CERN openlab

SIEMENS

Data Analytics and IoT for Industrial Control Systems

Filip Široký

22 / 01 / 2020

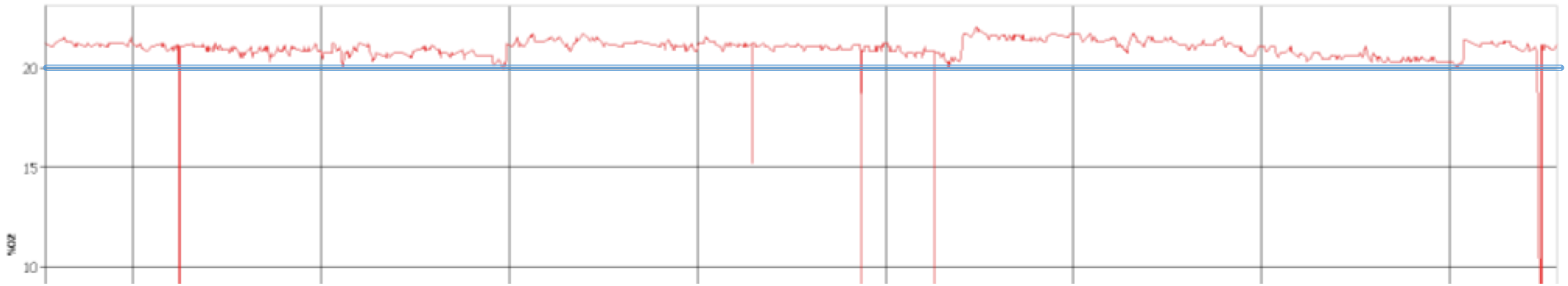
Outlook

- Retrospective:
  - ELVis – a web-based platform for handling multiple streams of data from sensors
  - Tighter integration between ELVis and Smart IIoT technologies

- Using distributed complex event processing for oxygen level monitoring
- Other projects:
  - Linac3 ion source optimization with machine learning
  - Room occupancy detection via IoT infrared sensors

Oxygen level monitoring in the LHC tunnel

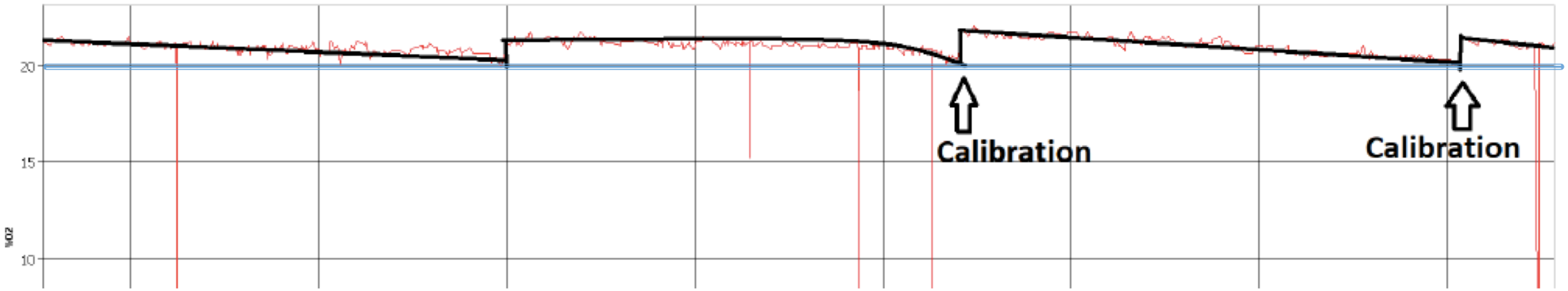
- 320 oxygen sensors are spread across LHC tunnel
- Periodically sensors get clogged
- We want to avoid false alarms



Alarm threshold

Oxygen level monitoring in the LHC tunnel

- 320 oxygen sensors are spread across LHC tunnel
- Periodically sensors get clogged
- We want to avoid false alarms



Alarm threshold

Signal Event Processing Toolbox

Infer information from events about system states and fail modes

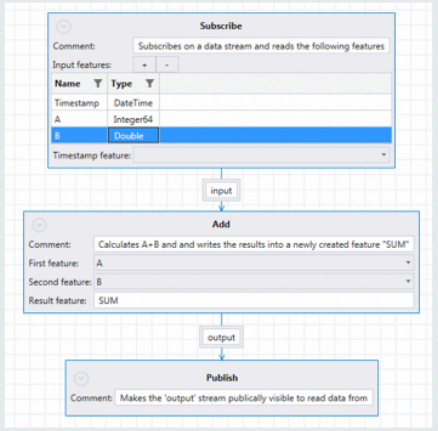
Calculate failure / degradation **indicators**

