

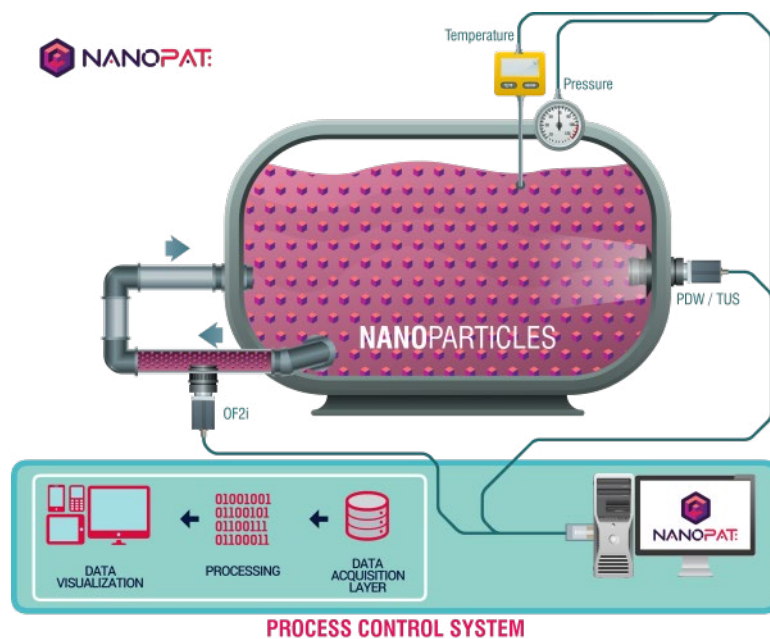
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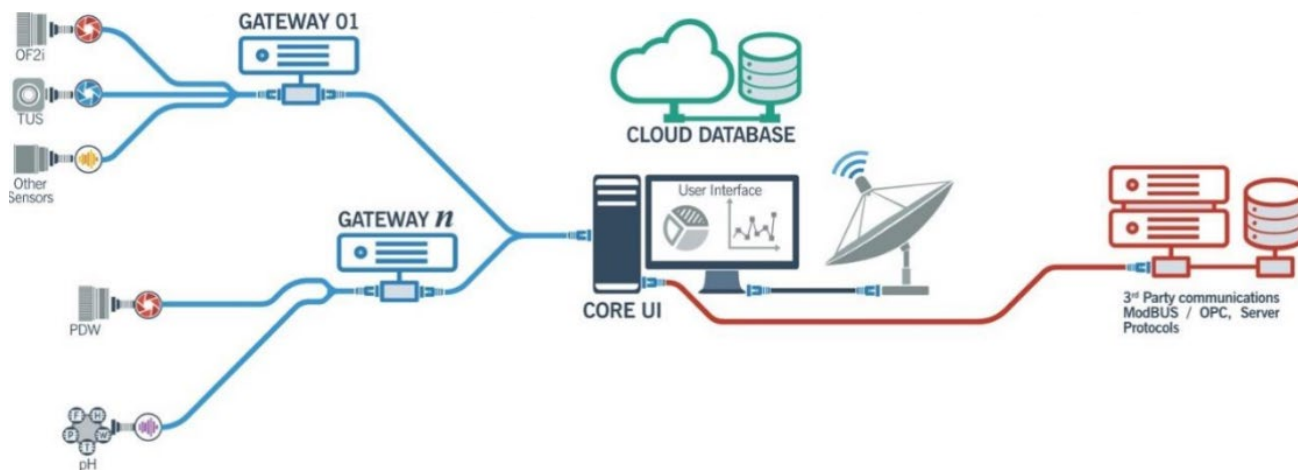


General information

The NanoPAT platform is a user-friendly software application for data gathering from different systems (e.g., sensors, analysers), data handling and data visualisation tailored to the needs of the end user (e.g., measurements on composition, particle size and local bulk properties of the (nano)materials in use). The versatile control platform is a data management system capable of dealing with complex sensors in industrial processes, for data acquisition of Process Analytical Technologies (PATs), data processing & mining. Additionally, it provides a friendly User Interface to visualise the analysis of the data provided by the connected systems, e.g. measurement of properties of process streams and products, accurately and in real-time, relevant for both PAT providers and customers



(industrial users). Furthermore, the included advanced models provide high added value predicting the suitable process parameters adjustments to process/convert target nanoparticles.

