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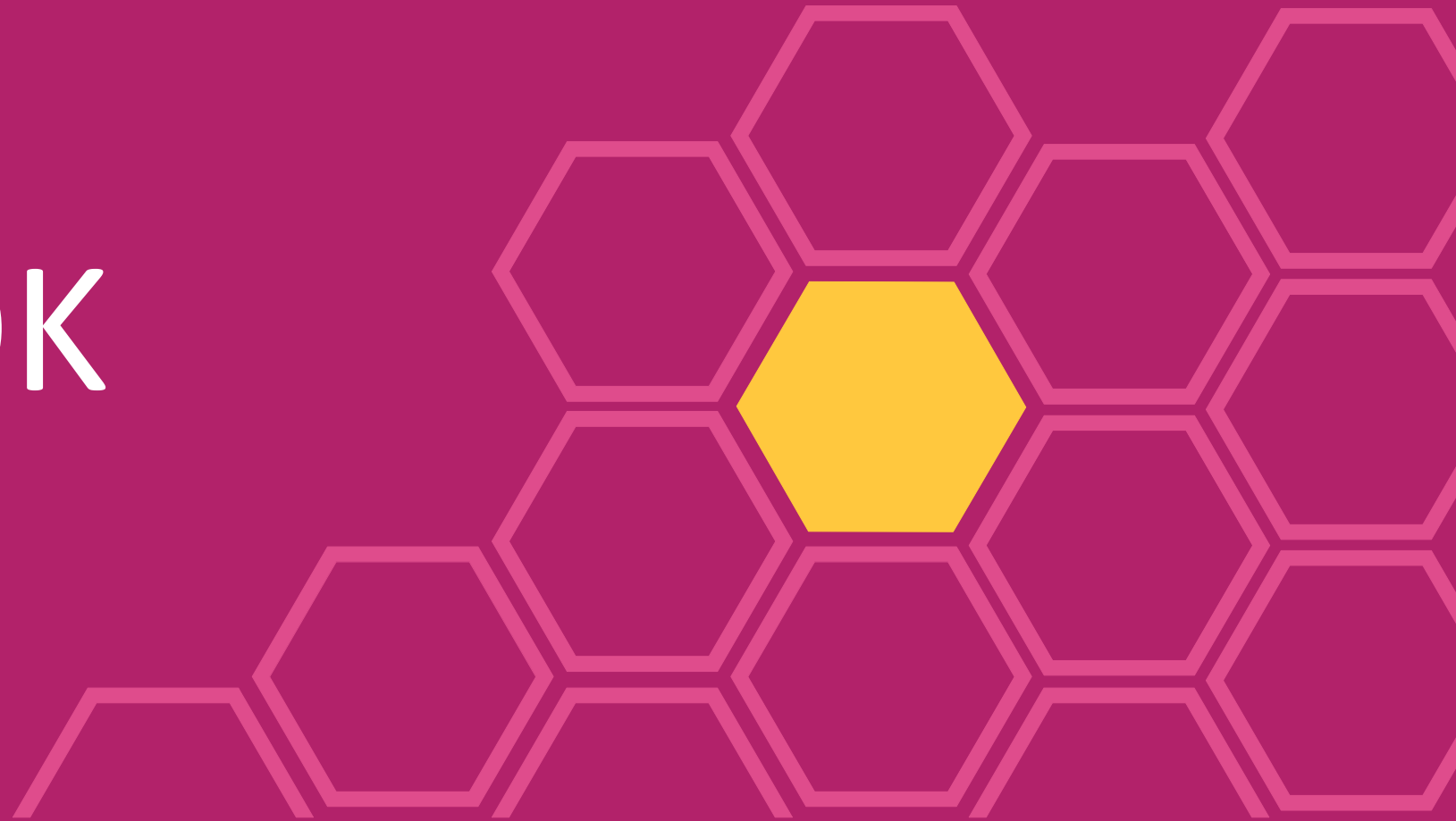
PLAYBOOK



AGENDA

1. What is UniversalAutomation.org?
2. Getting started with UAO
3. Deeper into UniversalAutomation.org
4. Who are the members?
5. Why they joined us?
6. UAO as Technology Enabler
7. Benefits
8. Membership Pricing
9. Deeper with the Technology
10. Use Cases
11. Cases Split
12. UAO Organization
13. Resources

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What is UniversalAutomation.org?

WHY
Universal Automation?

INNOVATION BARRIER

My digitization strategy is stalled because of the high cost to get data from my existing controllers

SOFTWARE RE-USE

I'm obliged to rewrite my SW application when my HW reaches end-of-life

MANAGING MULTIPLE SUPPLIERS

My maintenance teams have to learn multiple SW tools resulting in higher MTTR

Each new system is just "new legacy" 15 years later!

ATTRACTING TALENT

It is difficult to attract talented young software engineers!

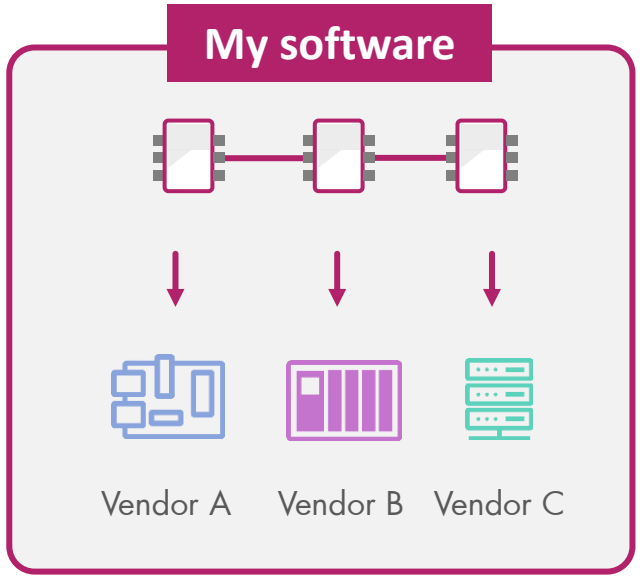
WHY
Universal Automation?

SUMMARY

Vendor lock increases my costs
& reduces my ability to innovate!

Automation Systems must become more Universal

- Control **application software** must be **vendor-independent**
- Shared technology to make **portability** a reality
- Facilitate re-use of software – **Plug & Produce**
- Emergence of **edge compute/edge control architectures**
- Appeal to **young software engineers** – Modern Tech



UniversalAutomation.org

The Missing Link for Industry 4.0

1. A **common automation layer** based on IEC 61499

Reference implementation

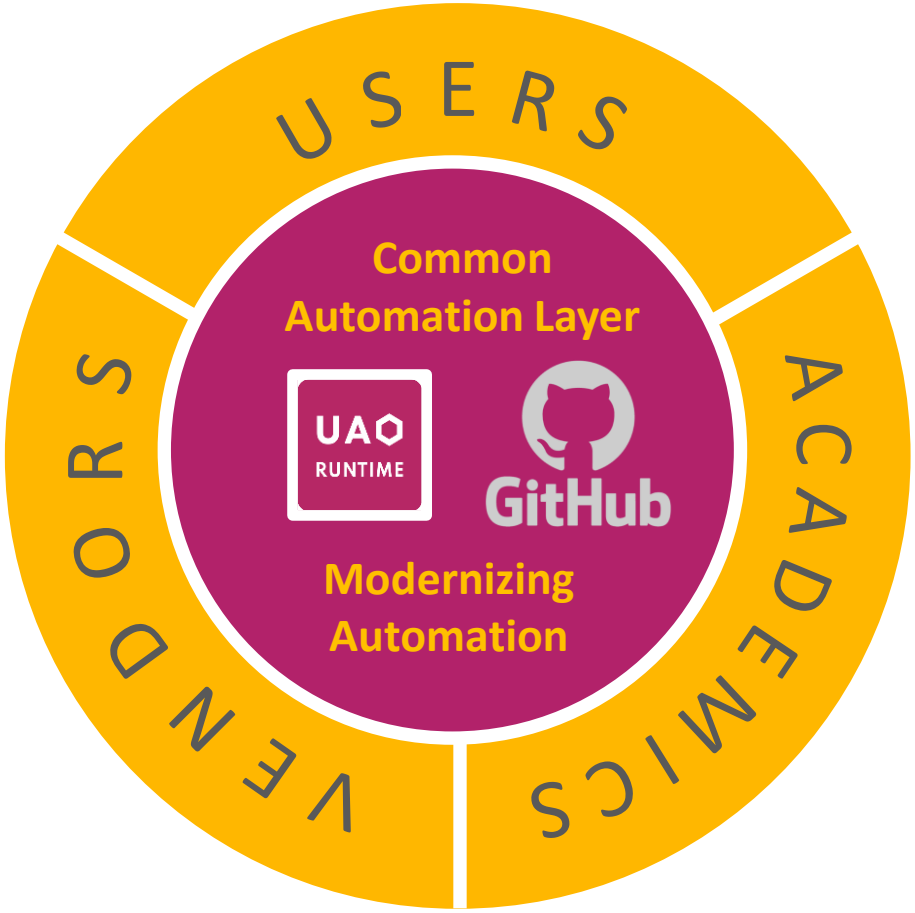
Linux + Ubuntu + debian + android = IEC 61499 = UNIVERSAL AUTOMATION.ORG

managed by

2. An **Ecosystem** of Users, Vendors & Academics

Enables AppStore for Smartphones (android) = Enables AppStore for Industrial Automation (UNIVERSAL AUTOMATION.ORG)

Independent, non-profit association



Ecosystem

A Community – Not a Standardization Body !

WE are — **A community of users, vendors and academics** organized around an independent non-profit association

WE use — Universal automation platforms that use a **shared-source IEC 61499 runtime execution engine**

WE promote — **Portability/Reusability** of vendor-independent automation application software

Benefits

- ✓ **Maximize application portability across vendor platforms**
- ✓ **Remove issues linked to « interpretation » of written standard**
- ✓ **Release universal automation offers in months rather than years**

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Getting Started with UniversalAutomation.org

Start benefiting from the technology right away

Transform your Legacy Systems with IEC 61499

Modernize Without Disruption: Unlock the Power of IEC 61499

Transform your existing systems without interrupting ongoing operations. By leveraging IEC 61499, you can modernize your automation infrastructure while maintaining business continuity.

Key Benefits:

- ### Non-Disruptive Modernization

  Upgrade legacy systems incrementally, ensuring continuous operation throughout the transition.

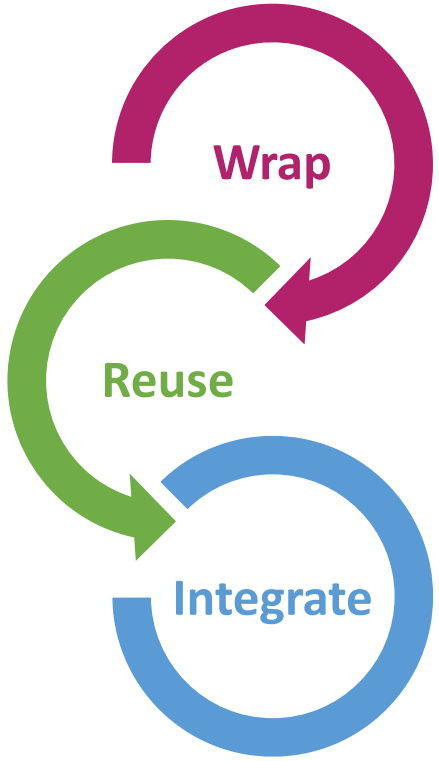
- ### Enhanced Efficiency and Decision-Making

  Enable real-time data exchange between Operational Technology (OT) and Information Technology (IT) layers, improving responsiveness and insight-driven decisions.

- ### Seamless System Integration

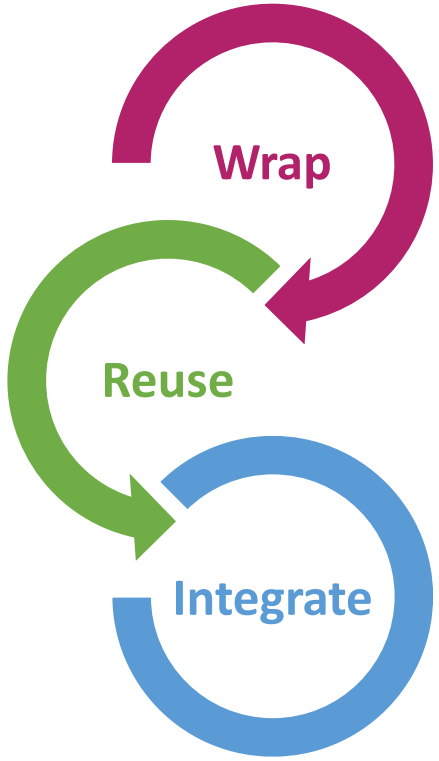
  IEC 61499 facilitates smooth communication and coordination across diverse system components, regardless of vendor or platform.

Integrate and Expand your Current Systems



- **Wrapping** legacy systems within a new interface that complies with the IEC 61499 standard allows these systems to continue operating while benefiting from advanced features.
- **Reusability** is achieved by encapsulating functionalities into Function Blocks, which can be adapted and reused, reducing development time and costs
- **Integrating** legacy systems into IEC 61499 system creates a cohesive, distributed control system and enables interoperability, data exchange, and coordinated control between new and old systems provided by the **IEC 61499 based Plant orchestration layer**.

Integrate and Expand your Current Systems



How it works:

- A wrapper function block is created in IEC 61499.
- This wrapper acts as a proxy or interface to the legacy system.
- Communication is typically handled via standard protocols (e.g., OPC UA, Modbus, MQTT).
- The legacy system continues to operate as-is but can now interact with modern components.

Benefits:

- Preserves investment in legacy systems, no need to rewrite legacy code.
- Enables integration with modern, distributed systems.
- Improves flexibility and scalability
- Legacy systems can be monitored and managed using modern tools.
- Enables gradual migration to modern architectures

Installed Base Strategy

Principle 1: wrap & reuse existing legacy systems

Build library of universal automation software components to interface legacy systems to site/enterprise-level orchestration

Principle 2: for new automation systems, stop installing "new legacy"

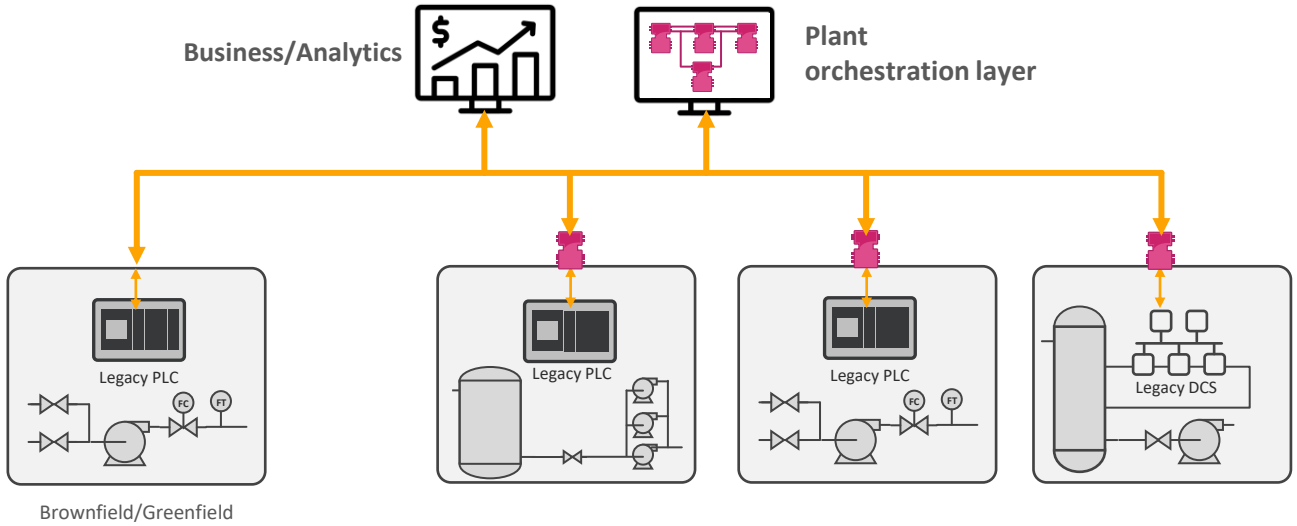
Universal Automation: multi-vendor, portable software components, flexible architectures

Universal Automation

Principle 3: upgrade systems to universal automation as they become obsolete

If possible, replace CPU's while conserving IO and field cabling

Universal Automation



IEC 61499 as the Foundation for Orchestration

Implementing **IEC 61499 as the Plant Orchestration Layer** allows for distributed, event-driven control without disrupting existing production. Each machine or process retains its autonomy while participating in a coordinated, modular system - ensuring seamless integration, scalability, and optimal performance.

Key Benefits:

- **Simplified Integration**

  Seamlessly connects equipment from multiple vendors, reducing engineering complexity and integration time.

- **Increased Flexibility**

  Enables process line evolution and reconfiguration without requiring direct support from each individual vendor.

- **Improved Coordination and Performance**

  Enhances synchronization across machines, leading to more efficient operations and measurable performance gains.

Begin with a Non-Critical System

- To ease the adoption of IEC 61499, it is recommended to start by applying the technology to a non-critical system. This approach allows teams to explore and understand the framework without impacting essential operations.

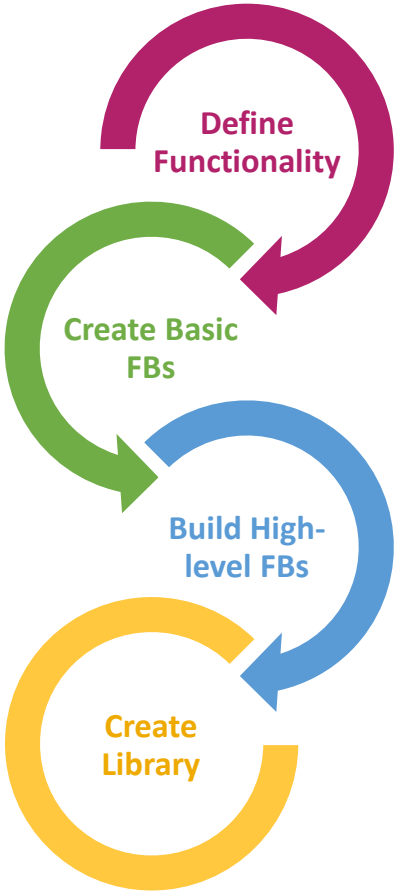
Select a system such as:

- **Temperature monitoring**
- **Humidity tracking**
- **Air quality sensing**
- **HVAC (Heating, Ventilation, Air Conditioning)**
- **Compressed Air Monitoring (if not directly tied to production tools)**
- **Water Supply for Sanitation**

- These systems are ideal for experimentation because they:
  - **Operate independently** of core production processes
  - Allow **safe testing of event-driven function blocks**
  - Provide a practical introduction to **distributed control architectures**

By starting with a low-risk application, teams can **build confidence and expertise in IEC 61499** before scaling to more critical systems.

Begin with a Non-Critical System



Define the Functional Description

Begin by decomposing the system into logical components based on its functionality and physical layout. This modular approach ensures clarity, scalability, and ease of maintenance.

Create Basic Function Blocks (FBs)

Develop individual Function Blocks for each fundamental physical or logical element of the system. These FBs encapsulate specific behaviors or control logic, making them reusable and testable units.