Intuitive for engineers and programmers

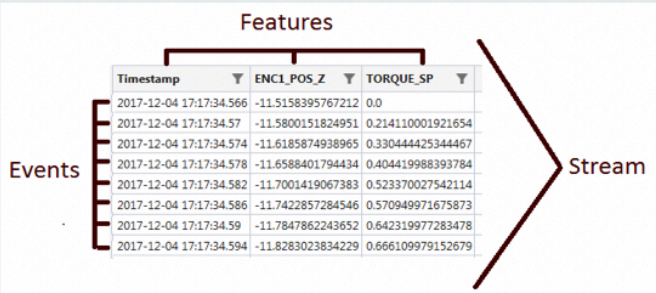
The **same model** for stream and batch processing

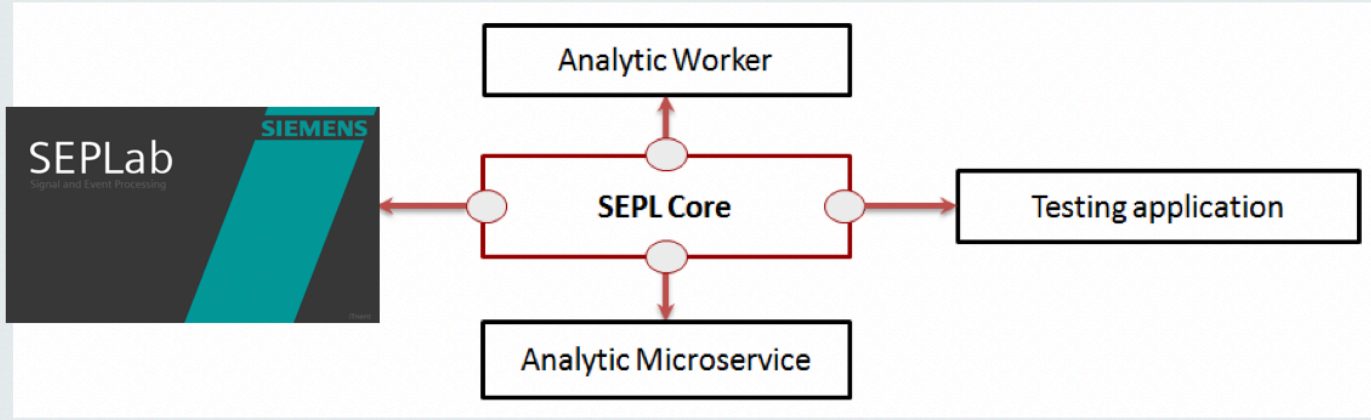
