

OPC Foundation & Adoption of OPC UA Today

OPC Day Finland 2021 – Virtual Event – November 16th, 2021



Stefan Hoppe
President & Executive Director OPC Foundation
stefan.hoppe@opcfoundation.org

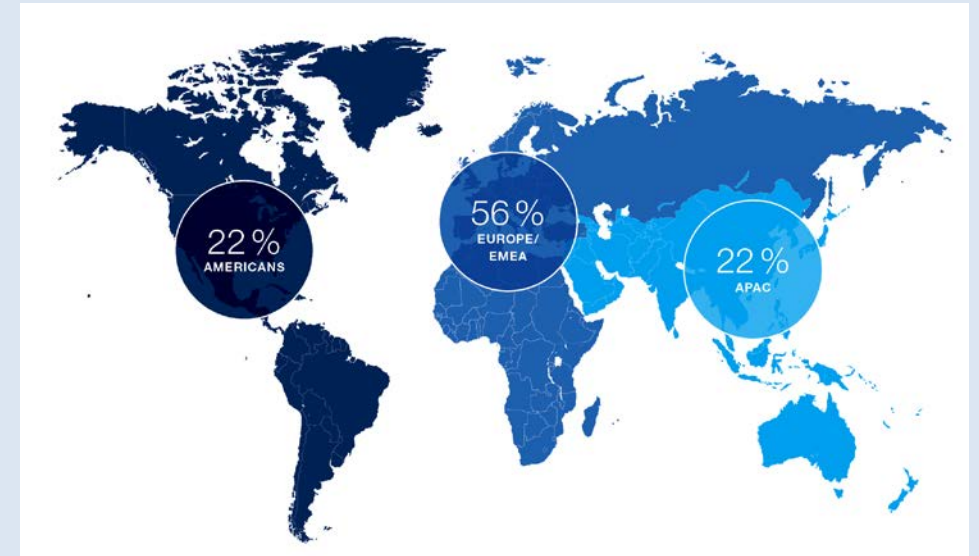
OPC Foundation <https://opcfoundation.org>

- ▶ Vision
 - Secure & reliable
 - Vendor, platform, and domain agnostic
 - interoperability from sensor to enterprise and beyond
- ▶ Global Profile
 - Non-profit organization (founded 1995)
 - Companies from Automation & IT
 - Internationally recognized: OPC UA is IEC62541
- ▶ Deliverables
 - Specifications: openly available
 - Tools and code examples: open source for faster, easier adoption (AnsiC/C++, C# .NET Standard, Java)
 - Certification: OPC Labs open to everyone
 - Marketing: Evangelize solution in various markets
- ▶ Ecosystem with toolkits and education
- ▶ Modern IPR policy



Organizational Overview

Membership: 852 (Status: Nov 16th, 2021)

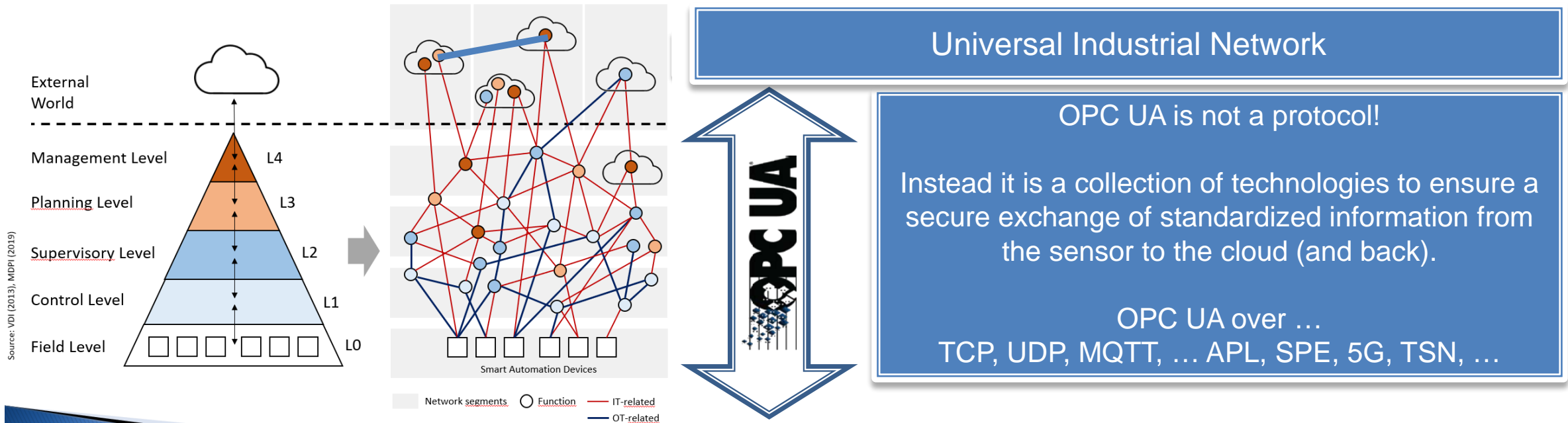


Board of Directors (elected for 2021/2022)

Microsoft	Honeywell	Rockwell
SAP	Yokogawa	Schneider
Siemens	Mitsubishi	ABB
Beckhoff	Ascolab	Emerson