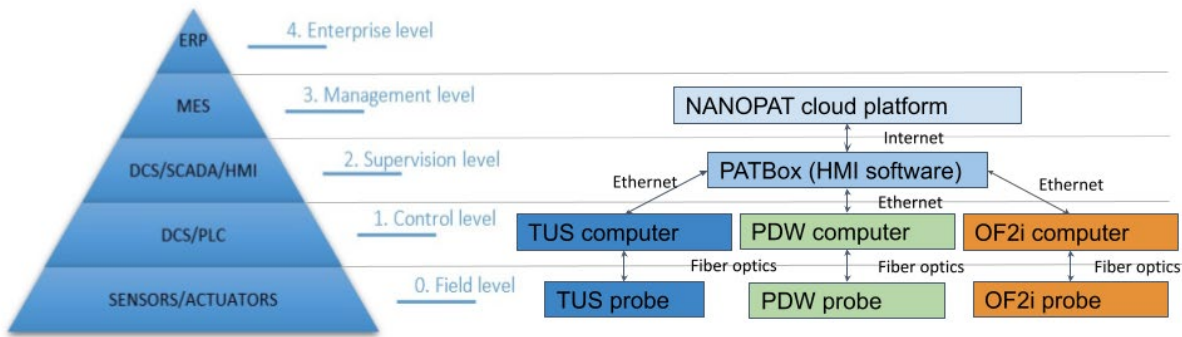


Structure

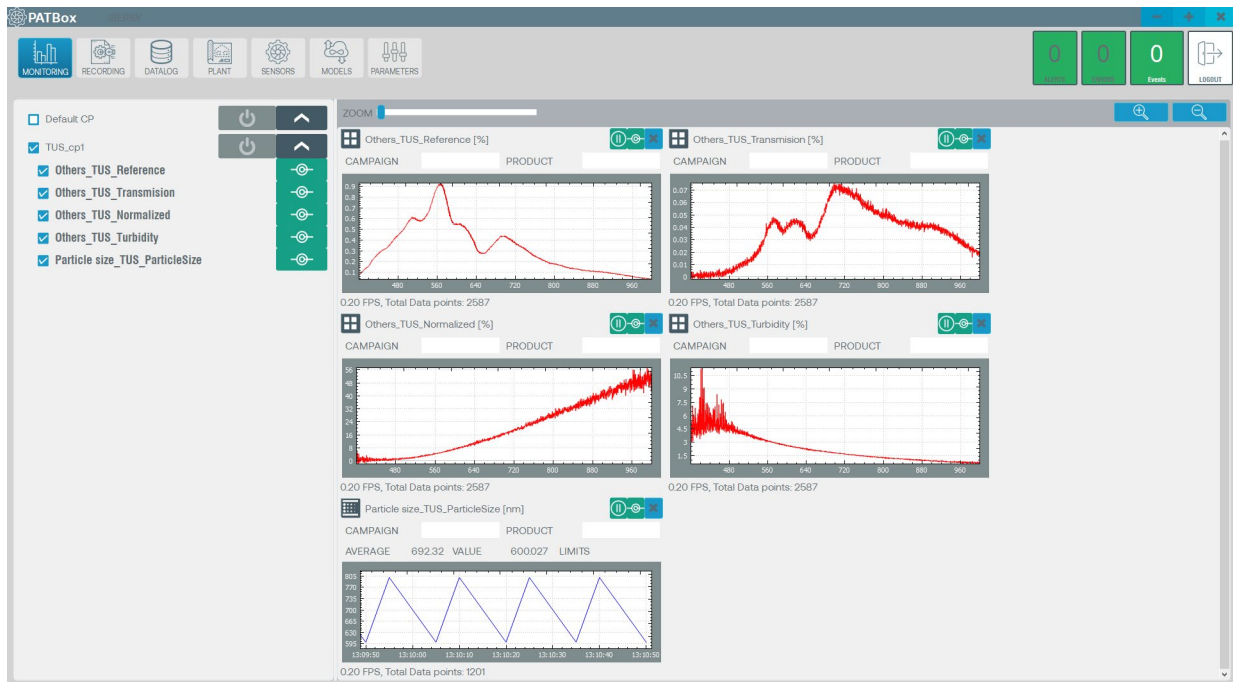
The PAT platform mainly encompasses two infrastructures. On one hand, PATBox software orchestrates the edge computing infrastructure for real-time assessment of monitoring signals and application of PAT models. PATBox software provides interconnection with the three monitoring technologies developed in the project and also has the capabilities to interconnect with industrial common protocols like modbusTCP. It provides visualisation dashboards and interfaces oriented to guide users into the evaluation of data.

