INFN-LNS Control System

MIDDLE TIER
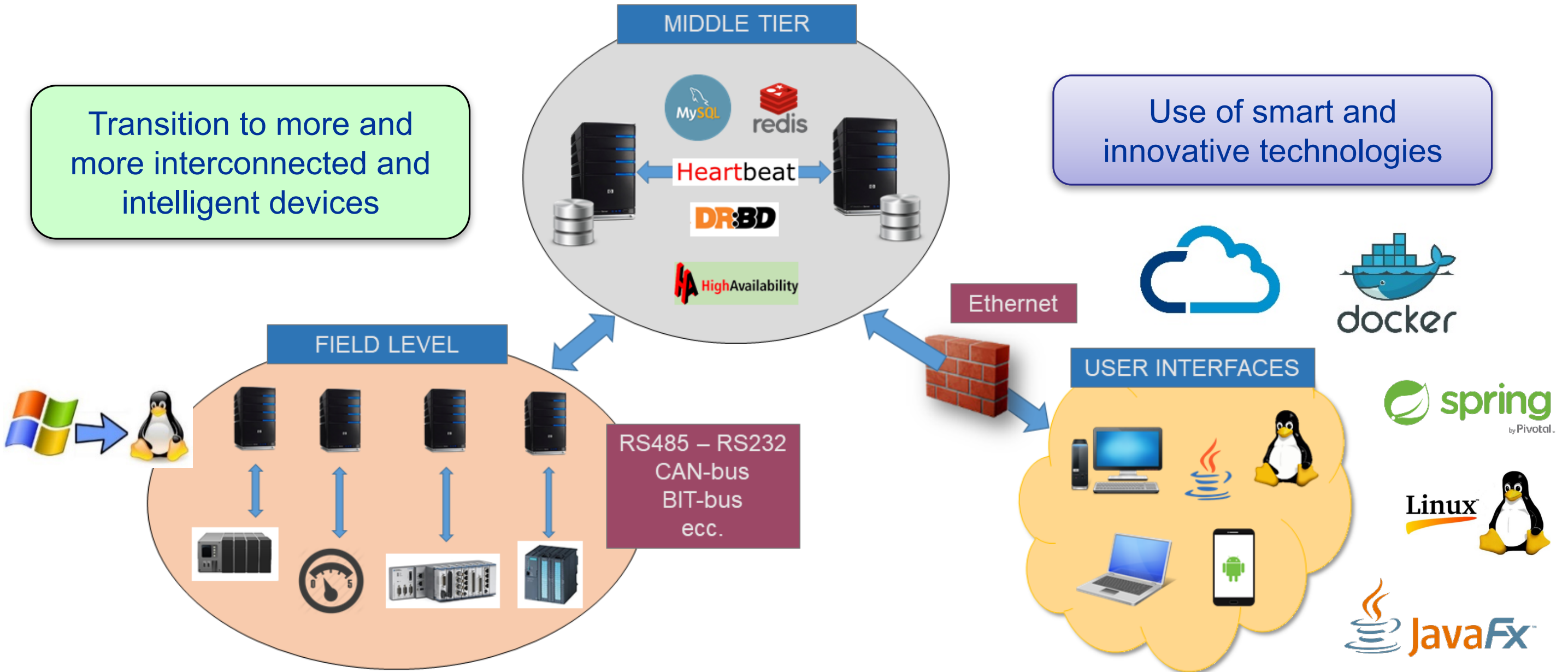