Extendable and reusable

Deployable on all device ranges

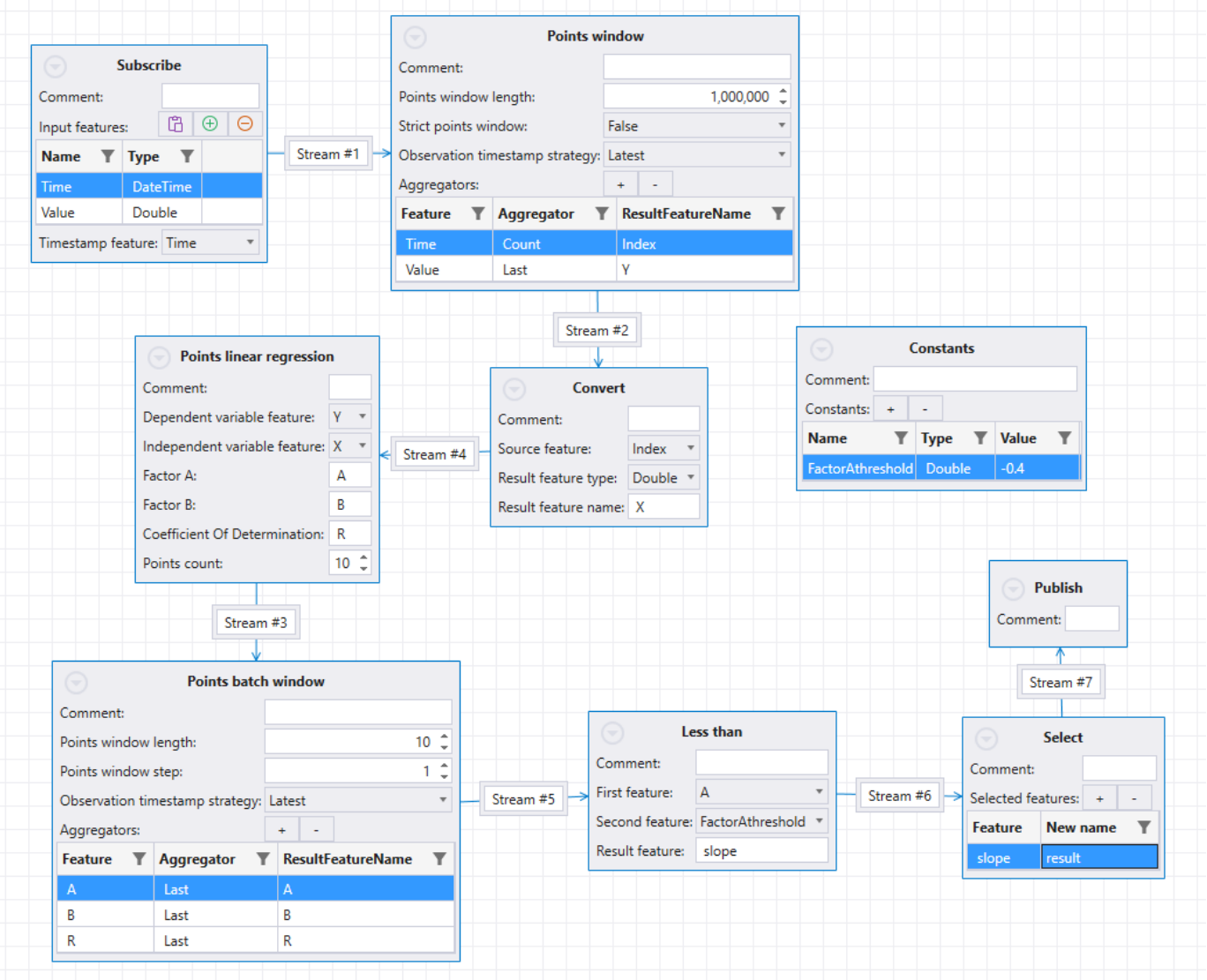


Graph processing





Signal Event Processing Lab

