PLAYBOOK

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Reference Examples

Use cases Summary (1)

SEGMENT		Operational Excellence			Digital Transformation	
		Vendor-independent Plug & Produce SW components	Flexible Architectures	Asset-centric control – Modular machine/ process	IT/OT convergence	Wrap & Reuse/ Orchestration
HVAC	Air Handling Units	X			X	X
	Industrial Air Cleaning	X	X	X		
CONSUMER PACKAGED GOODS	Food & Bev	X	X			X
	Tobacco : AIMIRIM & ASRock Industrial				X	X
	Packaging OEM			X	X	
	Consumer Packaged Goods – Master Systèmes – Sophim	X				X
ENERGY & CHEMICALS	Carbon Capture					X
	E2COMATION				X	
	IEC 61499 Application for Offshore: Trisystems Engineering	X	X			X
	Offshore platforms: Kongsberg Maritime					X
	Automated Well Barrier Testing Using IEC 61499: Enhancing Offshore Safety and Efficiency					
	Oil & Gas Refining: ExxonMobil	X				
	Open Process Automation Lighthouse Project: Exxon Mobil	X			X	

Use cases Summary (2)

SEGMENT		Operational Excellence			Digital Transformation	
		Vendor-independent Plug & Produce SW components	Flexible Architectures	Asset-centric control – Modular machine/ process	IT/OT convergence	Wrap & Reuse/ Orchestration
WATER & ENVIRONMENT	Gr3n	X		X	X	
	Waste Treatement – Royal HaskoningDHV	X				
	WWW - Smart Plant				X	X
LOGISTICS	Automated warehouse 1			X	X	
	Automated warehouse 2	X		X		
	J&W Smart Logistics Center with ASRock Industrial					
MANUFACTURING	Automotive	X	X			
	MODUL4R			X		
	METAWAVE	X				X
MINING, METAL MINERALS	Mining	X	X			
	Autodiscovery with HSOL	X	X		X	
	Mobile Stone Crusher machine	X		X		

IT/OT Convergence, Wrap & Reuse

Segment – HVAC – Air Handling Units

Challenge

The development of an application model to standardize the management and optimization of Air Handling Units.

Benefits

- Can be used in both Brownfield and greenfield

- Vendor independent solution

- Encapsulation of main functionalities

- Scalable solution

- Reusability of the object and libraires created

- Fast integration & commissioning of new units

- Connectivity with IT models for data collection & optimization

Solution

- IPC based solution with containerized runtime

- 10% more energy efficient

- 50% more scalable

Flexible Architecture, Vendor independence

Segment – **HVAC – Industrial Air Cleaning**

Challenge

- Aggregation of many technologies to address a large scale of machine variants
    - Small to medium PLC / Homemade control
- Huge level of modularity
    - 1 to N fans / 1 to N dust handling or cleaning systems
- Sell added valur service for machine process and energy consumption optimization

Solution

- From VSD to small PLC to IPC
- Asset library to easily manage
    - Machine modularity
    - Standardize application

Benefits

- Rationalize SW solution VS all machine variants
- Vendor independent

Combustible Dust

Oil Mist Filtration

Dust Collection and Housekeeping

Welding Fume Extraction

Wood Dust Collection

Vendor Independence
Wrap & Reuse

Segment – Food & Beverages

Challenge

- Control and manage the receiving and transferring of Soda to the factory

- Exchange data with different PLC manufacturers (Siemens and Rockwell) for manage and interlock the Soda transfer for each area of the plant. Also manage he Soda consumption for the area.

- Innovation and agnostic solutions to run on industrial PC, where in the future the control can be moved to the datacenter

Solution

- UniversalAutomation.org runtime running in the Harmony iPC and Harmony HMI

- EAE runtime communicates with the third-party IOs and third-party PLCs to manage and control the Soda system.

Benefits

- Breaking down automation silos, achieving greater efficiency and greater process safety.

- Developing a standard solution ready for the future that can be replicate in other factories

Wrap & Reuse, IT/OT Convergence

Segment – Tobacco Industry – Aimirim & ASRock Ind

Challenge

British American Tobacco faced operational inefficiencies in their manufacturing facilities, including frequent machine stoppages and inconsistent product quality.

Details

ASRock Industrial collaborated with Aimirim to deploy an AI-driven solution. The AI agents provided instant, intelligent recommendations to address production inefficiencies, ensuring smoother operations and higher efficiency.

Benefits

The implementation of ASRock's iEP-6010E edge AI device and Aimirim's Shaman software led to:

- Real-time process control

- Predictive maintenance

- Improved automation scalability

- Reduced machine stoppages

- Consistent product quality

IT/OT Convergence
Modular machine/ process

Segment – **Consumer Packaged Goods**

Challenge

- Detect automatically wrapping defaults during process

Solution

- Algorithm running on an iPC analysing images from camera connected to this iPC
- Machine-learning technology for detecting "good" and "bad" wrapping

Benefits OEM

- Strong differentiations vs other OEMs
- New dimension for machine optimization
- Quality improvement – ensuring End-User satisfaction
- Financial gain – saving penalties from EU

Benefits EU

- Waste reduction
- Avoiding non-conformity process

Wrap & Reuse, Vendor Independence

Segment - Consumer Packaged Goods – Master Systèmes – Sophim

Challenge

- Modernize legacy automation systems to an Industry 4.0 solution in a managed, low-risk, and agile manner

- Clean integration of IT technologies, focusing on predictive maintenance

- Leverage external engineering expertise without introducing project or solution complexity

Solution

- UAO runtime runs on a Linux iPC & PLC to manage the control (drives, actuators…)

- Dedicated software for CPG also runs on iPC

Benefits

- Reduced design time and faster time to production

- Increased operational efficiency through maintenance improvements that enable rapid configuration of the system, reassignment of resources, and updates to human and machine interfaces

- More flexibility in the choice of automation platforms, and easier integration of analytics or other software solutions in the future thanks to the edge computing capabilities

MASTER SYSTEMES

"This is a game-changer for us. EcoStruxure Automation Expert's advanced engineering tools will help us reduce the time to develop an application and supports easy integration of IT technologies, including predictive maintenance. This translates into faster time-to-market with an easier to maintain solution for our end users."

Maurice Re, Automation Director, Master Systèmes

Photo by Mathilde Langevin on Unsplash

IT/OT Convergence
Wrap & Reuse

Segment – **Carbon capture**

Challenge

- Find a mature open automation solution to move from initial PoC to a commercial demo plant

Solution

- IEC 61499 with UniversalAutomation.org runtime
- Integration with SCADA & IT
- Drives included in scope of delivery

Benefits

- Standard based solution
- High level of reusability in upcoming commercial plants
- Efficient upscaling

IT/OT Convergence

Challenge

The E2COMATION project aims to optimize sustainability and energy efficiency in the manufacturing industry through a comprehensive framework. This framework integrates various subsystems to manage and analyze energy-related data from production environments.

Benefits

- **Energy Monitoring (EMon):** Collects and analyzes data from sensors.

- **MQTT Protocol:** Facilitates communication between devices.

- **APAMA Stream Analytics:** Analyzes data streams for performance forecasting.

- **Digital Twin:** Simulates and monitors production processes for optimization.

Solution

The project leverages advanced tools and methodologies to enhance energy performance and sustainability in manufacturing.
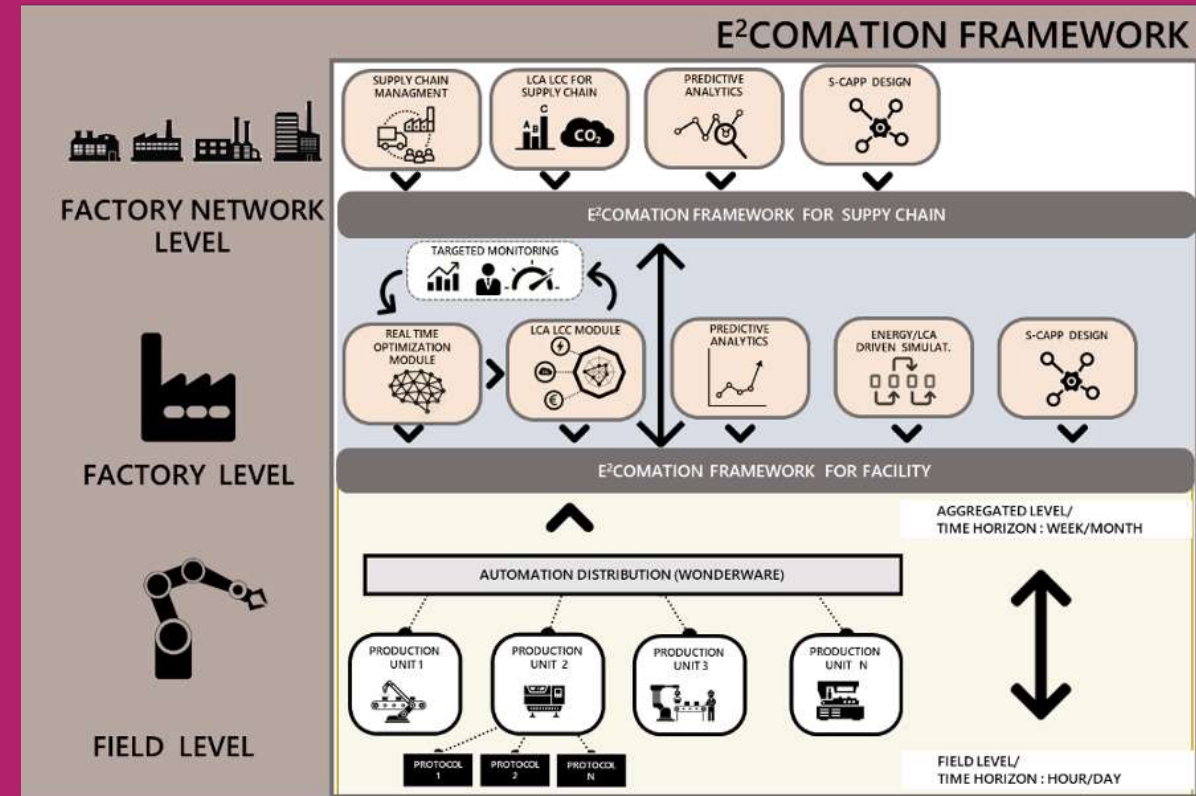
Vendor-independent
Plug & Produce Software Components

