

OPC UA: 20-year standardization Status Quo & Update

OPC Day Finland 2023 – Tampere November 30th, 2023



Stefan Hoppe
President & Executive Director OPC Foundation
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Agenda

- ▶ **News Organization: Members / Board Election**
- ▶ **OPC UA: 20th anniversary of standardization!**
- ▶ **Collaboration: Overview Companion Specifications**
- ▶ **Interoperability: OPC UA growing into cloud scenarios**
 - **OPC UA: Interoperability on Field & Edge**
 - **OPC UA: Interoperability from Edge to Cloud**
 - **OPC UA: Interoperability for IT & Cloud**
- ▶ **News**
 - **Certification updates**
 - **OPC UAcademics**
 - **OPC UA get adopted in cloud apps**
 - **Call for action**

Organization – Election for 2024/2025 Board of Director seats

- ▶ 5 open seats for 2024/2025
- ▶ Candidates: Nomination period ended Sept 22nd - 7 candidates, including 2 Chinese candidates (first time!)
See candidate profiles here: [OPCF-BoD-2024-Candidate-profiles.pdf \(opcfoundation.org\)](https://www.opcfoundation.org/OPCF-BoD-2024-Candidate-profiles.pdf)
- ▶ Election period: November
- ▶ Public announcement during OPCF General Assembly Meeting Dec 6th, 2023



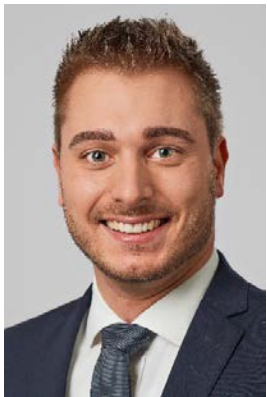
SIEMENS

Honeywell

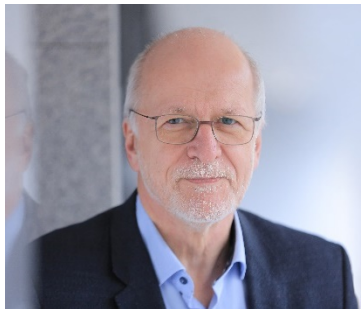


INOVANCE

YOKOGAWA



Andreas Faath



Thomas Hahn



Ziad Kaakani



Holger Kenn



Ridley Lee



Shinji Oda



Wei Xiong

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OPC UA 2003 – 2023:

standardization of

2003

Start of OPC UA



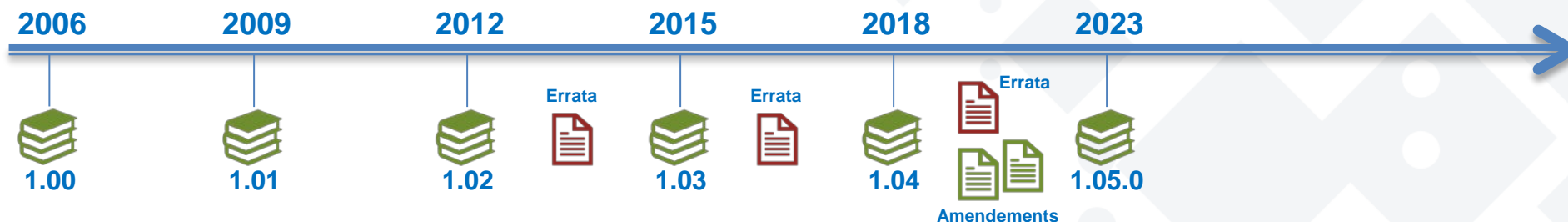
OPC Unified Architecture (OPC UA), comprising of 13 separate parts, is created by the OPC Foundation.

The first OPC UA working group meeting was held on November 3-7, 2003.

The original OPC specification is now referred to as “Classic OPC” or “OPC Classic”.



