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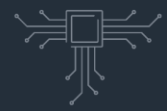
International Data Center

Solution Concept: Toward Predictive Maintenance

Hassan Al Sakka and Nipesh Dulal

20230922


Electronics

Helicopters

Aircraft

Cyber & Security

Space

Unmanned Systems

Aerostructures

OUTLINE

- IoT
- Example
- Monitoring and maintenance
- The concept
- Advantage

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OUTLINE

- **IoT**
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INTERNET OF THINGS: IOT

Interconnected ecosystem of physical devices, embedded with sensors and software.

Communicating and exchanging data seamlessly over networks .

Improve efficiency and add value.

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CURRENT REAL TIME EXAMPLE

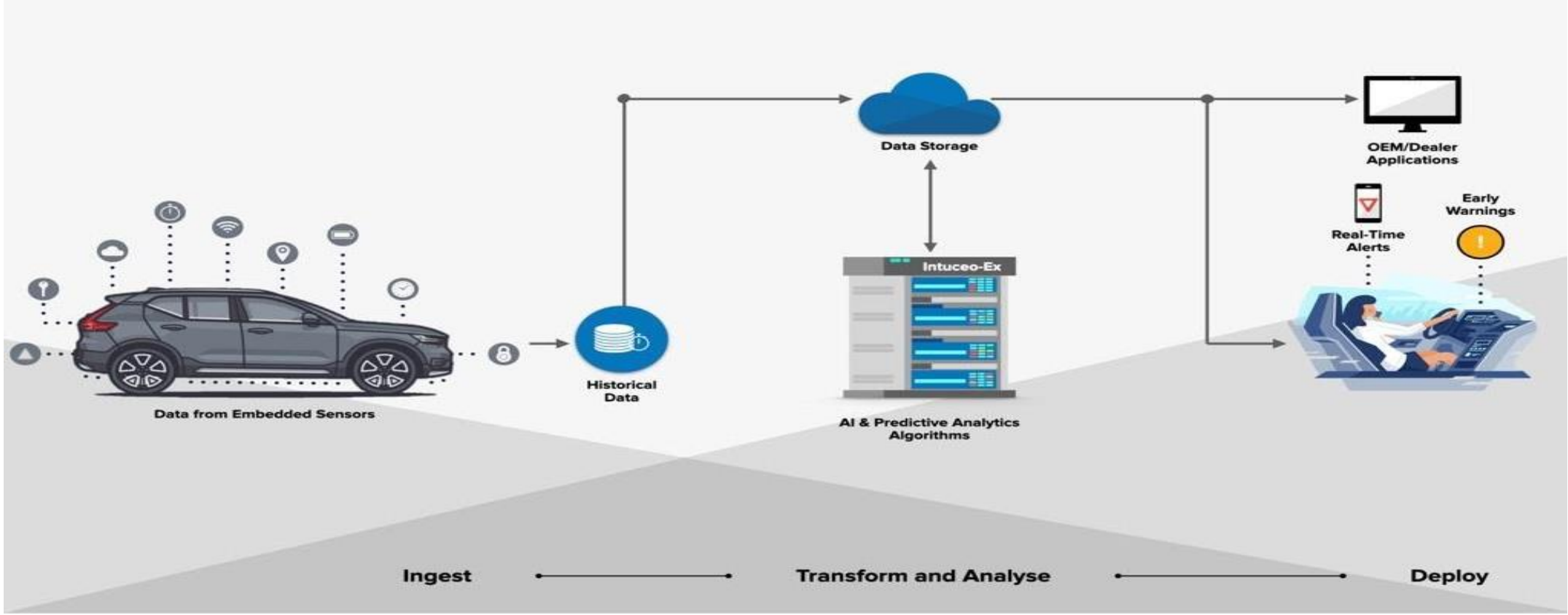

Image credit: Product design and development using Artificial Intelligence (AI) techniques: 10.31224/2958 ER

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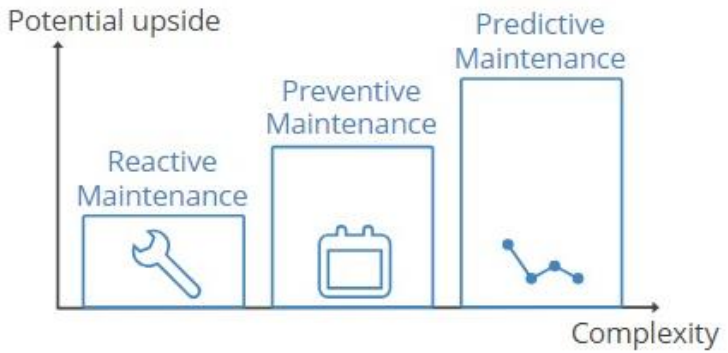
TYPES OF MAINTENANCE



- **Reactive Maintenance (hotline, helpdesk, remote check)**:

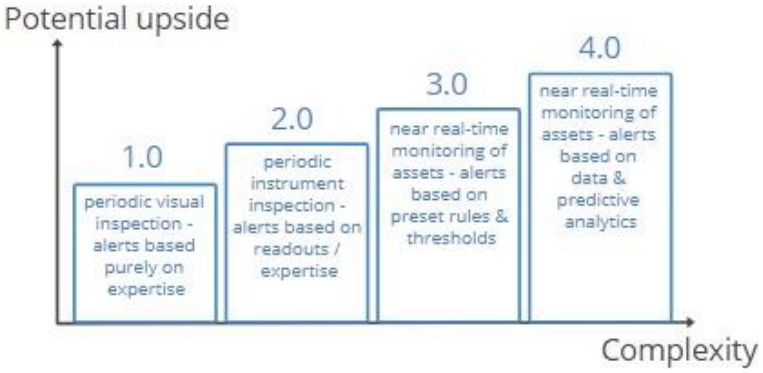
Address issues post-failure or open question.

Often involves on-site, immediate response

- **Preventive Maintenance**:

Regularly scheduled.

On-site checkups based on experience and expertise



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- **Predictive Maintenance 1.0 and 2.0:**

Utilizes set rules and thresholds for alerts.