Segment – **Oil & Gas – Offshore Energy Operations**
Trisystems Engineering

Challenge

- **Aging systems** were hard to maintain

- **Remote locations** made servicing time-consuming

- **Limited power and bandwith** sonstrained operations

- **Poor interoperability** hindered integration across vendors

Solution

Trisystems upgraded a 30-year-old offshore platform using **IEC 61499**, replacing legacy systems with **event-driven control**, **edge computing**, and **automated power management**—enhancing efficiency and remote operation.

Benefits

- **Cross-platform compatibility**

- **Faster local decisions** via edge computing

- **Efficient bandwidth use** with event-driven control

- **Proactive maintenance**

- **Less on-site servicing** for improved safety and efficiency

SEE PRESS ARTICLE >
IEC 61499 Application for Offshore

Image source: Pixabay

Vendor-independent Plug & Produce Software Components

## Segment - Oil & Gas Refining: ExxonMobil

Challenge

To build an **application using best-in-class software components** from **different suppliers**.

Solution

ExxonMobil research published an IEC 61499 adapter interface for PID control and asked their suppliers to provide components using the adapter. XOM were then able to program a cascaded control loop using different blocks from different suppliers in a Plug & Produce fashion

Benefits

- **Reduce engineering time** & shorter commissioning using proven-in-use software

- **Increased innovation** using best-in-class software components

- Continuous improvement enabled by swapping out existing components with improved ones sharing the same adapter interface.
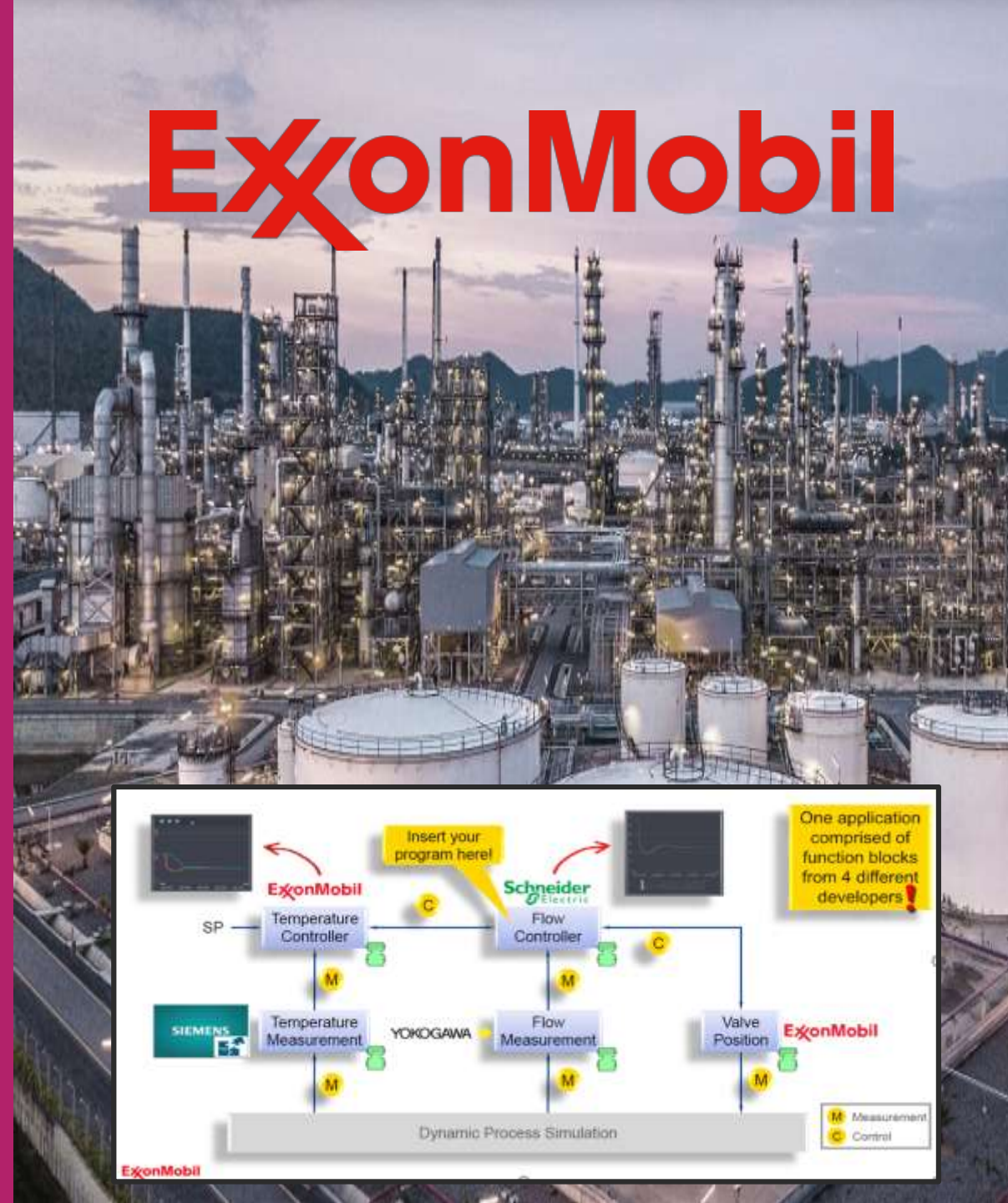
Vendor independence, Flexible Architectures, IT/OT Convergence

Segment – **Energy & Chemical - Exxon Mobil**

Open Process Automation Lighthouse Project

Challenge

- Deploy an OPA System at a commercial operation to become vendor agnostic

Solution

- Embed the UniversalAutomation.org runtime as one of the technology enablers for having an OPA System

Benefits

- Reduce costs of at least 20% compared to traditional industrial control systems

- Improved efficiency and flexibility

- First facility operating OPA and embedding the UniversalAutomation.org runtime proving the functionality

Image source: ExxonMobil Open Process Automation (OPA) Lighthouse project
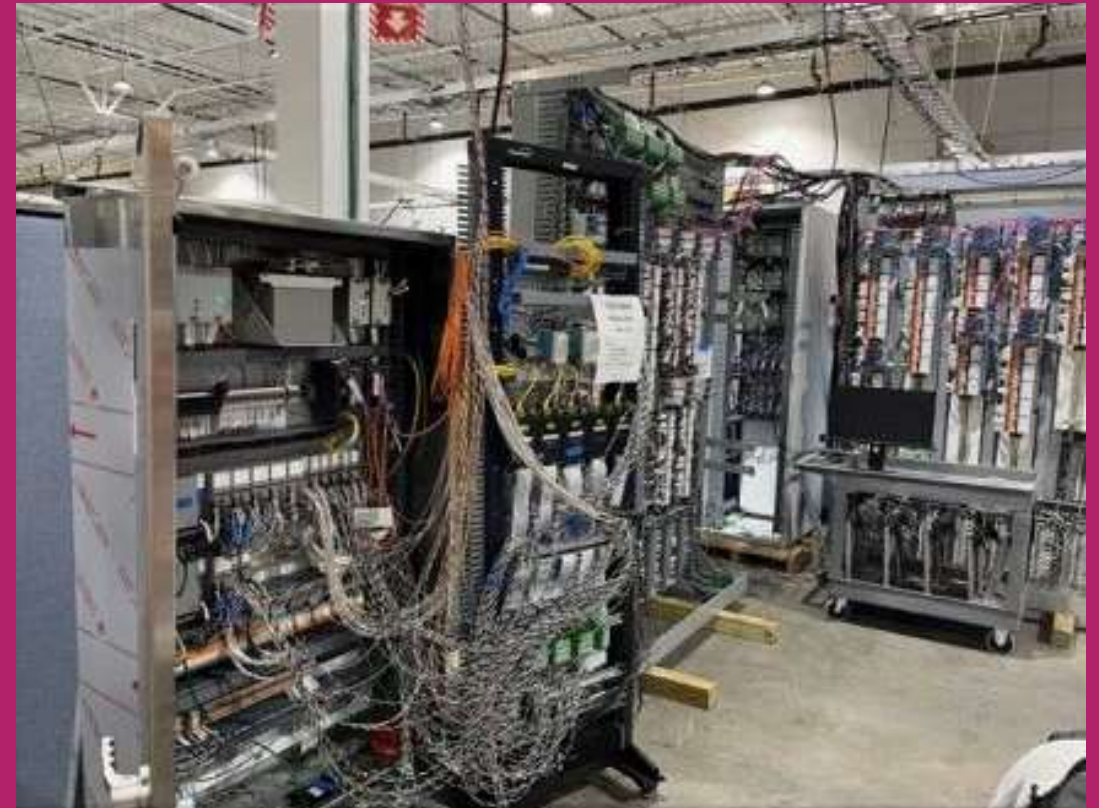
Vendor-independent
Plug & Produce Software Components