OPC UA availability 2006 – 2023: 17 years of stability and backward compatibility



SEMANTIC Interoperability: The key for the digitalization

Generic Device Models: Controller, Field Device, Process Device

- OPC 10000-100 – UA for Devices
- OPC 10020 – UA for Analyzer Devices
- OPC 30000 – UA for PLCs based on IEC 61131-3
- OPC 30001 – UA for IEC 61131-3 Function Blocks
- OPC 30010 – UA for AutoID Devices
- OPC 30081 – UA for Process Automation Devices (PA-DIM)
- OPC 30400 – UA for Cloud Library
- OPC 30500 – UA for Laboratory & Analytical Device Standard (LADS)*
- OPC UA for Analytical System Integration (CAISI)*
- OPC UA for Cloud Federation*
- OPC UA for Global Positioning*
- OPC UA for Non-destructive Evaluation
- OPC UA for Power Consumption Management*
- OPC UA for Secure Elements

Energy

- OPC 10040 – UA for IEC 61850 – Electrical Substation Automation (Release Candidate)
- OPC 30020 – UA for MDIS
- OPC UA for Wind Power Plants (IEC61400-25)* Power Consumption*
- OPC UA for Carbon Capture, Storage and Reporting*
- OPC UA for Solar PV Operations and Maintenance (SPOM)*

Building

- OPC 30030 – UA for BACNET (Release Candidate)

Miscellaneous

- OPC 30060 – UA for Tobacco Machines
- OPC 30200 – UA for Commercial Kitchen Equipment

Manufacturing Devices: Robots, Machines, Machine Tools

- OPC 30070-1 – UA for MTConnect, Part 1: Device Model
- OPC 40001-1 – UA for Machinery – Basic Building Blocks
- OPC 40001-2 – UA for Machinery – Process Values
- OPC 40001-3 – UA for Machinery – Job Management
- OPC 40001-100 – UA for Machinery – Result Transfer
- OPC 40010 – UA for Robotics
- OPC 40020 – UA for Cranes & Hoists
- OPC 40083 – UA for Plastics Rubber – General Types
- OPC 40077 – UA for Plastics Rubber – Injection Moulding Machines to MES
- OPC 40079 – UA for Plastics Rubber – Injection Moulding Machines to Robot
- OPC 40082-1...n – UA for Plastics Rubber – <device>
- OPC 40084-1...n – UA for Plastics Rubber – Extrusion
- OPC 40100 – UA for Machine Vision
- OPC 40200 – UA for Weighing Technology
- OPC 40210 – UA for Geometrical measuring Systems
- OPC 40223 – UA for Pumps and Vacuum Pumps
- OPC 40250 – UA for Compressed Air Systems
- OPC 40301 – UA for Flat Glass Processing
- OPC 40400 – UA for Powertrain*
- OPC 40444 – UA for Textile Testing Devices*
- OPC 40450 – UA for Joining Systems Base
- OPC 40451 – UA for Tightening Systems
- OPC 40501 – UA for Machine Tools
- OPC 40502 – UA for Computerized Numerical Control (CNC) Systems
- OPC 40530 – UA for Laser Systems
- OPC 40550 – UA for Woodworking Machinery
- OPC 40560 – OPC 40569 – UA for Mining
- OPC 40740 – UA for Process Air Extraction and Filtration Systems (PAEFS)*
- OPC UA for Cable Harness Manufacturing
- OPC UA for High Pressure Die Casting*
- OPC UA for Intralogistics Communication*
- OPC UA for Surface Technology*

Enterprise, Asset Mgmt, Packaging

- OPC 10030 – UA for ISA-S95
- OPC 10031-4 – UA for ISA-95 Job Control
- OPC 30050 – UA for PackML (OMAC)
- OPC 30260 – UA for OpenSCS Serialization Model
- OPC 30261 – UA for OPEN SCS – Job Order Profiles
- OPC 40600 – UA for Weihenstephan Standards
- OPC UA for Asset Administration Shell – AAS*
- OPC UA for Mimosa CCOM*