From Automation Pyramid to Information Network



- Challenge to transformation from an Automation Pyramid (with proprietary protocols between all layers) to an Information Network (providing standardized information exchanged secured end-to-end and be able to bypass layers)
- OPC UA is an open framework delivering end-to-end secured, standardized information exchange
Openness is key: Open Specs, Open source (GitHub) and Open Labs for certification (without be paying member)
- OPCF defines with 63+ partners standardized information models for verikals like pumps, motors, robots, coffee machines,
- OPC Foundation is the „Collaboration Organization“

OPC Foundation: Promise for OPC UA based, secured Industrial Interoperability

**Interoperability
Robustness & Security**

Vendor, Platform, Market and OS
Independent

Scalable From Sensor to Cloud

**Discoverable Services Oriented
Architecture**

Independent of transport protocol

Non-Profit (OPC Foundation)

Widely Adopted: >50M install base

Open Source on GitHub

Security Design from Ground up

**66+ Joint Working Groups
Data Modelling/Harmonization**

Graph Support, preserves source context

Vendor **extendable** data model via
Companion Specifications

Relevant: Enables domain specific
information models

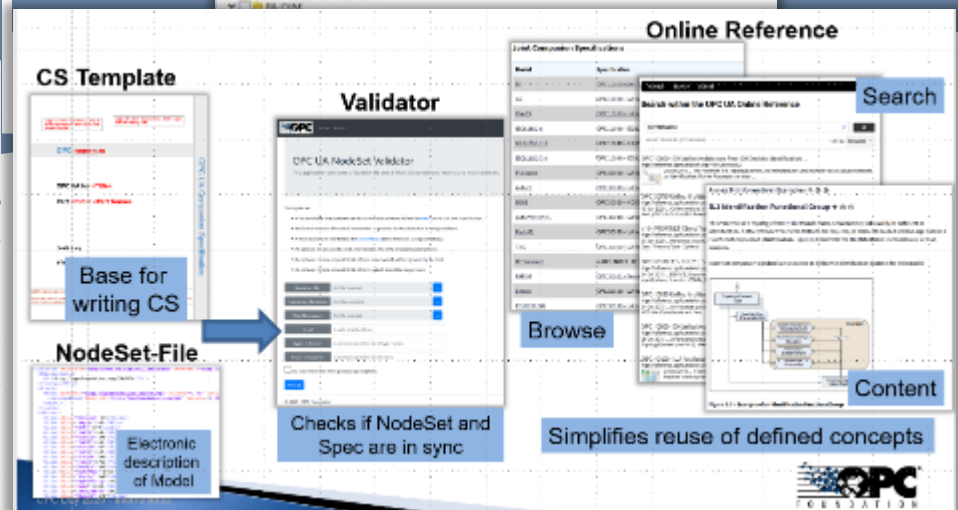
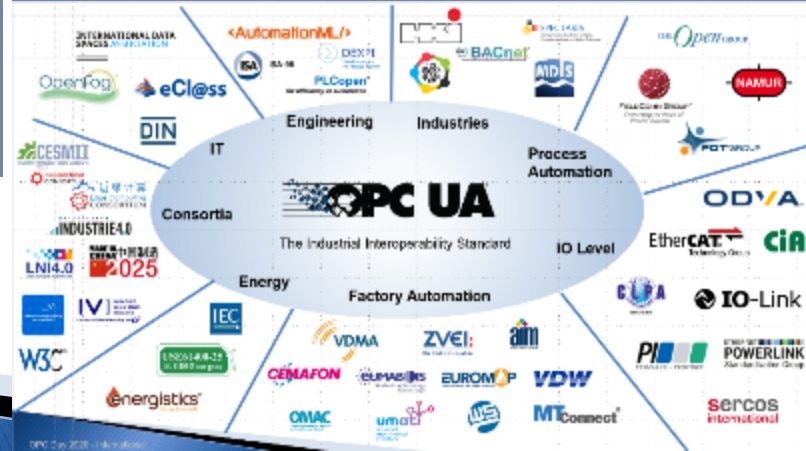
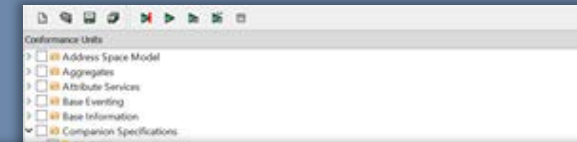
- Discrete: Robotics, Machine Vision, ...
- Process: FDI, FDT, PA-DIM, MDIS, NOA..
- Energy: IEC61850, ..

**Validating / Certification
Online Reference**

Validation of Companion Specs

Compliance Test Tool (CTT): Open available
1800 test scripts for the OPC UA core functionality
and for the Companion Specifications
e.g. for PA-DIM / PLCopen / MDIS / ...

Online Reference: Public reference with all models



OPC UA + Companion Specs = Promise for Industrial Interoperability

OPC UA
Pub / Sub

OPC UA
Security

OPC UA + CS
Certification

OPC UA
TCP

OPC UA
over MQTT

OPC UA over
APL / TSN

Modelling

➤ **OPC UA: Collection of technology bricks**

- Discovery, Connectivity, different protocols like TCP, UDP, MQTT, ..
- Security, built-in by design, end-to-end
- Information modeling capabilities



+

➤ **Companion Specifications: Collection of bricks for different markets**

- Information modelling to describe specific market
- Field devices need TCP, UDP, Safety, Motion, real-time, ...
- Gateway & Cloud services need UA over MQTT, 5G



Robotic
Pumps
...