Segment - Waste Treatement – Royal HaskoningDHV

Challenge

AquaSuite Nereda Controller, a smart, integrated process controller for Nereda for waste-water treatment requires easy integration to the real-time control systems

Solution

A library of IEC 61499 software components to easily integrate with the PC-based Nereda controller

Benefits

- **Reduced engineering time** & shorter commissioning using proven-in-use software library

- The promise of **vendor-independence**

Simultaneous Fill and Draw

In | Out

Nereda® Cycle

Fast Settling

Aeration

Air

Aerobic zone:
- Oxidation of organic compounds
- Nitrification

Anoxic / anaerobic zone:
- Denitrification
- Phosphorus removal
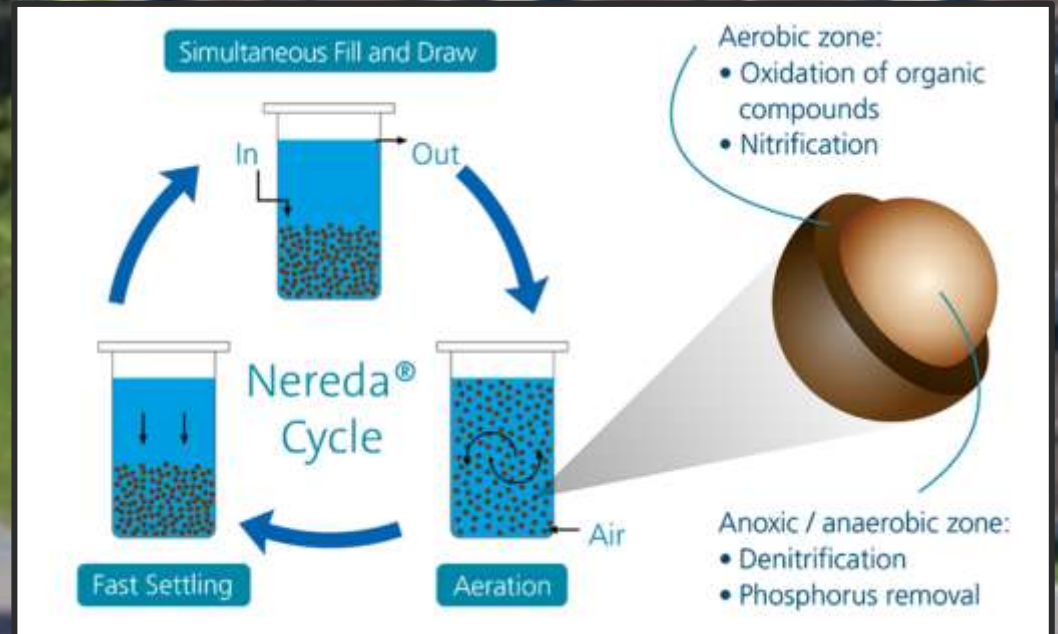
IT/OT Convergence, Wrap & Reuse

Segment – WWW – Smart Plant

Challenge

- Common platform for telemetry and process optimization of hundreds of plants

- Vendor independence of the solution

- Edge computing & Scalability

Solution

- Barbara for high scale deployment

- IPC & containerized UAO Runtime

Benefits

- Plant performance optimization by adding control strategies on top of the existing automation system

- Virtual Sensor (AI)

- Software based plc able to manage the update of the application using standard IT mechanisms

Flexible Architecture, Vendor independence

Segment - **Mining**

Challenge

- Many variants of the same machine due to Machine options requiring hardware/software changes

- Final end users asking for specific brands

- Complexity and costs along life cycle (construction and maintenance of the machine)

Solution

- **Standardize** application software

- PC based automation for **scalability** (Linux)

- **Free to select hardware** matching end user specifications

- Orchestration of installed based for retrofit

Benefits

- Division by 3 of number of variant per machines (ca. 250k EUR/year savings)

- Scalable controller, change simply CPU and RAM

Asset Centric Control
Plug & Produce SW components

Segment – **Mining – Mobile Stone Crusher Machine**

Challenge

- Reduce Time to Market

- Better and faster fit to European Union Domain

Solution

- Based on machine PLC with analog & digital IP

- Asset application library

Benefits

- Faster to design the application by reuse of asset models
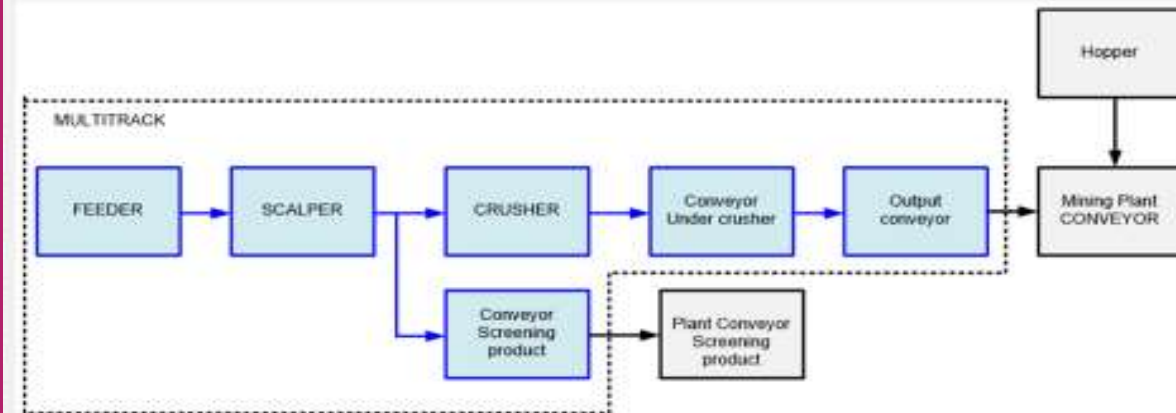
Plug & Produce, IT/OT Convergence Flexible Architectures

Segment – Mining – Hovering Solutions / Flexbridge

Challenge

- **Challenging environments** hinder autonomous system deployment

- **Manual setup** is slow and error-prone

- **Real-time anomaly detection** and efficient data collection needed

Solution

- **IEC 61499 + mDNS/MQTT** for auto-discovery and communication

- **Hovering Solutions drones** with IceBlock from Flexbridge linked with sensors for anomaly detection

- **Flexbridge's** application using IEC 61499 enables plug-and-produce and scalable deployment

- **Autonomous swarm** with localization and wireless communication

Benefits

- **Real-time detection** boosts safety

- **Auto-discovery** cuts deployment costs

- **Faster data & missions** in underground operations
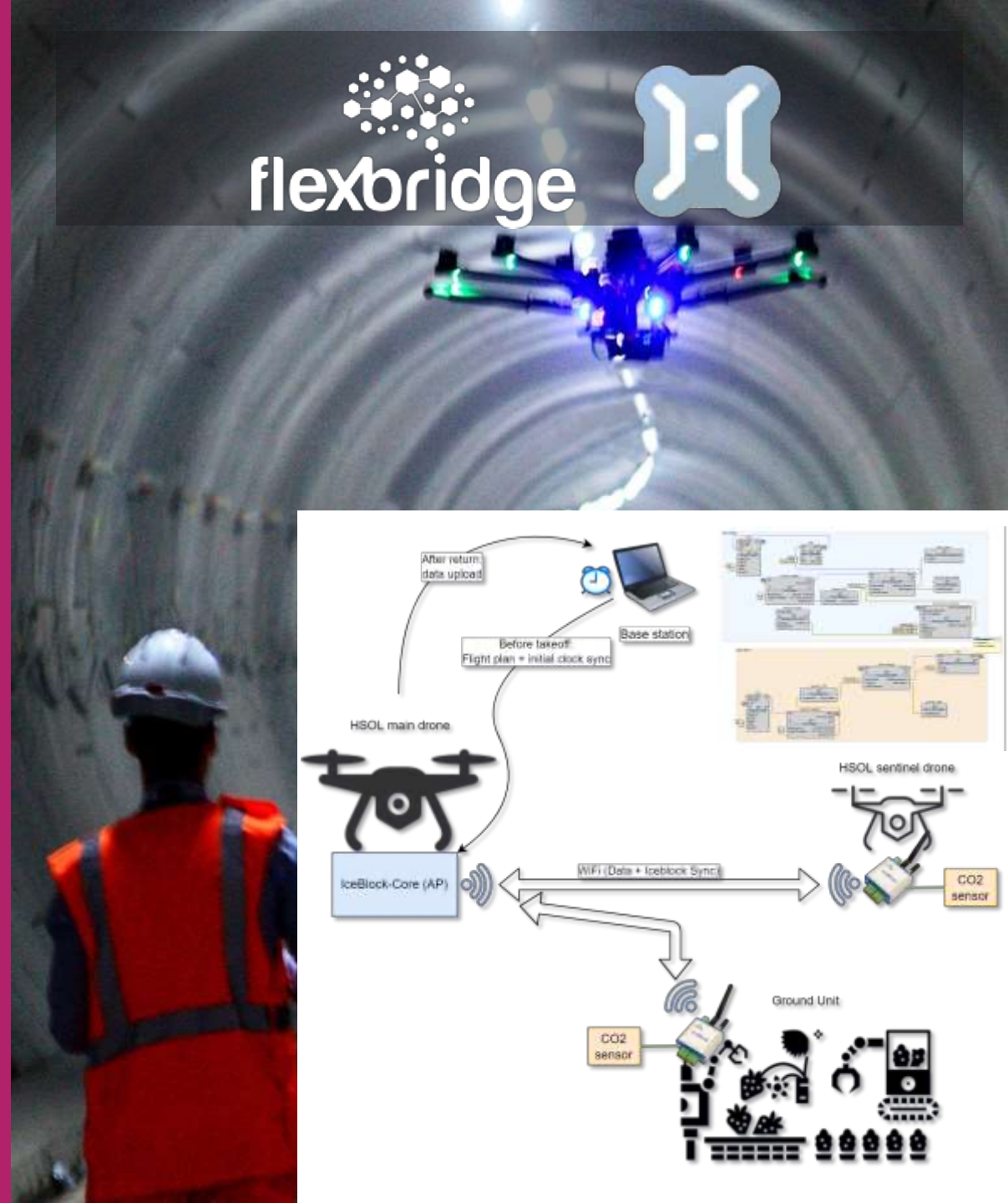
Modular machine, IT/OT convergence