Build High-Level Function Blocks

Combine the basic FBs into more complex, high-level FBs that represent integrated subsystems or major functional units. This hierarchical structure supports abstraction and simplifies system integration.

Develop a Reusable FB Library

Organize all FBs into a structured library of reusable components. This library can be leveraged to efficiently program and integrate similar systems within the IEC 61499 environment, promoting consistency and reducing development time.

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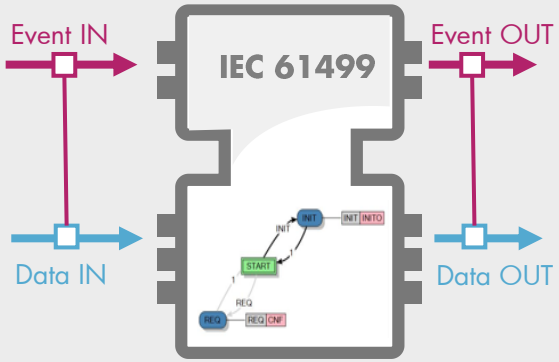
Deeper into UniversalAutomation.org

IEC 61499

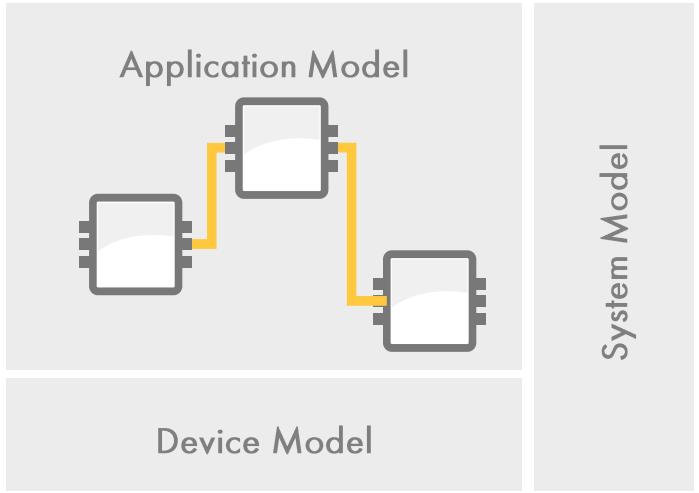
The Technology Enabler of UAO

Event-Driven Function Block



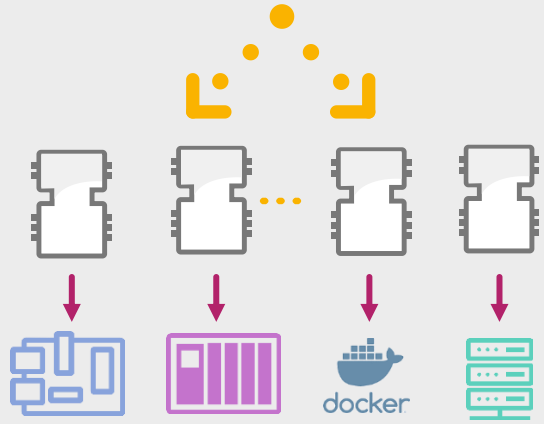
Self-contained SW component

Software-Hardware Decoupling



Decoupling of Application Software from Hardware

Distribution



Distribution of SW components to devices

“Plug & Produce programming using hardware-independent, proven-in-use libraries of software components“

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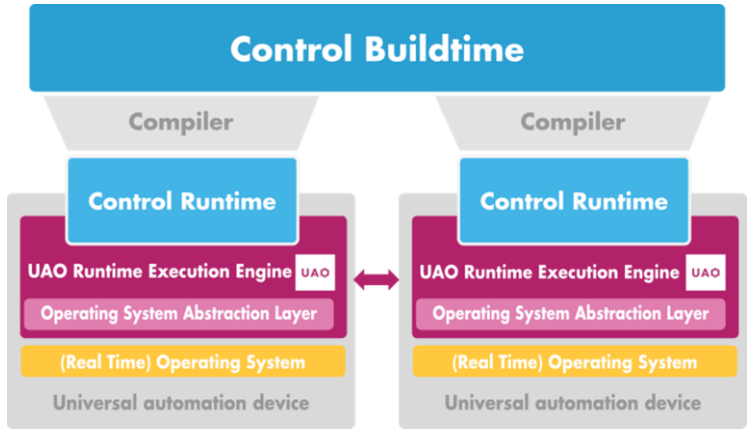
WE promote — **Portability/Reusability** of vendor-independent automation application software



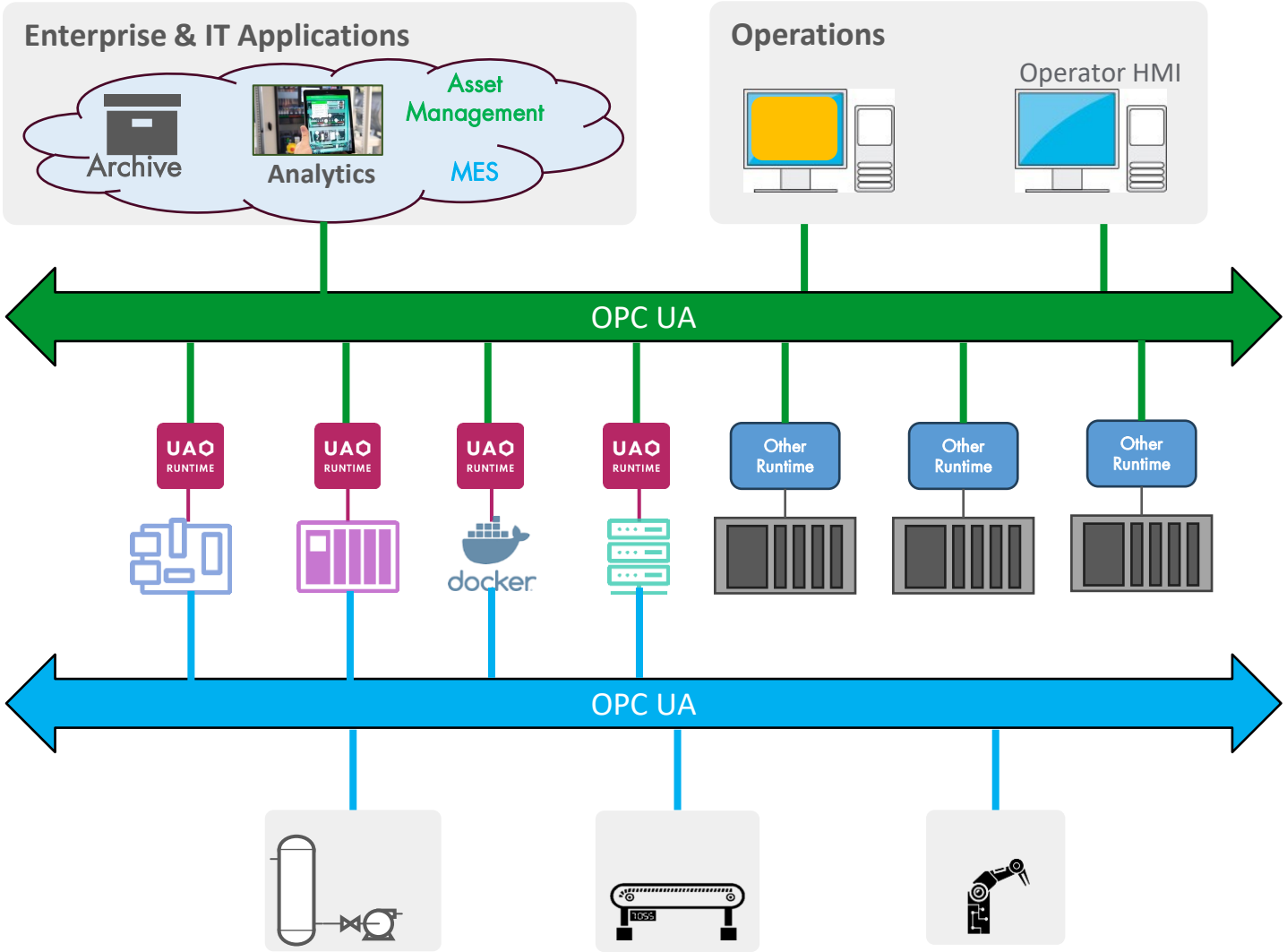
GitHub

Benefits

- ✓ **Maximize application portability across vendor platforms**
- ✓ **Remove issues linked to « interpretation » of written standard**
- ✓ **Release universal automation offers in months rather than years**

UniversalAutomation.org Runtime & OPC UA

- Unified Automation High Performance Stack
- Both OPC UA Server and Client available
- Server Namespace – Modeled, Prepared and compiled in buildtime & deployed to runtime.
- OPC UA Client modeled as a set of Service Interface Function Blocks for use in application.



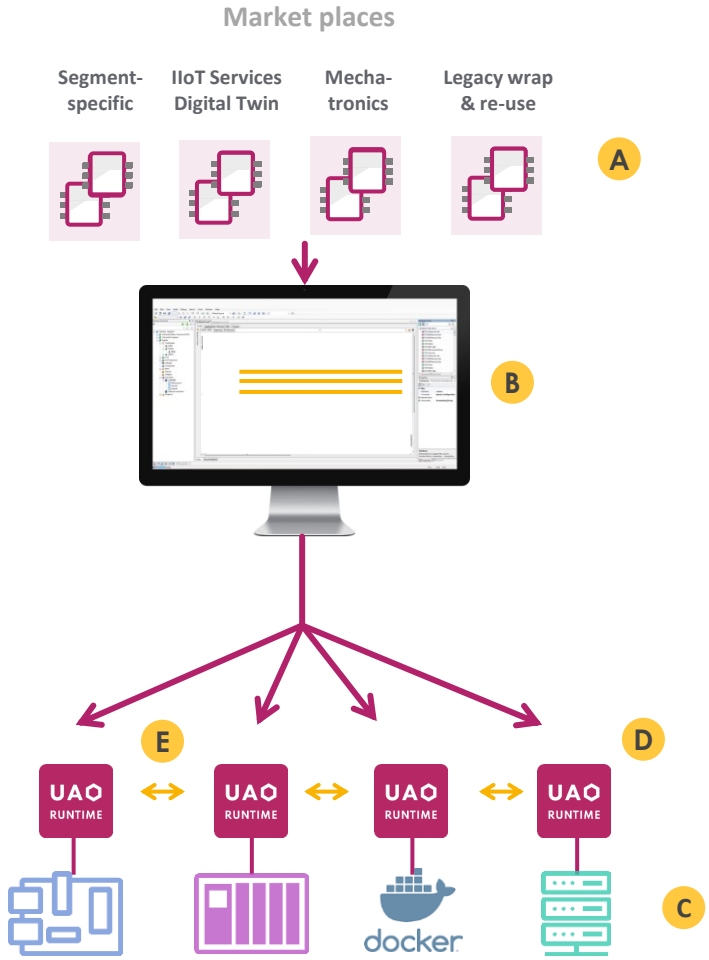
Plug & Produce SW Components:

The Missing Link for Industry 4.0

Proven-in-use software components (automation apps)

Integrated Development Environment for IEC61499 application
"BuildTime"

Distributed control HW with embedded **"RunTime"**



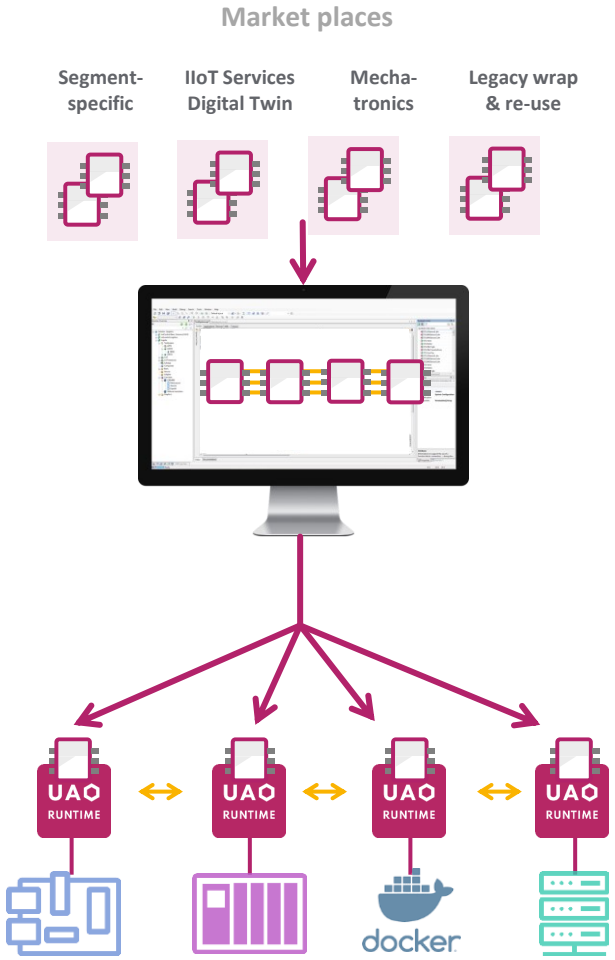
- A Instantiate from library
- B Program whole application
- C Select hardware topology
- D Deploy application to controllers
- E Inter controller communications generated automatically

Plug & Produce SW components

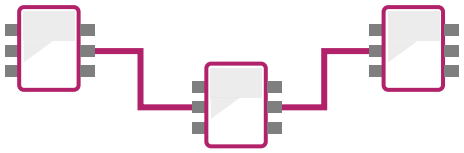
Proven-in-use software components (automation apps)

Integrated Development Environment for IEC61499 application
"BuildTime"

Distributed control HW with embedded **"RunTime"**



"Plug & Produce"



"Write once, distribute across universal automation devices"

Today

Low value proprietary applications

- Costs
- Time to Market
- Flexibility
- Quality

Tomorrow

High value portable apps

- Costs
- Time to market
- Flexibility
- Quality

1. Integrated Development Environment

How UAO Helps You Improve your KPI's

		Traditional objectives			Emerging objectives			
		Productivity	Lower TCO	Reliability	Employee Experience	Resiliency	Flexibility	Sustainability
Rewriting the rules of automation	Plug & Produce SW Components	Low code/ no code		Proven-in-use application SW components		SW re-usabiility		Accelerate open standards (OPAF, MTP,..)
	Software/Hardware Decoupling		BIC hardware- SW re-usability		Only one automation tool to learn	Easier supply chain & obsc- olescence mgt		
	Asset Centric Design (Object-Oriented)	Lower downtime/ MTTR			Attractive to new gen of SW engineers		Modular process/ machines	
	Event/Data-Driven	Automation + IT (Digital Twin, analytics, …)						Automation + IT (Digital Twin, analytics, …)

Degree of impact: Low High

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Who are the Members ?

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Overview of Today's Members:

25 Vendors, 45 Users, 38 Academics/Institutes/Startups

Vendors (1/2)
Advantech
Analog Devices
ASRock Industrial
Belden Group
Bihl + Wiedemann
Bucher Automation
Cognex
Endress+Hauser
HNAC
Honeywell
Inovance
Intel
Kongsberg Maritime
Kyland
Matribox

Vendors (2/2)
Odot
Omron
Phoenix Contact
R. Stahl
Schneider Electric
Sciyon
Stratus
Unionscience
Wilo
Yokogawa

Users (1/3)	Users (2/3)	Users (3/3)
Accenture	ExxonMobil	Platinum Engineering
All About Control	Fare Engineering	Radical
AB InBev	FLSmidth	Rovisys
Actemium	Gr3n	Summit Electric Supply
AFRY	Graybar	Tenlink
Armony System	Hyundai	TriSystems
Autodriver	ICT Group	Upstate Automation
BASF	Indeff	Veolia
Bilfinger	Isaac Engineering	Westcon
BPX	J&W	Wood
Cargill	KPI Automation	**Start ups**
Crescent	Laplace Solutions	AIMIRIM
Dhandy Mecha	Master Systemes	Barbara
EDF	Mayer	Dynamic Process
Ematics	Neodyne	Flexbridge
ENGlobal US	Nestlé	OpenEmbed
Enterprise Automation	Novo Nordisk	Sinapsi
	Onify	Taotech

Academics (1/2)
Aalto University
Edith Cowan University
Ernst-Abbé-Fachhochschule Jena
ESME Sudria
HBLFA Francisco Josephinum
HTW Berlin
HUST
HWK München
ISAE Supmeca
INSA Hauts-de-France
INSA LYON
Javeriana University
Johannes Kepler University Linz
Luleå University of Technology
Meisterschulen am Ostbahnhof
NMIS
Postech

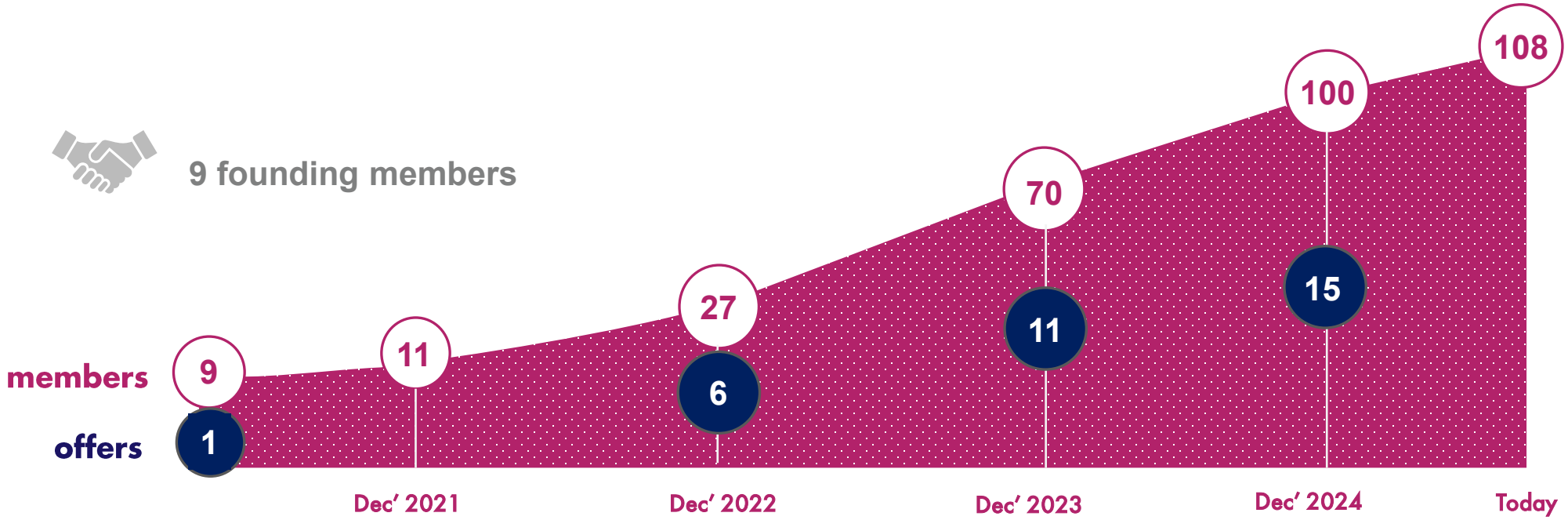
Academics (2/2)
SUPSI
The University of Queensland
Technical University of Kosice
Universidad Nacional de Colombia
University of Jaume I
University of León
University of Reims
University of Sevilla
University of Warwick
UFCG – Universidade Federal de Campina Grande
Universidade Federal do Rio Grande do Norte

Institutes
Alten
Korea Testing Laboratories
SIMTech

108 fully signed-up members!