Engineering

- OPC 30040 – UA for AutomationML
- OPC 30250 – UA for DEXPI

Field Device Integration

- OPC 30080 – UA for Field Device Integration (FDI)
- OPC 30090 – UA for Field Device Tool (FDT)

Field Communication

- OPC 30100 – UA for SERCOS Devices
- OPC 30110 – UA for POWERLINK
- OPC 30120 – UA for IO-Link Devices and IO-Link Masters
- OPC 30130 – UA for Control & Communication System Profile (for Machine) CSP + (CCLink)
- OPC 30140 – UA for PROFINET
- OPC 30141 – UA for PROFInergy
- OPC 30142 – UA for PROFINET Remote IO
- OPC 30143 – UA for PROFI-Encoder
- OPC 30144 – UA for PROFINET-GSD
- OPC UA for CIP Devices*

▶ 151+ groups with domain experts have defined the semantics for their verticals

▶ Largest eco-system for information models for the automation world

▶ Landing page with complete overview here:

www.opcfoundation.org ->
[About -> Working Groups->](#)
[List of Working Groups](#)

▶ Available free of charge

OPC Foundation – Energy Working Groups

- ▶ Working groups in progress
 - Power Consumption (chaired by VDMA)
 - Carbon Capture, Storage and Reporting (chaired by Microsoft)
 - SPOM – Solar PV Operations and Maintenance (chaired by C-Labs)
- ▶ Larger OPC Foundation initiative is coming for a series of energy-related workgroups
 - intended to standardize and simplify connectivity of energy-related systems, services, and devices for:
 - Energy-Production (i.e Solar, Wind, Hydro, Nuclear, Oil/Gas/Coal)
 - Energy-Transformation (i.e. Conversion of Energy to Hydrogen, Heat, and other Energy Forms)
 - Energy-Distribution (i.e. Transport of Energy via Pipelines, Trucks, Powerlines)
 - Energy-Storage (i.e. Batteries, Hydrogen, Heat)
 - Energy-Consumption (i.e. SmartMeters, Appliances, Machines, Production Lines, Facilities and Buildings)
- ▶ OPC Foundation’s “Energy Harmonization Committee” to synchronize all efforts

Collaborations: News 2023

<https://opcfoundation.org/news/technology-news>



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OPC Technology News

Technology News informs about publications, documents in review, and working groups in initialization.

- Publications**
- Call for Review
- Call for Participation



DOCUMENT	DATE	
OPC 30144-1 PROFINET GSD - V 1.00	2023-09-25	▼
OPC 40740 Process Air Extraction and Filtration Systems - V 1.00	2023-08-10	▼
OPC 40020-1 Cranes&Hoists - MotionDevicesSystemBase - V 1.00	2023-07-21	▼
OPC 30020 MDIS OPC UA Companion Specification - V 1.3	2023-07-07	▼
OPC 40001-1 Machinery Basic Building Blocks - V 1.03.0	2023-06-08	▼
OPC 30030 BACnet - V 2.00.1	2023-06-02	▼
OPC 40210 Geometric Measuring Systems - V 1.00	2023-05-24	▼

Jan 1st, 2023 through Nov 14th, 2023

- 25 Publications (release)
- 17 Call for review
- 9 Kick-Offs
- 1 Call for participation



LADShack #5 @ Agilent

Open Collaboration, Working Side by Side ..