Part of the RAVIS approach

- **Predictive Maintenance 3.0 and 4.0: DATACENTER**

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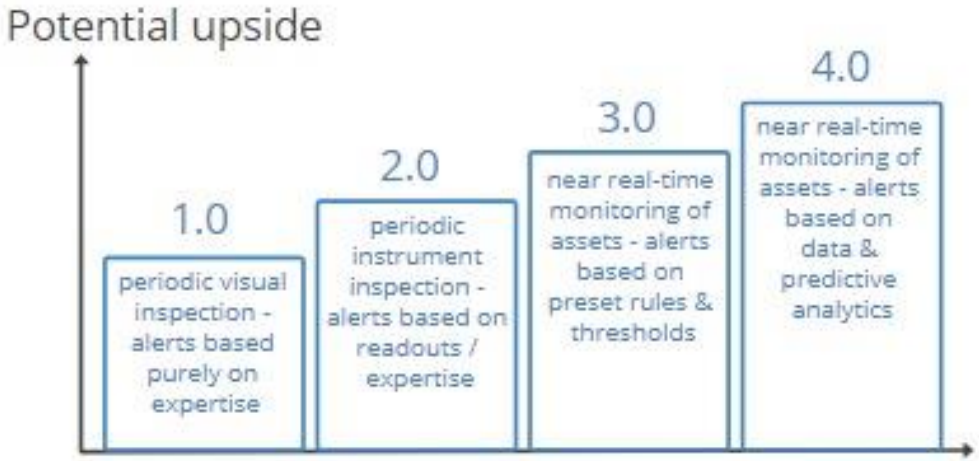
TYPES OF MAINTENANCE



Historical Data → Current Data → Analysis → Intelligent decisions

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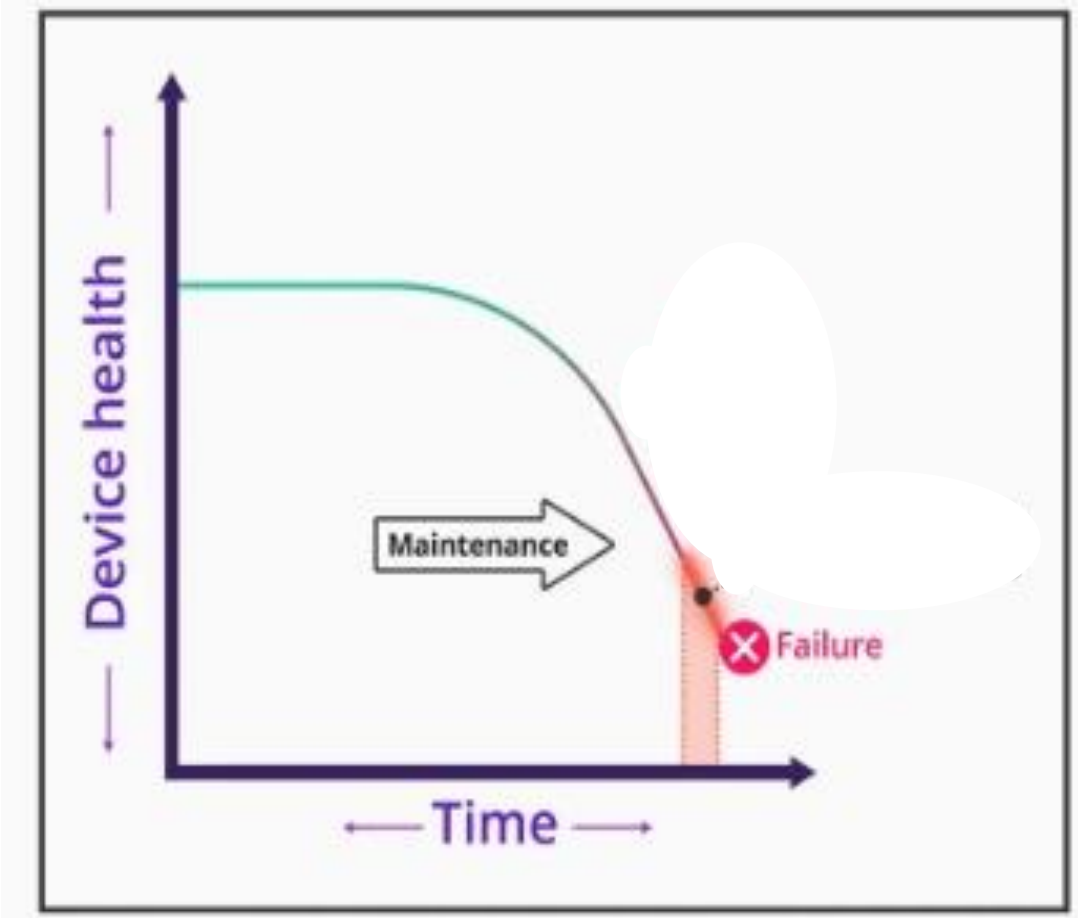
PREDICTIVE MAINTENANCE

Centralizing the data



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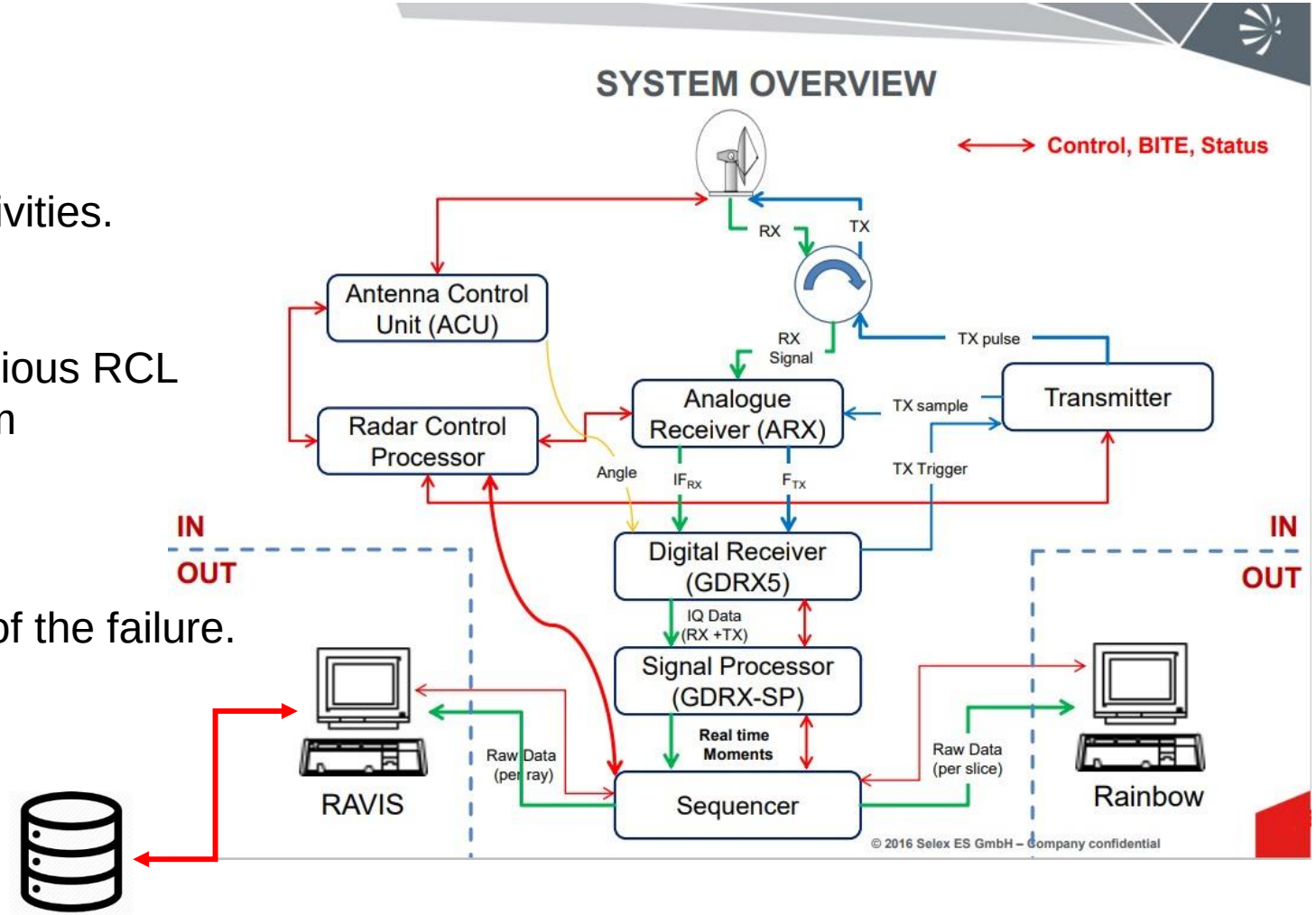
Back to Radars/Lidars