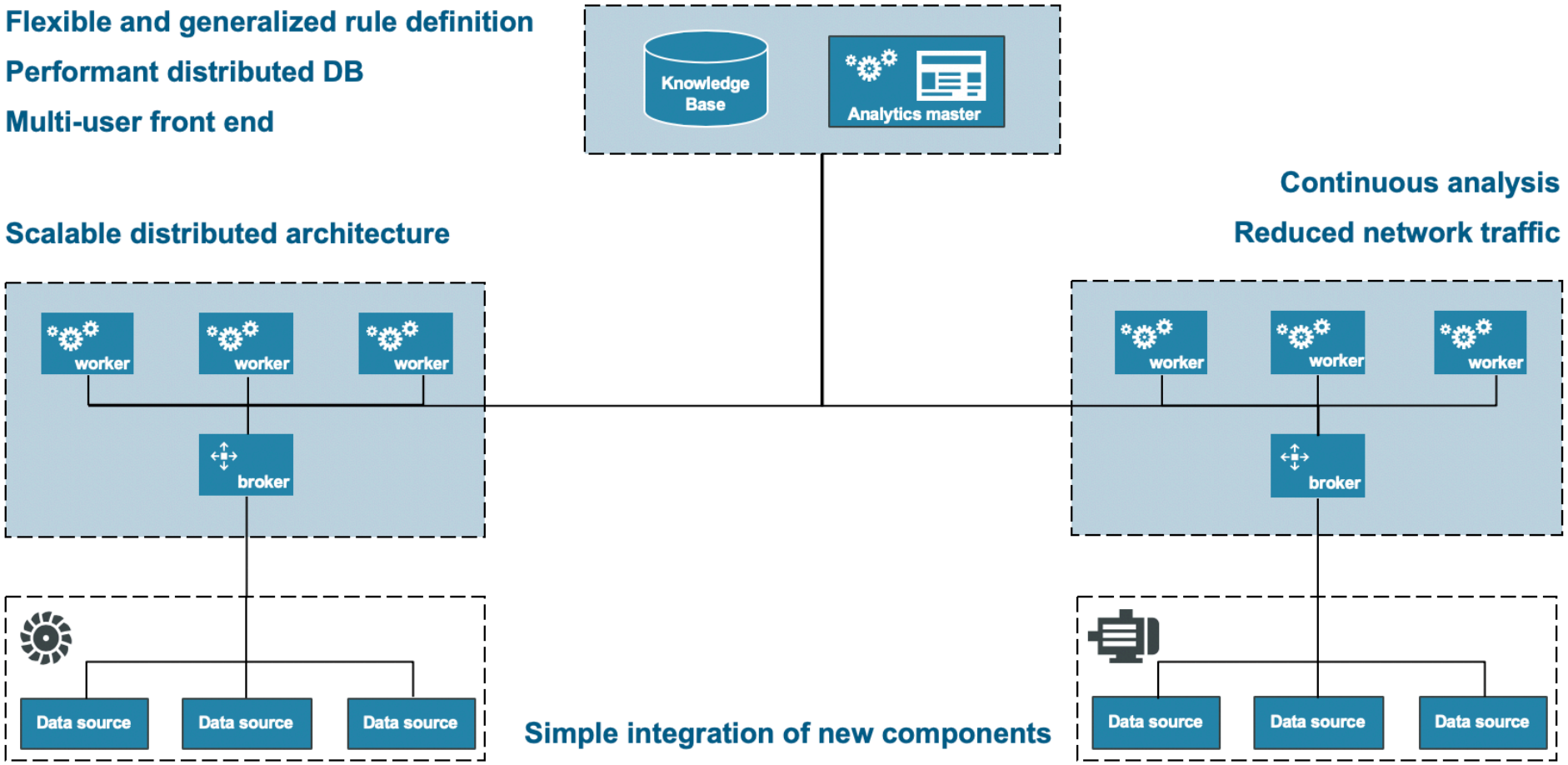


Distributed Complex Event Processing (DCEP)

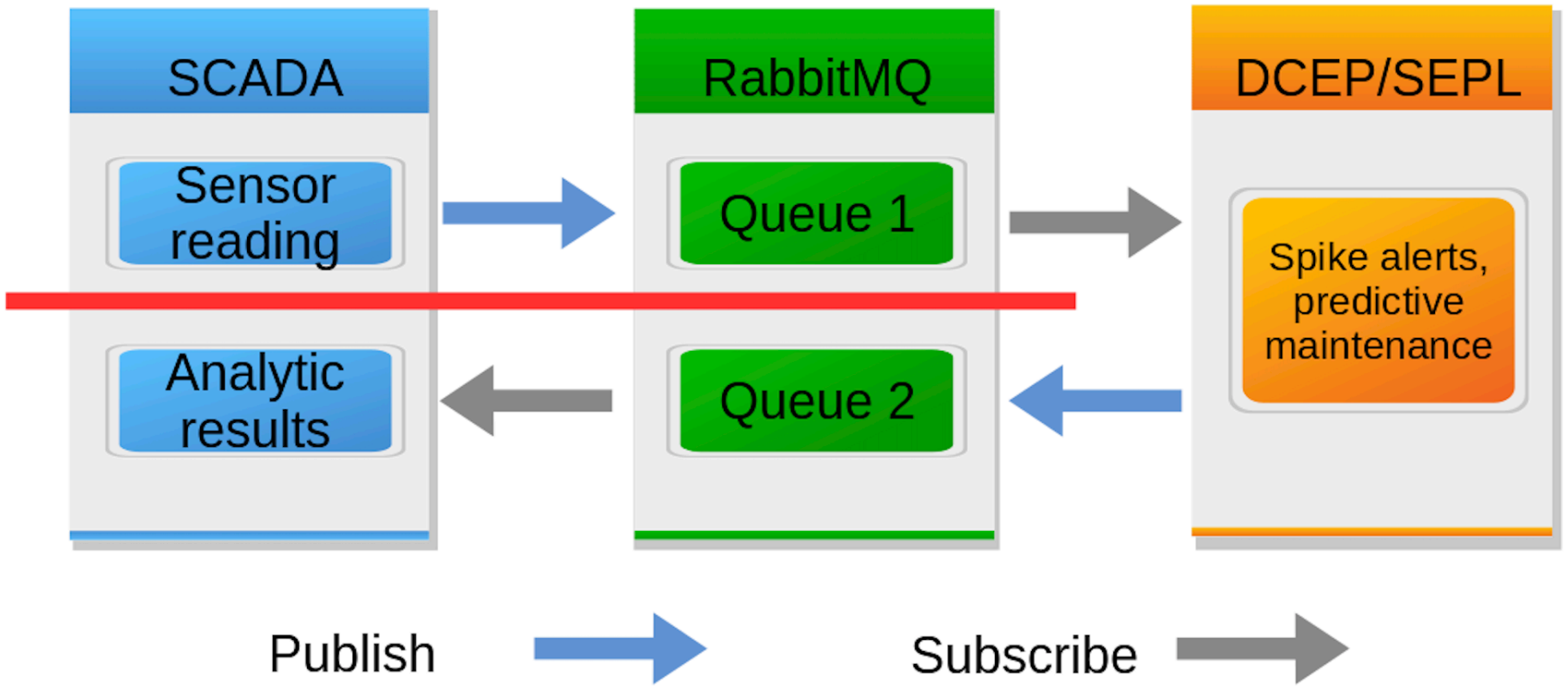
Flexible and generalized rule definition