=

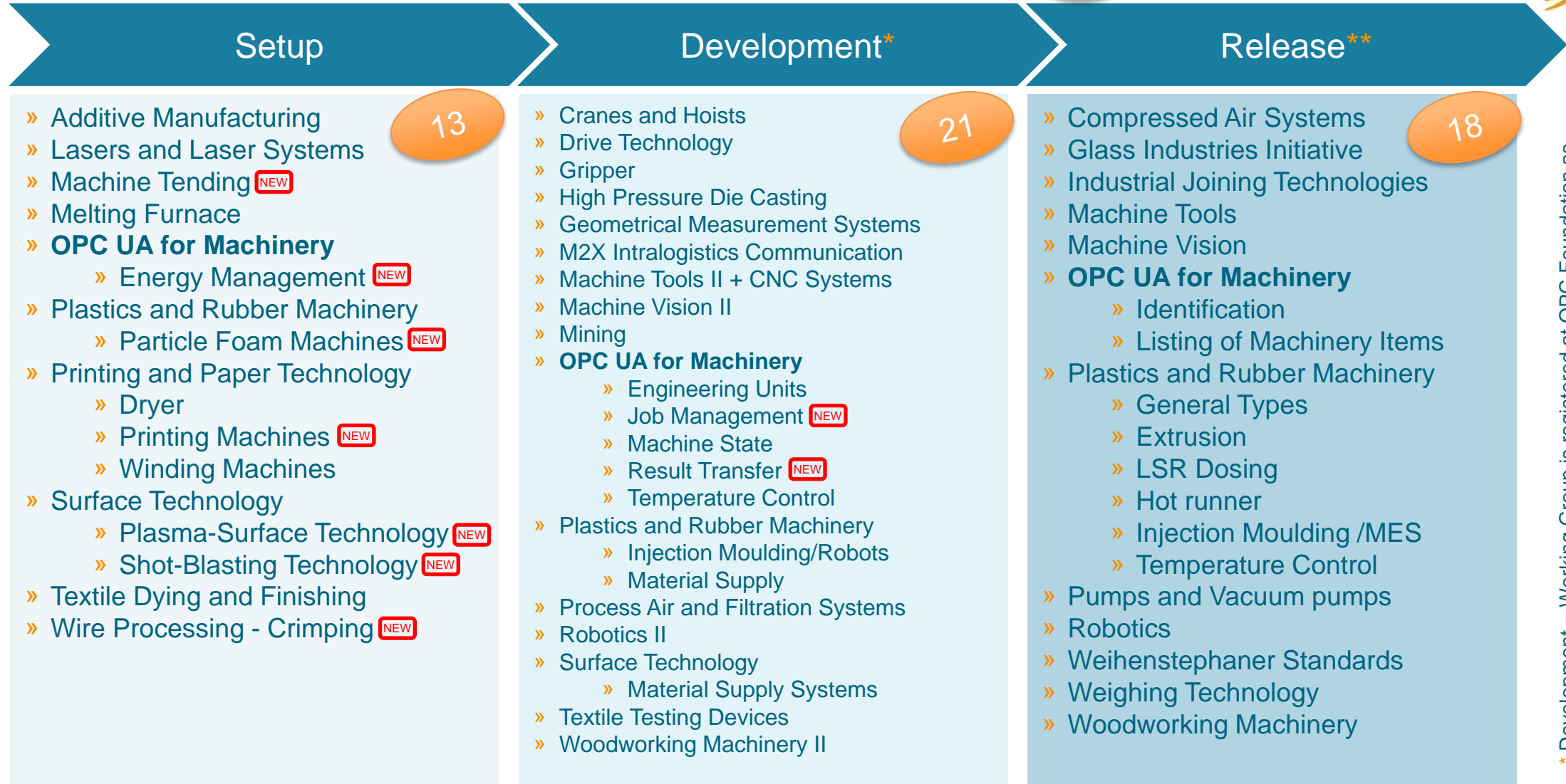
➤ **OPC UA + Companion Spec guarantee 100% Interoperability**

- Mandatory bricks guarantee interoperability
- Optional bricks allow flexibility
- OPCF: Tools and infrastructure for certification

Status of Companion Specifications



Σ52!



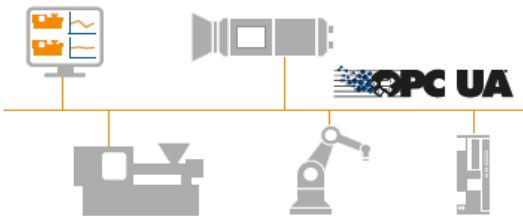
* Development = Working Group is registered at OPC Foundation as Joint Working Group.