Features which already used in

- for Monitoring and Control activities.
- Supplies real-time data for various RCL states of different radar system subsystems.
- Identify the underlying cause of the failure.



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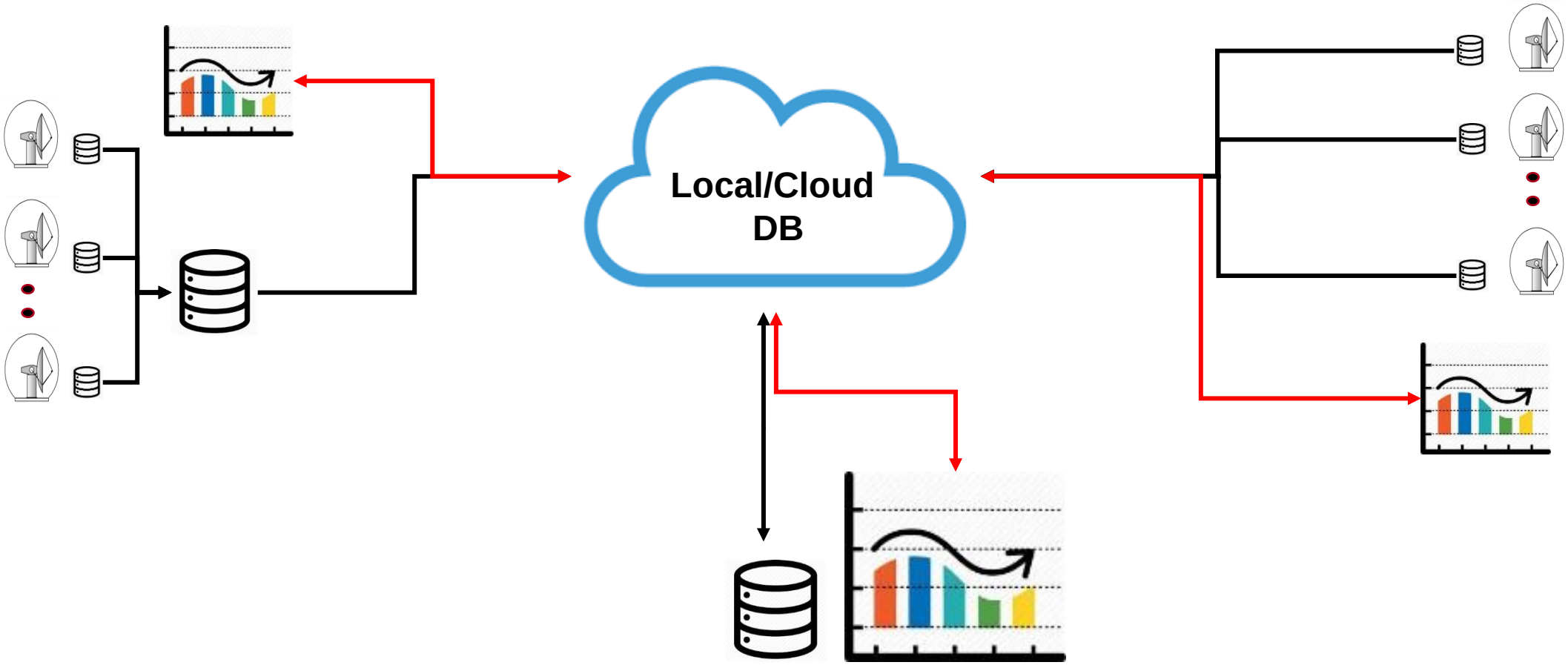
TO THE DATA

Data Center



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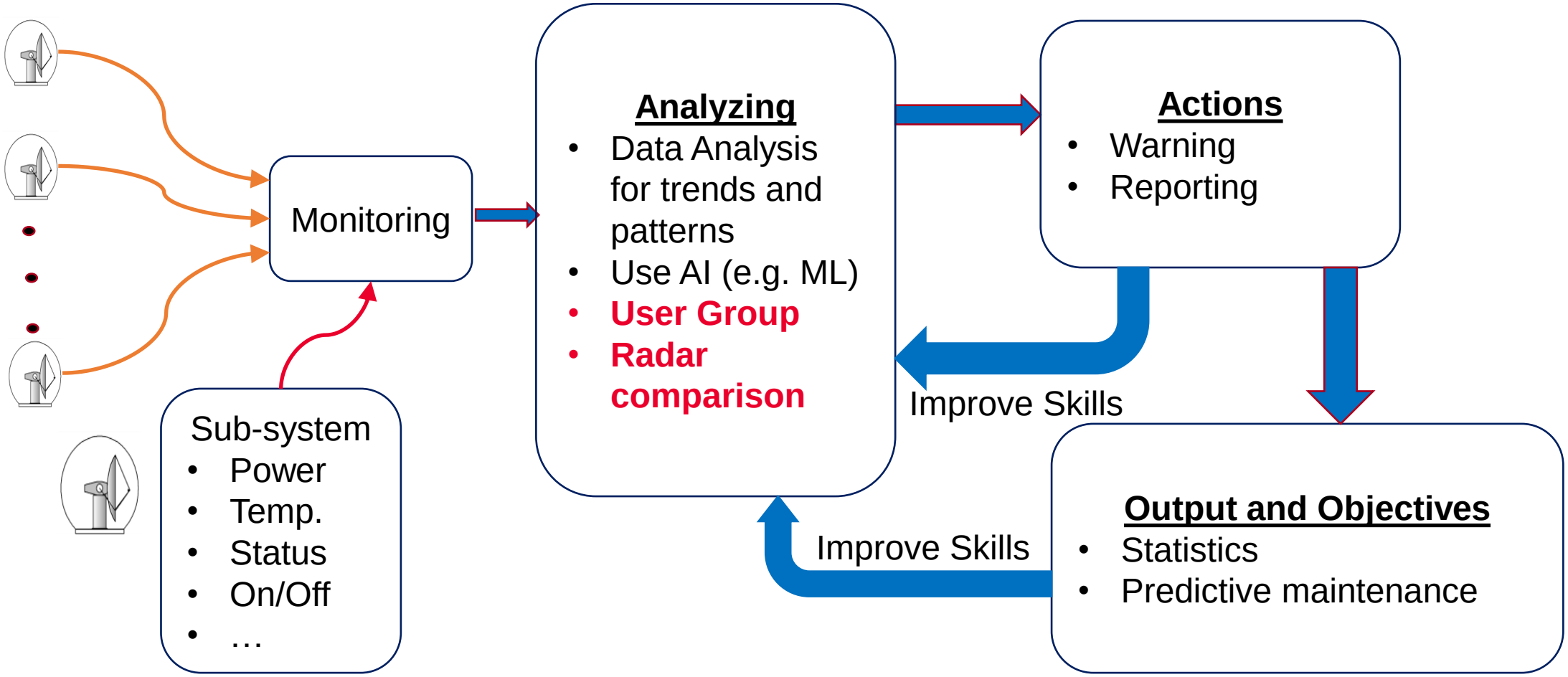
WORKING SCENARIO