Offers launched New members

We are Growing Fast



ADVANTECH Enabling an Intelligent Planet · ASRock Industrial · PHOENIX CONTACT · YOKOGAWA · Cargill · REVISYS Automation & Information Solutions · ABInBev · VEOLIA · wood.
Belden · COGNEX · KONGSBERG OMRON · intel. · EDF · Nestlé · BILFINGER · BASF · HYUNDAI · AFRY AF PÖYRY · STAHL
Schneider Electric · ExxonMobil · GR3N · ENTERPRISE AUTOMATION A TETRA TECH COMPANY · novo nordisk · Honeywell · Endress+Hauser People for Process Automation

Overview of Today's Members

Vendors

ADVANTECH — Enabling an Intelligent Planet
ASRock Industrial
ANALOG DEVICES — AHEAD OF WHAT'S POSSIBLE™
Belden
Bihl+Wiedemann
BUCHER automation
COGNEX
INOVANCE 汇川技术
lumbergautomation — A BELDEN BRAND
intel.
KONGSBERG
odot
MatriBox
OMRON
PHOENIX CONTACT
STAHL
Schneider Electric
SCIYON 科远股份
wilo
YOKOGAWA
ProSoft TECHNOLOGY
Stratus — A PENGUIN SOLUTIONS™ BRAND
HIRSCHMANN — A BELDEN BRAND
LicOS — 联诚科技集团 UNIONSCIENCE GROUP
HNAC
Honeywell
KYLAND
Endress+Hauser — People for Process Automation

Users

ACTEMIUM
IAS — Armony System
Cargill
BILFINGER
CRESCENT ELECTRIC SUPPLY COMPANY
ExxonMobil
GR3N
GraybaR
Ingénierie
MASTER SYSTEMES
MAYER
ENG
Upstate Automation
KPI Automation
BASF
accenture
BPX — HELP TO CHOOSE | HELP TO USE
TriSystems
PLATINUM
ICT GROUP
Radical Ingenuity Group
ICT GROUP Raster — Industrial Automation
TENLINK
wood.
VEOLIA
ONIFY
FLSmidth
INDEFF
morson projects
NeoDyne
Nestlé
westcon
Ematics — CONTROL SYSTEMS ENGINEERS
AAC — all about control
HYUNDAI
AFRY — ÅF PÖYRY
eDF
BASF — We create chemistry
SUMMIT ELECTRIC SUPPLY
ROVISYS — Automation & Information Solutions
TECHNOLOGY IN YOUR HANDS
ISAAC
ABInBev
ENTERPRISE AUTOMATION — A TETRA TECH COMPANY
Autodriver
novo nordisk
OHANDYMECHA
Laplace

Academics, Institutes & Startups

Aalto University
Dynamic Process
ECU EDITH COWAN
Singapore Institute of Manufacturing Technology
flexbridge
htw Hochschule für Technik und Wirtschaft Berlin
ESME
LULEÅ UNIVERSITY OF TECHNOLOGY
SUPSI
UFRN
ktl Korea Testing Laboratory
Pontificia Universidad JAVERIANA Bogotá
UNIVERSITÉ DE REIMS CHAMPAGNE-ARDENNE
WMG THE UNIVERSITY OF WARWICK
TAOTECH 道茁智远科技
JKU LIT Cyber-Physical Systems Lab
NMIS National Manufacturing Institute Scotland
Aimirim
TECHNICAL UNIVERSITY OF KOŠICE Faculty of Mining, Ecology, Process Control and Geotechnologies
UNIVERSIDAD NACIONAL DE COLOMBIA
OpenEmbed
barbara
isae supméca
Meisterschulen am Ostbahnhof
UFCG
POSTECH — POHANG UNIVERSITY OF SCIENCE AND TECHNOLOGY
THE UNIVERSITY OF QUEENSLAND AUSTRALIA — CREATE CHANGE
Handwerkskammer für München und Oberbayern
UNIVERSIDAD DE SEVILLA
UJI UNIVERSITAT JAUME I
INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON
SINAPSI
universidad de león
HBLFA Francisco Josephinum Wieselburg
Ernst-Abbe-Hochschule Jena University of Applied Sciences
ALTEN

Universal automation Offers are Ready for Test Today!

The first member offers are ready to use.

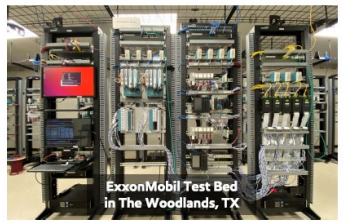
Based on a shared automation runtime, the offers allow users to test the benefits of the UAO technology for themselves.

More about the universal automation offers

End Users are Using the Technology

ExxonMobil

- Using UAO runtime execution engine in OPAF test bed since 2018
- Real-life field trial ongoing
  - Replace existing DCS/PLC's
  - 2000 IO points, 90+ loops
  - UAO runtime + OPC UA



ExxonMobil

KONGSBERG

- Orchestration layer above existing legacy controllers
- Additional IT/OT applications

GR3N

- Built "Reference IEC 61499 application"
- Multi-vendor system commissioned:

  R. Stahl, Schneider Electric, ESA

Cargill™

- Objective – decouple application library from vendor platforms
- Ongoing food oil unloading application with EcoStruxure Automation Expert

ASRock Industrial

Aimirim

- Real-time process control
- Predictive maintenance
- Improved automation scalability
- Reduced machine stoppages
- Consistent product quality

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Why They Joined Us?

Aalto University

We are excited to be part of UniversalAutomation.org because it promises to be a complete game changer. It opens up a new world of possibilities for organisations like ours. Unlocking valuable data currently buried in proprietary systems, making the connectivity and deployment of new technologies like Artificial Intelligence quick and simple. **As part of UniversalAutomation.org we are actively collaborating with and supporting like-minded organisations to create an exciting new open era in operations and automation.**

Valeriy Vyatkin

Professor of Electrical Engineering at Aalto University

ADVANTECH

Enabling an Intelligent Planet

Advantech is growing really fast and I believe if you want to keep on growing in the future, you need to be able to innovate. And when I see the universal automation approach, it is exactly the way of innovation we need to go with.

Who is inside Universal Automation? You have institutions, you have academics, you have OEMs, manufacturers and users. This means that you have **all the voices of the market on one platform**, no one is pushing in one direction. We are just finding the way to grow together to the next level.

Universal Automation is really the concept you want to push today. In the past there was one piece of hardware with one task, but we have to move on, we have to evolve. The evolution is that the hardware can have different kinds of software and everything can run on top of it. The hardware itself is not so important anymore.

Marco Zampolli

Industrial IoT Product Sales Director

ANALOG DEVICES

I think now is a great time to disrupt the industry, really **become hardware agnostic** and let the end user decide what hardware they want to use.

Customers can basically choose the hardware they want using just one automation platform, so they become very versatile and are not bound to one particular vendor.

Universal Automation provides precisely the level of flexibility that a competitive and sustainable industry requires. For our customers, this is exactly what they are looking for today.

Nicholas Holland

Managing Director - EMEA Broad Market

barbara

There is a huge room for improvement on the way runtimes are managed and orchestrated today. By joining UAO we aim to contribute to **make large runtime deployments more scalable and secure through modern Edge Management functions**. Our participation in UAO represents another significant step in our commitment to delivering **open and flexible solutions** based on industry standards, enabling industrial organizations to innovate more rapidly and with reduced risk.

David Puron

CEO and Co-founder at Barbara

Cargill™

We joined UAO because we strongly believe that we have to **decouple the application from the hardware**.

The value of our automation is not in the hardware and (yet today) we design every plant in hardware-centric way. That is no longer possible with the regional complexities of cyber security, more maintenance, more complex software requirements. On our current path towards Industry 4.0 that hardware-centric approach no longer good. So in short, we must decouple hardware & software to make sure that we are able to survive as an industry in Europe.

Dominic de Kerf

Plant Systems and Controls COE

On our hydroelectric power plants, we have technology from the 1950s that we need to modernize it. UAO's technology will allow us to **decouple software from hardware** and create **portable libraries of functions to replicate across our assets**, **independent of the automation hardware**.

We want to completely change our approach, focusing on functions rather than hardware constraints. This functional approach from design to implementation is a revolution for us.

Our automation teams were quickly impressed with this new approach and have understood it very quickly.

Laurent Bacon

Head of Industrial Information and Control

The creation of UniversalAutomation.org is the dawn of a new era within automation technology; over the course of the next five years, it will create a sea change for the future of automation software development. We are delighted to be a part of UniversalAutomation.org, driving the **development of a "plug and produce" system** which will help the industry keep up with the increasing demands of **flexible manufacturing**. There is no doubt that as members continue to join the organization and reap the benefits of collaboration and openness, that industry-wide change will follow.

Dmitrii Drozdov

Chief Technology Officer at Flexbridge

FLSmidth

Open Automation technologies like UAO's will allow us to deliver innovative automation systems **faster** and at **lower cost**. That enables more **efficient manufacturing** and **faster time to market** for green solutions. We plan to starting using IEC 61499 to innovate on top of existing infrastructure and technology as our first use cases. Longer term, more efficient integration of technology from different OEM machine and automation suppliers will have a major positive impact.

To those considering joining UAO, don't join if you like being locked into expensive proprietary PLC platforms and enjoy using the same old thing!

David Campain

Global Product Manager, Process Control Systems

I joined UAO because by being open, by being an international standard, by being already supported by quite a certain number of relevant companies, it paves the way for a new generation of not just automation systems, but a **new way of conceiving automation systems**. Because in the end it leaves behind the problem of hardware and unleashes the power of software, which has not yet happened in automation.

Franco Cavadini

Chief Technical Officer

KONGSBERG

I like to have a system that is based on an open standard instead of a system that is defined by just one vendor.

So for us, 61499 is one way of opening up our system and make it future ready and that's why we joined the UAO.

Today there are a lot of obsolescence issues in in the industry so you can end up in a corner where it's hard to move out from. Instead, **by using an open standard, you're having the opportunity to select the best vendor.**

A standard is always good but it's even better to also have an implementation of a standard. And that's exactly what UAO provides.

It's not an open-source, but a **guarded-source-community**. And that's very important because then there is **someone behind it to make sure that the quality of the software is good**.

Sølve Raaen

Principal Architect OT

od·t
零点自动化

When we came to UniversalAutomation organisation, they offered us a stable solution with the IEC 61499 standard as the future of open automation. This **standard eliminates the need for code conversion**. This means that customers can use only **one programming for our PLCs on different machines**. This also helps them to increase their efficiency, reduce their costs and run more stable machines.

We are very optimistic about our cooperation with Universal Automation because there are so many different types of machines and PLCs in China, and it takes a lot of engineering to make different machines talk to each other. We joined this ecosystem to make every machine and PLC talk in one standard.

In fact, we are the first local company in China to offer large scale IEC 61499 compliant hardware.

Raphael Xiong

Sales Manager

STAHL

THE STRONGEST LINK.

We want to have an open system because our customers ask for it. It will also make our life much easier if there's only **one product with one interface that basically works with every controller**.

You can run the application on our system. You can also use another system. You can mix and match different systems. So literally a part of the system can be installed here and the other part can be installed in Australia and it will work together.

Most of our customers in process automation are pretty conservative, they never want to change a running system. But now, we see a new generation coming up that is used to new technologies. They are open to test and try these new functionalities and I think most of them pretty well understand the advantages on this. I'm doing this for 20 years now and I think over the years, this is the most exciting change.

Andre Fritsch

Senior Product Manager

Schneider Electric

The change to Universal Automation is really enabling the industries of the future.

Business data, coming from the automation level, is the foundation to make much more conscious decisions. Universal Automation is an ideal prerequisite for efficiently obtaining this data and performing valuable analyses.

Universal Automation of course is much closer to the IT-thinking and therefore young talents are more attracted to work in this environment.

Barbara Frei

Executive Vice President Industrial Automation

Stratus, a proud member of UniversalAutomation.org, is committed to advancing open, vendor-independent automation. By creating open ecosystems, UniversalAutomation.org enables users to choose the **best hardware and software combinations for optimal performance**. The Universal Automation Open approach allows users the ability to pair their software with a hardware platform that brings **reliability**, **security**, and **simplicity** to the forefront. With built-in virtualization, OT supportability, high availability and fault-tolerance, Stratus platforms enable users to deploy UAO projects with confidence in their mission critical operations. By aligning with UniversalAutomation.org, Stratus empowers businesses to scale, innovate, and accelerate time to market with reliable, secure solutions across multi-vendor environments.

Rudy de Anda

Head of Strategic Alliances

VEOLIA

We operate several thousand third-party installations, so we find ourselves with a large volume of equipment from different brands. This requires great complexity of skills to maintain them. This is why the association's approach interests us greatly: to **simplify the multi-vendor complexity**. Pooling the skills of our employees on a limited number of platforms is a guarantee of operational efficiency, and a vector of success for the dissemination of standards.

Michel Arroyo

Operations and Performance Director

Wood is excited to be part of defining the future of automation and transforming profitability and productivity for the customers in our industrial markets. UniversalAutomation.org technology will enable business innovation, increase digital adoption and agility with its **open**, **interoperable** and **portable solutions- building business resiliency** and empowering our clients to be future-ready.

German Carmona

Global President of Wood's Digital Consulting business

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UAO as Technology Enabler

UAO is an accelerator of other open standards

Implementation of standards using proven-in-use software components

THE OPEN GROUP
OPEN PROCESS AUTOMATION™ FORUM

UAO Library components accelerate implementation of open standards

OPAF library

OPC FOUNDATION
The Industrial Interoperability Standard™

OPAF/UAO Liaison Agreement already effective

Universal automation device
Vendor 1

Universal automation device
Vendor 2

Universal automation device
Vendor 3

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UAO is an accelerator of other open standards

Implementation of standards using proven-in-use software components

Defines Dosing Service

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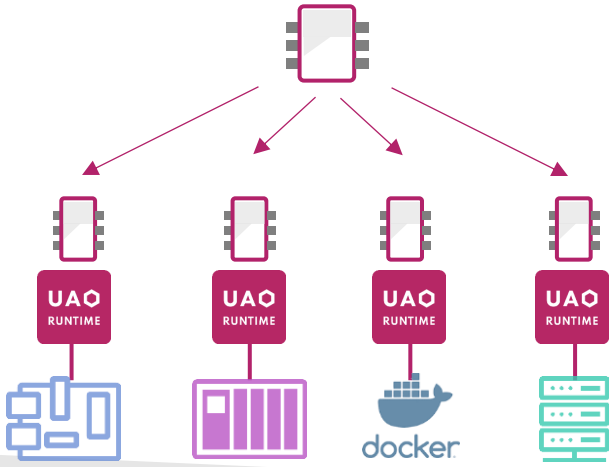
Implements “Dosing” as a software component



BENEFITS

Test “Dosing” software component once (vendor independent), run on multiple UAO devices.

- Lower engineering cost
- Faster commissioning
- More reliable (Proven-in-use components)
- One software environment to learn

Execute “Dosing” on UAO devices
UAO device = MTP-compliant device

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Benefits

Driving Significant Benefits for…

Users

- **More cost-effective** – write once, re-use regardless of vendor
- **More reliable & safer** using proven-in-use, reusable software libraries
- **Incrementally improve** over the lifecycle
- **End-of-life proof** - re-use software, even when automation hardware is obsolete
- **Embed & reuse IP** to protect competitive edge or to get better ROI on increasing software investment

Vendors

- **Grow** software **revenues**
- **Access new end users**/segments with new offer
- **Shape** state-of-the art **software technology**
- **Decreased costs**/risks thanks to platforming

Why should END USERS join UAO?

Network with other members to learn, exchange and collaborate

Get your employees trained on the technology

Be invited to world-leading industry events on behalf of UAO to share your unique Point of View

Be invited to exclusive live events to network with other industry leaders and relevant thought leaders

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Leverage UAO's network and community to advance your business goals

Sponsor the initiative
Without users we will NOT attract vendors

Influence the next development of the runtime execution engine

Why should SIs/EPCs join UAO?

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- Get access to key **End Users & Projects**
- **Get trained** on the technology
- **Embed your knowhow/IP** in software component libraries
- **Be promoted** by the association (social media, webinars, fairs…)
- **Be invited to world-leading industry events** on behalf of UAO to share your unique Point of View
- **Be invited to private events** to network with other members and relevant thought leaders
- **Promote your experience and skills within the community**

Why should **VENDORS** join UAO?

Obtain license for UAO runtime execution engine - **create a new category of automation device** in months rather than years

Share R&D costs with platforming approach

Influence the next development of the runtime execution engine

Get access to key End Users looking for IEC 61499-based systems

Position your company as thought-leader/innovator

Be invited to world-leading industry events on behalf of UAO to share your unique Point of View

Be invited to private events to network with other members and relevant thought leaders

Promote your experience and skills within the community

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Why should ACADEMICS join UAO?

Stay up to date with Next Gen automation systems Sponsor the initiative

Network with other companies & academics to learn & drive standardization

Influence the next development of the runtime execution engine

Get trained on the technology, interact with UAO Ecosystem

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Membership Pricing

Membership structure

Membership Level	Yearly Fee €k	Voting Rights		Runtime Access
		General	Roadmap[1]	
Platinum	150	1	10	Yes
Gold	75	1	4	Yes
Silver	25	1	1	Yes
Sponsor Voting	18	1	0	No
Sponsor Non-Voting[2]	2-8	0	0	No
Startups[3]	6	0	0	TBD[4]
Academics	2	1	0	TBD[4]

1. Roadmap voting rights applicable in phase 2
2. Revenue dependent: <€10m = €2k, €10m-€100m = €5k, >€100m = €8k
3. Conditions (duration, revenue levels, etc.) determined by Board
4. Access to source code determined on case-by-case basis by Board

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The Benefits of UniversalAutomation.org

There is more

Summary of benefits/UVP's

			Unique Value Proposition				
			Operational Excellence			*Digital Transformation*	
	Feature	**Benefit**	Vendor-independent Plug & Produce SW components	Flexible Architectures	Asset-centric Control - Modular machine/ process	IT/OT convergence	Wrap & Reuse/ Orchestration
IEC 61499	Event-driven Function Bloc	Self-contained SW component	■	■	■	■	■
	Service Interface FB	Integration with IT/OT systems				■	■
	Adapters	Hide complexity single-line eng			■	■	
	System model	Mapping of FB's to devices/ resources		■	■		
	App Model	Decoupling of app software from hardware	■	■	■		
	Device/Resource Model		■	■	■		
UAO	Shared runtime execution engine	Multi-vendor app software portability	■	■			
	IP Policy	Member freedom-to-operate	■				

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Features / Benefits

Summary of benefits/UVP's

			Unique Value Proposition				
			Operational Excellence			*Digital Transformation*	
	Feature	**Benefit**	Vendor-independent Plug & Produce SW components	Flexible Architectures	Asset-centric - Modular machine/ process	IT/OT convergence	Wrap & Reuse/ Orchestration
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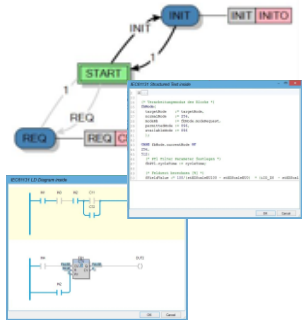
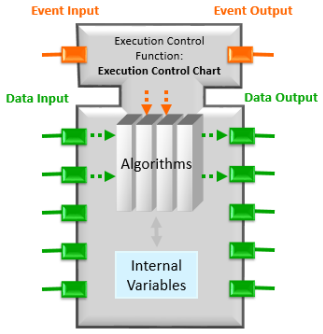
	Device/Resource Model						
UAO	Shared runtime execution engine	Multi-vendor app software portability	■	■			
	IP Policy	Member freedom-to-operate	■				

IEC 61499 – Event Driven Function Block

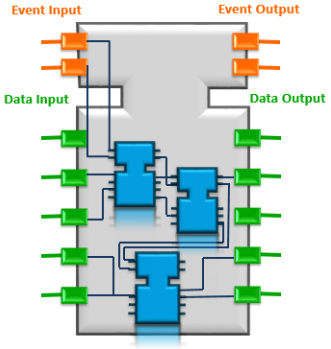
- Self-contained SW component providing functions ***thru defined interface***
- Programmed in any language
- Real-time + Right-time
- SFB: FB interface to functionality beyond IEC 61499, e.g comms networks, device hardware, etc.