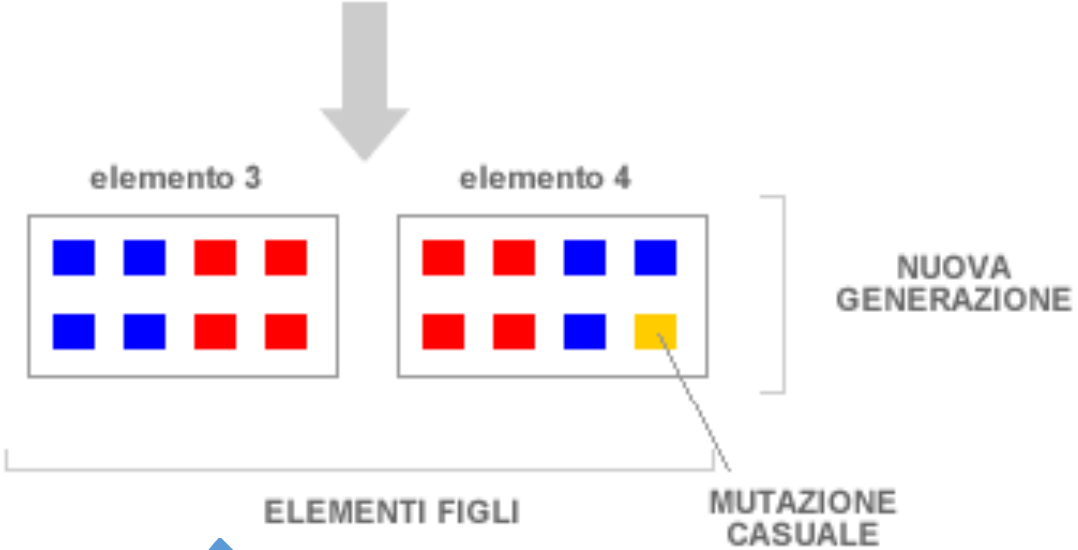Transition to more and more interconnected and intelligent devices