Data Center



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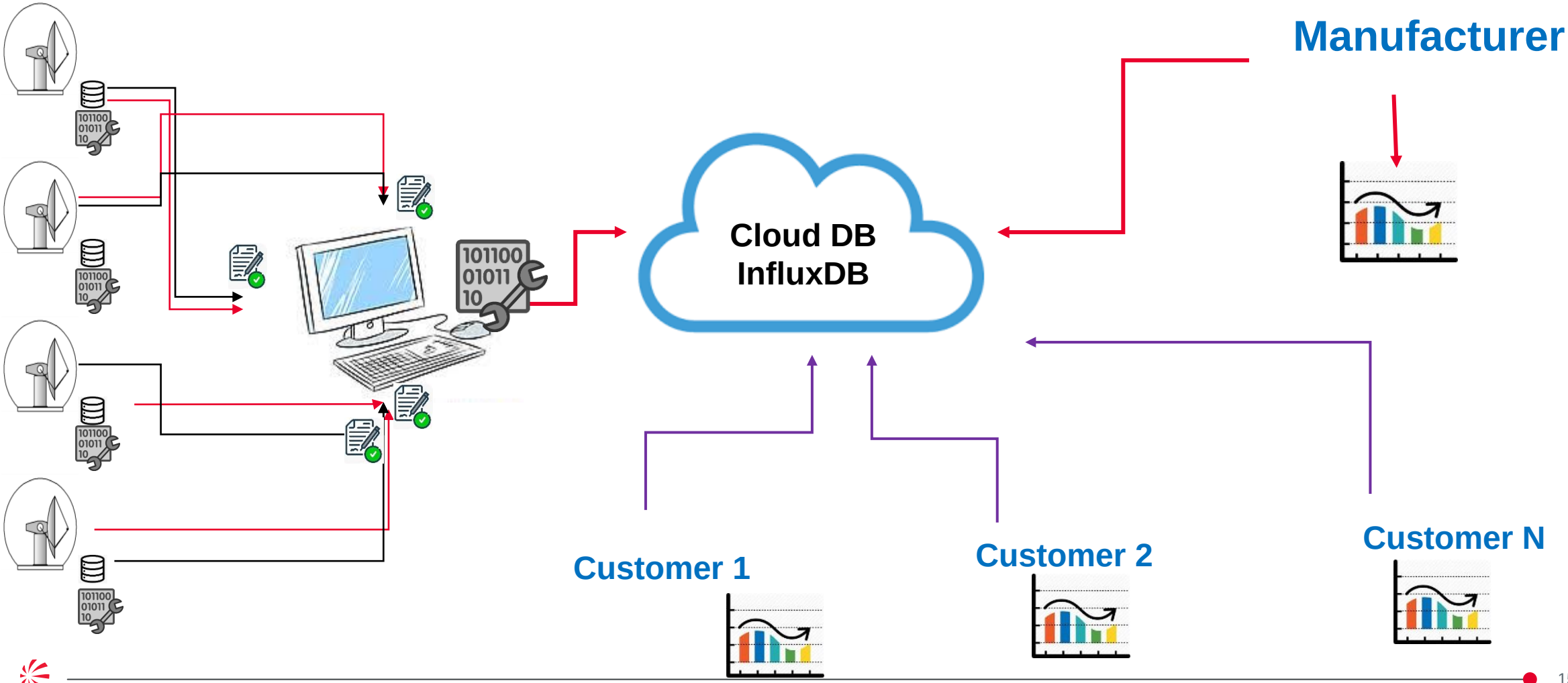
REAL TIME CONNECTION



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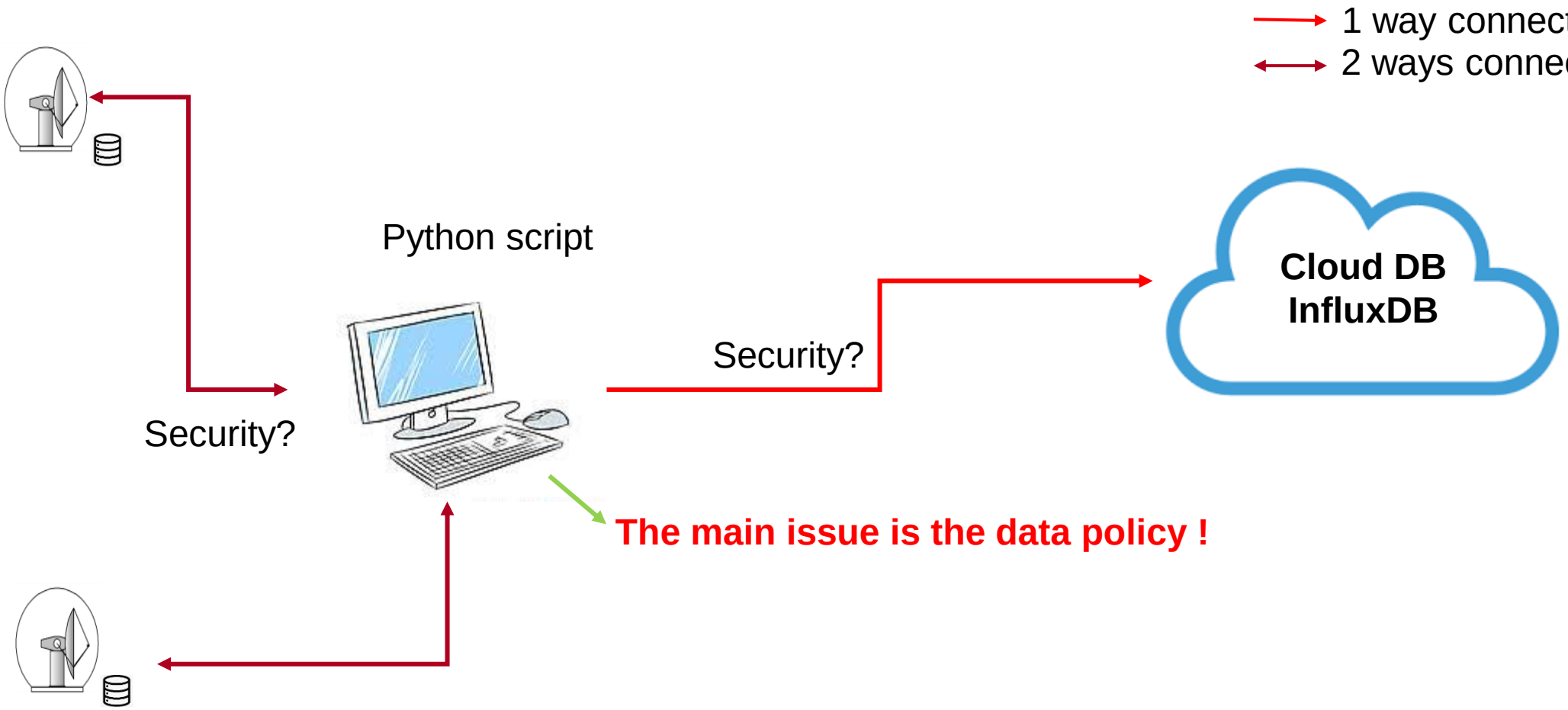
REAL TIME CONNECTION