On the other hand there is the cloud based infrastructure, this one hosts and centralises the data sent by PATBox from different locations. The cloud platform is a multi-user platform. That means that it is designed to allow multiple

users to access it simultaneously. The cloud platform also includes the Decision Support System which is based on an expert system, with the objective of being manipulated by materials experts or by introducing data from empirical tests. When information is entered, a limited Digital Twin based on a series of precalculated scenarios offers the expert users the opportunity to have an initial mixing assessment for each of the industrial applications already included in the Decision Support System. This mixing assessment aims to optimise the Nano Surveillance systems and instrumentation of the production processes, in order to establish a guarantee in the representation of the measurements.

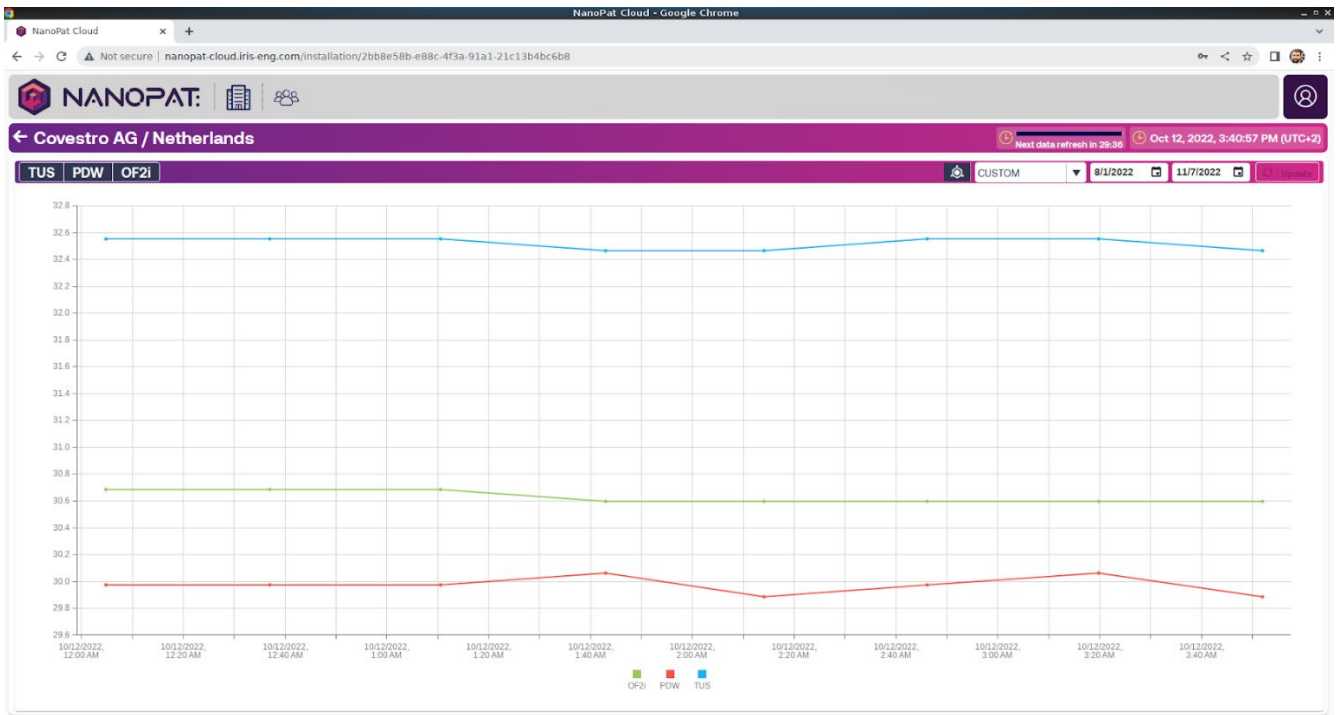


Overall PAT platform

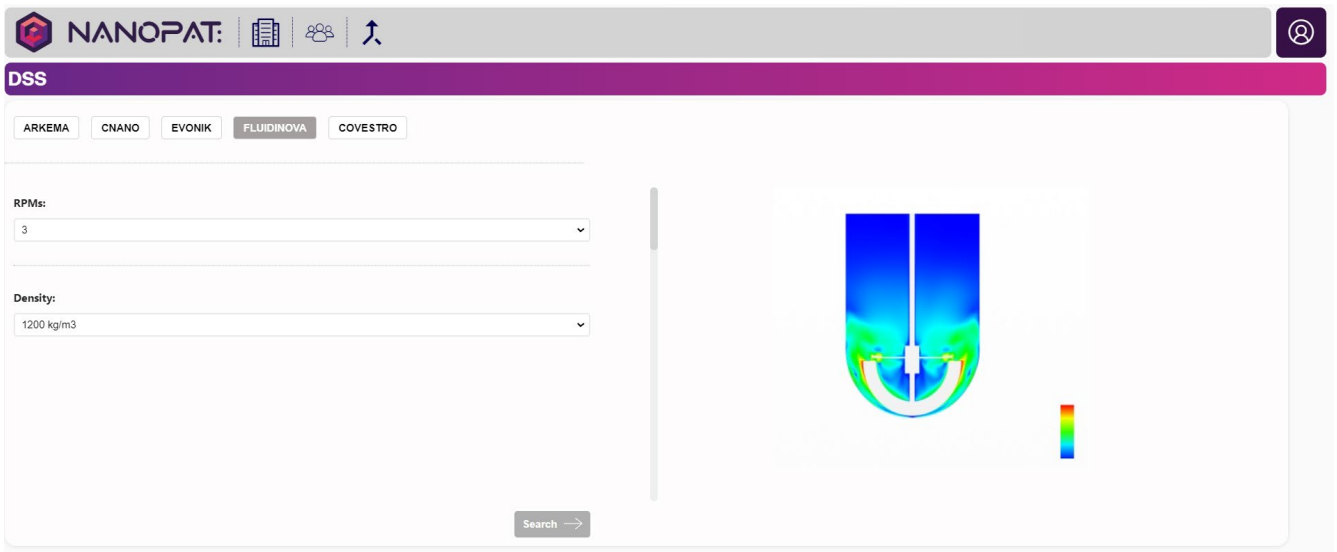


Edge computing infrastructure PATBox software





Cloud infrastructure, data gathering and representation



Cloud infrastructure, Decision Support System



This project has received funding from the Horizon 2020 Framework Programme of the European Union under grant agreement n° 862583.

Benefits

- 1 user friendly tool for data gathering, analysis and visualisation of different PAT technologies at the same time, in parallel
- Reduction of unnecessary retraining and calibration of machine learning models
- Use of machine learning approaches for the manipulation of large data amounts