Basic FB
e.g. Motor
+ Execution Control Chart
+ Algorithms (ST)

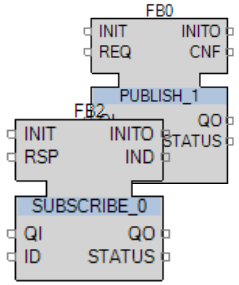


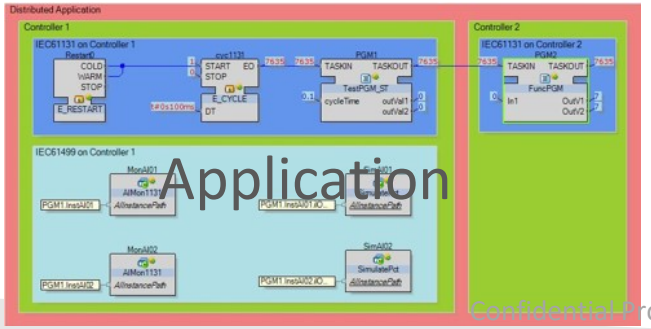


Composite FB
e.g. Conveyor line
Composed out of Basic FB, Composite FB, Service FB



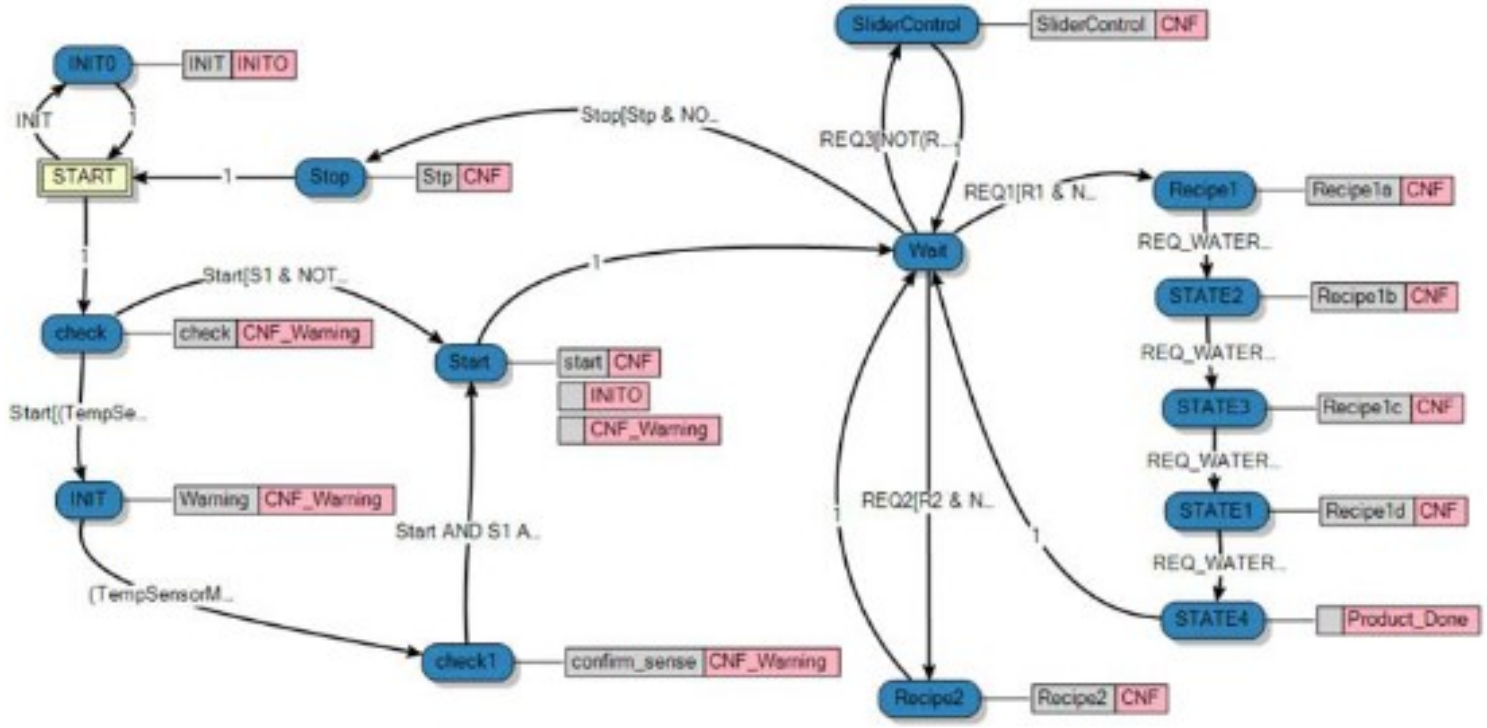
Service FB
e.g. I/O access (Data, HMI, Communication …)
Provided by the System





IEC 61499 –
Execution Control Chart

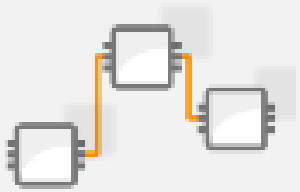
- State-transition machine
- Structured approach to programming
- Small programs easy to read
- Debug & commissioning simplified



Example recipe controler (Valeriy Vyatkin)

IEC 61499 – Adapters

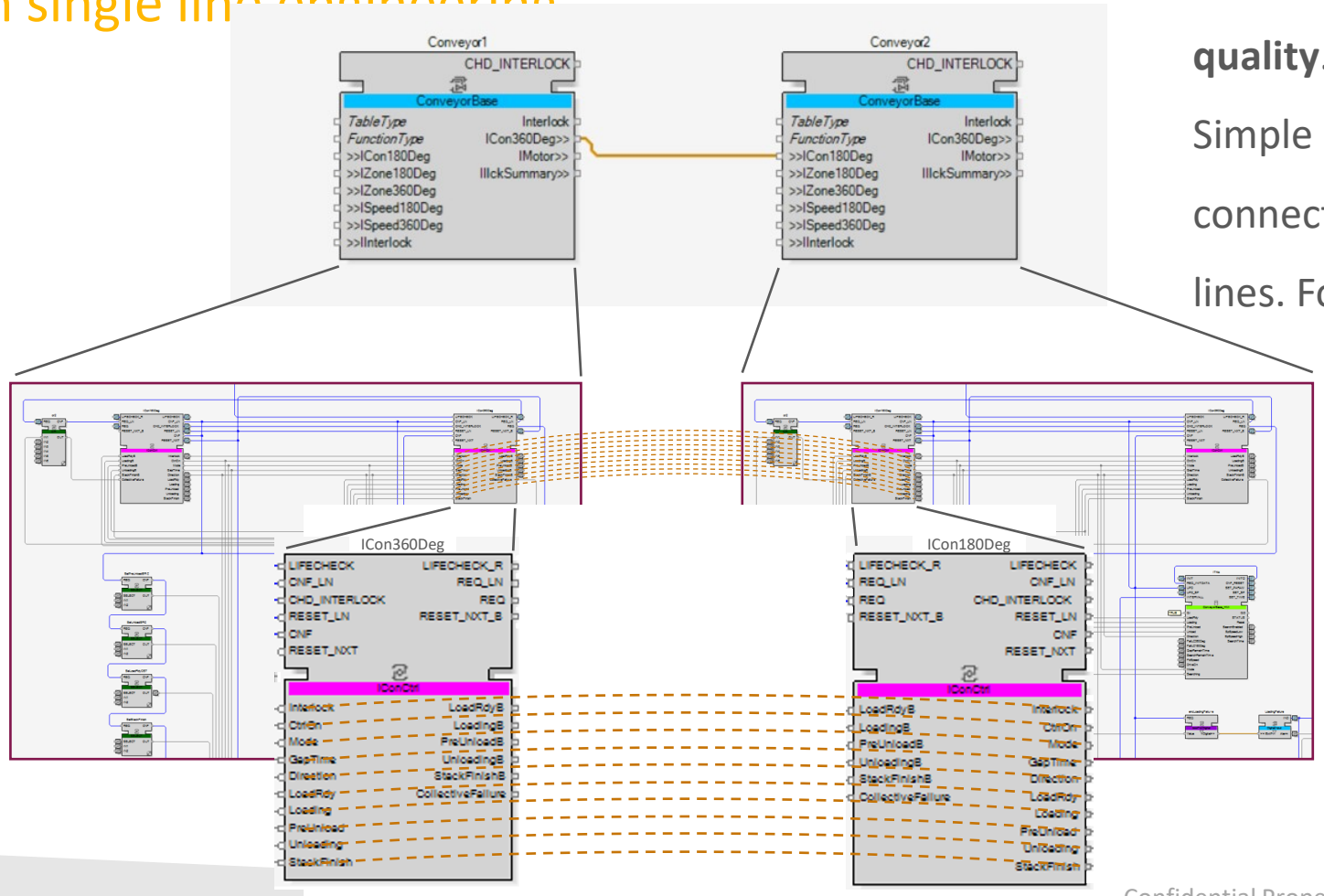
Hide complexity with single line engineering



Simplest Automation

A library concept hiding the complexity in engineering. Programming by simple but intelligent lines, helping to prevent failures.

Tremendous cost savings.



Simplest engineering possible enabling **savings** and **consistent quality**.

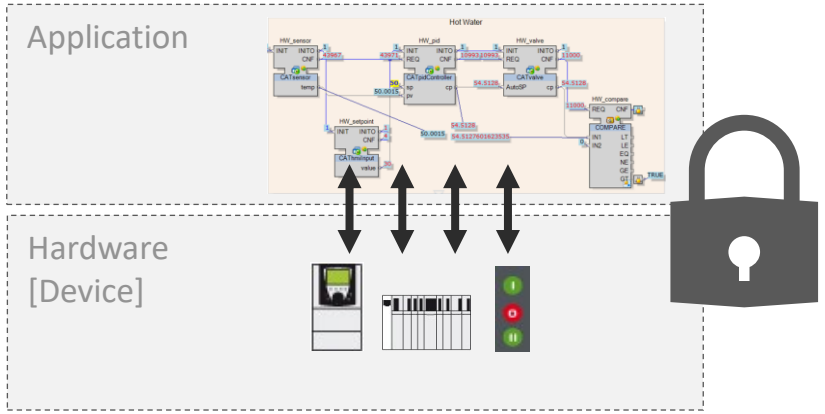
Simple **ready-to-use objects** connected together by simple lines. Forget events.

IEC 61499 –
Application and Device/Resource models

Decoupling of Application software from hardware

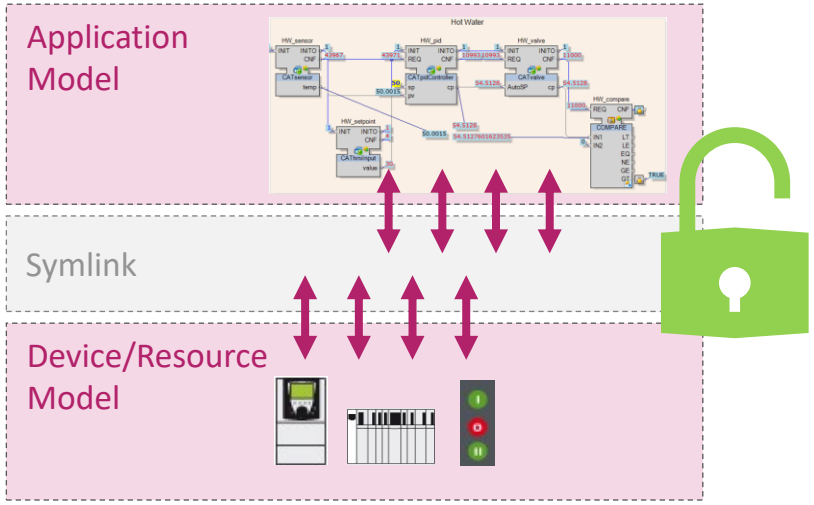
- **Application Model** defines how to create application using FB networks
- **Device/Resource** models define the compute resources on which the application will execute

Today
Hardware & Application
is tigthly linked



- Reusability is difficult
- Late modifications are challenging and costly

Tomorrow
Hardware & Application
is completely independent due to Abstraction

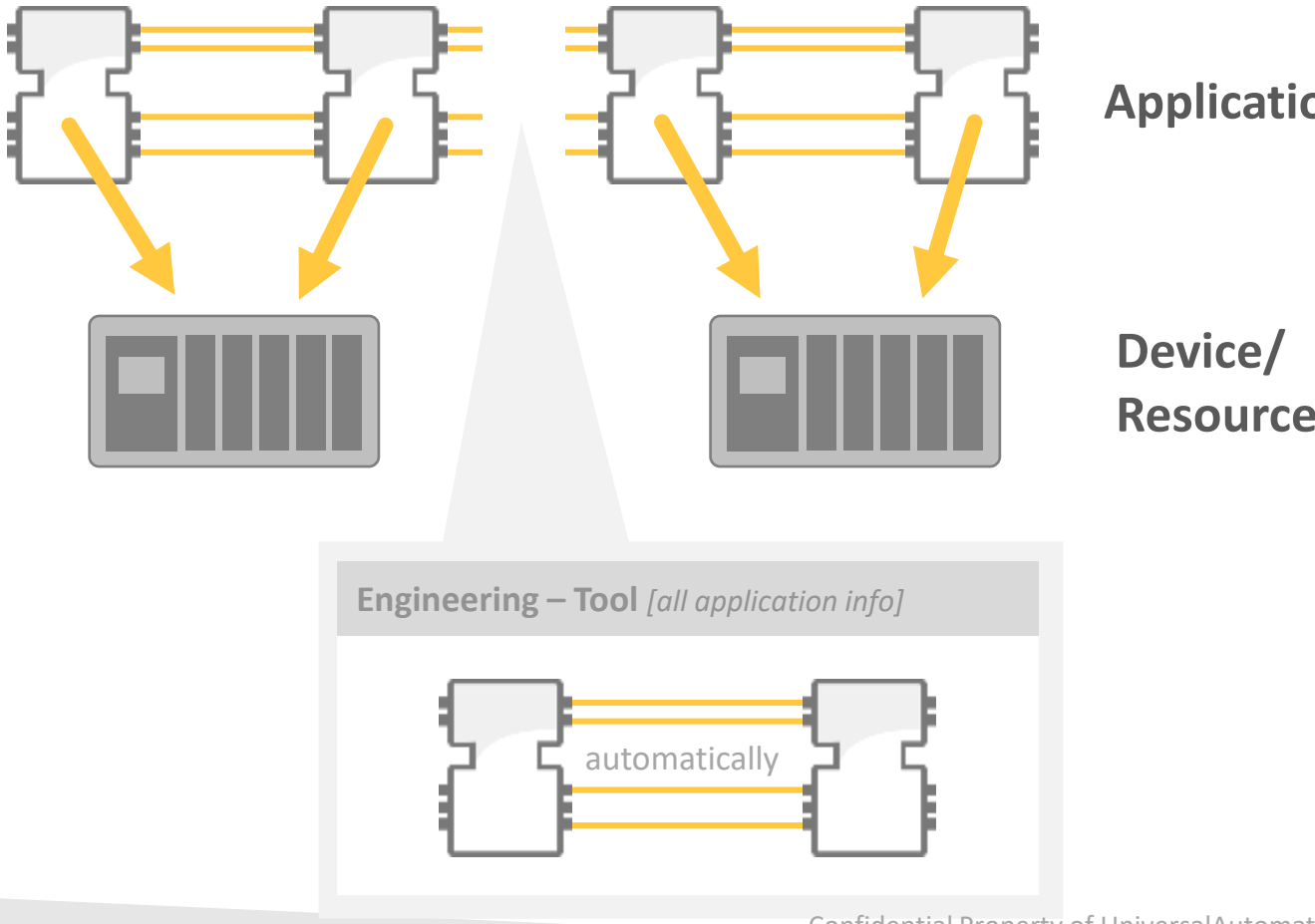


- Create applications without considering the HW where it will be deployed
- Link application and hardware at the latest possible time in the project schedule

IEC 61499 – System Model

Mapping of FB's to Device/Resources

- **System model** maps FB's to hardware on which application will execute
- **Event-driven** structure allow automatic establishment of comms paths across networks

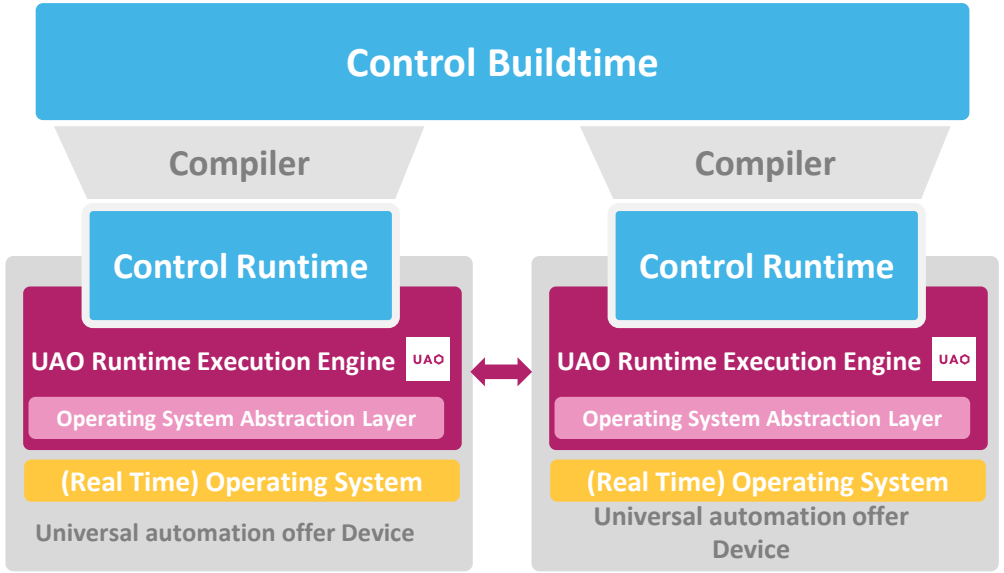


Shared runtime execution engine

WE are — **A community of users and vendors** organized around an independent non-profit association

WE use — UAO-compliant platforms that use a **shared-source IEC 61499 runtime execution engine**

WE promote — **Portability/Reusability** of vendor-independent automation application software



- Initial source code contribution from Schneider Electric
- Member contributions will shape the technology moving forward
- **Common IP Policy** to ensure single RT, manage member contributions & protect member interests