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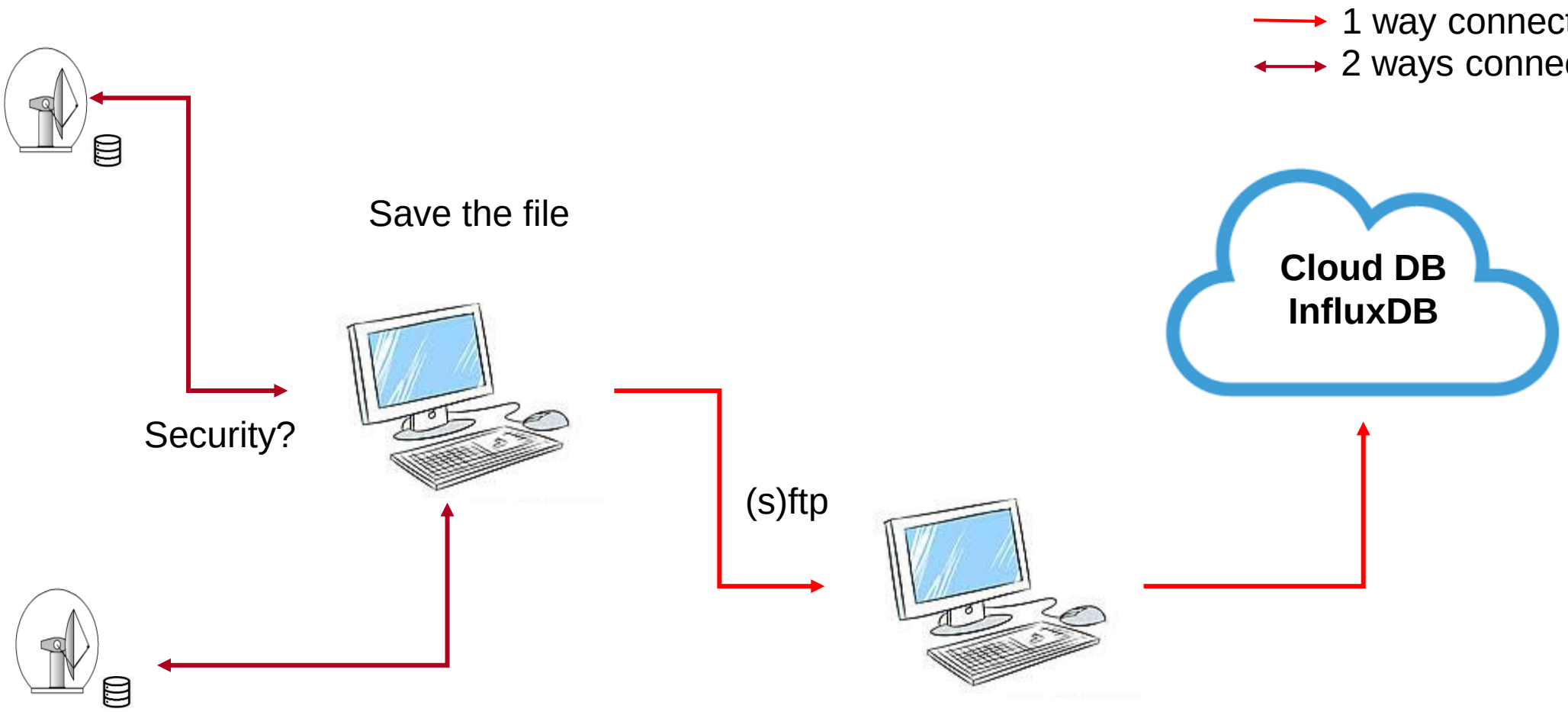
ALTERNATIVE CONNECTION



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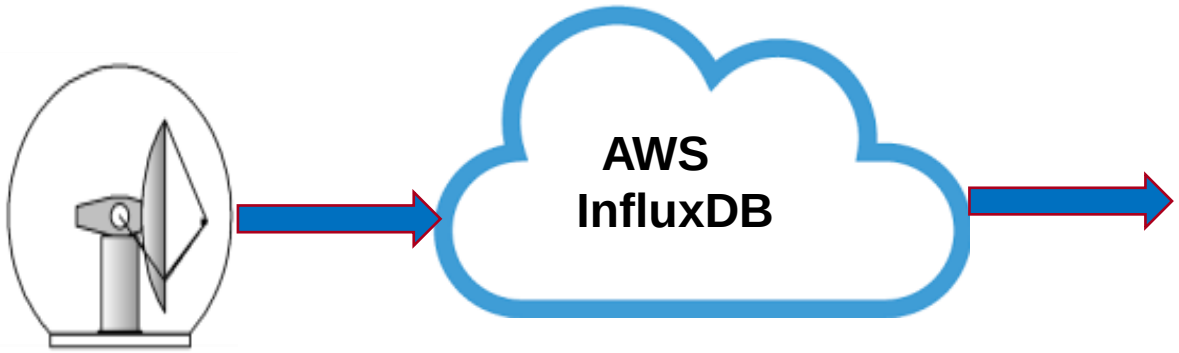
THEN WHAT WE DO NOW :
USING GRAFANA TO DISPLAY ALL BITE DATA