- Cost reduction by slight deviations from the optimum process, thanks to the self-learning and predictive capabilities

Applications

- In NanoPAT, it is validated for polymers, silica, hydroxyapatite, zeolites and ceramics
- Other applications: Pharma, metals, ceramics, mining and chemical industries, as well as organic photovoltaic materials production, plastic recycling, films processing, biorefinery, and fermentation processes, etc.

Technical Information

Technical Specs PATBox Software:

- **Functionality:**
 - Orchestrate edge computing infrastructure for real-time assessment of monitoring signals and application of PAT models
 - Connect with industrial common protocols like ModbusTCP
 - Provide visualisation dashboards and user interfaces for data evaluation
 - Cloud platform integration
- **Sensor Integration:**

Host various sensors including NIR sensors, granulometers, flow sensors (air and mass), and temperature sensors
- **Modelling Techniques:**

Support Partial Least Squares Regression (PLSR)
- **Data Processing:**

Integrate data from:

 - Raw and synthetic data from offline sources
 - Sensors
 - Production process parameters

Technical Specs Cloud-Based Infrastructure:

- **Multi-user platform:** Allows multiple users to access simultaneously
- **Data storage:** Centralizes data sent by PATBox from different locations
- **Decision Support System (DSS):**
 - Based on an expert system, allowing manipulation by materials experts or data input from empirical tests
 - Offers an initial mixing assessment for included industrial applications through a limited Digital Twin based on pre-calculated scenarios
 - Optimizes Nano Surveillance systems and instrumentation of production processes for measurement accuracy