Performant distributed DB

Multi-user front end



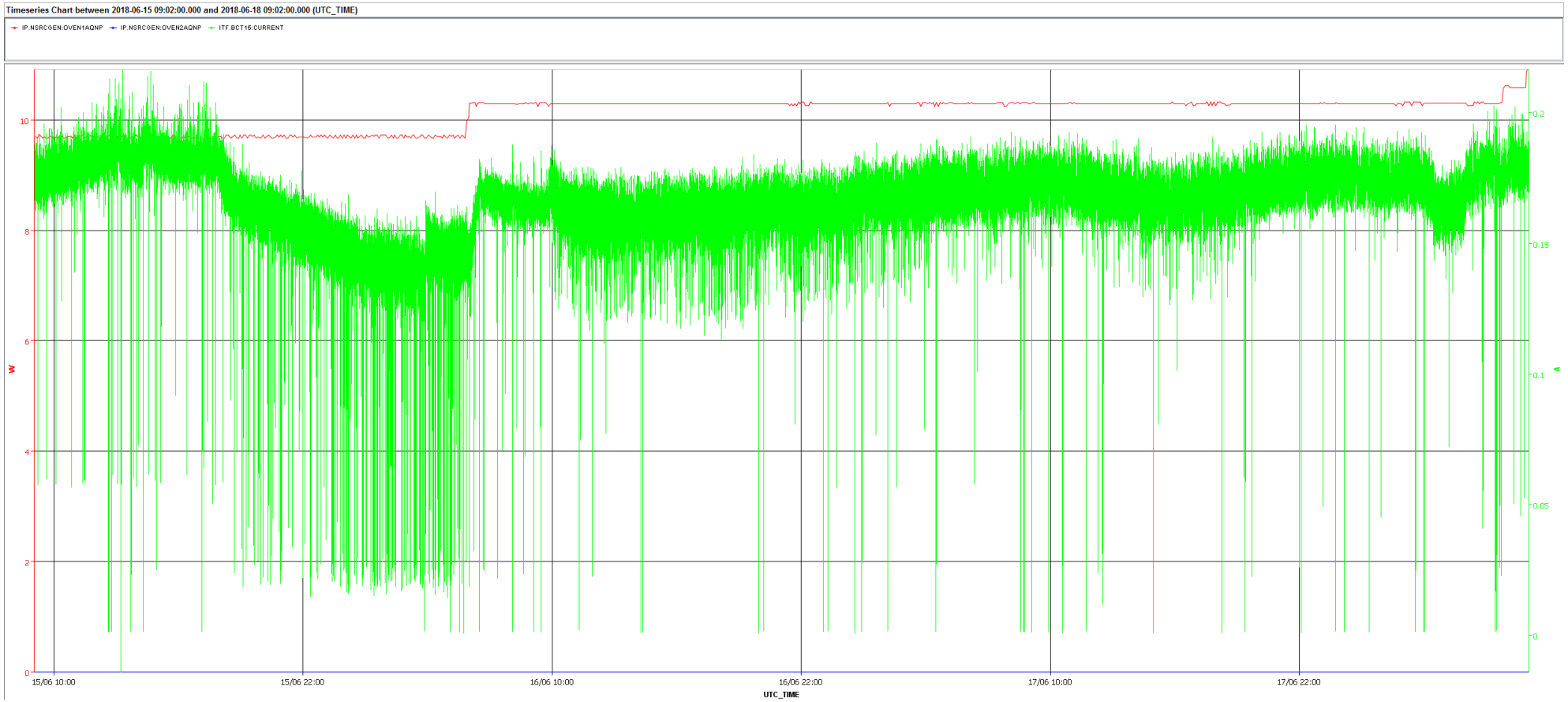
Distributed data analytics workflow for ODH