Segment - Logistics – Automated warehouse 1

Challenge

- Due to different requested shapes and performance, conveying systems require many variants.

- Usual solution is a central (large) PLC with multiple application code – however it is complex and expensive along lifecycle

Solution

- Principle is to create different modules – each of them controlled by a simple PLC - an iPC bridges the OT (Soft controller & HMI) with the IT (AI, Northbound connectivity, Scada)

- Digital Twin solution simplifies the tests, visualization and the setup – allowing drastic reduction of the commissioning

- A specific AI algorithm is trained on Visual Inspection to perform quality control on the transported items

Benefits

- Modular control system, no need to rethink application code
- Ease to scale up or down, reconfigure along lifecycle
- CapEx reduced by ca. 35% and downtime cut by ca. 25%

Modular Machine, Vendor independence

Segment - **Logistics – Automated warehouse 2**

Challenge

- Looking for multi source solution
- Optimize his production workflow to become more competitive
- Value add services to differentiate vs competition

Solution

- PC based control + Distributed to variable speed drive
- OPC UA connection to existing Warehouse Management Syst
- Profinet to connect to existing field devices
- Asset application library

Benefits

- Flexibility of choice of control solution
- Faster to design the application by reuse of functional Unit models (eg conveyors)
- Easier to integrate diagnostic information's
- Easier to combine IT based added value services
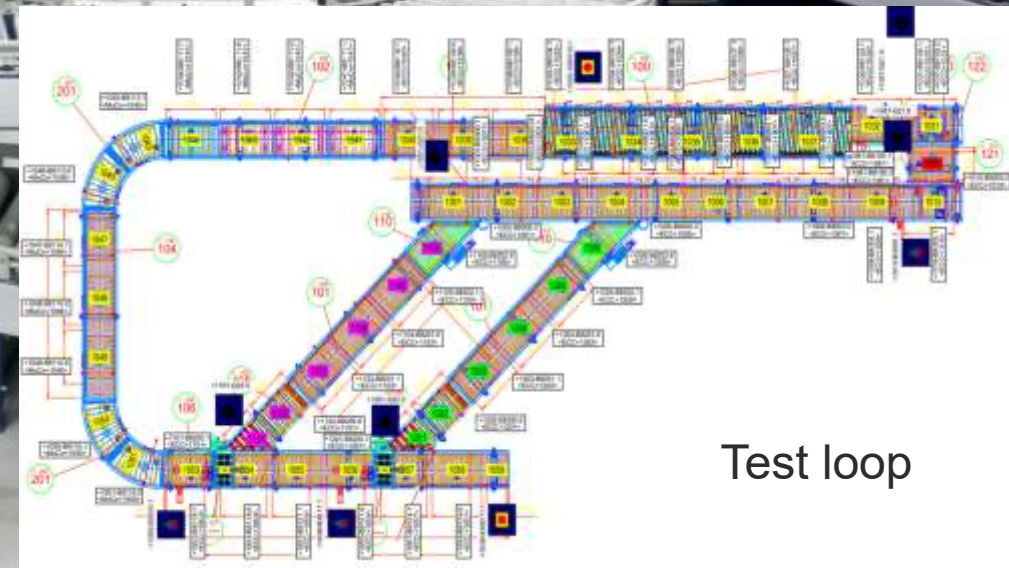
Test loop

IT/OT Convergence, Modular machine

Segment – J&W Smart Logistics Center with ASRock Industrial

Challenge

Manual processes led to errors, delays, and low throughput. The system was inflexible and poorly integrated, making updates slow and decision-making inefficient.

Details

J&W implemented a **hybrid automation system** using ASRock Industrial's **iEP-5000G Industrial IoT Controller** running **IEC 61499** from UniversalAutomation.org.

The system includes:

- **Human-cobot collaboration** at picking stations.

- **Modular conveyor loops** with smart sensors and RFID/NFC readers.

- **Vision-based control gates** for real-time item recognition.

- **Autonomous Mobile Robots** (AMRs) for bin transport.

- A **maintenance station** for non-disruptive system updates.

The infrastructure enables **real-time coordination** across all components.

Benefits

- **Increased operational efficiency** and **scalability**.

- **Reduced error rates** and labor dependency.

- **Future-ready flexibility** with modular, reconfigurable logic.

- **Improved energy efficiency** and **system uptime**
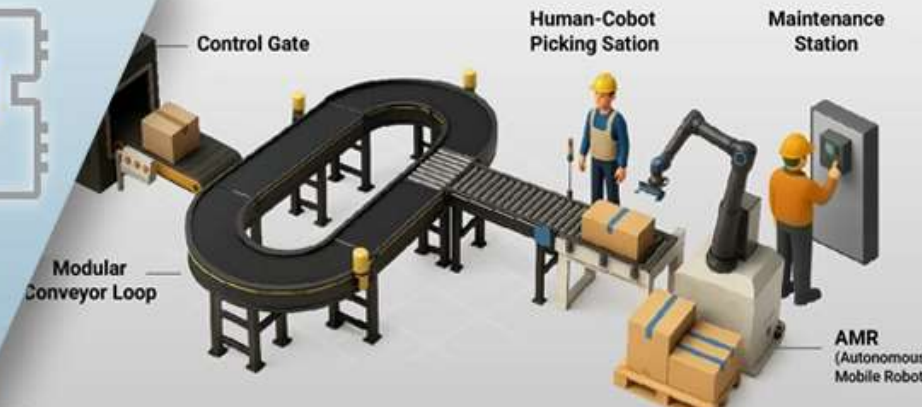
IT/OT Convergence, Modular machine

Segment – Discrete Manufacturing – MODUL4R

Challenge

The MODUL4R project focuses on advancing manufacturing through robust and autonomous modular production lines and resilient supply chains.
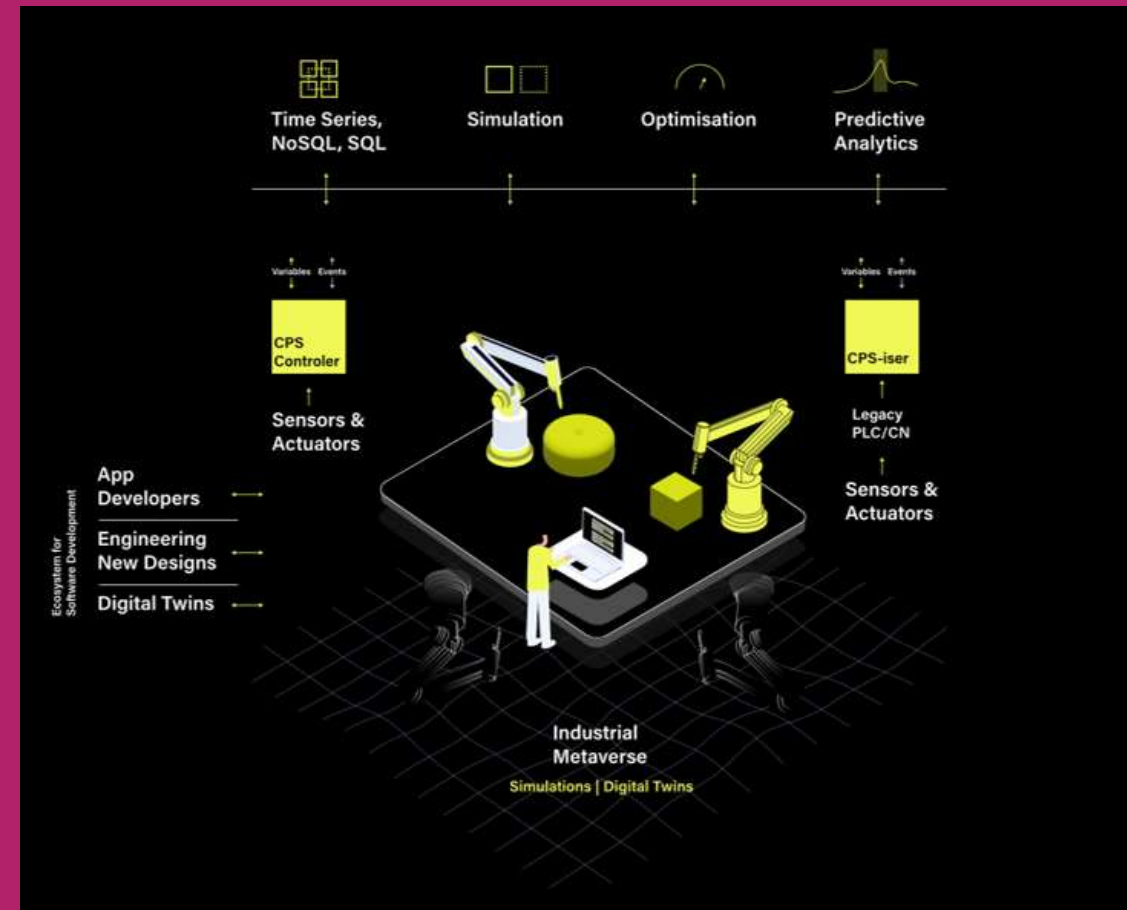
Benefits