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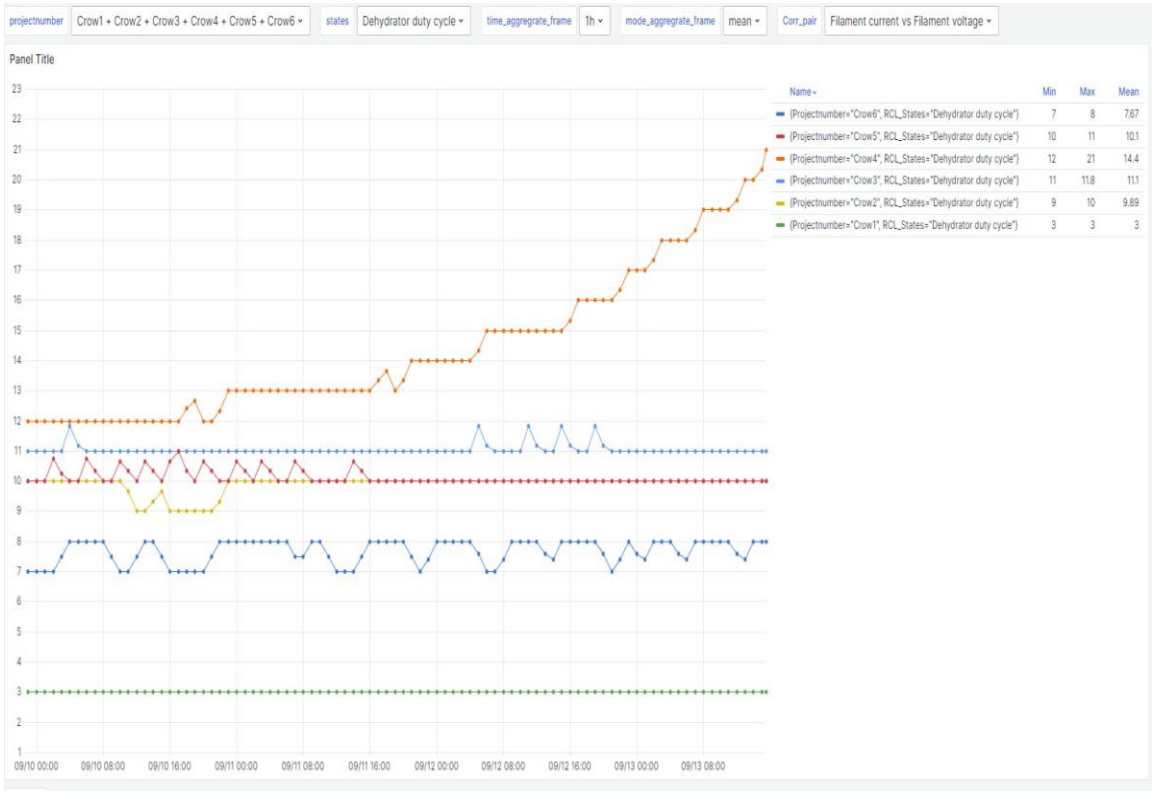
WHAT IS PREDICTIVE MAINTENANCE (3.0 AND 4.0)? = DATA-DRIVEN

Few Recent Real Case



Working Fine → Something went wrong →

Window of time before customer getting notifications

May be we can inform and warn customer to check, or replace later

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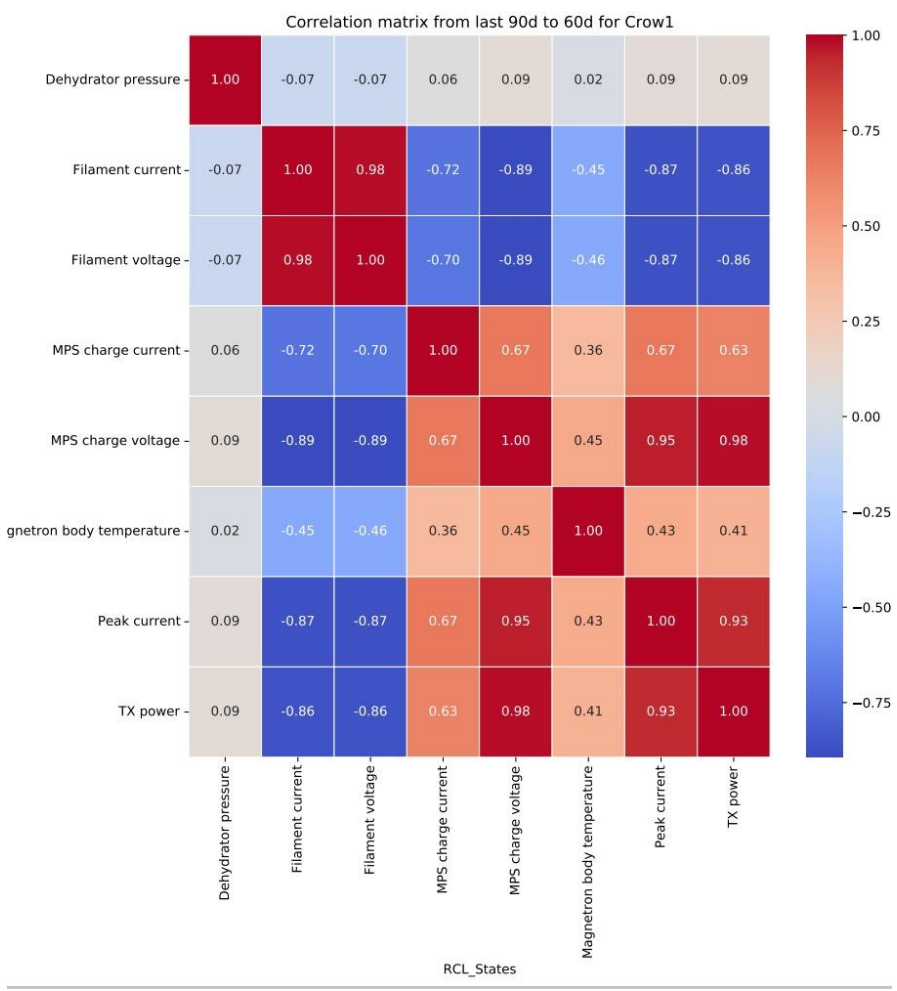
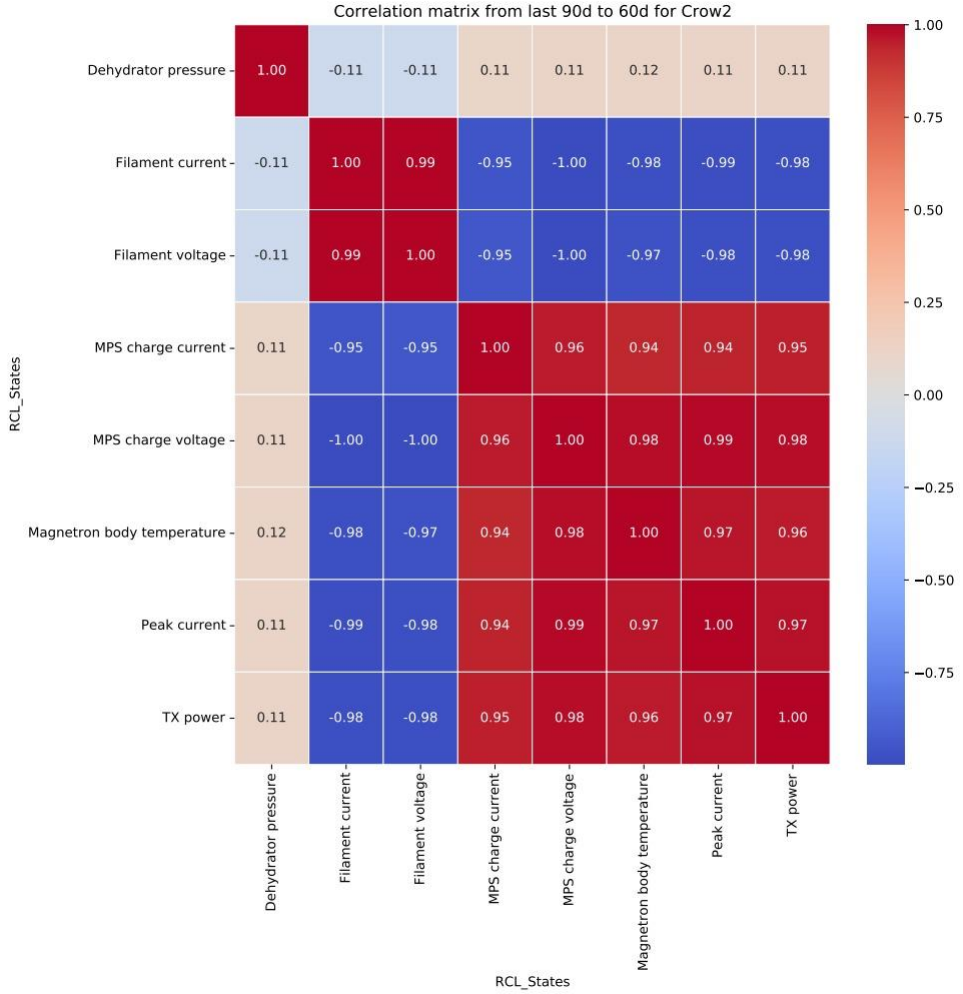
Statistics of different parameters