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User Value Propositions

Summary of benefits/UVP's

			Unique Value Proposition				
			Operational Excellence			*Digital Transformation*	
	Feature	**Benefit**	Vendor-independent Plug & Produce SW components	Flexible Architectures	Asset-centric control - Modular machine/ process	IT/OT convergence	Wrap & Reuse/ Orchestration
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	Device/Resource Model						
UAO	Shared runtime execution engine	Multi-vendor app software portability	■	■			
	IP Policy	Member freedom-to-operate	■				

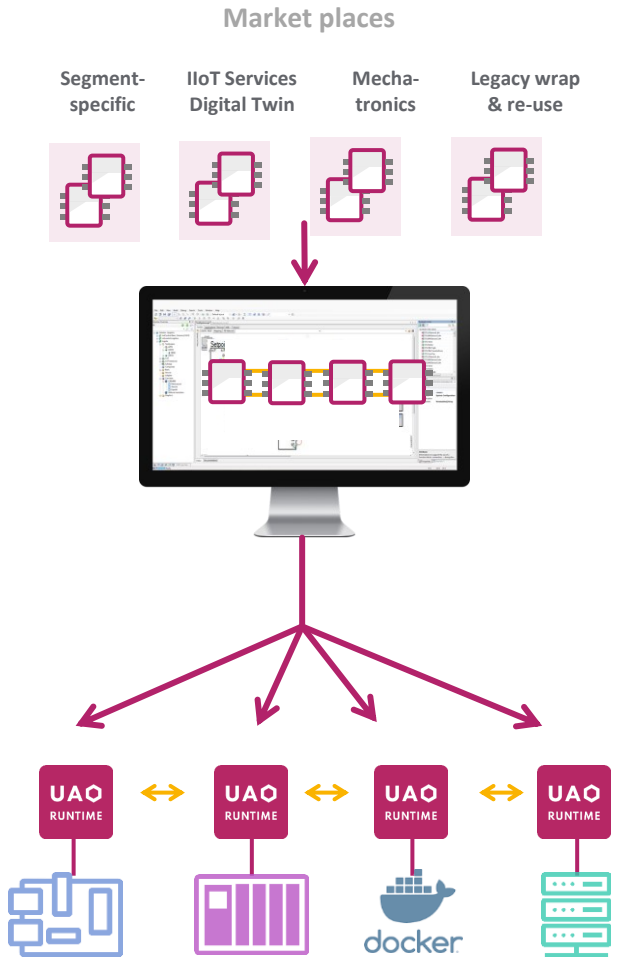
Plug & Produce SW Components:

The Missing Link for Industry 4.0

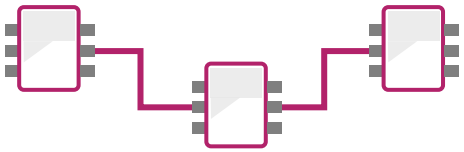
Proven-in-use software components (automation apps)

Integrated Development Environment for IEC61499 application
“BuildTime”

Distributed control HW with embedded **“RunTime”**



“Plug & Produce”



“Write once, distribute across UAO-compliant devices”

Today

Low value proprietary applications

- Costs
- Time to Market
- Flexibility
- Quality

Tomorrow

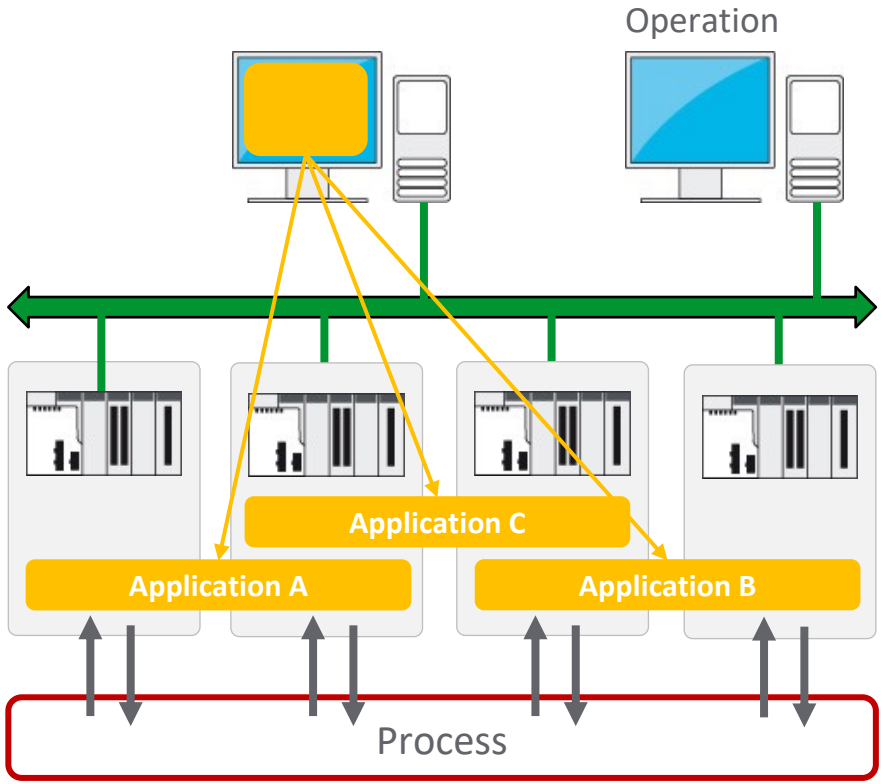
High value portable apps

- Costs
- Time to market
- Flexibility
- Quality

1. Integrated Development Environment

Flexible Architectures:
Centralized to distributed

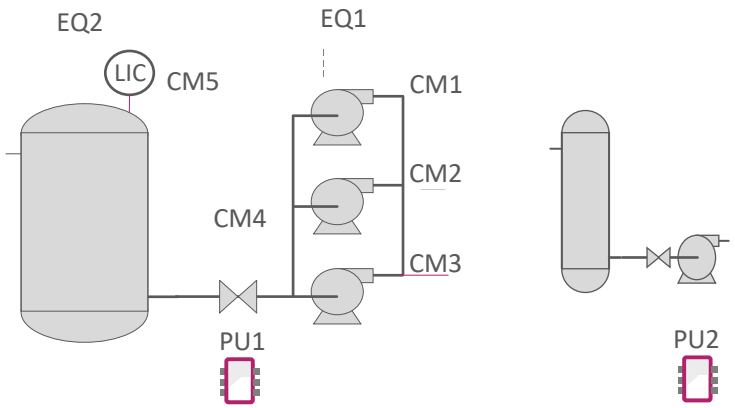
- Distribute the control logic of a complete system to several controllers by drag & drop
- Automatically generated cross-communication
- Late-binding
- Distributed, centralised or hybrid



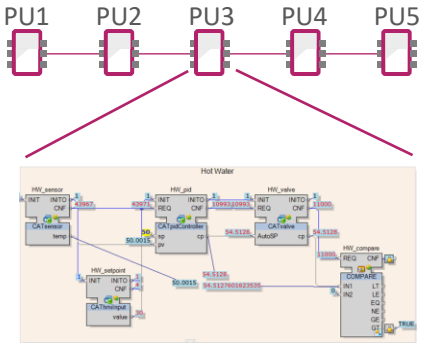
Centralised – edge computer

Distributed Control Nodes

Asset Centric Automation-Modular machine/process



Single line engineering with adapters



Process Engineer
Commisioning

Automation specialist

Master complexity

- Representing real devices as ready-to-use software objects, encapsulating all their aspects - Building block for CPS.
- Complexity hidden from users.

Efficient engineering

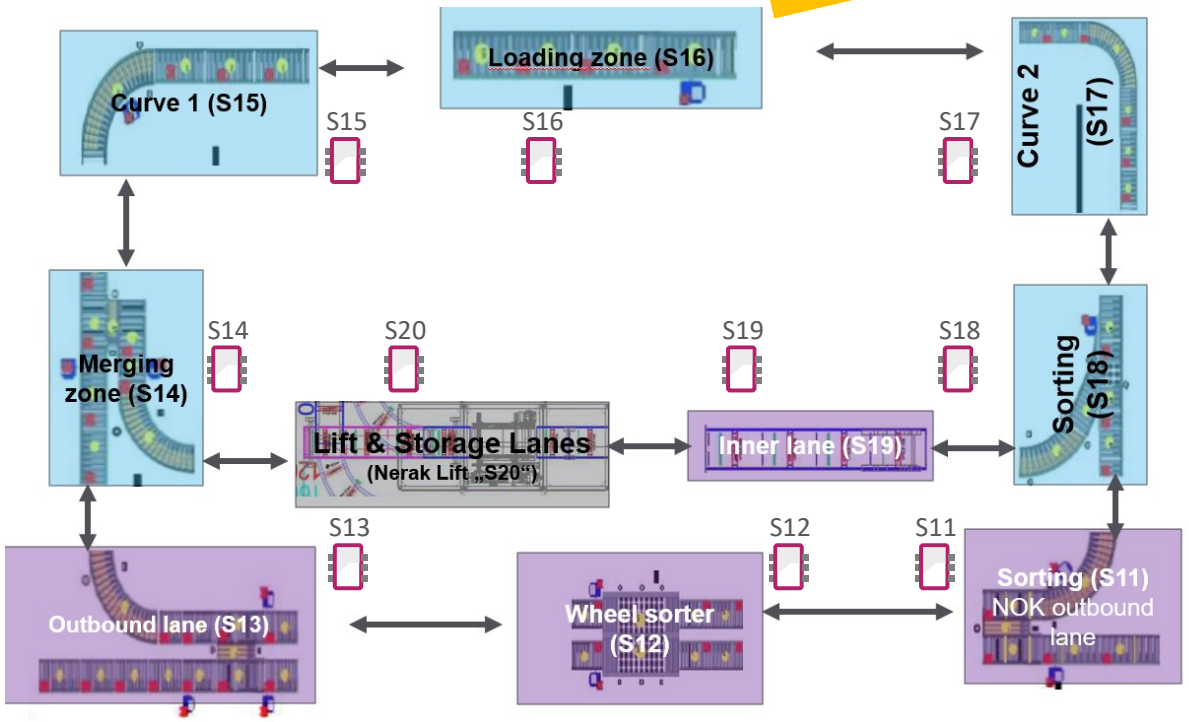
- Using proven-in use library instances
- From process specification (P&ID) to detailed control program very quickly
- Maintain one software library Independent of control hardware
- Quicker commissioning

Modular Machine Process

- Match control modularity with mechanical/electrical modularity
- Expand by adding modules

Embed IP/know-how libraries

Asset Centric Automation-Modular machine



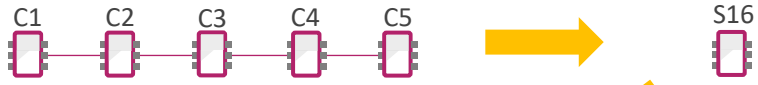
5 conveyors

Cx

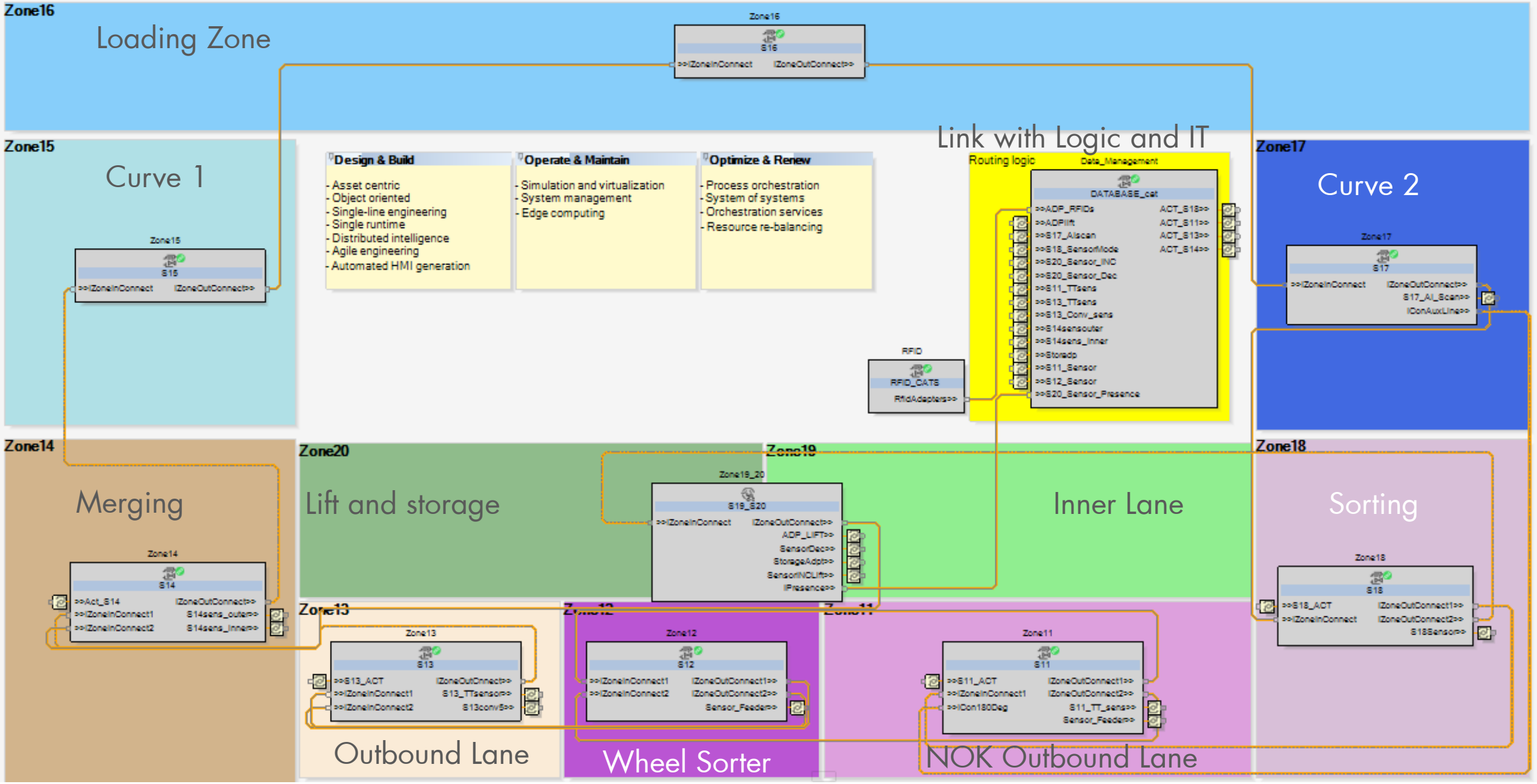
Conveyor

Automation specialist

Single line engineering with adapters



Commisioning Engineer


Zone16
Loading Zone
Zone16
S16
>>IZoneInConnect
IZoneOutConnect>>
Zone15
Curve 1
Zone15
S15
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IZoneOutConnect>>
Design & Build
- Asset centric
- Object oriented
- Single-line engineering
- Single runtime
- Distributed intelligence
- Agile engineering
- Automated HMI generation
Operate & Maintain
- Simulation and virtualization
- System management
- Edge computing
Optimize & Renew
- Process orchestration
- System of systems
- Orchestration services
- Resource re-balancing
Link with Logic and IT
Routing logic
Data_Management
DATABASE_cat
>>ADP_RFIDs
>>ADPlift
>>S17_Alscan
>>S18_SensorMode
>>S20_Sensor_INC
>>S20_Sensor_Dec
>>S11_TTsens
>>S13_TTsens
>>S13_Conv_sens
>>S14sensouter
>>S14sens_Inner
>>Storadp
>>S11_Sensor
>>S12_Sensor
>>S20_Sensor_Presence
ACT_S18>>
ACT_S11>>
ACT_S13>>
ACT_S14>>
RFID
RFID_CATS
RfidAdapters>>
Zone17
Curve 2
Zone17
S17
>>IZoneInConnect
IZoneOutConnect>>
S17_AI_Scan>>
IConAuxLine>>
Zone14
Merging
Zone14
S14
>>Act_S14
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IZoneOutConnect>>
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S14sens_Inner>>
Zone20
Lift and storage
Zone19_20
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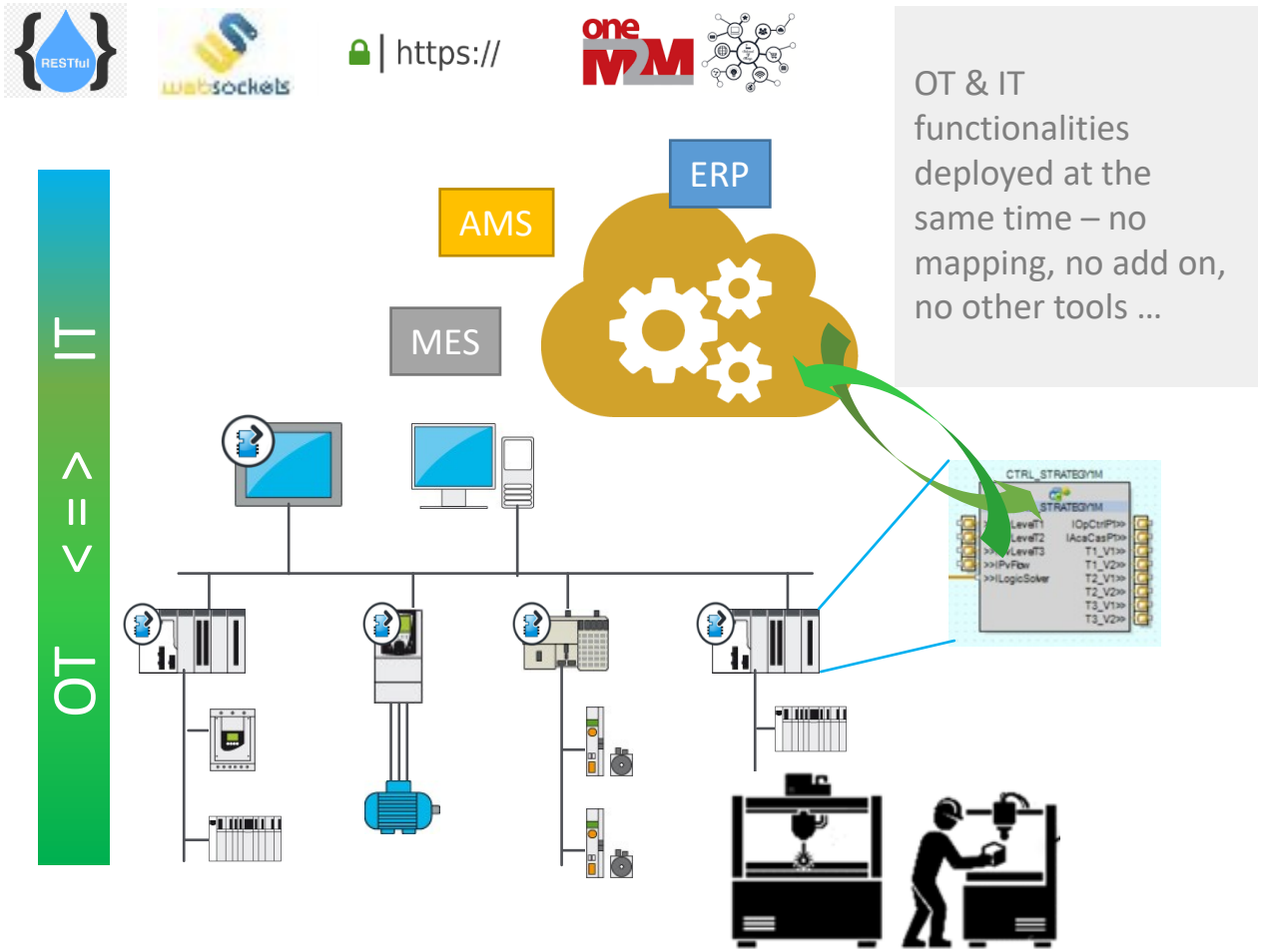
>>IZoneInConnect2
IZoneOutConnect1>>
IZoneOutConnect2>>
Sensor_Feeder>>
Wheel Sorter
Zone11
Zone11
S11
>>S11_ACT
>>IZoneInConnect1
>>ICon180Deg
IZoneOutConnect1>>
IZoneOutConnect2>>
S11_TT_sens>>
Sensor_Feeder>>
NOK Outbound Lane