** All these groups are continuing to work on the OPC UA standards.

NEW = Start in 2021

Levels of Interoperability

Industrie 4.0



I 3.0



Interoperability

Cross domain harmonized information models



OPC UA for Machinery

Domain specific harmonized information models

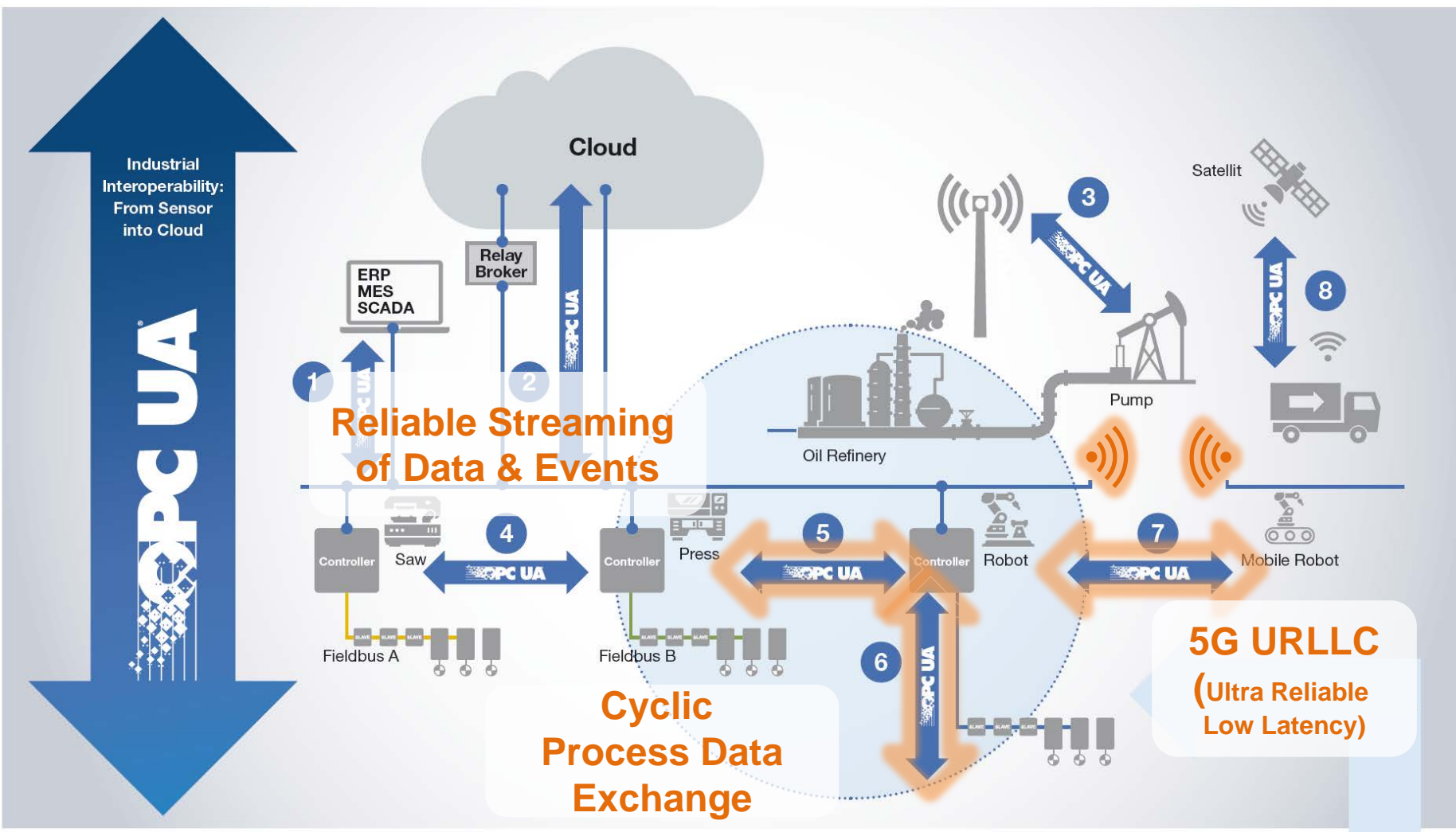
<ul style="list-style-type: none"> » Additive Manufacturing » Agricultural Machinery » Air Conditioning & Ventilation » Air Pollution Control » Automated Guided Vehicles » Battery Production » Building Control and Management » Building Materials » Ceramic Machinery » Cleaning Systems » Compressors, Compressed Air and Vacuum Technology » Construction Equipment » Continuous Conveyors » Cranes » Die & Mould » Drying Technology » Electronics, Micro & New Energy Production Technologies 	<ul style="list-style-type: none"> » Electrical Automation » Engines & Systems » Fire Fighting Equipment » Fluid Power » Food Processing and Packaging Machinery » Foundry Machinery » Glass Machinery » Industrial Process » Integrated Assembly Solutions » Intralogistic Systems » Lasers and Laser Systems for Material Processing » Length Measurement Technology » Lifts & Escalators » Machine Tools and Manufacturing Systems » Machine Vision 	<ul style="list-style-type: none"> » Metallurgical Plants and Rolling Mills » Micro Technologies » Mining » Photovoltaic Equipment » Plastics & Rubber Machinery » Power Transmission Engineering » Precision Tools » Printing & Paper Technology » Process Plant & Equipment » Production » Pumps & Systems » Refrigeration & Heat Pump Technology » Robotics » Security Systems » Software & Digitalization » Surface Technology » Textile Technology 	<ul style="list-style-type: none"> » Textile Care, Fabric and Leather Technology » Textile Machinery » Thermal Power Plants » Thermo Process Technology » Vessels » Waste Treatment & Recycling » Welding Technology » Welding & Pressure Gas Equipment » Wind Power Plants » Woodworking Machinery
--	---	--	---