Correlation matrix





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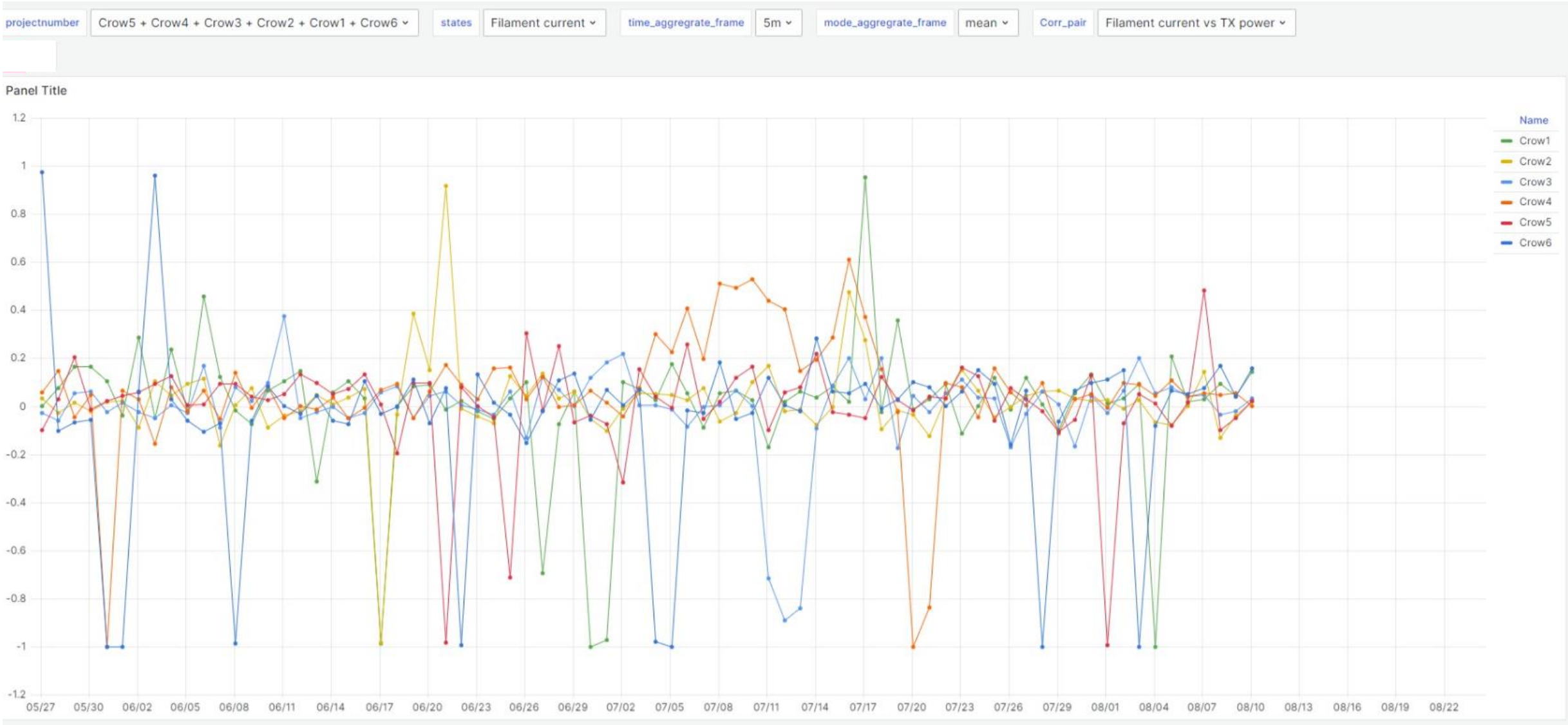
Statistics of different parameters