Other projects

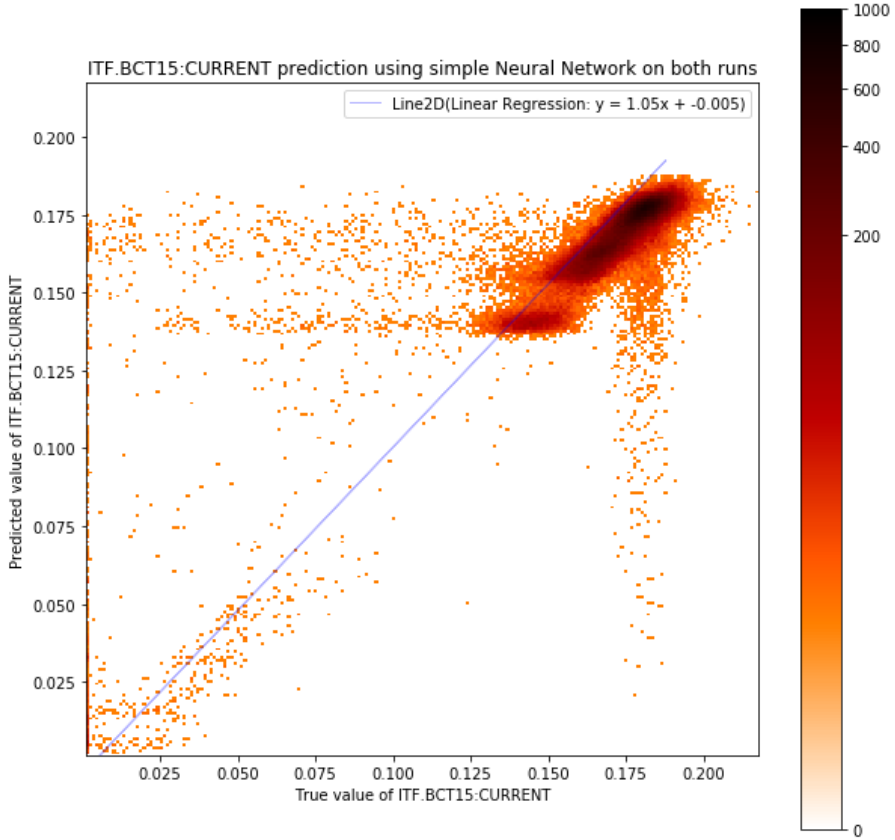
- Linac3 ion source optimization with machine learning
- Room occupancy detection via IoT infrared sensors