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OPC UA: Industrial Interoperability

One harmonized solution for OT and IT

Including:

... **rich modeling language**

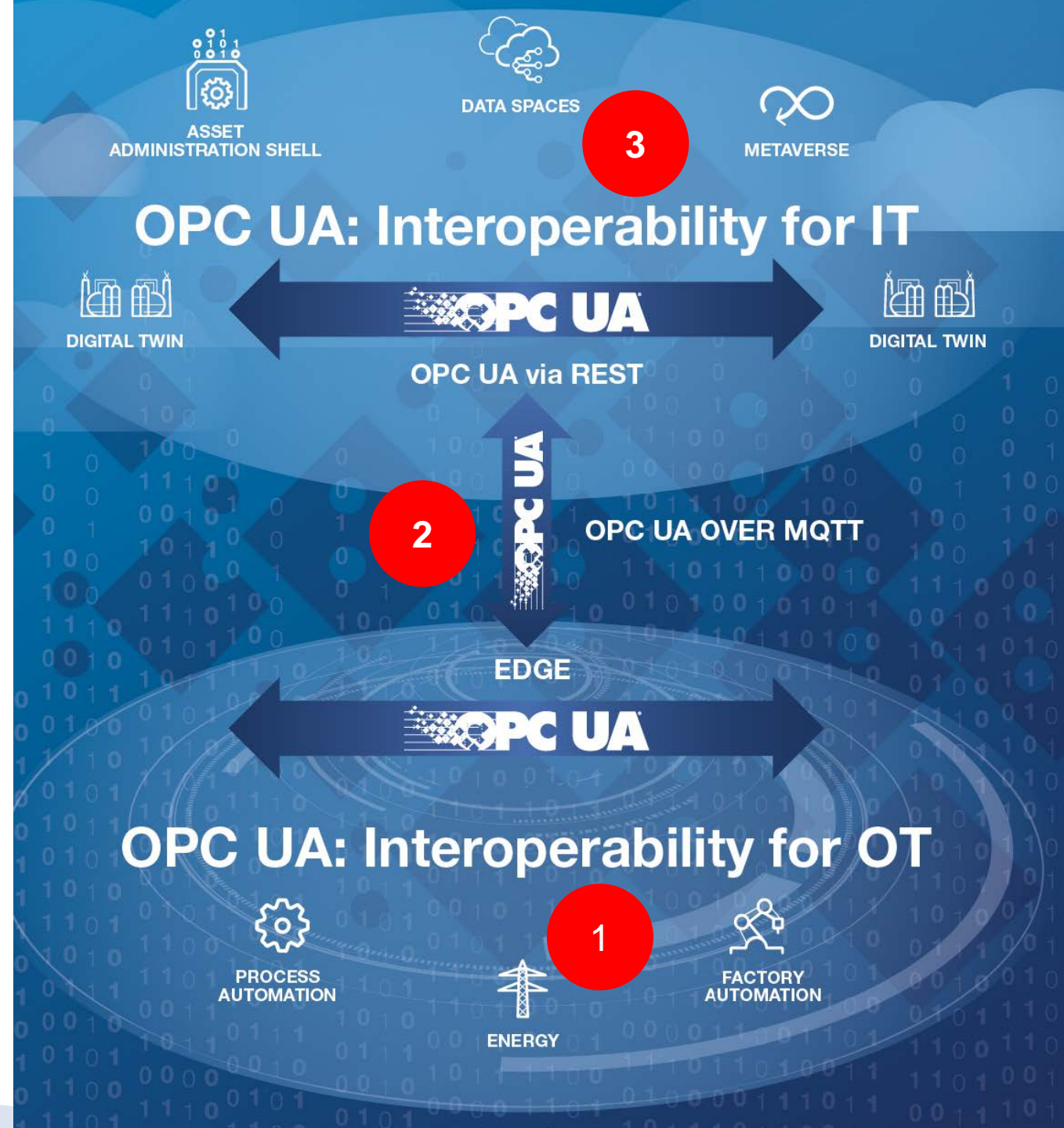
- complex data
- inheritance

... **flexible transport**

- TCP/IP, UDP, MQTT
- File Transfer (since 2013)
- REST interface (since 2016)

... **security**

- for accessing information
- for transport of information
- onboarding
- infrastructure certificate management



OPC FLC Initiative: C2C News

1. Phase 1: Controller-to-Controller (C2C)

- OPC UA FX Specification Series Part 80-84 released
- Certification efforts finalized
- First products expected 2024