Meshed communication network



Proprietary communication

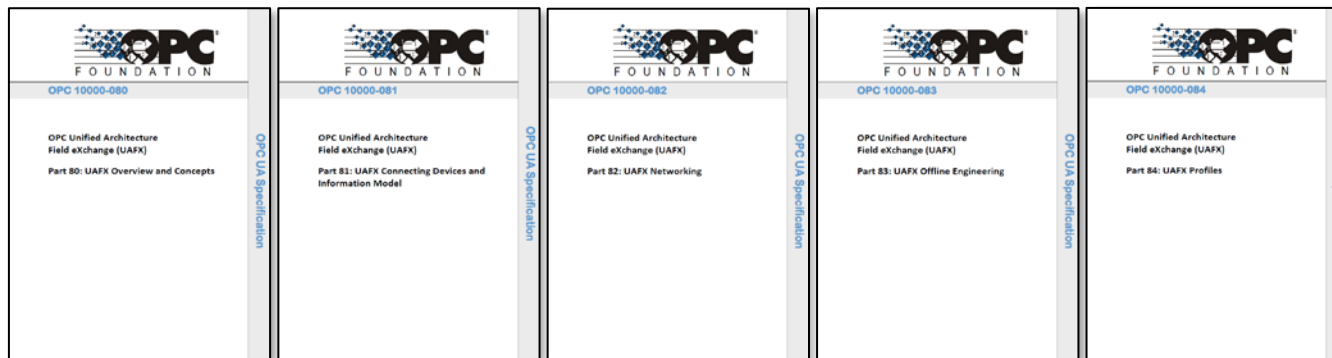
Examples of OPC Applications with QoS Requirements



- 1 IT / OT Communication
- 2 Cloud Integration
- 3 Secure Remote Access
- 4 Local OT Communication
- 5 Controller to Controller
- 6 Controller to Field Device
- 7 Wireless Integration (5G)
- 8 Future Ready

Conclusions

- ▶ TSN and IEC/IEEE 60802 enable determinism and network convergence for OPC UA FX
- ▶ We are preparing for an early integration of IEC/IEEE 60802 into OPC UA FX
- ▶ Upcoming OPC UA FX C2C Release as meaningful first step towards Plug & Produce TSN



OPC UA FX
Controller-to-
Controller
Interoperability
Demo planned
for SPS 2021
>15 vendors
>20 prototypes



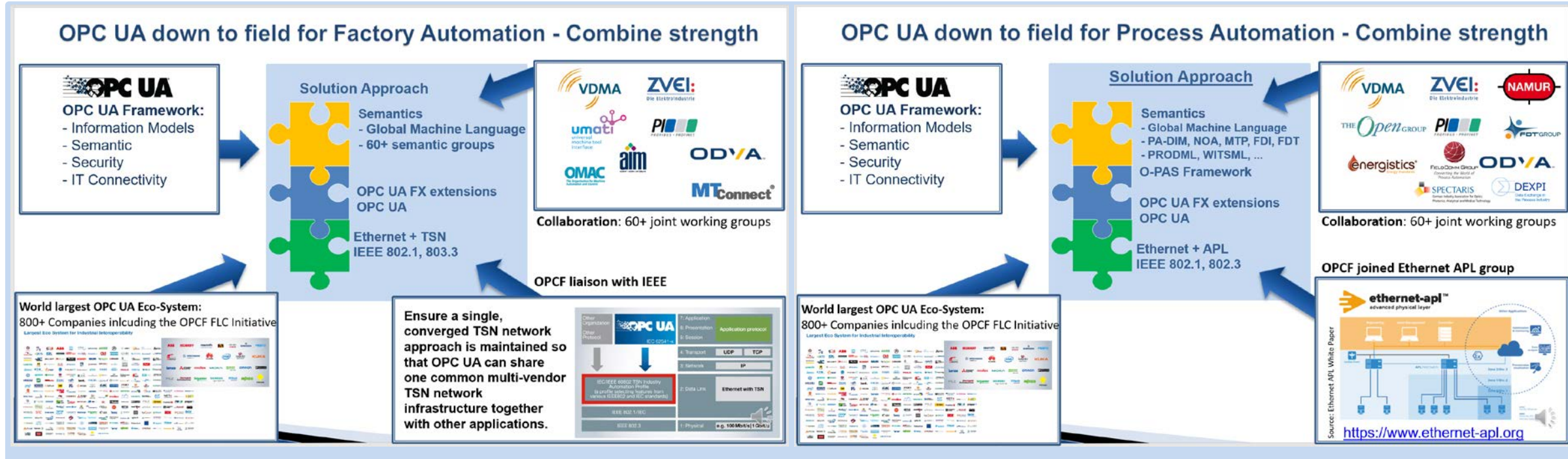
Looking for more information? Brochures, Recordings, Slides, ...

<https://opcfoundation.org/>

<https://opcfoundation.org/flc>

<https://opcfoundation.org/apl>

OPC UA + semantic: Gravity Center for your business



OPC UA
plus OPC UA FX specification extensions for harmonized field (FA + PA)
plus collaborations for semantics

= the gravity center for your business in next decates

Activities 2021: OPCF Press Release

June 15th, 2021 ARC report with focus PA for Achema

ARC report: OPC UA Momentum Continues to Build

“[...] OPC UA has become the most important interoperability technology in today's industrial landscape, and it appears poised to extend this lead even further [...]”