Linac3 ion source optimization with machine learning

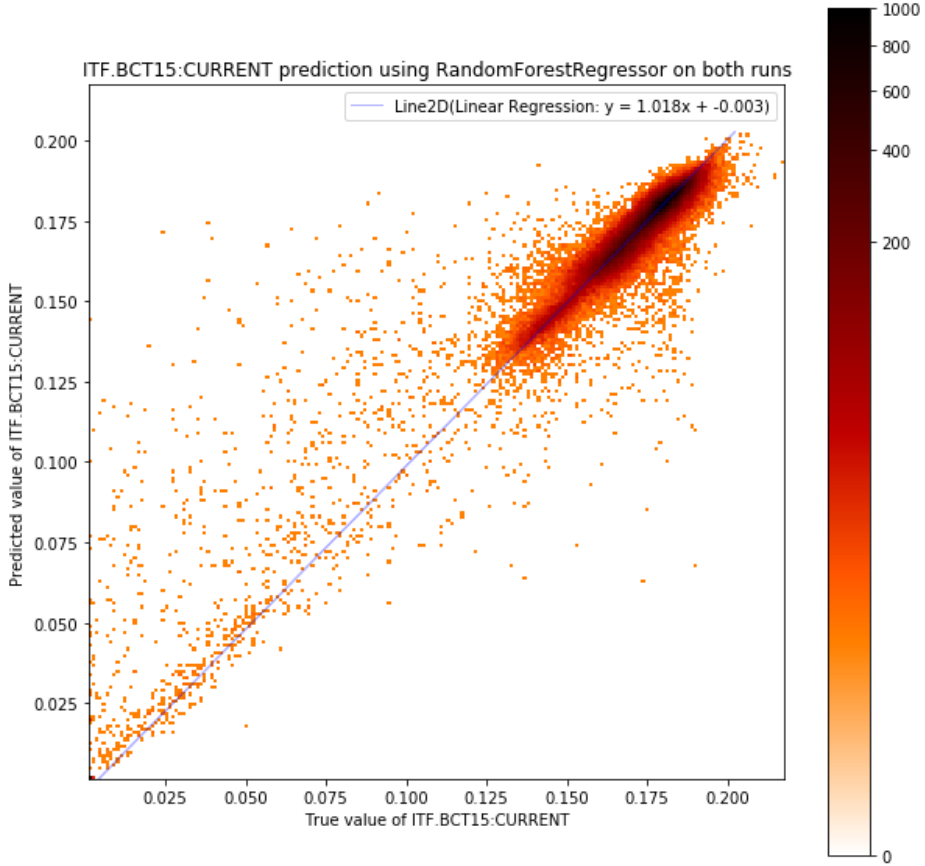


Linac3 ion source optimization with machine learning

Pearson correlation squared: 0.69
MSE of NN: 0.000139



Pearson correlation squared: 0.92
MSE of NN: 3.2e-05



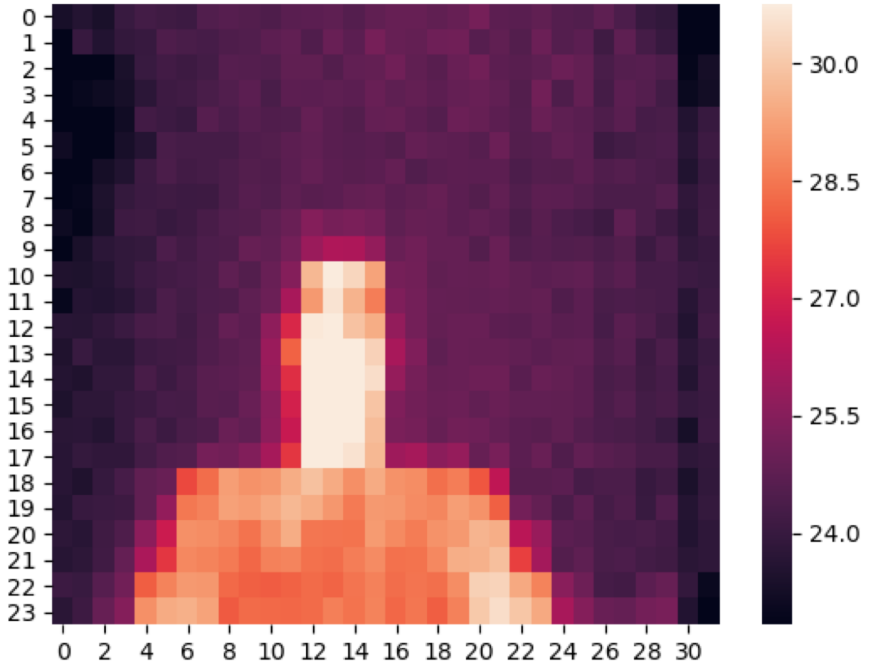
MindDoT – Siemens IoT sensors

The MindDoT sensors can provide:

- infrared image
- temperature
- relative humidity
- atmospheric pressure

Used for room occupancy detection.

To be integrated with room booking system.



Conclusions

- Pilot deployment of Siemens technologies to real-life problems at CERN by end of Q1 2020
- Ongoing R&D on Linac3 ion source optimization
- Preparations for the deployment of Siemens IoT sensors in selected meeting rooms

The end

Thank you for your attention!