UAFX Multi-Vendor Demos

- Controller-to-Controller (C2C)
- OPC UA Safety
- OPC UA over 5G Demo

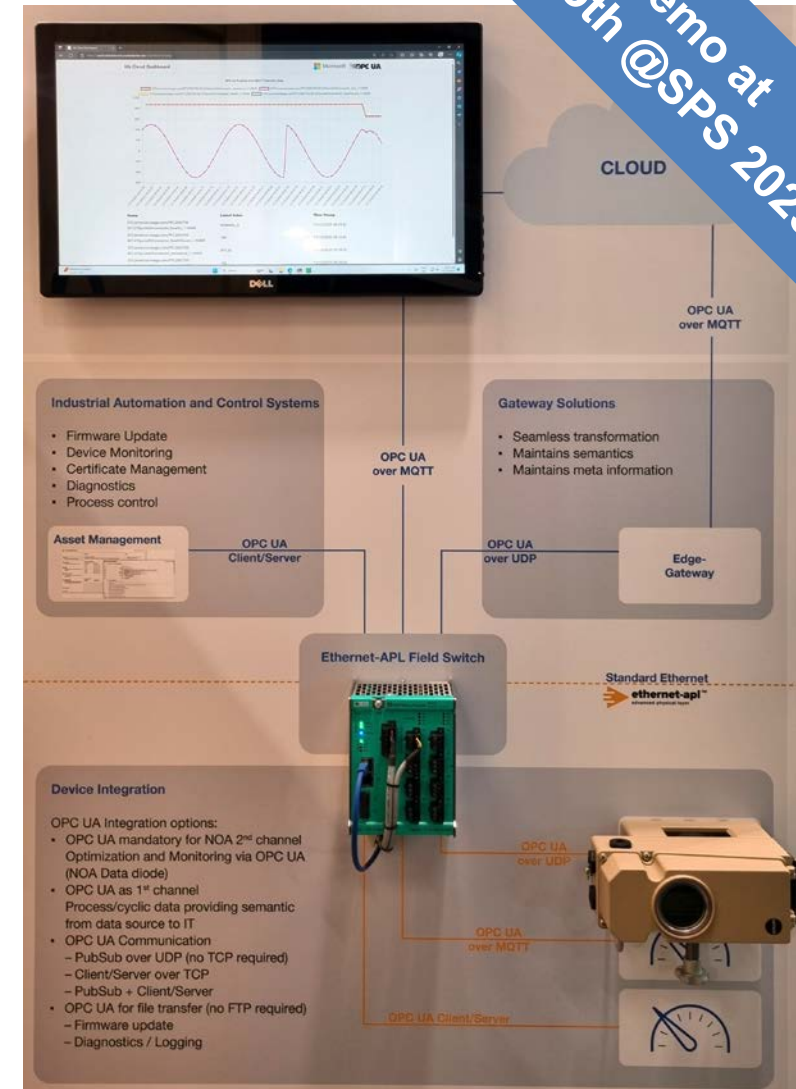
More than 20 participating companies incl. all major automation suppliers

Ethernet-APL: Enabler for OPC UA in the field

- ▶ OPC UA is the chosen Industrial Interoperability solution by NOA, OPAF, MTP and MDIS
- ▶ Direct cloud connectivity or utilization of gateways based on well-defined semantics

OPC UA Integration options:

- ▶ OPC UA as „second channel“ for monitoring & optimization (NOA = Namur Open Architecture)
- ▶ OPC UA as „first channel“ for exchange of cyclic process data
- ▶ Communication options:
 - OPC UA over MQTT
 - OPC UA Client/Server over TCP/IP
 - OPC UA PubSub over UDP/IP or Layer 2 Ethernet