IT/OT Convergence



OT & IT functionalities deployed at the same time – no mapping, no add on, no other tools …

Utilizing well known and accepted IT concepts, practices & standards

Same concepts:

- Event driven execution
- Methods with parameters
- Service oriented & blackbox design

Usage based connectivity:

- Register and establish connectivity when needed
- Close connection/unregister when done

Use cases:

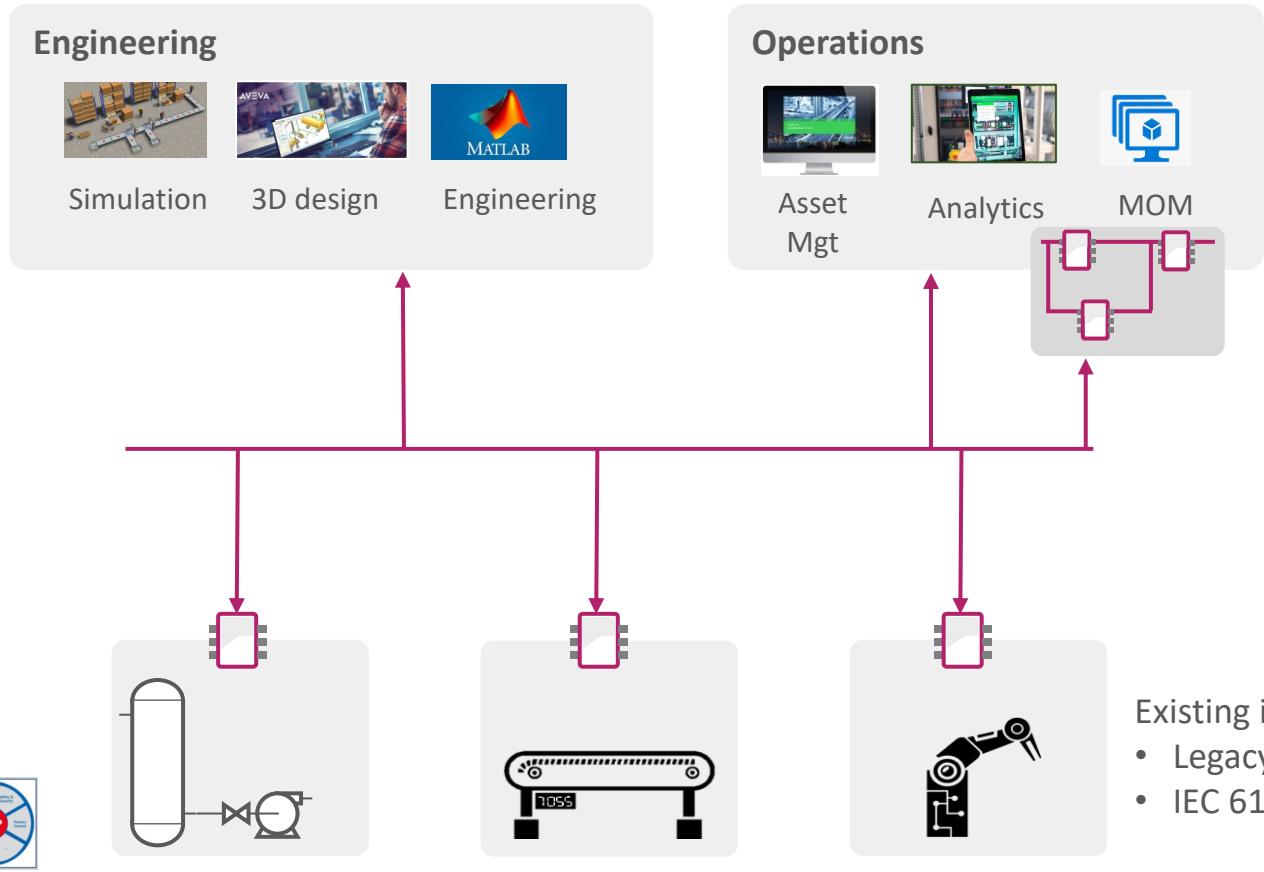
- Query/update datasets from IT level
- Connection to MES, ERP, AMS …
- Trigger tickets in CMMS, provide root cause information …
- Multi-level & shared control strategies (Cloud, Fog, local)
- Enabler for
  - Decision support/process optimisation, autonomuous operation
  - Pay per use services/control strategies

Wrap & Re-Use/Orchestration

IT

MQTT

websockets



OT

OPC FOUNDATION

MTP

Existing installed base
- Legacy Equipment
- IEC 61131 controllers

Two main orchestration use cases

1. **Close coupling IT and OT systems** to implement Industry 4.0 Use Cases, e.g., Digital Twin
2. **Application orchestration** of complete process or multiple machines (additional OT functions)

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- Pipeline leak detection
- Well test automation
- One Button Startup

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Reference Examples

Use cases Summary (1)

	Operational Excellence			Digital Transformation	
	Vendor-independent Plug & Produce SW components	Flexible Architectures	Asset-centric control – Modular machine/ process	IT/OT convergence	Wrap & Reuse/ Orchestration
Oil & Gas Refining: ExxonMobil	x				
Waste Treatement – Royal HaskoningDHV	x				
Mining	x	x			
HVAC Industrial Air Cleaning	x	x	x		
Logistics – Automated warehouse 2	x		x		
Mobile Stone Crusher machine	x		x		
Gr3n	x		x	x	
Logistics – Automated warehouse 1			x	x	
WWW - Smart Plant				x	x
Consumer Packaged Goods – Master Systèmes – Sophim	x				x
Kongsberg Maritime					x
Packaging OEM			x	x	
Food & Bev	x	x			x
Facility Management		x			
Carbon Capture					x

Use cases Summary (2)

	Operational Excellence			Digital Transformation	
	Vendor-independent Plug & Produce SW components	Flexible Architectures	Asset-centric control – Modular machine/ process	IT/OT convergence	Wrap & Reuse/ Orchestration
Tobacco : AIMIRIM & ASROCK				x	xx
E2COMATION				x	
MODUL4R			x		
METAWAVE	x			x	
HVAC : Air Handling Units	x			x	x
Autodiscovery with HSOL	x	x		x	

Vendor-independent

Plug & Produce Software Components

Segment - Oil & Gas Refining: ExxonMobil

Challenge

I would like to build my **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-independent
Plug & Produce Software Components

Segment - Waste Treatement – Royal HaskoningDHV

Challenge

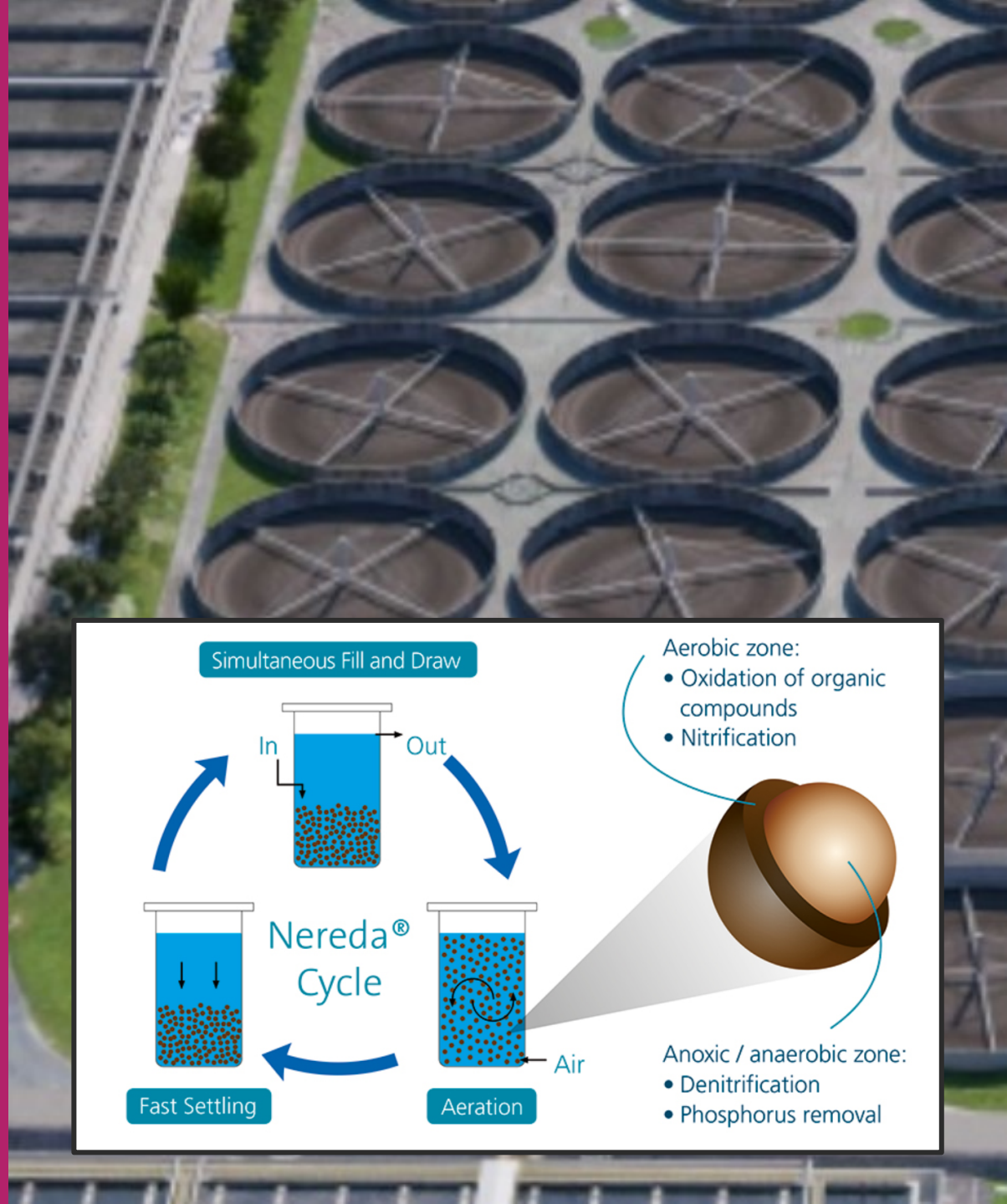
AquaSuite Nereda Controller, a smart, integrated process controller for Nereda for waste-water treatment requires easy integration to the real-time control systems

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**



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

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

Modular Machine
Vendor independence

Segment - Logistics – Automated warehouse 2

Challenge

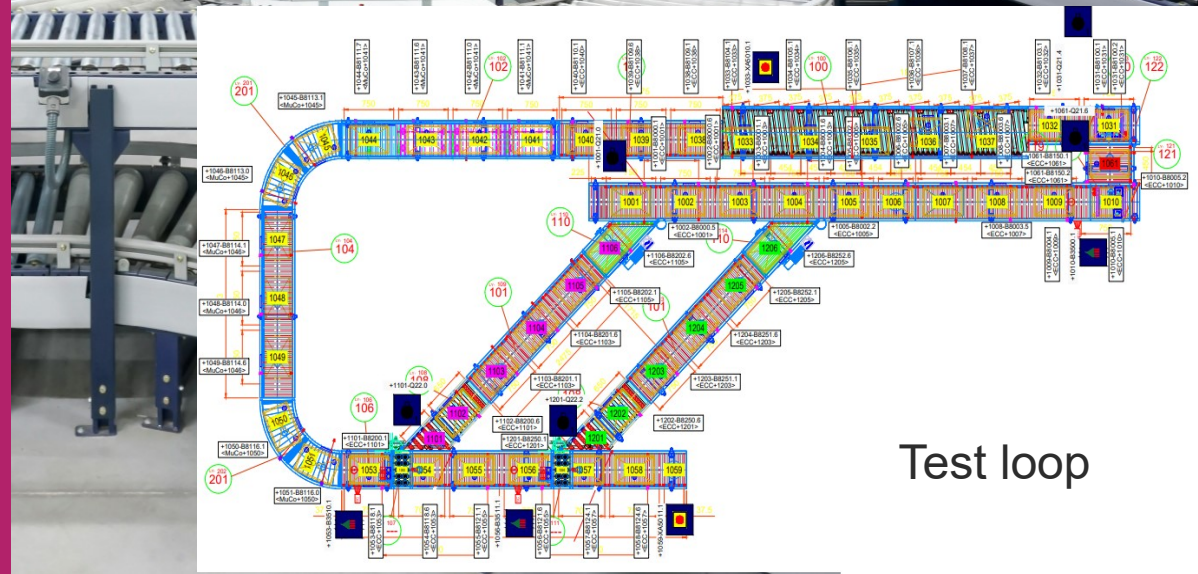
- Looking for multi source solution
- Optimize his production workflow to become more competitive
- Value add services to differentiate vs competition

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

Asset Centric Control
Plug & Produce SW components

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

Challenge

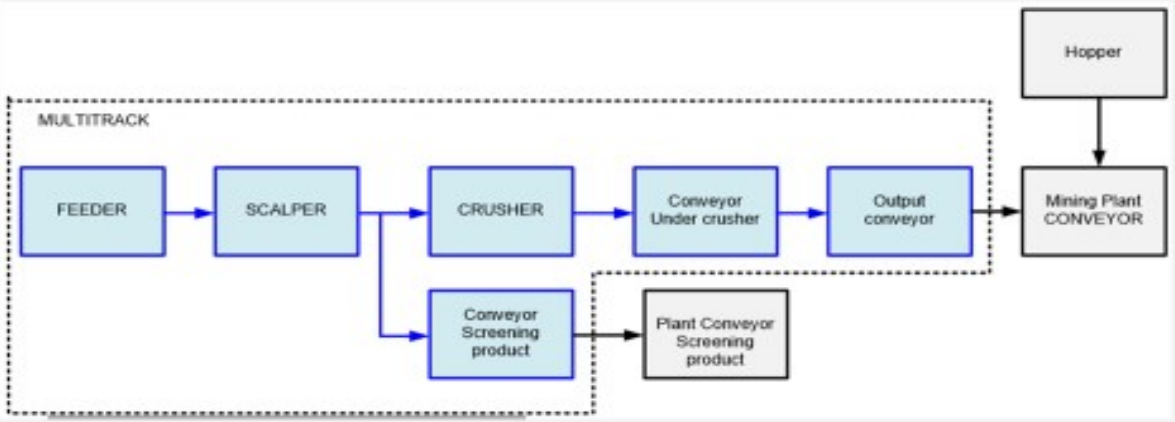
- Reduce Time to Market
- Better and faster fit to European Union Domain

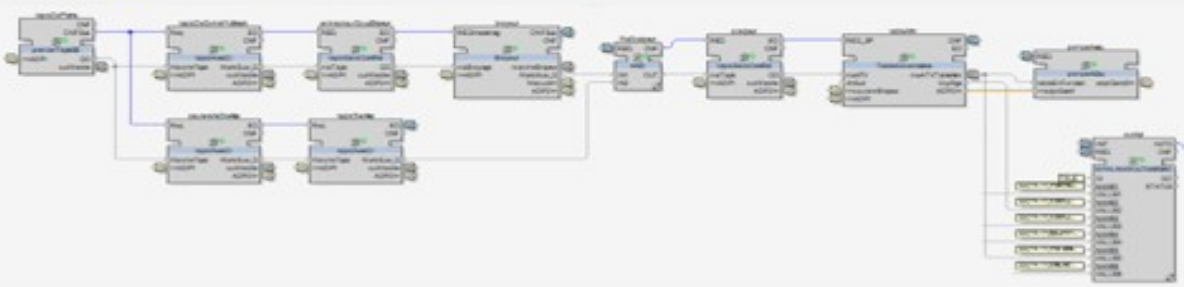
Solution

- Based on machine PLC with analog & digital IP
- Asset application library

Benefits

- Faster to design the application by reuse of asset models





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%

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

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

"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

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

Segment – Energy Efficiency – E2COMATION

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.

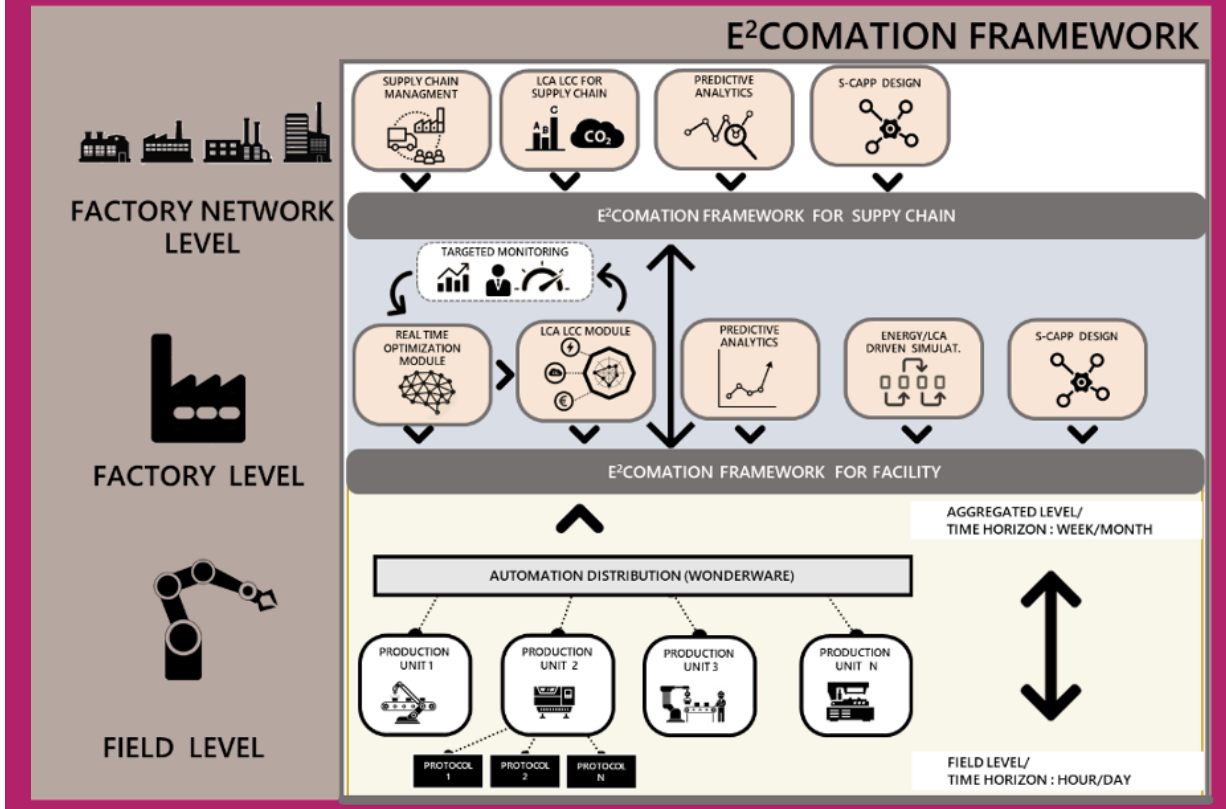
Benefits

- **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.