Reasons for the Recent Growth of OPC UA

- Vendor Independence
- Standardization, Security, Scale
- Openness and Accessibility
- Extensibility
- Collaboration

ARC VIEW

JUNE 15, 2021

OPC UA Momentum Continues to Build

By Harry Forbes

Keywords

Device Management, Industry 4.0, Interoperability, OPC UA, OPC UA FX, Process Industries


The Growth of OPC UA

OPC UA has become the key technology for several next-generation automation standards, including Industry 4.0, NAMUR NOA, the Open Process Automation Forum, and Ethernet APL (which represents the next generation of process field-level communications). OPC UA thus is extending to become a harmonized process and factory automation interoperability solution, including Safety, Motion, and Real-time. Automation end users benefit from: 1) a vast ecosystem working for greater interoperability, 2) OPC UA as a single framework for secure interoperability and information exchange, 3) standardized information models and semantics via OPC UA Companion Specifications, 4) the combination of Ethernet APL and OPC UA providing a common interoperability technology from cloud service providers all the way to process field devices. OPC UA has begun to appear in many new areas and applications and its growth is outpacing other industrial interoperability technologies.

A major advancement in market position for OPC UA came from its inclusion in the European Industry 4.0 interoperability road map for industrial manufacturing. This brought OPC UA awareness to a much broader set of decision makers. As part of Industry 4.0, software developers in many areas needed to learn about and use OPC UA. As the Industrial Internet of Things (IIoT) emerged, OPC UA became a common part of industrial factory-to-cloud technology and also industrial edge software applications.

Today, OPC UA is on a path to further increase its scope to include field measurement devices in the process industries (and for that matter in factory

This report provides an executive overview examining the reasons behind the growing importance of OPC UA versus other industrial interoperability technologies, especially for the process industries.



ARC
Advisory Group

VISION, EXPERIENCE, ANSWERS FOR INDUSTRY

SPS 2021: Motto



Visit us at: OPC Booth // Hall 5 – 140

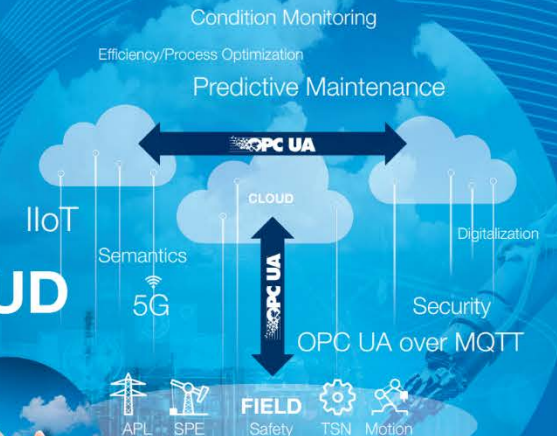
ONE HARMONIZED
SOLUTION FOR
PROCESS & FACTORY
SCALING FROM
FIELD TO CLOUD

OPC UA
FOR FIELD

Factory Automation
Process Automation

OPC UA
FOR CLOUD

OPC UA IIOT
STARTER KIT
AVAILABLE



OPC UA IIoT Starter Kit: Available

Vision

- Educational purpose only
- Show easy user experience for OPC UA PubSub incl. semantics
- Strategy: KISS (keep it simple stupid)

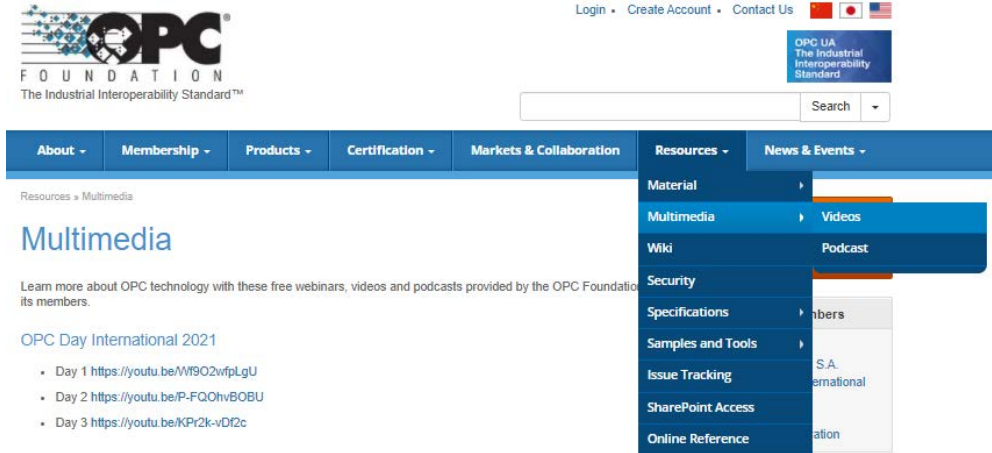
Steps done

- Hardware platform based on Raspberry
- OPC UA Server based on .NET Standard reference code
- GitHub landing page for OPC UA IIoT Starter kit



Activities 2021 – OPC Day International 2021

Real world: OPC UA success stories for end users: Experience shared by and for vendors and end-users



OPC Day International - Day 3: Adaption & Solutions (Target Group: End-Users)