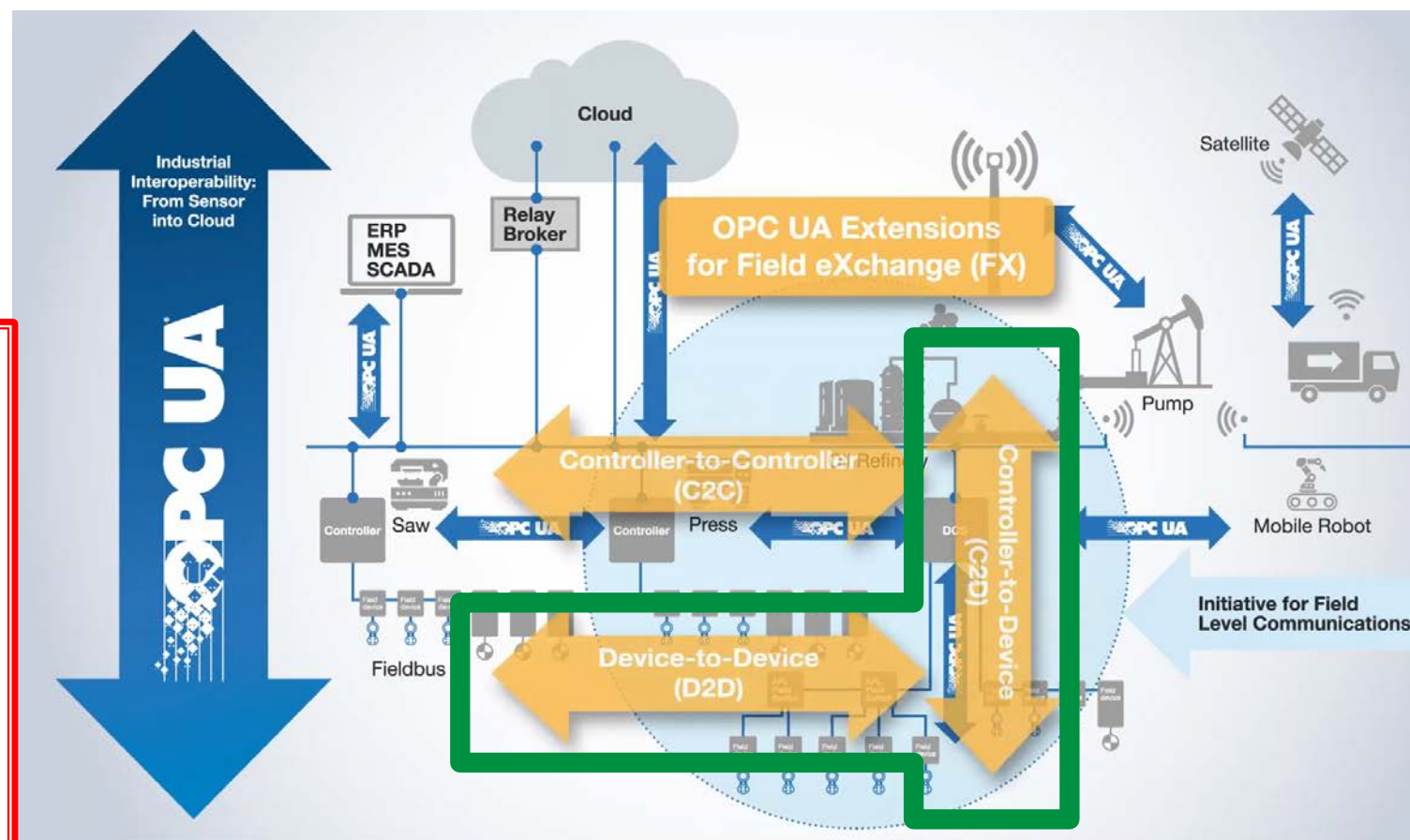


OPC FLC Initiative: Launch of Phase 2 (2024 – 2027)

- ▶ FLC Phase 1 (2019 – 2023):
 - Focus on C2C Use Case
 - UAFX Base Concepts for Controllers (and Field Devices)
 - Online & Offline scenarios