- **Resilience**: Adapting to changes in customer demands and supply chain disruptions.

- **Modular Technologies**: Enhancing flexibility in manufacturing operations.

- **Simulation and Interfaces**: Integrating with the Industrial Metaverse.

- **Human-Centered Technologies**: Upskilling workers for new manufacturing environments

Solution

The project aims to support low-volume production and rapid adaptation to unexpected situations.

IT/OT Convergence, Vendor Independence

Segment – MMM - METAWAVE

Challenge

The METAWAVE project aims to revolutionize high-temperature industrial heating processes using microwave-based heating systems.

Benefits

- **Efficiency**: Improving energy efficiency and reducing consumption.

- **Sustainability**: Lowering greenhouse gas emissions.

- **Productivity**: Increasing productivity through innovative technologies.

- **Integration**: Utilizing renewable energy sources and advanced digital systems for process optimization

Solution

The project targets sectors like ceramics, asphalt, and aluminum, demonstrating the benefits of these technologies in real industrial settings.

Flexible architectures
Vendor Independence

Segment – **Automotive**

Challenge

- Frequent data interactions between subsystems and tedious communication interface programming are common
- Non-modular equipment design leads to repetitive tasks and higher error rates
- Traditional PLCs use closed protocols, making integration with enterprise systems costly and inefficient.

Solution

- Modular design improves program reusability
- Distributed programs manage the entire plant system, and a variety of IT interfaces provide flexible access to the upper system

Benefits

- Reduce downtime by 20% and save approximately 15% on maintenance costs
- Improved engineering efficiency by 20% through modularization and system level simulation
- Establish an asset library to standardize the engineering and application development process

Wrap & Reuse Orchestration

Segment - **Offshore platforms – Kongsberg Maritime**

Challenge

Legacy automation systems have limited capacity to support new functions, expansion.

Solution

UAO runtime runs at server level above real-time controls

Benefits

- Offload real-time legacy controllers to allow systems expansion

- Add new advanced multi-controllers automation functions without stopping running systems
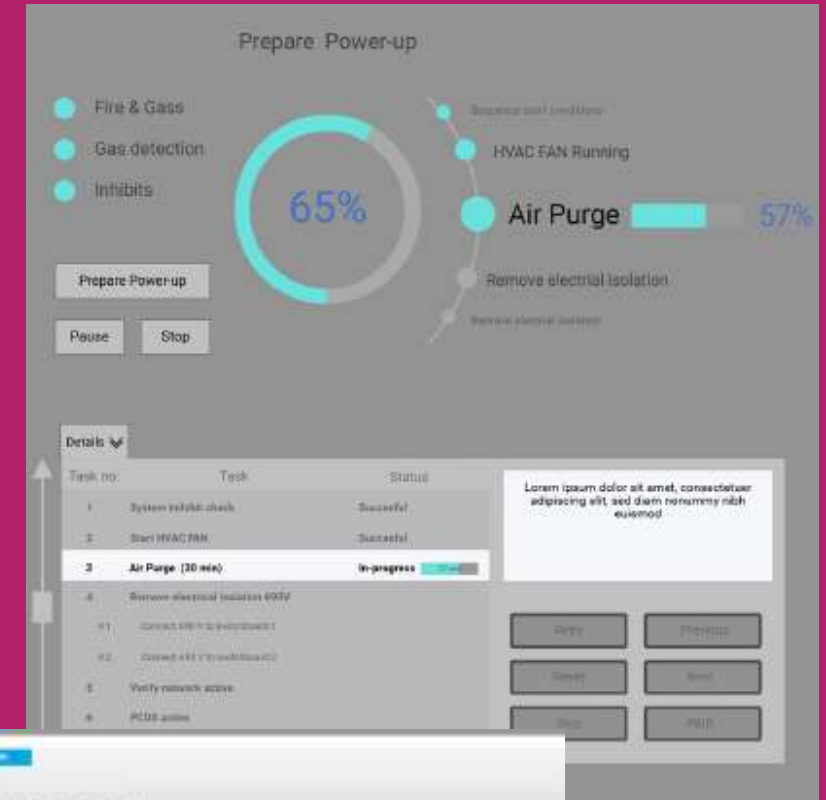
- Automation complex operator procedures
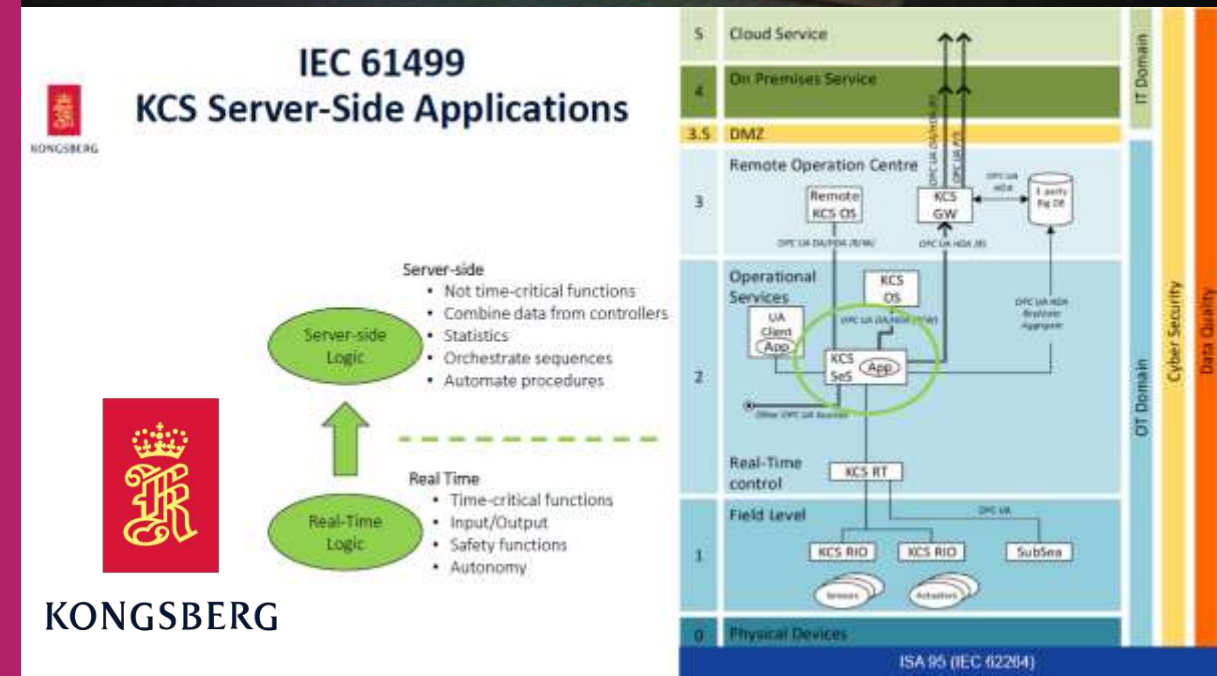
OBS – One Button Startup

Start as by the most experienced operator

One Button Startup (OBS) describes the high level funcitons used to automatically start and stop systems/equipment without other operator intervention than