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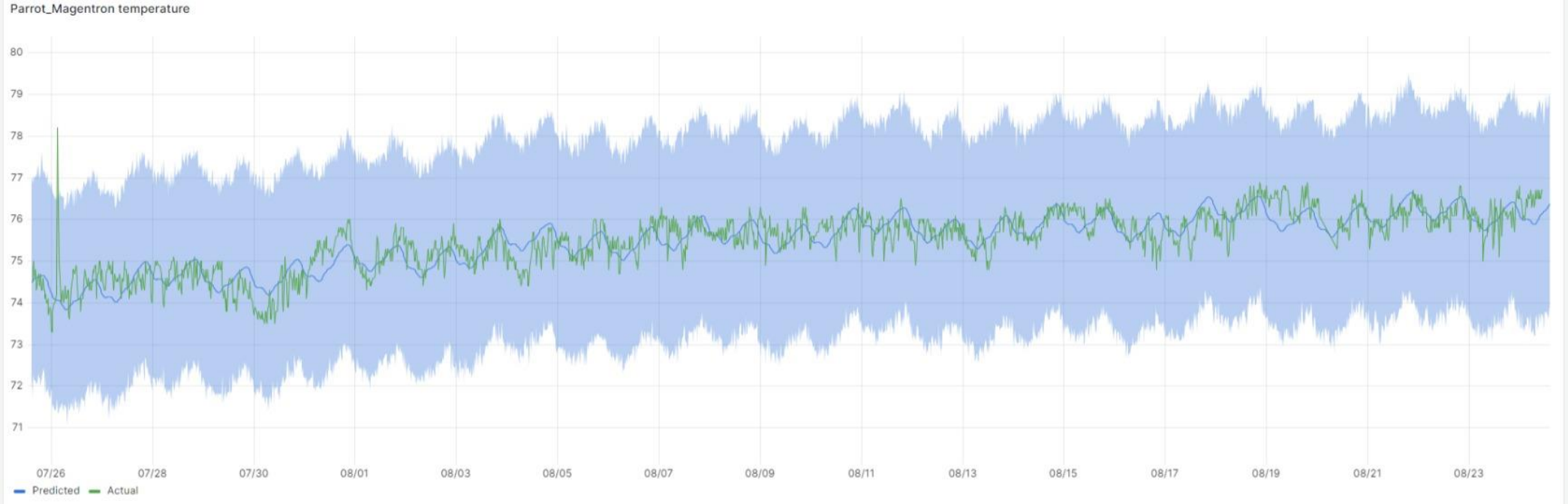
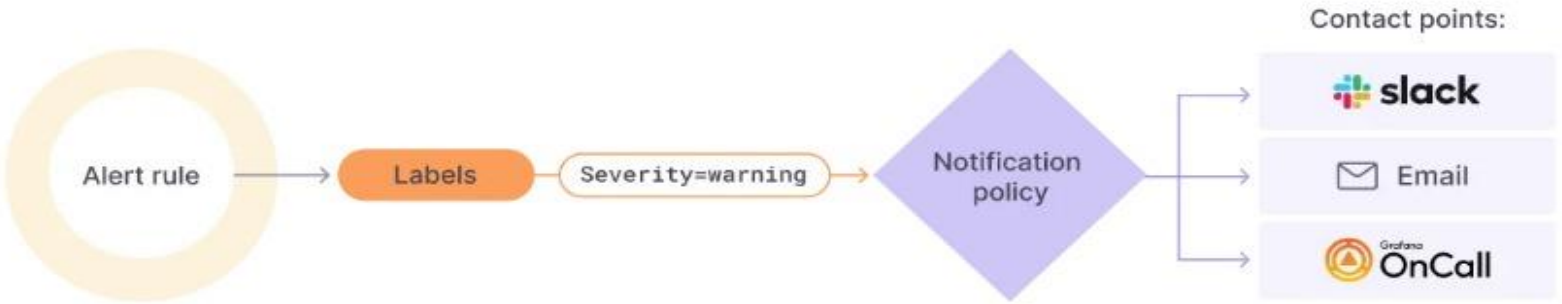
Machine learning, prediction, and real-time alert notification



Model to forecast time series data

Prophet Model Developed by Facebook



These alerts can serve as a simple data-driven predictive maintenance 3.0

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STEPS OF DATA DRIVEN PREDICTIVE MAINTENANCE 4.0

- Data Collection
- Feature Engineering
- Machine learning Models
- Interpretation and improvement
- Predict the failure‘s time window - predictive maintenance 4.0
- Estimate the remaining useful time of machine - predictive maintenance 4.0

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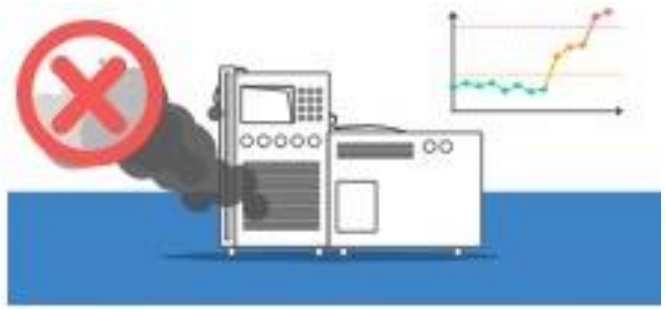
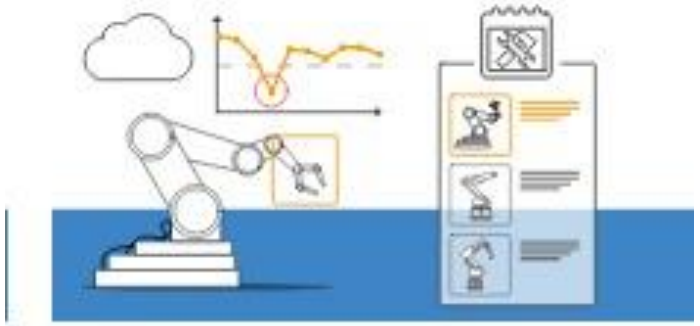
ADVANTAGES



Reduced asset downtime

Maintenance can be scheduled to prevent unplanned downtime

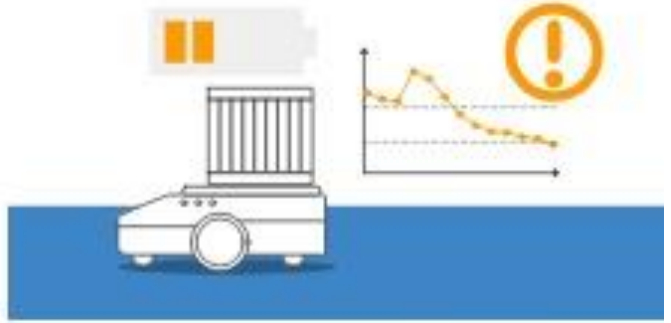
Ensures Consistent operational efficiency.



Maintenance & parts optimization

Replacements are on hand when needed

Avoids last-minute rush and potential error



Extend remaining useful life

Optimizes the use of assets

Operates efficiently for a longer time extending their useful lifespan

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Thank you

datacenter@leonardogermany.com

LEONARDO Germany GmbH
Raiffeisenstrasse 10
41470 Neuss, Germany
Tel: +49 (0) 2137 782-0
info@leonardogermany.com
www.leonardogermany.com