▶ OPC Foundation now launches Phase 2 (2024 – 2027)

- Focus on C2D and D2D
- Extend existing UAFX base concepts (e.g. Parametrization, Diagnosis and Networking)
- Develop application profiles for motion control, I/O and instrumentation



- Technical working groups & FLC Steering Committee open to all OPC Foundation members
- FLC Steering Committee members provide extra support (financial contributions & man-power)

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OPC UA: One IEC standard for multi vendor cloud solutions



CLOUD-RELATED ACTIVITIES:

1. Cloud Library

- Repository for OPC UA based information models (IMs)
- Upload, store, search, download IMs

2. Cloud Federation

- Standardized communication
 - Cloud to Cloud

3. Asset / Edge / Cloud

- Standardized communication
 - Field to Cloud
 - Cloud to Field

Challenge

- MQTT is a "payload agnostic" protocol
- No definition of the message payload
- Results in multiple company or consortia mapping definitions

Solution

- OPC UA Pub/Sub (over UDP and MQTT) published in Feb 2018
- Different bindings (JSON/BINARY) for different use-cases
- OPC UA is IEC62541 Standard
- Supported by 6 major cloud vendors
- Plugfest with 25+ major OT companies

4. Education IIOT Starter Kit



<https://github.com/OPCFoundation/UA-IIOT-StarterKit>



5. Cloud success stories



<https://opcfoundation.org/resources/case-studies/>

► **Transport (Status 2023)**
„OPC UA over MQTT“
Information exchange

- 53 OT companies
- 2 IT companies
Microsoft, AWS

► **Cloud Library**

**World largest online
Repository of Information
models**

- Association standardized
- Companies standardized

Free of charge

OPC UA PubSub vs Sparkplug discussions

- Lot of wrong messages and comparisons about OPC UA PubSub
- But... neutral content is available now!

[White Paper published at Automation.Com](#)

[Is MQTT transport lighter than OPC UA? \(onewayautomation.com\)](#)

Leveraging the Potential of MQTT in Industrie 4.0 through Standardized Information Models

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Abstract—Interoperability and scalability are key requirements for the implementation of Industrie 4.0 (I4.0) application scenarios targeting flexible and resilient production systems. In place of the rigid structures and heterogeneous communication solutions used in Operational Technology (OT) today, loosely coupled systems using standardized interfaces and information models are needed in order to decrease the high manual effort for re-configuration. With this regard, the Publish/Subscribe (PubSub) communication paradigm is well suited for the implementation of loosely coupled systems, that can e.g. be implemented using the MQTT application protocol. However, MQTT is data agnostic and does not address interoperability on the information layer, i.e. the definition of topic trees and payloads are up to the user. Specifications like Sparkplug or the OPC Unified Architecture (OPC UA) use MQTT as a transport protocol and add such missing features. In this paper, the two solutions Sparkplug and OPC UA are compared according to the requirements of the I4.0 scenario Plug & Work and Condition Monitoring. While Sparkplug offers a lower complexity, OPC UA is an international standard and widely adopted solution offering a broad set of features like a variety of transport and message mappings, standardized information models, increased scalability, end-to-end Cybersecurity, and compliance testing.

Index Terms—Industrie 4.0, PubSub, MQTT, OPC UA, Sparkplug, Interoperability, Information Models

I. INTRODUCTION

In this day and age, increasing manufacturing productivity, resilience and sustainability faces challenges regarding interoperability and scalability of technical systems [1], [2]. To enable most efficient and flexible production lines based on highly reconfigurable modules, the rigid OT and Information Technology (IT) architectures widely used today, have to develop into the direction of a dynamic and loosely coupled Industrial Internet of Things (IIoT) [3], [4].