- initiating the OBS

- monitor progress and technical system
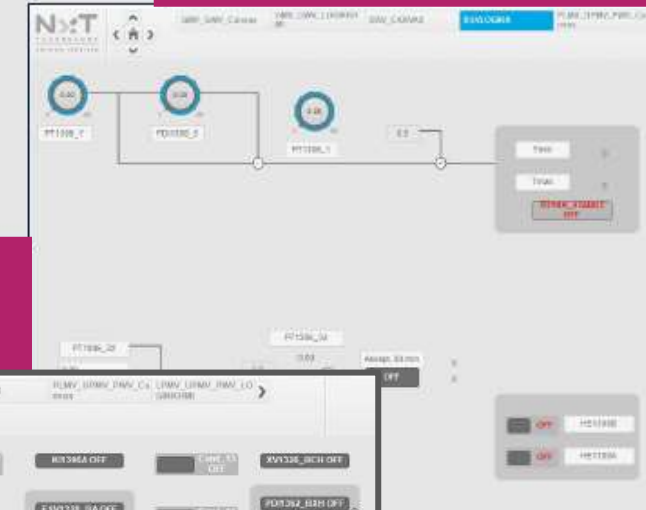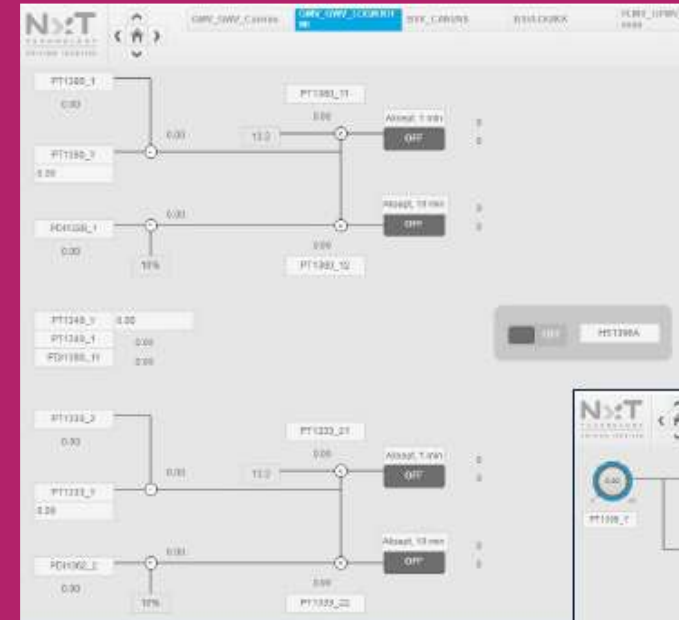
- observe the progress

Well Barrier Testing

- Periodical testing

- Release/spare capacity on the RCU (Real-Time Controllers)

- Release work-load for the operator by automating the procedure. Less pressure not to make manual mistakes.

- The test is executed in a minimum of time and consistent (no manual failure)

Server-Side Application (IEC 61499)

KONGSBERG
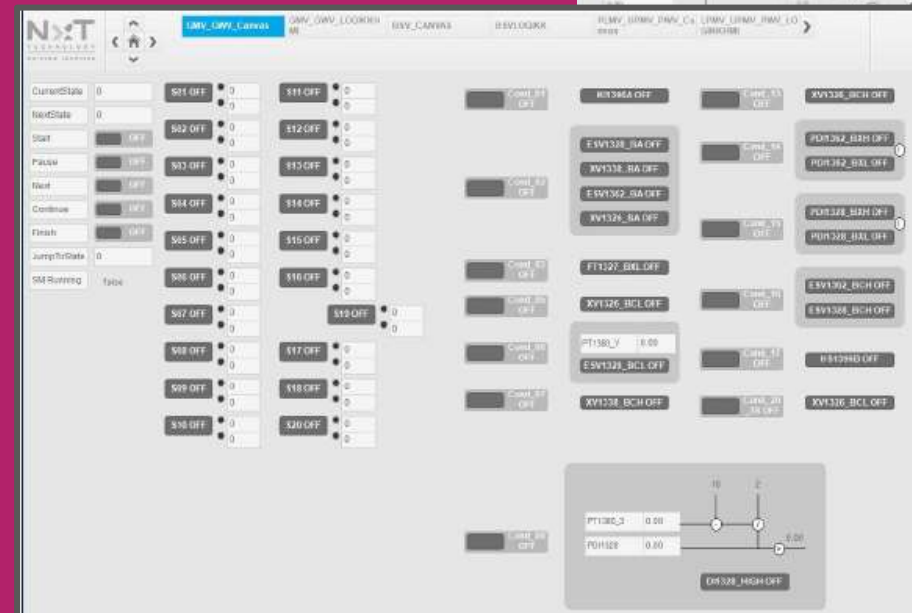
Pipeline Leak Detection

- Pipeline Leak Detection for
  - Production
  - Gas Lift
  - Water Injection
- The application detect any leakage by calculations
- Alarming
- Trending
- Warn the operator and give advise on action to take
- Save the environment
- Call for maintenance
- Save cost
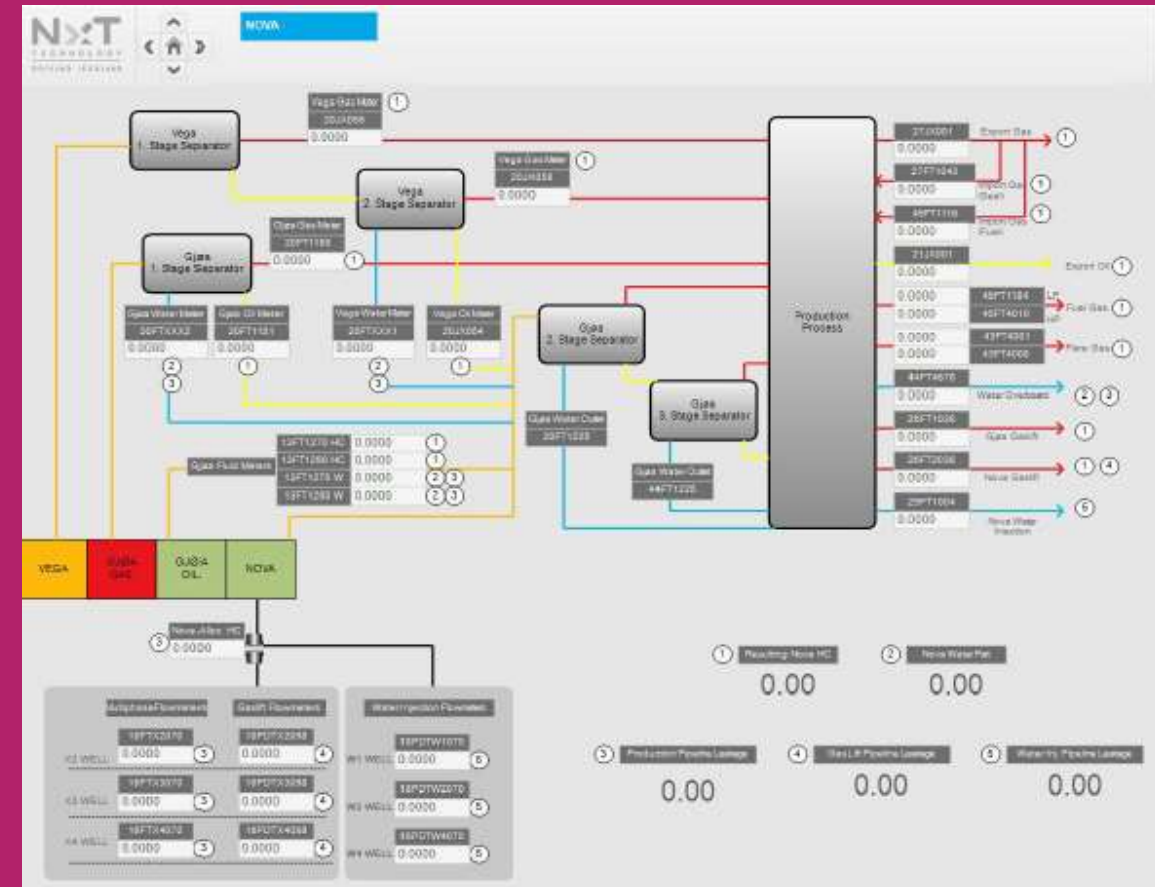
Server-Side Application (IEC 61499)

KONGSBERG

Enhancing Offshore Safety and Efficiency

**Segment** - **Offshore platforms – Kongsberg Maritime**

Challenge

Manual well barrier tests are time-consuming and inconsistent, requiring multiple procedures per well

Solution

Kongsberg Maritime uses IEC 61499 server-side logic and OPC UA interfaces to automate testing, enabling scalable, event-driven applications and seamless OT/IT integration

