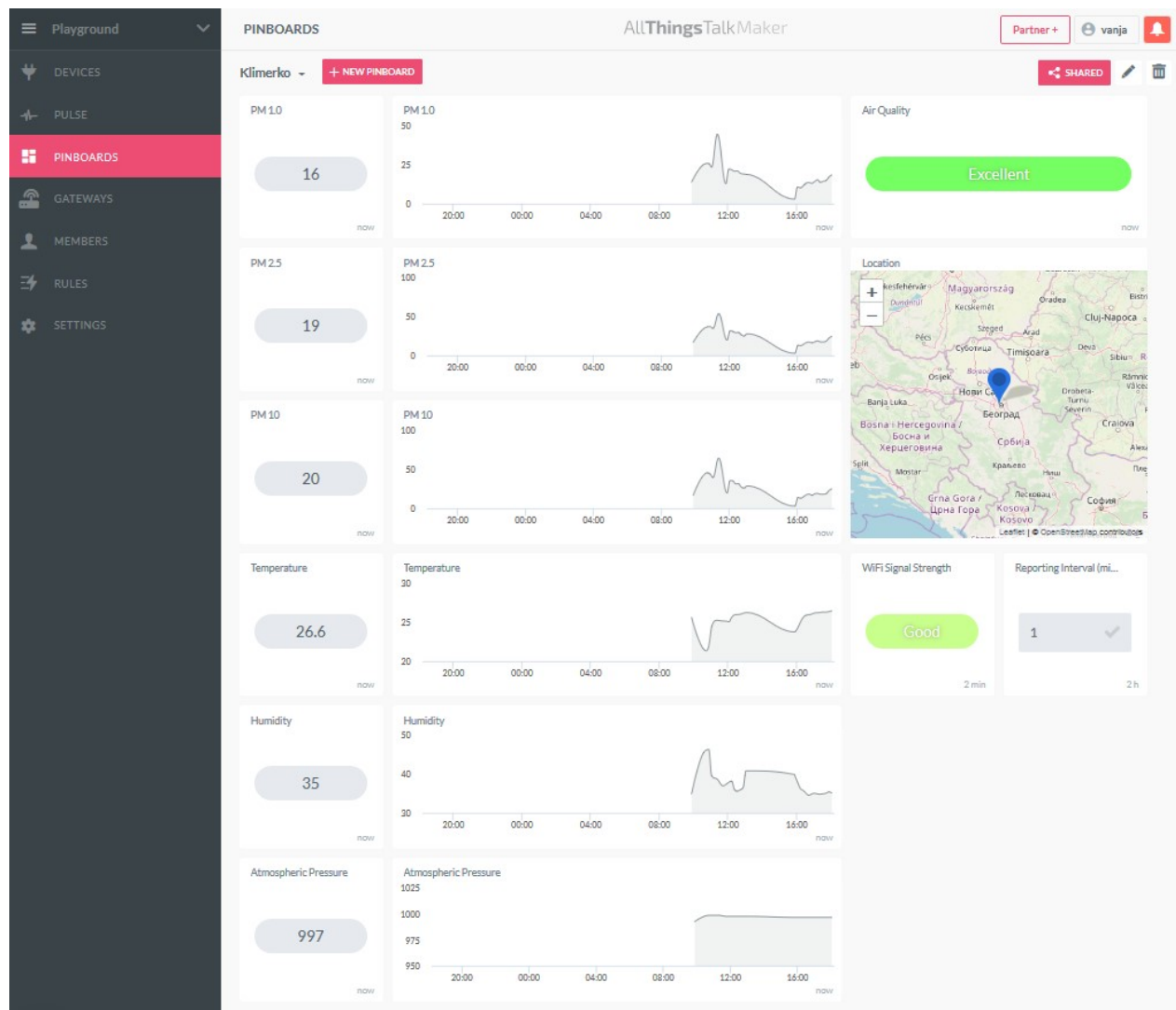
The cloud platform demonstration will be held at Descon where this device is being built, so you'll be shown how to build a pinboard like this (which is also shareable publicly if you wish to do so).