BASF



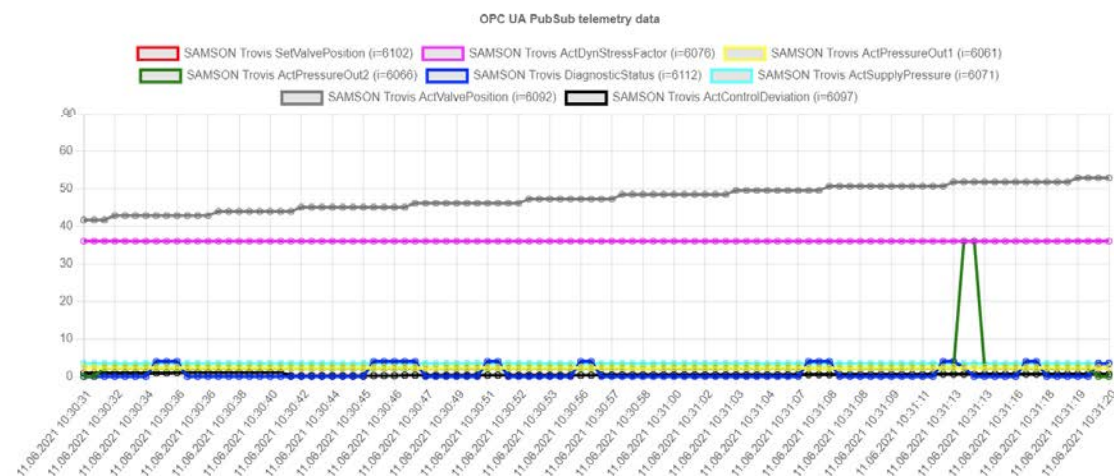
RENAULT



Multi-vendor demo: OPC UA + Ethernet-APL + PA-DIM

ACHEMA Pulse 2021: Multi-vendor including Endress+Hauser, Pepperl+Fuchs, SAMSON, Microsoft

OPC UA Web Dashboard



OPC UA Node ID	Latest Value	Time Stamp
SAMSON Trovis ActDynStressFactor (i=6076)	36	11.06.2021 10:31:15
SAMSON Trovis ActPressureOut1 (i=6061)	2,35	11.06.2021 10:31:15
SAMSON Trovis ActPressureOut2 (i=6066)	2,22	11.06.2021 10:31:13
SAMSON Trovis DiagnosticStatus (i=6112)	0	11.06.2021 10:31:13
SAMSON Trovis ActSupplyPressure (i=6071)	3,45	11.06.2021 10:31:16
SAMSON Trovis ActValvePosition (i=6092)	51,7	11.06.2021 10:31:13
SAMSON Trovis ActControlDeviation (i=6097)	0,6	11.06.2021 10:31:12

Real world: OPC UA scaling up into cloud

WHO

Equinor

We are Equinor, a broad energy company with 21 000 colleagues committed to turning natural resources into energy for people and progress for society in more than 30 countries worldwide. We are dedicated to safety, equality and sustainability. As the largest operator in Norway, a leading international offshore operator and a growing force in renewables, **we are shaping the future of energy.**



Equinor produces around 2 million barrels of oil equivalent every day



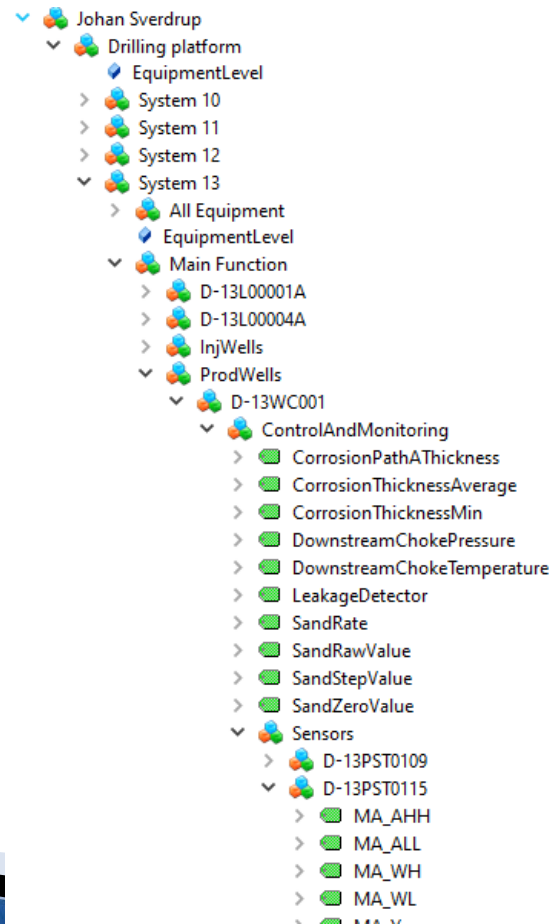
Providing renewable power to 1 million European homes



21,000 employees across more than 30 countries

WHY

- data in context (information)
- relations between objects to understand how things are connected