Use of smart and innovative technologies

Ethernet

FIELD LEVEL

USER INTERFACES

RS485 – RS232
CAN-bus
BIT-bus
ecc.

Automated Synoptic for Beam Transport

elemento 1 elemento 2 elemento 3

SELEZIONE NATURALE

ELEMENTO DEBOLE SCARTATO

elemento 3 elemento 4

NUOVA GENERAZIONE

ELEMENTI FIGLI MUTAZIONE CASUALE

Genetic algorithms

Automated beam tuning with Artificial Intelligence

Beam diagnostics and Machine Learning
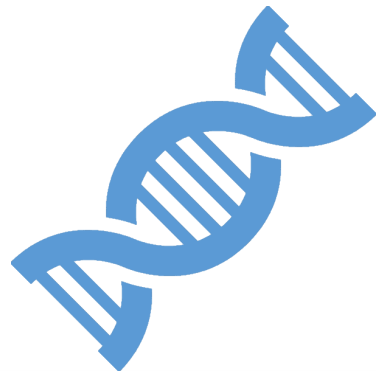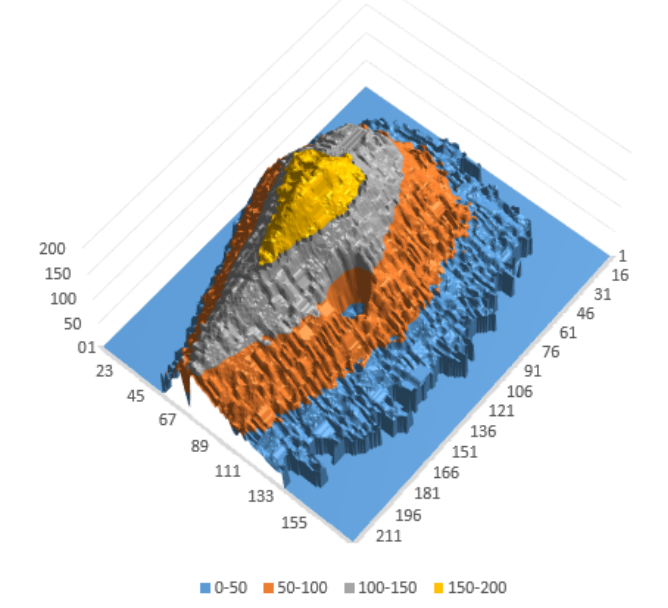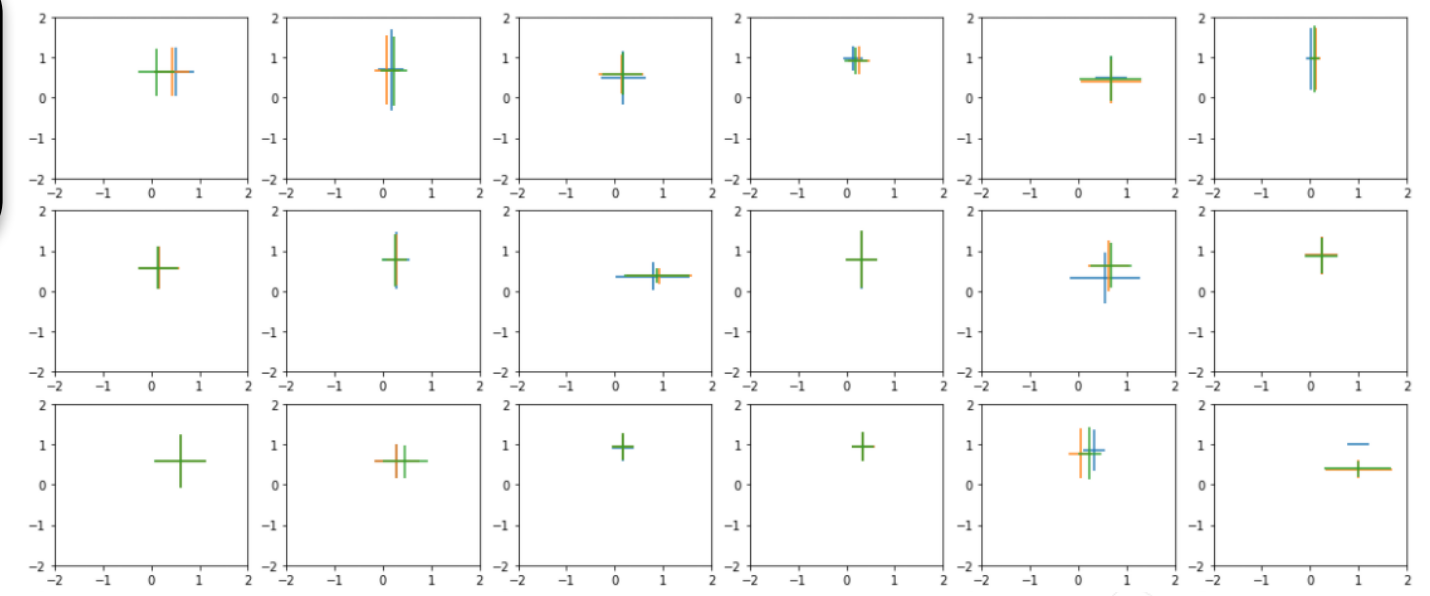
Analysis and storage in the database of the contour of the particle beam and automatic calculation of beam parameters using deep learning

