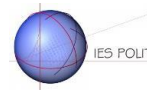




**ARVETI4.0 –**  
Project partner:



**LTTA2: presentation of the project developed by SPM Spa**

# SPM Metaverse



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SPM S.p.A. company

# S.P.M. METAVERSE

13/02/2023 3/03/2023



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**This project is only a part  
of a wider project whose  
aim is to virtualize all  
processes and machines  
of the company.  
To achieve the goal we  
need to collect data from  
real environment and the  
machines.**





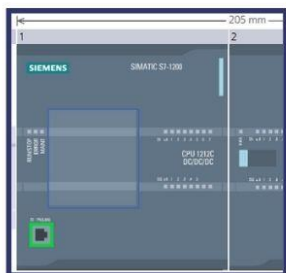
# Team

- **William Di Bella and Lyan Curcio (software), Fabiana Pepé and Luca Bonaddio (hardware).**
- **Company SPM S.p.A. in Brissago Valtravaglia.**
- **Company tutor Fabio Frusciello and the members from the process department.**
- **SM2CARE company in Luino, contributed to the creation of the software.**

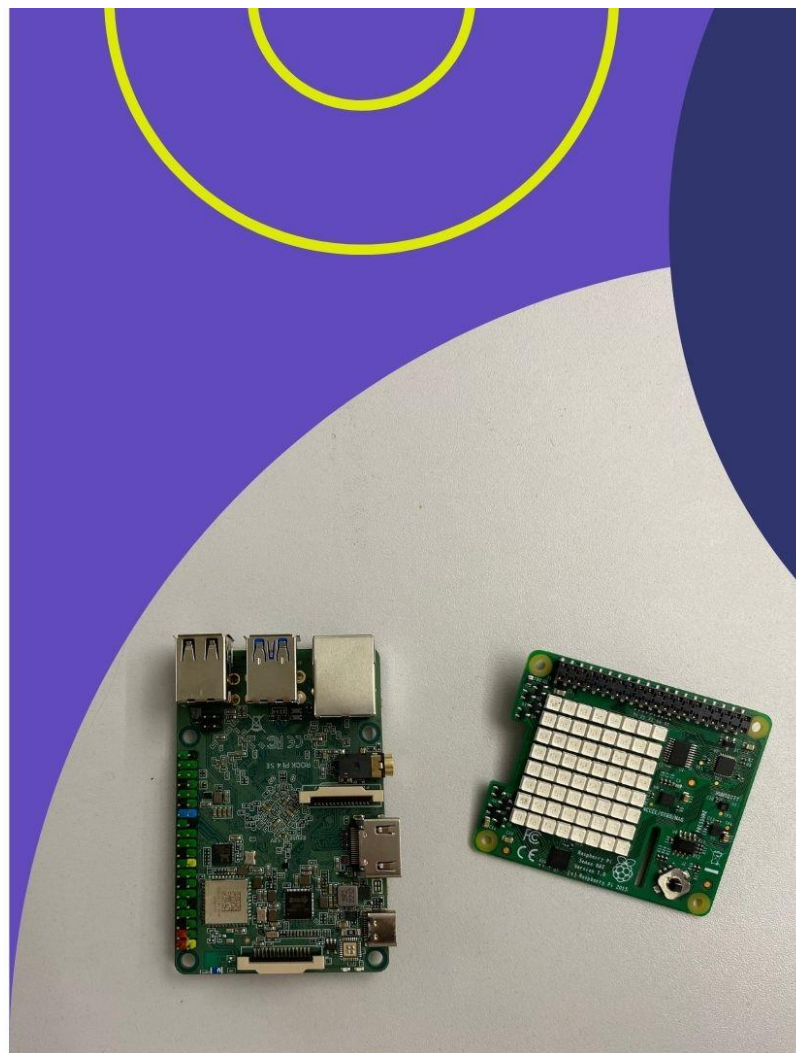


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# Projects

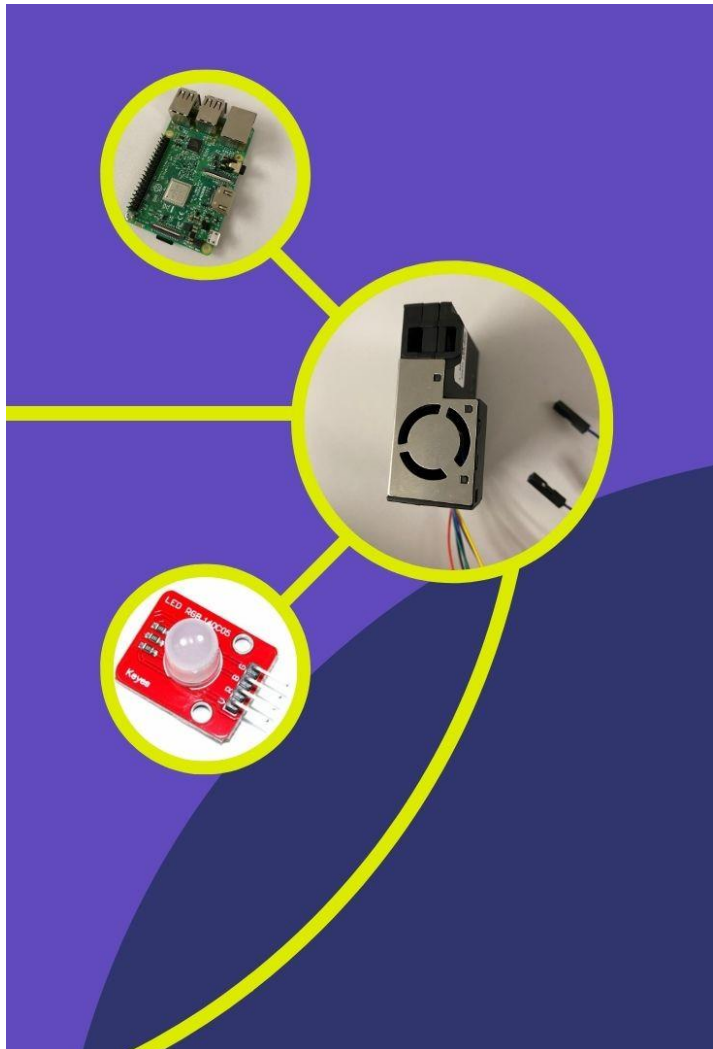


- **First project: control of environmental parameters (temperature, humidity, and particulate matter, PM 1.0, PM2.5, PM4.0, and PM10) and detection of vibrations from machines.**
- **Second project: control of the building automation, with Raspberry Pi configured with a relay card and with a PLC.**



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## Environmental data collection

- **Raspberry Pi 3 B, a Sensirion SEN55, and a LED.** The Sensirion SEN55 detects the percentage of humidity and the environmental temperature, it also measures the size of the particulate present in the environment with a laser sensor.
- **Design of a case, to protect the device and to make it work at its best.**
- **Find the ideal position for the device to analyse the best condition of the environment.**



# Vibration detector

- Raspberry Pi 3 B and a Sense HAT, it measures temperature, humidity and the vibrations made by the machine that is connected to it. The Sense HAT can detect vibrations through the accelerometer.  
Goal: to predict a problem if there is a change in the vibrations made by the machine.



**Software part:**  
The task of Di Bella and Curcio was to develop a software to measure and elaborate the vibrations coming from SPM's machinery.



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## Control of the building automation with PLC

For this part of the project, we used a Siemens S7-1212 DC/DC/DC PLC, with 8 digital inputs, 6 digital outputs and 2 analog inputs.

To configure the PLC, we created a DB (DataBlock), with all the available inputs and outputs and then we configured a function block. A standard OPC UA put/get protocol was used to remotely write and read directly on the DB.





## Control of the building automation with a relay board

- We used a Raspberry Pi board configured with one or more relay boards that can communicate with simpler devices than a PLC that need limited control, for which the PLC would be useless.
- Raspberries and Relays control switches and lights and activate/deactivate motors.
- The whole system was cabled and put into a protective box