WHAT

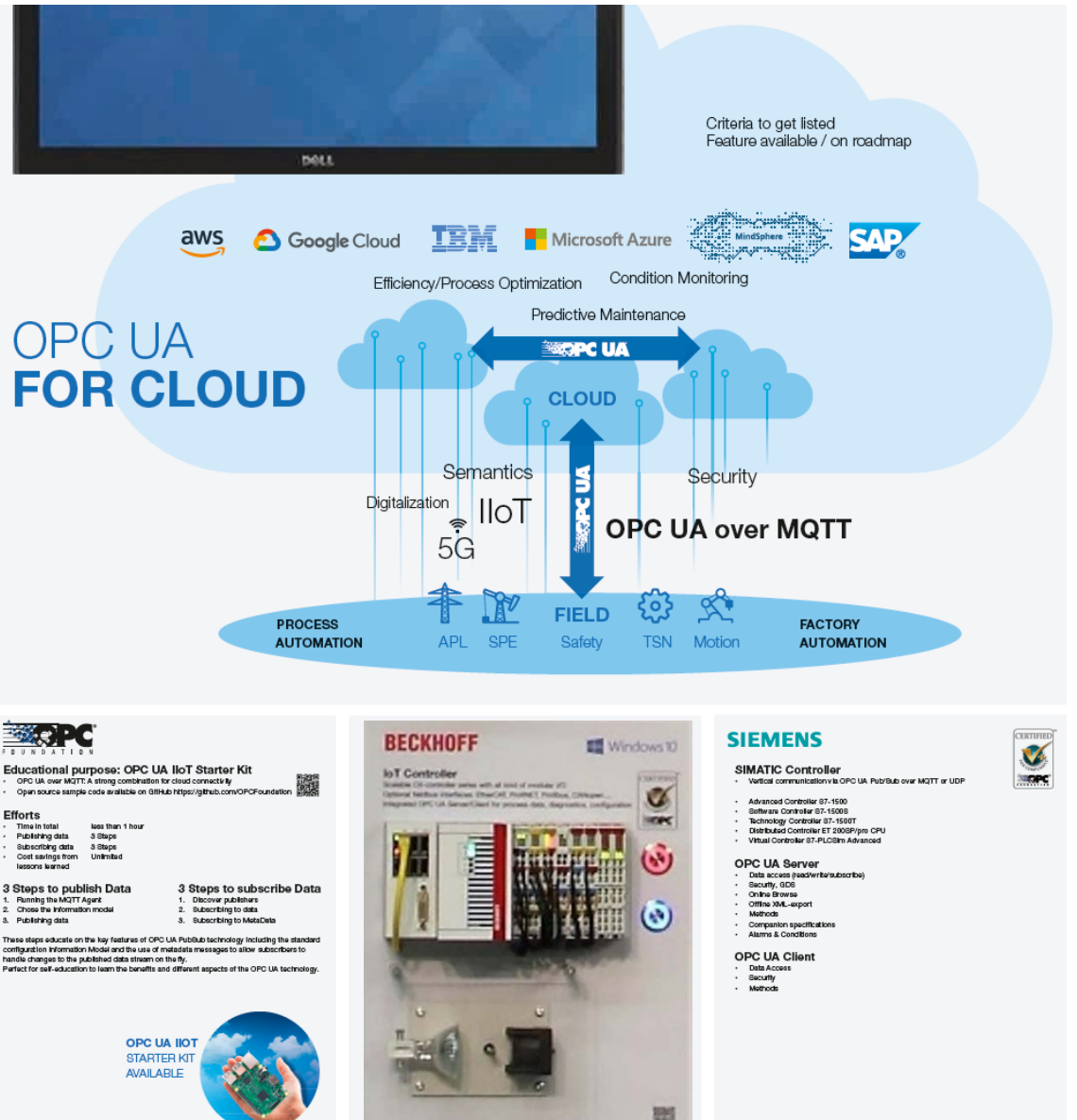
OPC UA implemented and proven in use at scale at Johan Sverdrup

<https://www.equinor.com/no/what-we-do/johan-sverdrup.html>



- Started production October 2019.
- This field alone will produce 30% of Norway's total production.
- OPC UA a central part of the digitalization strategy since 2015.
- 19 OPC UA servers on the plant floor aggregated into one central OT/IT Gateway using OPC UA Aggregation architecture pattern.
- 180.000 datapoints connected via OPC UA to Microsoft Azure Will be extended to 1.000.000 now

SPS 2021: OPC UA Cloud Solutions



First controller with integrated „OPC UA over MQTT“ „out of the box“

Real control loop application with interaction from user
„Lamp heating temperatur sensor, fan cooling“

What is so special here?

1. From cloud vendor point of view
 - All cloud vendors support MQTT – but everybody different flavor
 - „OPC UA over MQTT“ available in 2 different pattern
 - JSON binding for quick cloud integration
 - BINARY binding for large dataset
 - Major cloud suppliers like aws, GoogleCloud, IBM, MS Azure, Mindsphere, SAP confirmed to support „OPC UA over MQTT“ (mostly JSON)
2. From controller vendor point of view
 - agree on one common binding pattern: OPC UA over MQTT
 - How to offer: Gateway or integrated in controller?
3. From user (e.g. machine builder) point of view
 - One single solution to connetc to all cloud suppliers

eBook – 3rd edition published

- ▶ eBook <https://opcfoundation.org/resources/ebooks/>



- ▶ Concept
 - Re-use podcasts as series of articles
 - eBook – reuse of articles in compact PDF distributed via Automation.com / AutomationWorld / CFE Media
 - eBook – Edition 1 published Nov 2020
 - eBook – Edition 2 published March 2021
 - eBook – Edition 3 published Sept 2021
 - eBook – Edition 4 published Nov 2021

- ▶ Next: Articles are available for OPCF Hubs - re-publish authorized content in local channels



OPC Foundation: The United Nations for Industrial Automation

Thank you! - Questions? Please contact us!



Stefan Hoppe
President & Executive Director
OPC Foundation
Stefan.hoppe@opcfoundation.org

Looking for more information?
<https://opcfoundation.org/>