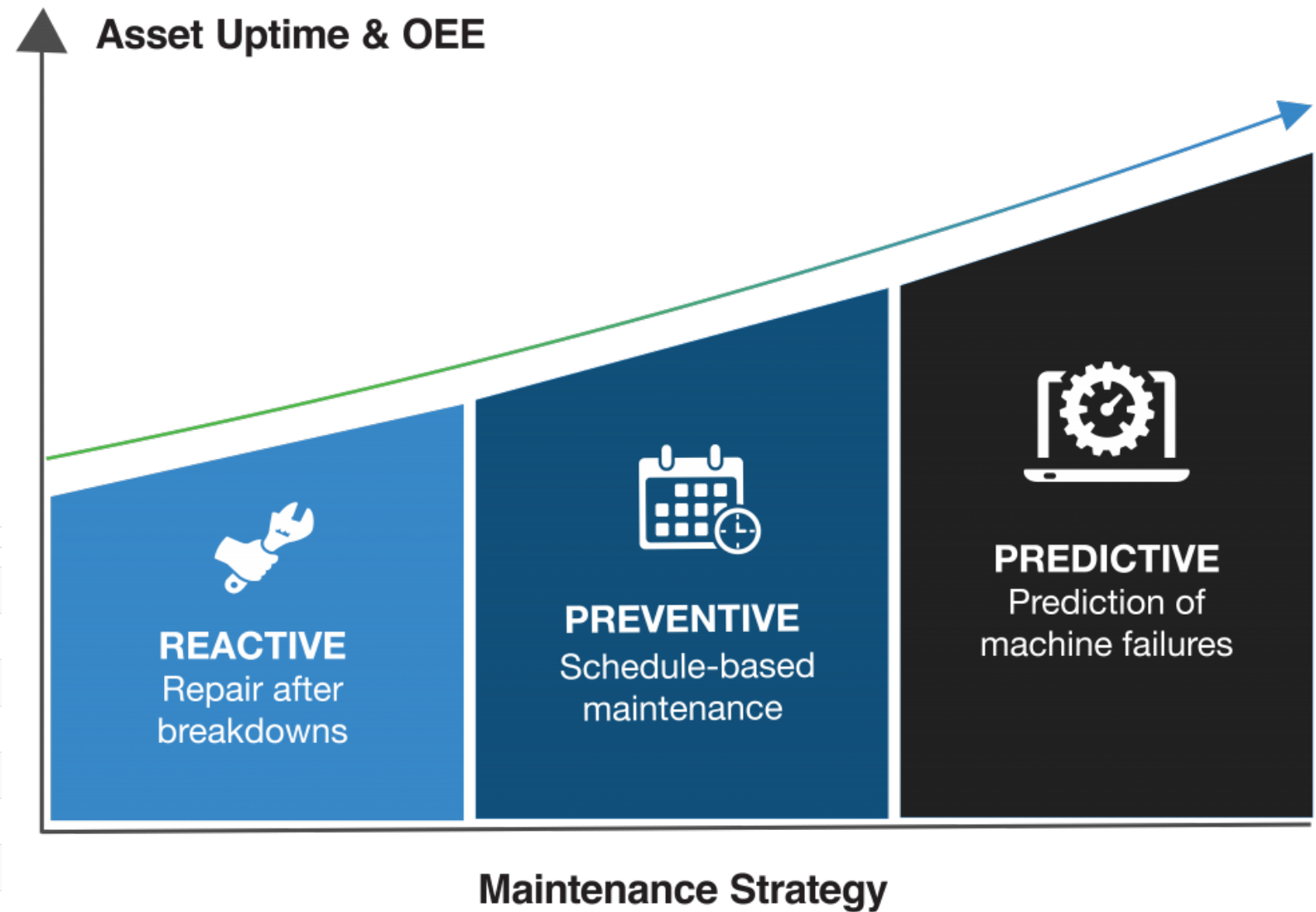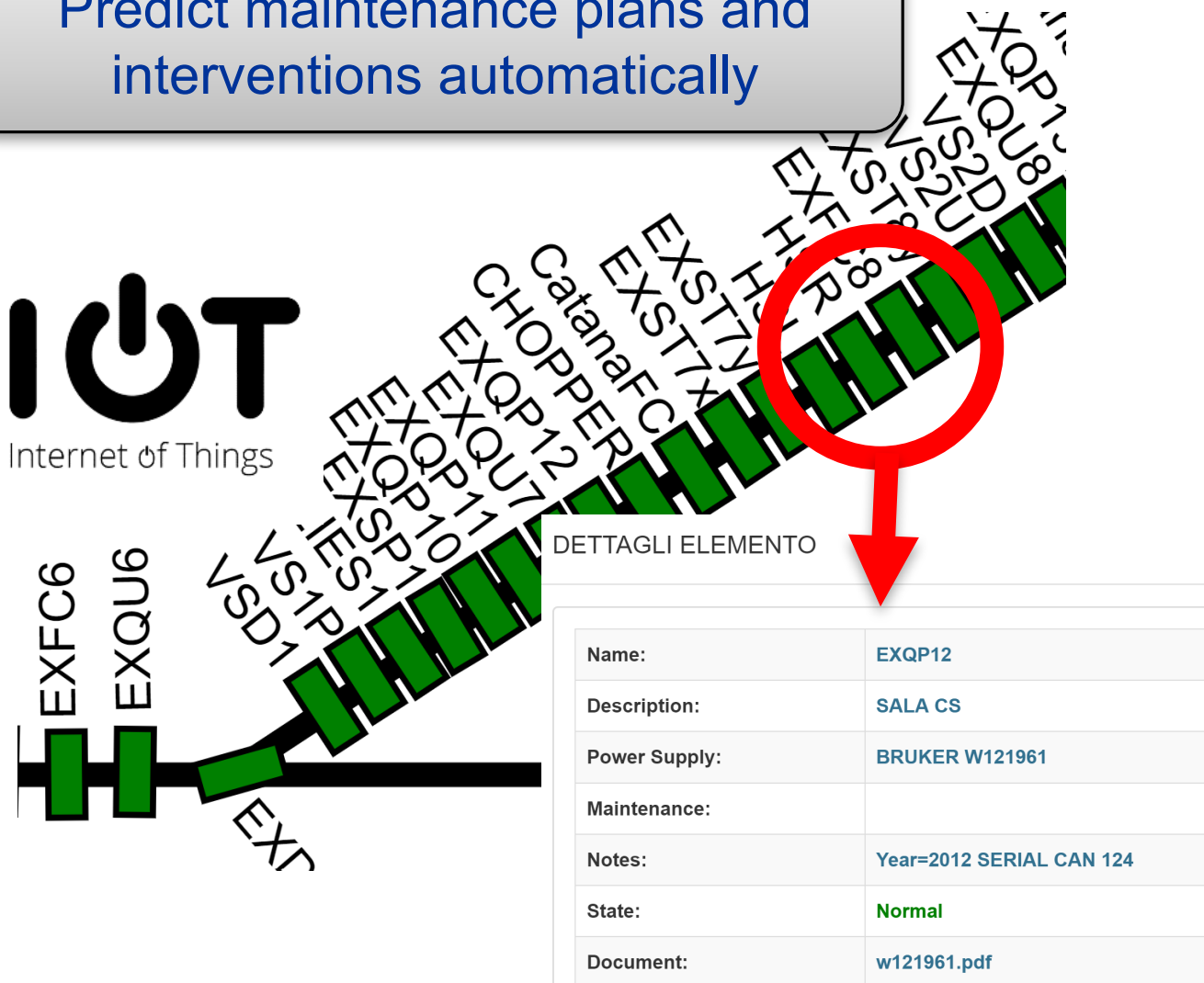$$\sigma = \sqrt{\frac{\sum\limits_{i=1}^{n} (X_i - \overline{X})^2}{n}}$$