Benefits

- Improved efficiency

- Reduced maintenance

- Consistent high-quality execution

- Enhanced operator focus through dynamic HMI and centralized orchestration
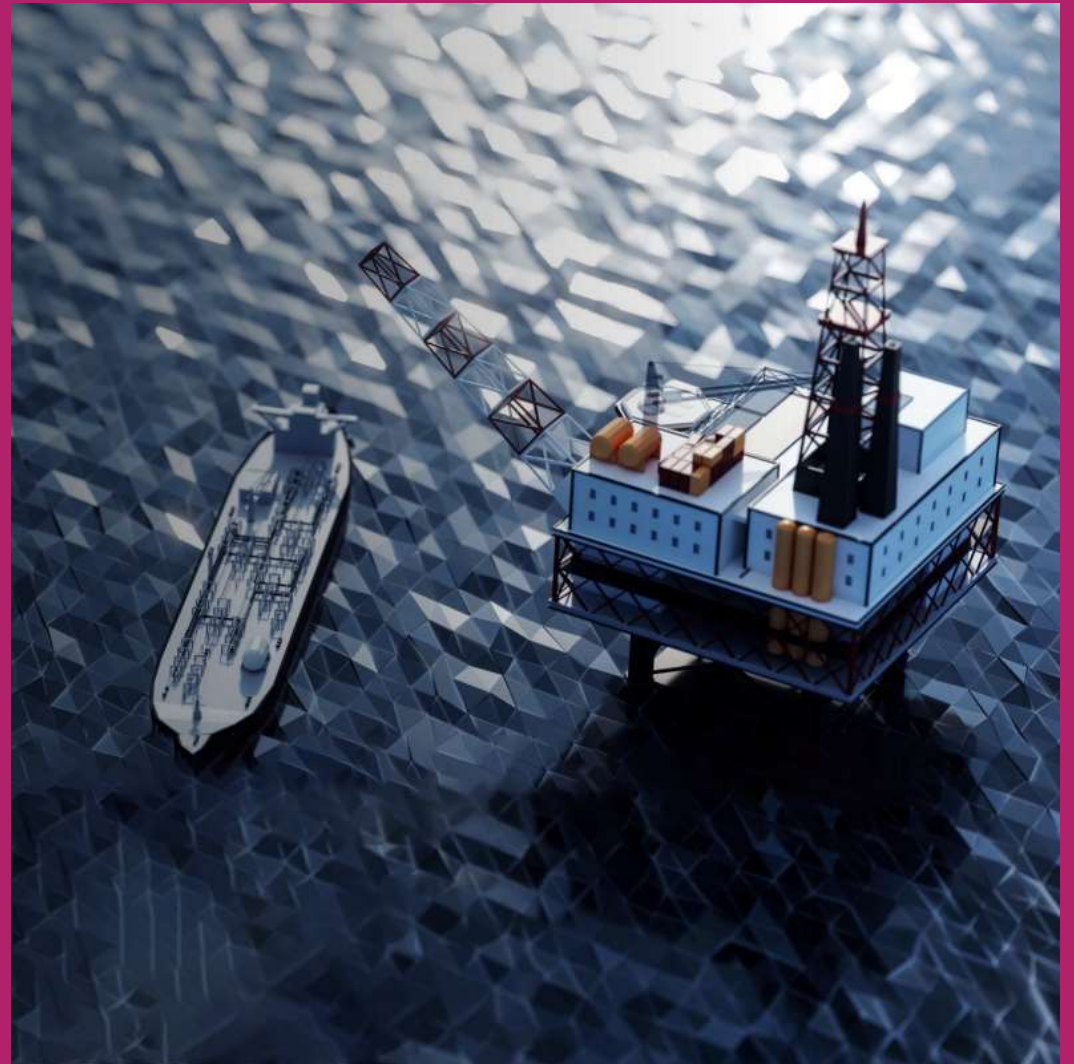
KONGSBERG

Gr3n

Asset-centric, Modular machine/process, IT/OT convergence

Segment - PET Plastic Recycling: GR3N

Challenge

Easily expand production using modular mechanical/electrical/control components

Solution

- Reactor unit controls designed as an intelligent vendor-independent automation object

- Object includes not only process automation & HMI, but IT services such as track & trace

Benefits

- Expanding capacity of process with no additional programming resulting in vastly reduced engineering time and time-to-market

- Vendor-independence allows controls to be distributed or centralized. Current project using Stahl ATEX controllers used
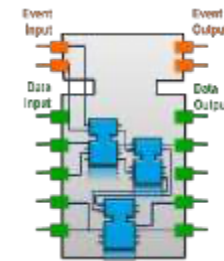
- Automatic reporting/logging of recycled waste
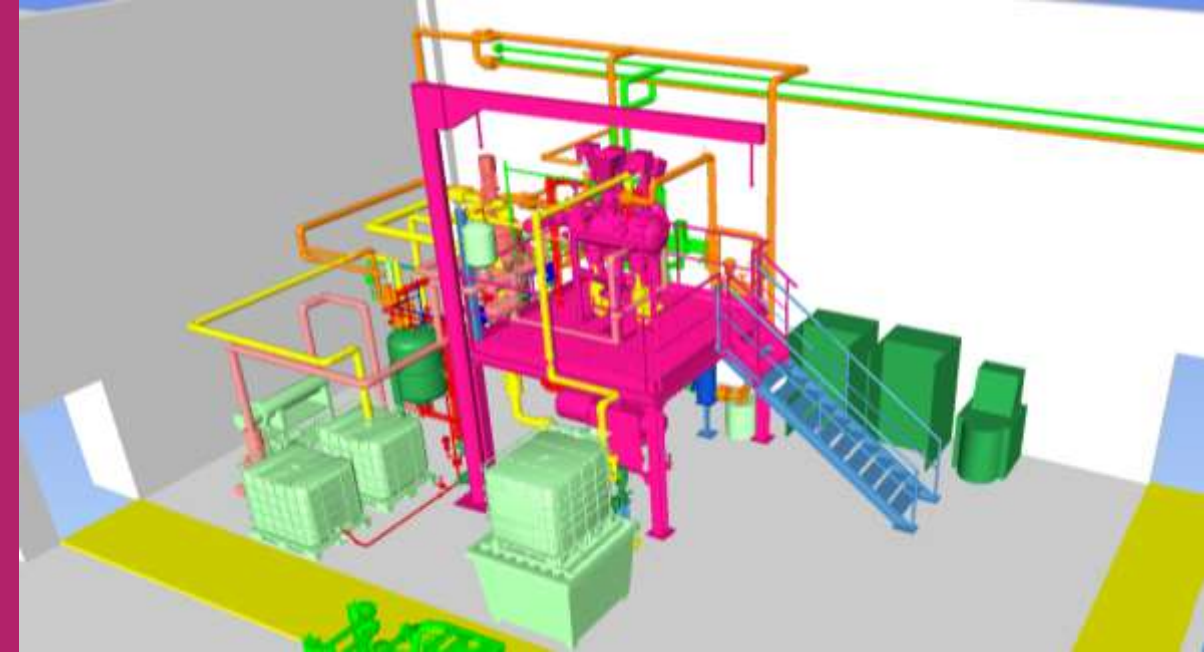
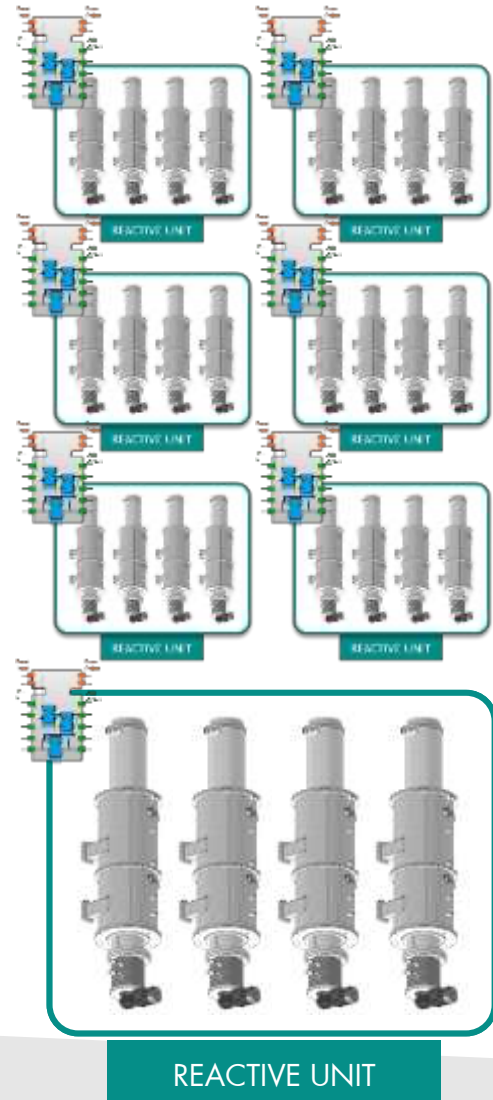# Technical foundation
for modularity in Gr3n

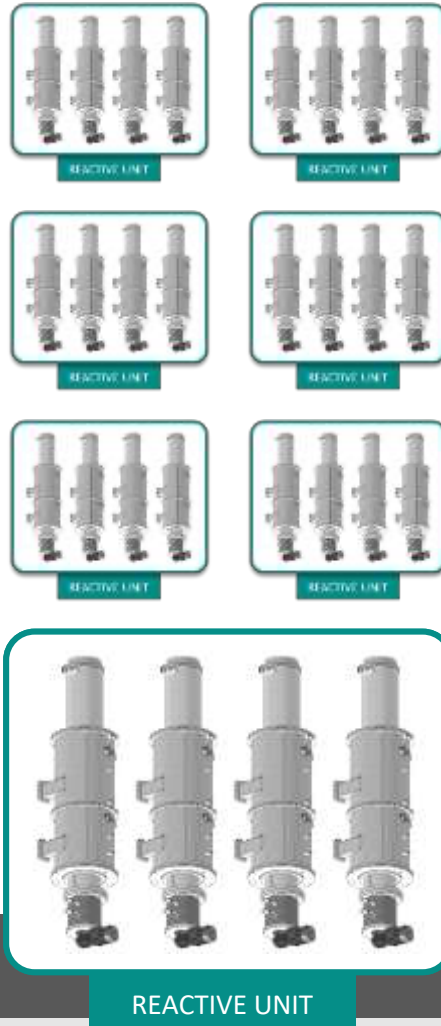**Intelligent Automation Object**

REACTIVE UNIT

Technical foundation
for modularity in Gr3n

Synergistic distributed automation management of independent Reactive Units based on IEC-61499