Funded by the European Union



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.

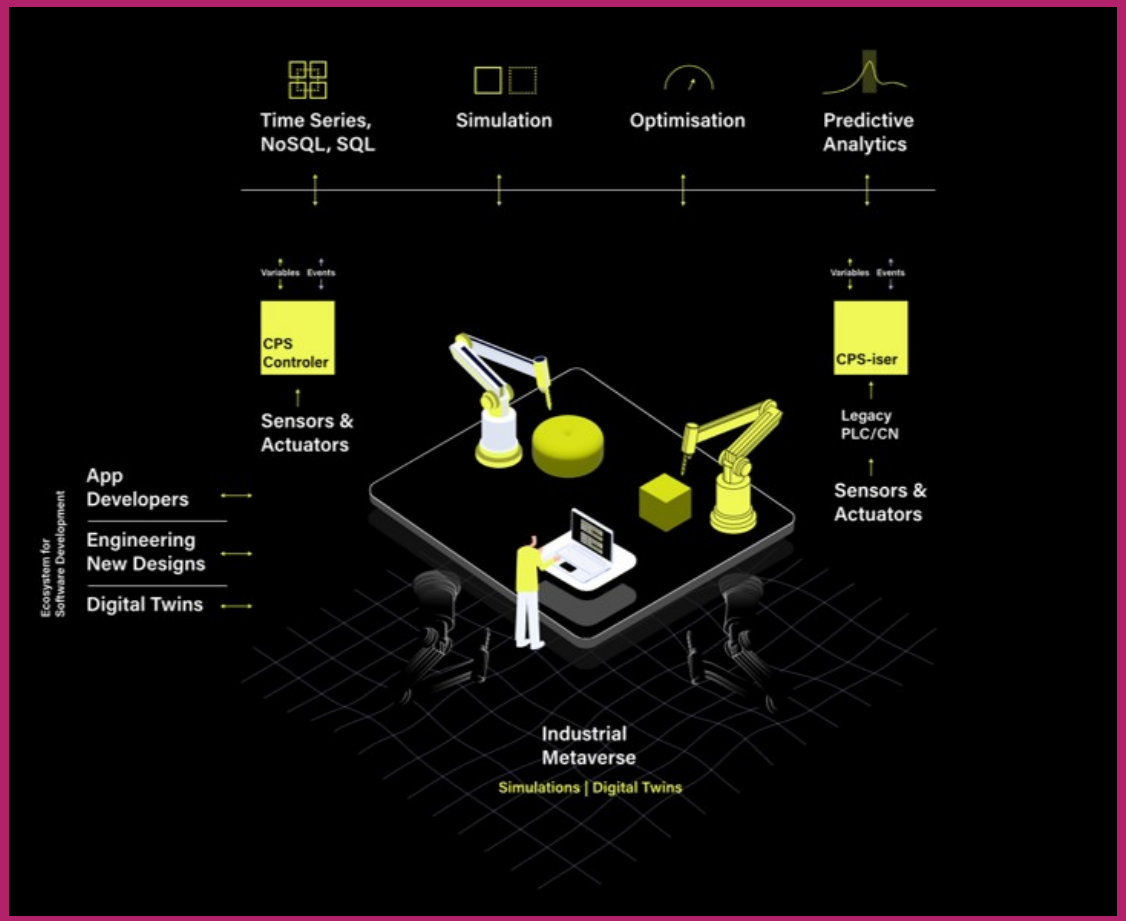
Benefits

- **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.

Funded by the European Union



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.

Funded by the European Union

METAWAVE

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

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

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

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

IT/OT Convergence
Wrap & Reuse

Segment – Carbon capture

Challenge

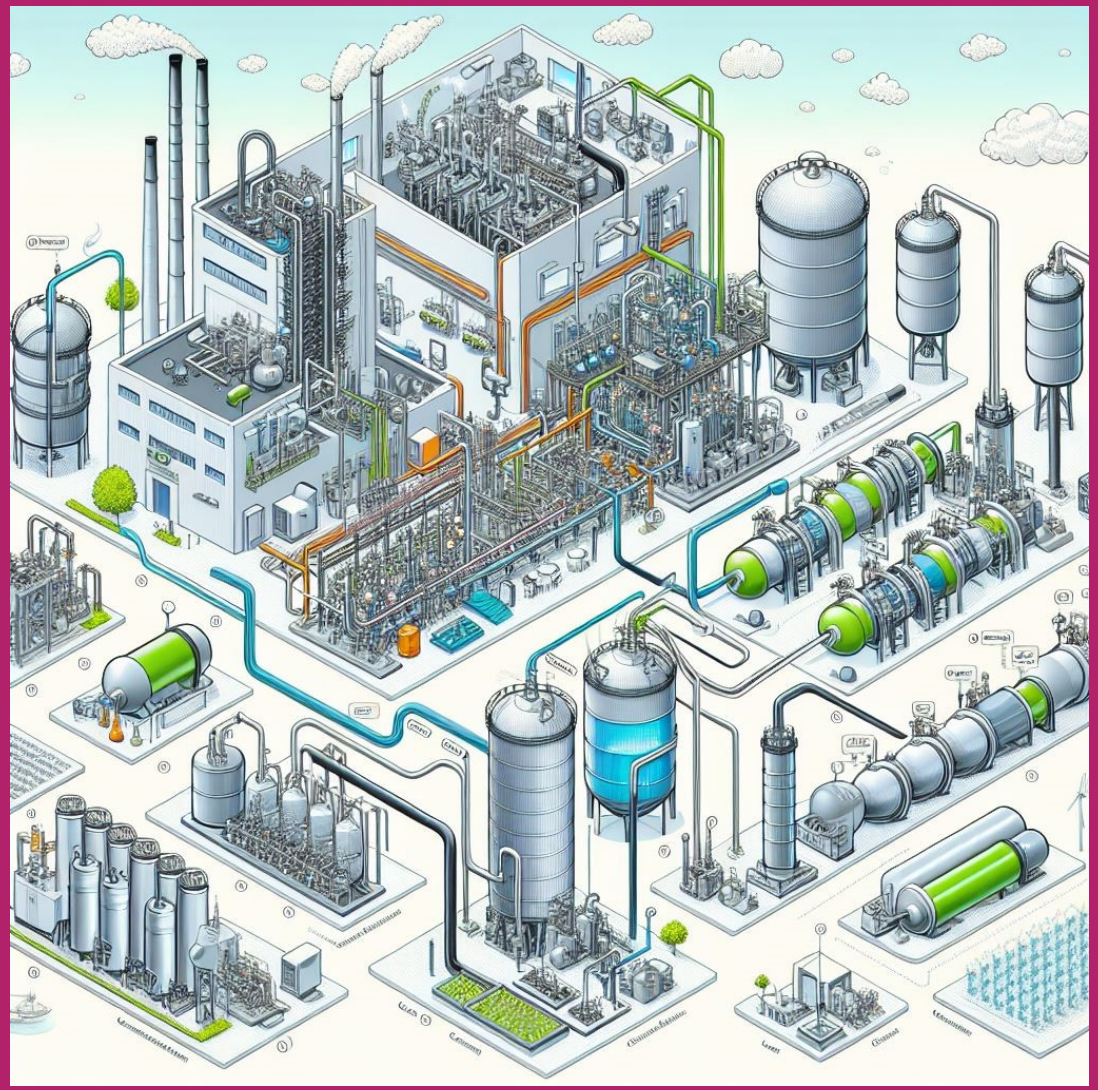
- Find a mature open automation solution to move from initial PoC to a commercial demo plant

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



Plug & Produce, IT/OT Convergence Flexible Architectures

Segment – Mining – Hovering Solutions / Flexbridge

Challenge

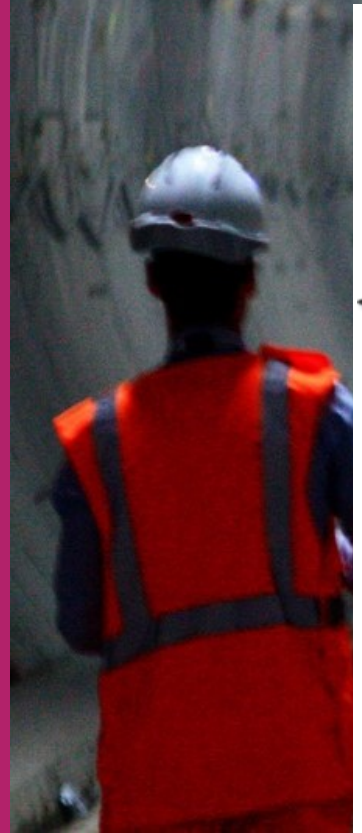
- **Challenging environments** hinder autonomous system deployment
- **Manual setup** is slow and error-prone
- **Real-time anomaly detection** and efficient data collection needed

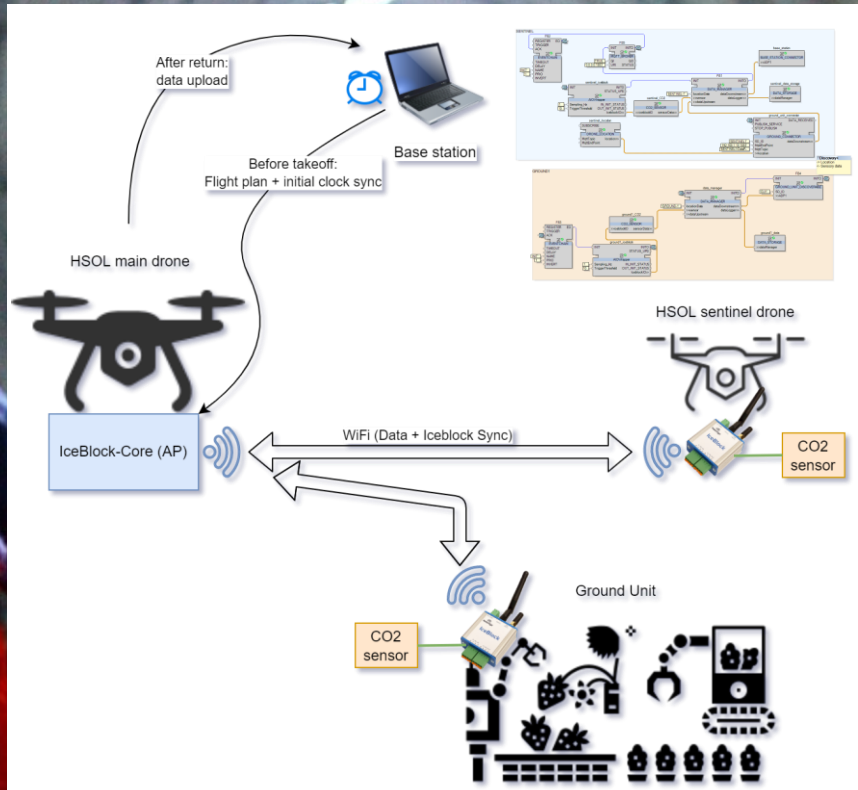
Solution

- **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





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

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Kongsberg Maritime

Wrap & Reuse Orchestration

Segment - Offshore platforms – Kongsberg Maritime

Challenge

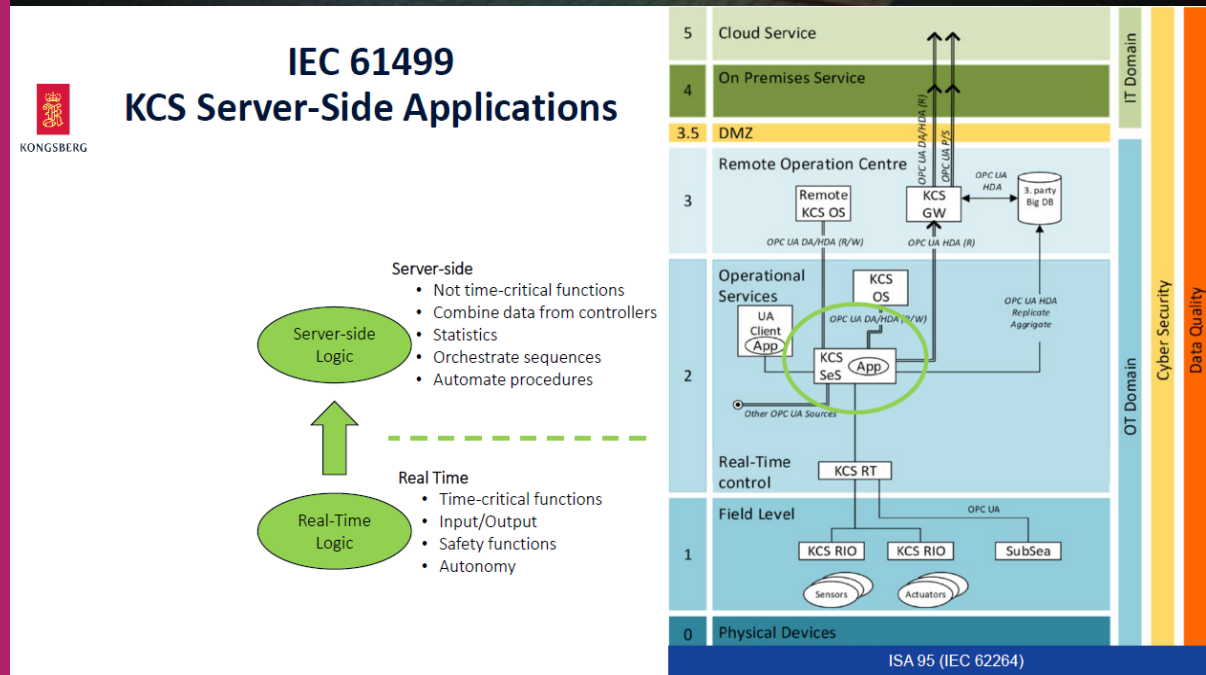
Legacy automation systems have limited capacity to support new functions, expansion.

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

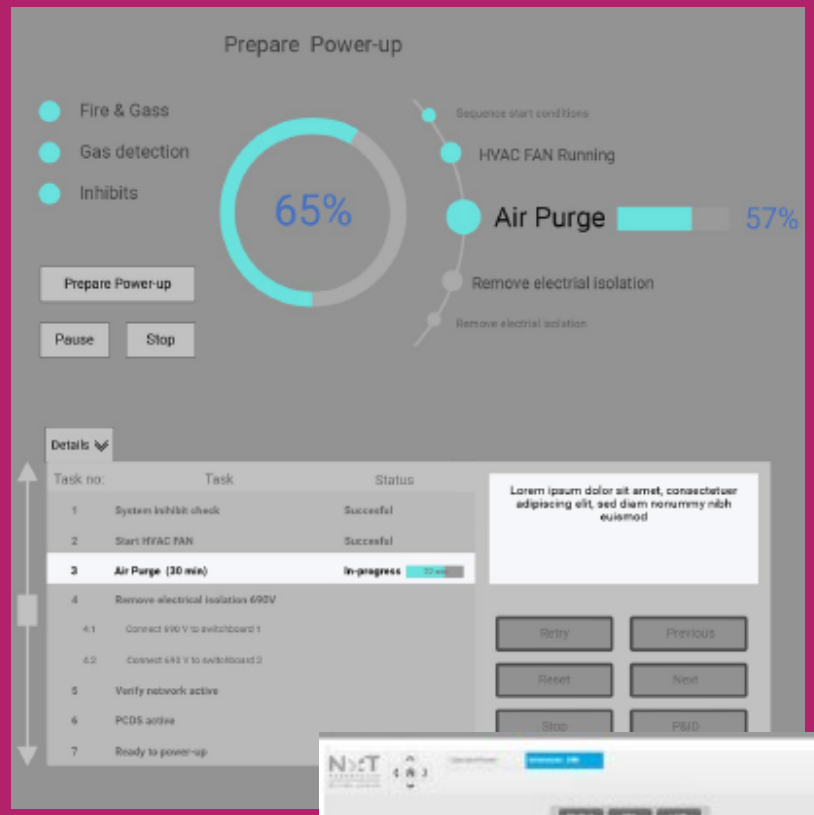


OBS – One Button Startup

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

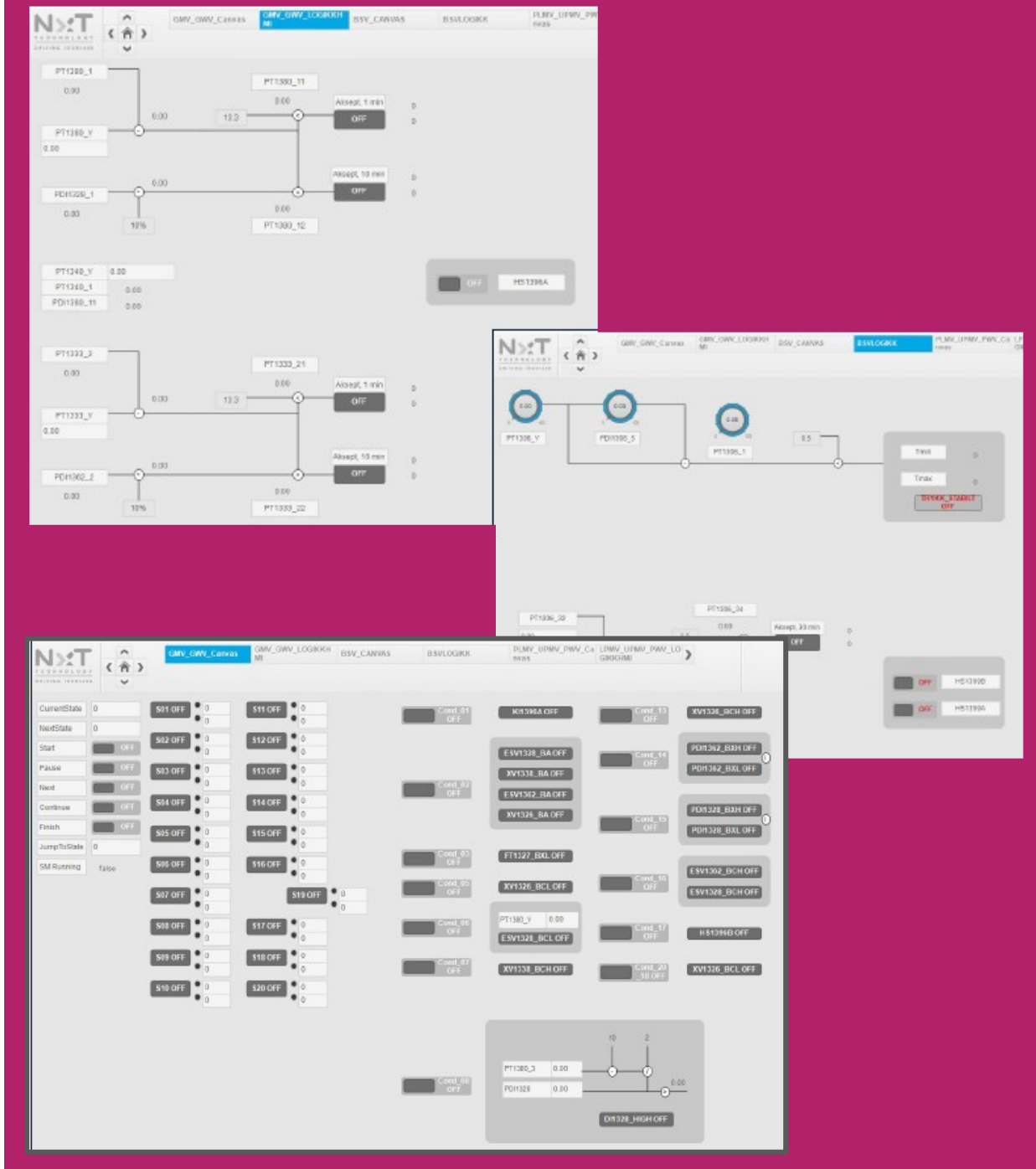


KONGSBERG

Server-Side Application (IEC 61499)