Predictive Maintenance

General information on the elements and indication of their status

Predict maintenance plans and interventions automatically

DETTAGLI ELEMENTO

Name:	EXQP12
Description:	SALA CS
Power Supply:	BRUKER W121961
Maintenance:	
Notes:	Year=2012 SERIAL CAN 124
State:	Normal
Document:	w121961.pdf

Asset Uptime & OEE

REACTIVE
Repair after breakdowns

PREVENTIVE
Schedule-based maintenance

PREDICTIVE
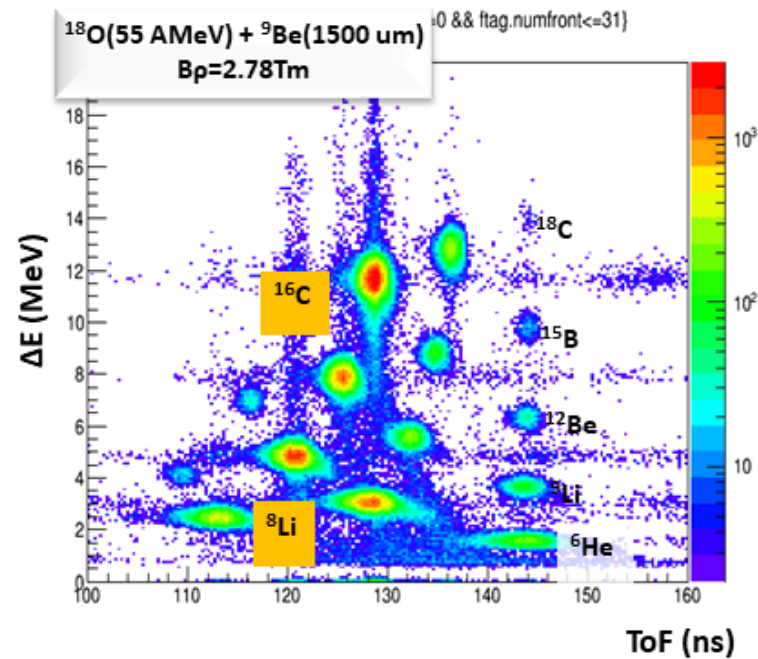Prediction of machine failures

Maintenance Strategy

Optimize transport of fragmentation beams by AI

present FRIBS@LNS

Diagnostics:
✓ MCP-DSSSD: check yield, composition (ΔE-ToF), 2D profile at **final user point** :
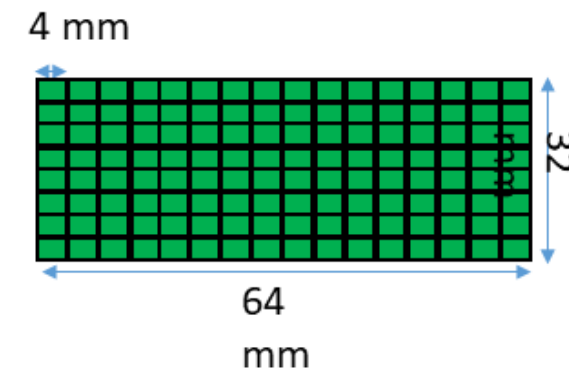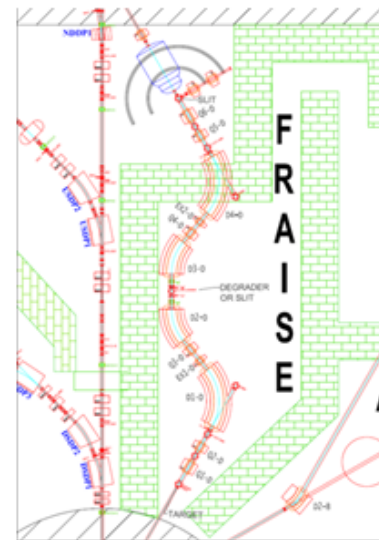

Optimization performed by hand selecting the isotope of interest and looking at yield variation during manual beam tuning operations

FUTURE FRAISE@LNS

Diagnostics:
✓ SIC-SIC: check yield, composition (ΔE-ToF), 2D profile
:

Optimization performed by pattern recogniction - selecting the isotope of interest and looking at yield variation with beam tuning operation performed with the help of machine learning and AI operation

Graphic pattern recognition for ion detection (see Development of fast and rad-hard sensors for Radioactive Ion Beams tagging and diagnostics by P.Russotto et al.)