Full-scale plants composed of intelligent units …

Intrinsic adaptability of the process to varying input streams

PET Waste

REACTIVE UNIT

PURIFICATION PROCESS

EG + PTA

... with seamless integration with IT functionalities

GR3N

Thermal Energy

Electricity

PET Waste

Water

DECISION SUPPORT

LIFE-CYCLE PERFORMANCE ASSESSMENT

REACTIVE UNITS

PURIFICATION PROCESS

EG + PTA

Waste to disposal

Discharged water
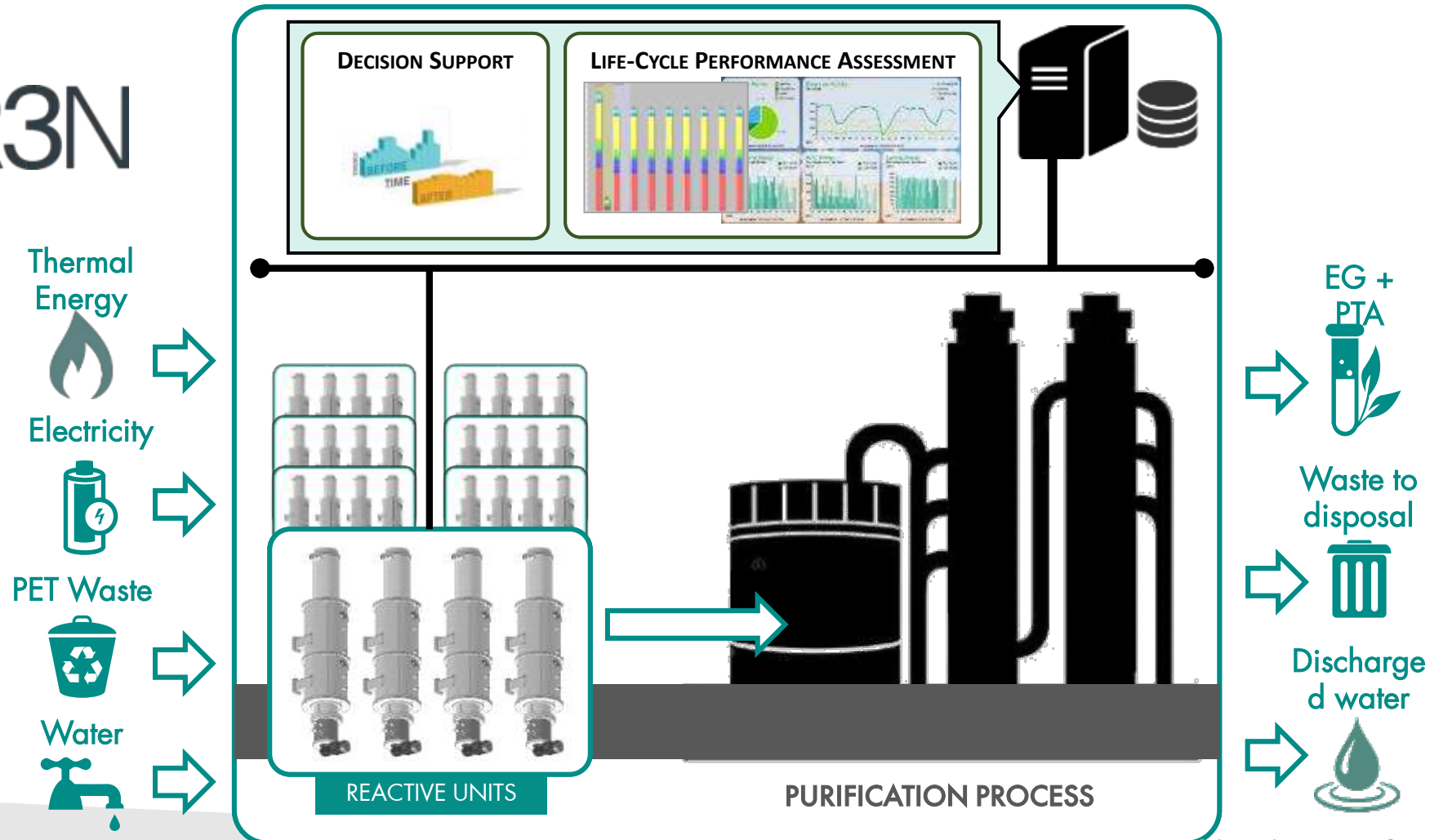
HW topology according to System topology

Visualization and Data Analytics
Edge Server with Hypervisor OS and virtualized runtime

Operator HMI
Windows PC with EcoRT HMI runtime

IEC-61499/ETH

Supervisory Control Logic
iPC with soft-PLC runtime

MW Reactor
Distributed IOs With local CPU

MEG Feed
VSD with integrated CPU

NaOH Feed
VSD with integrated CPU

Extractor
VSD with integrated CPU
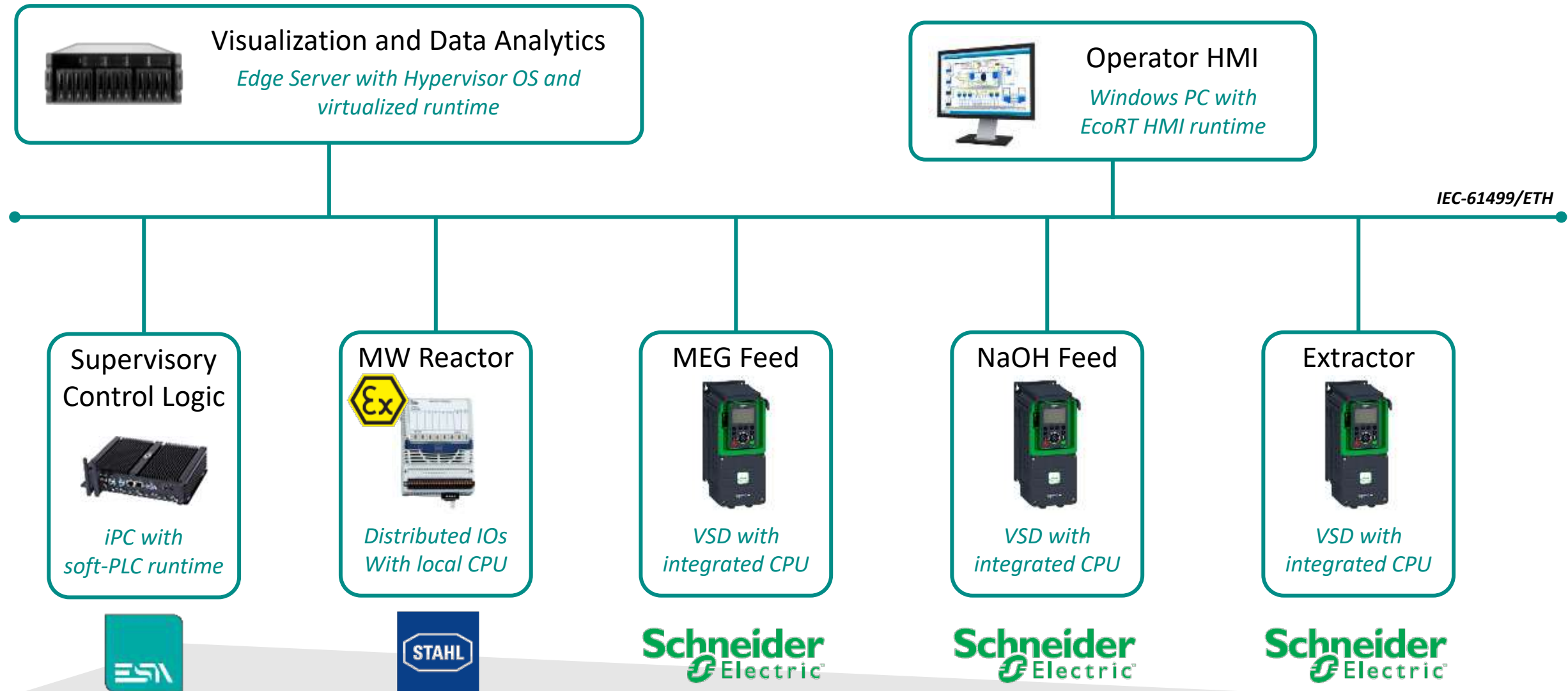
Opportunities for Gr3n in UniversalAutomation.org

- **Modular engineering** of plant automation according to process modularity

- Reduction of **engineering costs** during market scale-up

- Improvement of **TCO for automation** in our plants

- New **IP protection routes** for our Reactive Units for depolymerization

- Additional optimization by means of **advanced Data Analytics**

- **OT-IT integration** translating into new value chain opportunities

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