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)

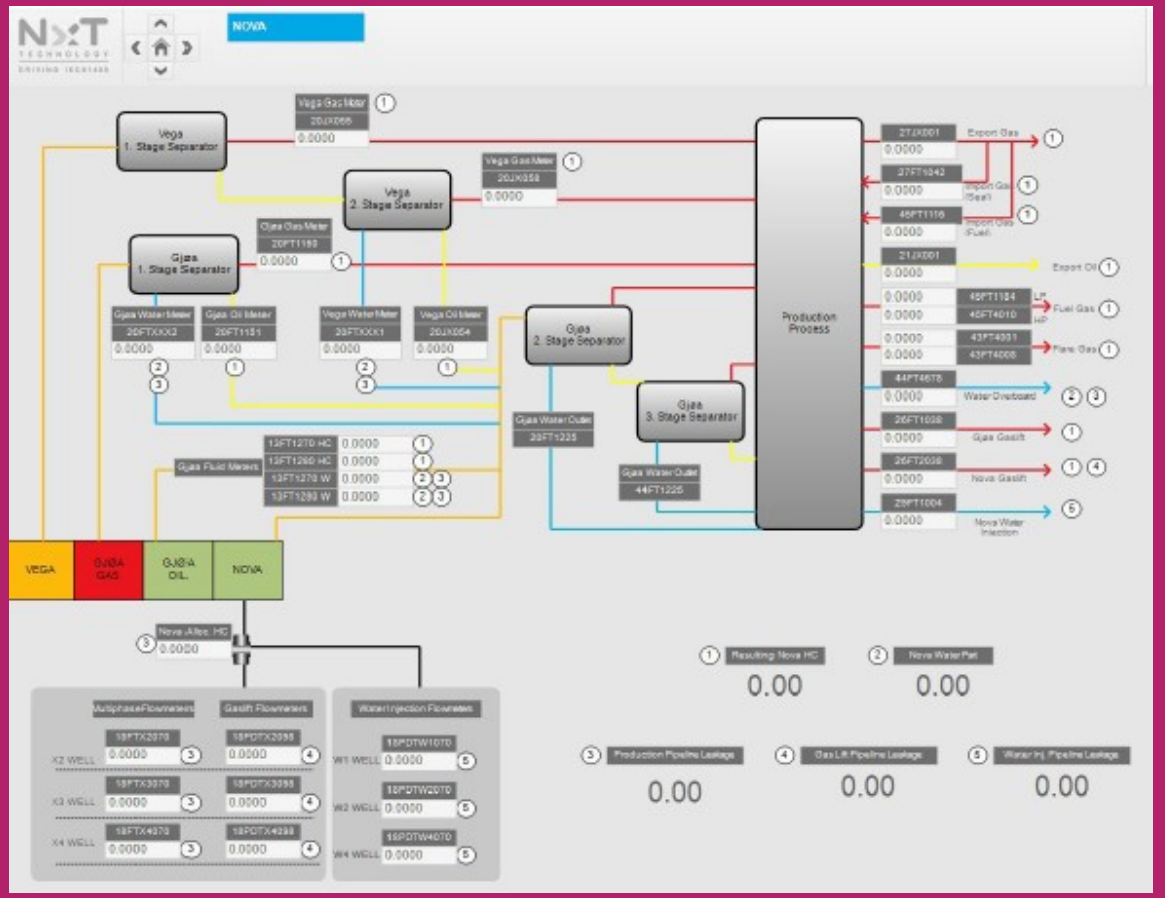


KONGSBERG

Server-Side Application (IEC 61499)

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



KONGSBERG

Server-Side Application (IEC 61499)

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Gr3n

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

Segment - PET Plastic Recycling: GR3N

Challenge

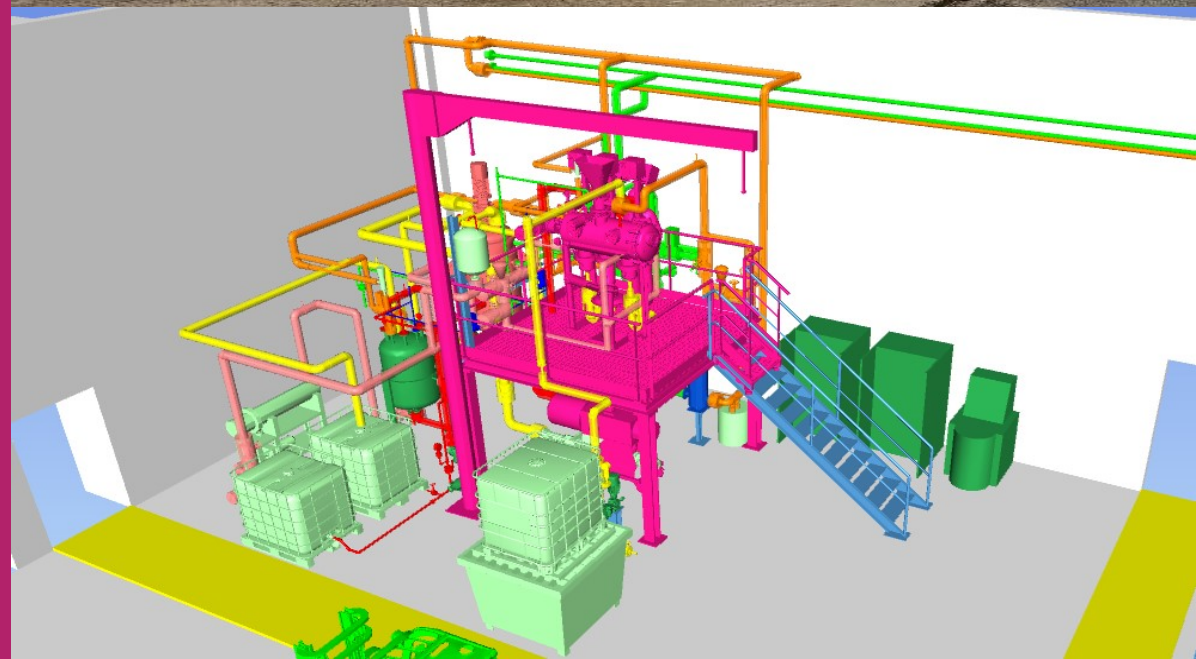
Easily expand production using modular mechanical/electrical/control components

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

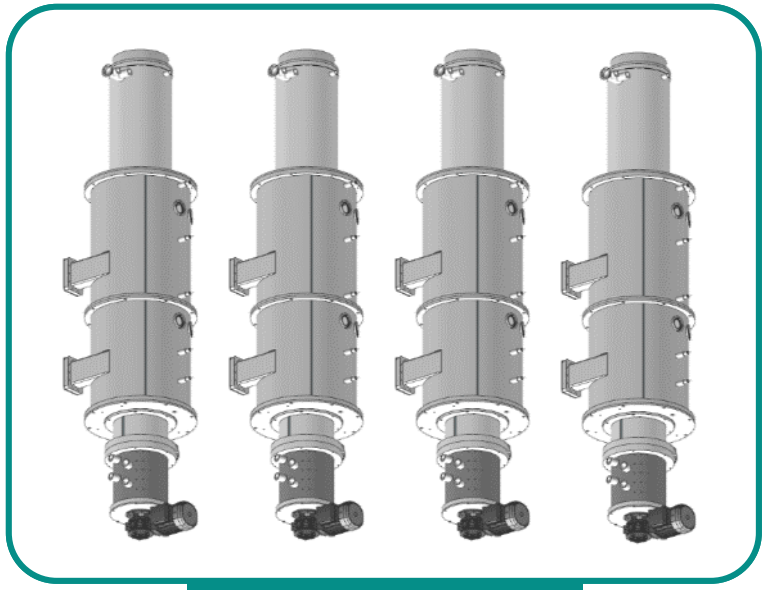
Benefits

- 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



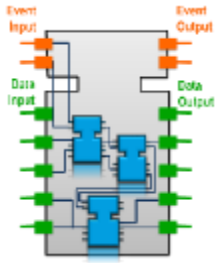
Technical foundation for modularity in Gr3n

GR3N



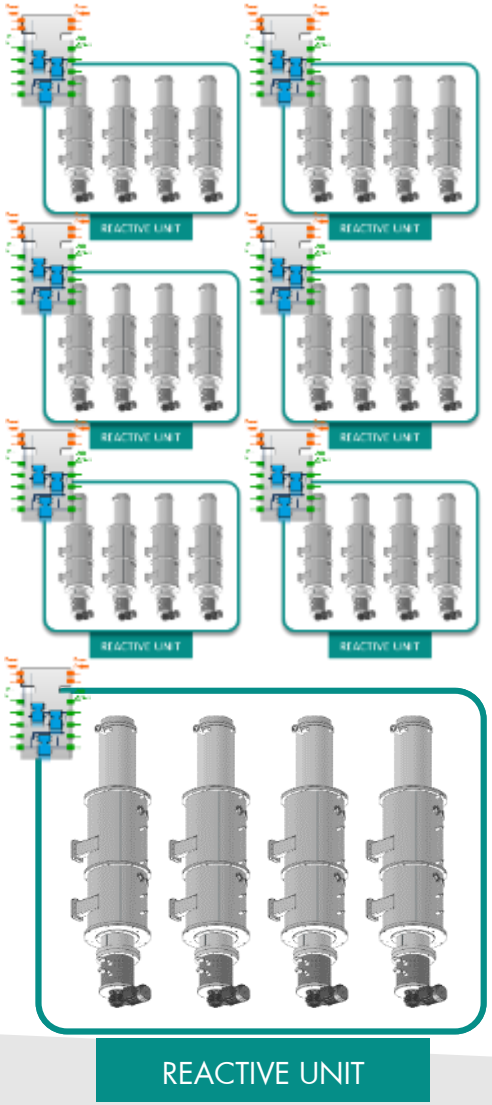
REACTIVE UNIT

Intelligent Automation Object



Technical foundation for modularity in Gr3n

GR3N

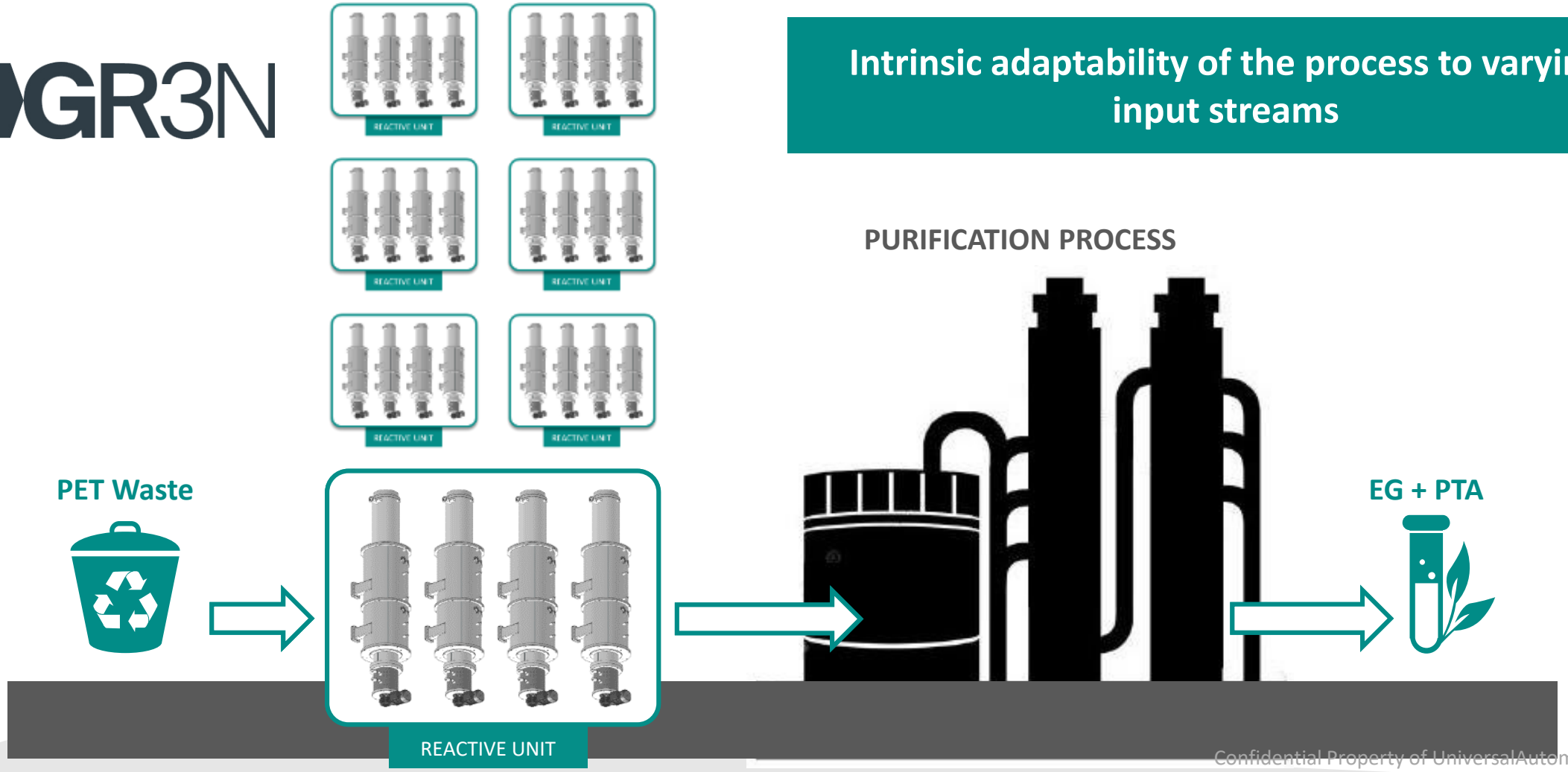


Synergistic distributed automation management of independent Reactive Units based on IEC-61499

Full-scale plants composed of intelligent units …

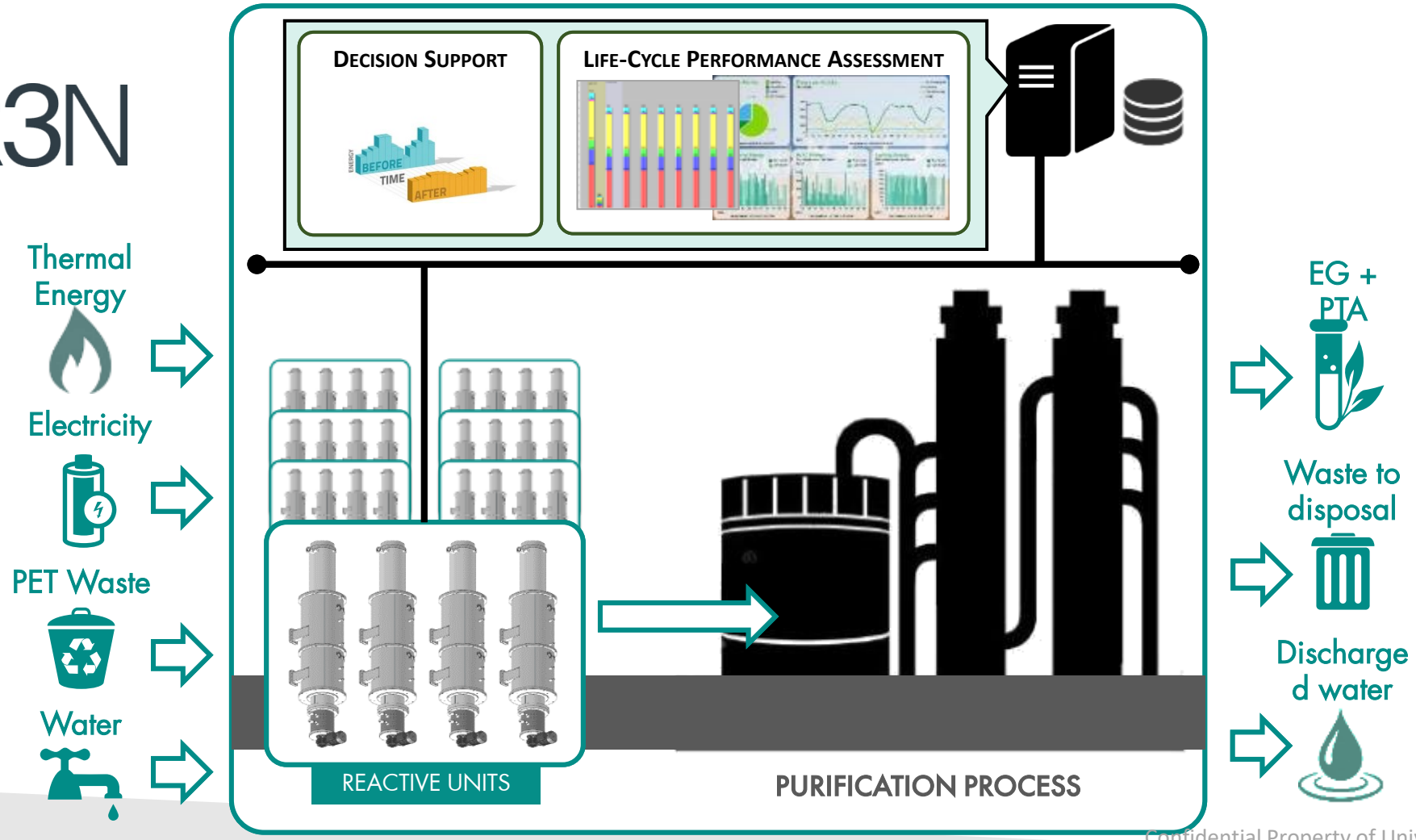
GR3N

Intrinsic adaptability of the process to varying input streams



… with seamless integration with IT functionalities

GR3N



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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Cases Split

Where is the UAO Technology Used?

IT Applications

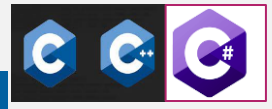
50%

3a: Connecting IT to OT

Engineering layer

Digital Twin

3D Design



3b: Connecting IT to OT

Operations Layer: Dashboarding, Analytics, AI

Augmented Reality

Power data and analytics

Machine learning and AI
Open eco-system

IT/OT convergence

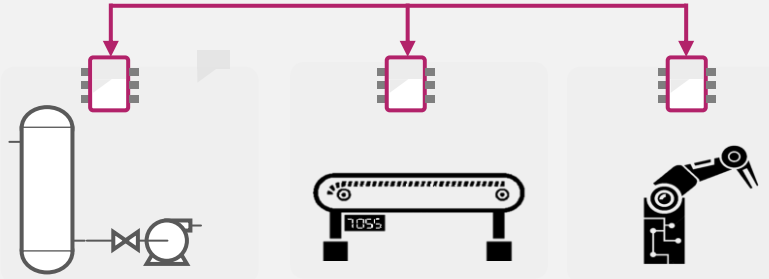
OT / Control Layer

25%

1. Classical real-time control + modular process/machine + edge control

25%

2. Legacy asset orchestration



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Resources

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