This is mainly due to high manual effort that is needed today to (1) configure point-to-point connections and (2) map data variables between lots of different and changing systems, e.g. Programmable Logic Controllers (PLCs), Manufacturing Execution Systems (MES), and Data Analytics Tools. Additionally, the (3) workload on systems and (4) network infrastructure becomes a bottleneck when trying to scale out the classic architecture, e.g. for large-scale distributed I4.0 application scenarios like (Collaborative) Condition Monitoring or (global) plant Optimization. A tight coupling might work in industrial control setups with a manageable amount of devices, where systems should know (about the state of) each other to achieve certain levels of Quality-of-Service (QoS), e.g. with regard to determinism, reliability, and maintainability

[5]. Nevertheless, I4.0 scenarios like “Plug & Work” require a looser coupling as well [3].

Avoiding the issues (1) - (4) during the implementation of the I4.0 application scenarios mentioned above requires a decoupling of the communicating entities in space, time, and synchronization [6]. These entities should not have to know each other (space), they should not have to be active at the same time, and they should not be blocked while producing events or waiting for events (synchronization) [6]. Exactly this can be achieved with the PubSub communication paradigm. Here, messages from publishers are broadcasted to multiple subscribers, who are interested in certain topics or content [6]. These broadcasts are handled by a Message Oriented Middleware (MOM), which is a software or hardware infrastructure that supports sending and receiving messages between distributed systems [7]. Several technologies offer implementations of the PubSub communication paradigm, e.g. Apache Kafka, AMQP or MQTT [8]-[10]. Especially MQTT is achieving increasing attention for IIoT Use Cases and is used as a transport protocol in standards like OPC UA [11] and specifications like Sparkplug [12]. Some reasons for this are that MQTT already addresses most of the challenges mentioned above, namely (1) PubSub for loose coupling, (2) focus on a small footprint for embedded devices, and (3) unbreakable low bandwidth networks [9]. Additionally, MQTT's protocol design is kept simple and does not specify an information or topic model [12]. But looking at challenge (2) from above, in the IIoT this can turn out to rather be a disadvantage. For this reason, MQTT topic namespaces and payload structures are defined by OPC UA and Sparkplug. While OPC UA PubSub defines the payload as a configurable DataSet based on the standardized OPC UA Information Model and offers a binary, as well as a JSON encoding, Sparkplug focuses on the binary encoding of a generic payload structure using Google's Protocol Buffers [13].

This paper is organized as follows. Section II introduces the I4.0 application scenarios Plug & Work and Condition Monitoring with regard to their requirements. Section III introduces the state of the art regarding IIoT and I4.0 Reference Architectures and introduces MQTT, OPC UA and Sparkplug as common technologies used for the implementation of the application scenarios from Section II. Section IV analyzes the solutions OPC UA and Sparkplug based on the requirements of the application scenarios from Section II and aims at deriving best practices for their implementation. Section V concludes this paper and identifies open issues for future work.

One-Way Automation

Is MQTT transport lighter than OPC UA?

Introduction.

It is very common to read about MQTT protocol that it is very lightweight in terms of network traffic:

MQTT is an OASIS standard messaging protocol for the Internet of Things (IoT). It is designed as an extremely lightweight publish/subscribe messaging transport that is ideal for connecting remote devices with a small code footprint and minimal network bandwidth.
(Quote from [MQTT home page](#)).

At the same time, OPC UA is often considered heavier than MQTT.

Conclusion

Total network traffic in the case of using MQTT protocol is multiple times (from 3.76 to 7.91 depending on the test case) higher than in OPC UA. Which does not correlate with results published by Johnathan Hottell.

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European administration

European Union (EU) is preparing couple of administrative rules

Have to be fulfilled, if a machine is operating inside EU (produced inside EU or imported to EU)

- DPP (Digital Product Passport)
- PCF (Product Carbon Footprint)
- CRA (Cyber Resilian Act)

Good news:

- DPP and PCF ...
... is „just“ a very small OPC UA companion spec which can easy integrated into any OPC UA server running in the field (assuming not in the asset itself), in edge, in the cloud...
- CRA ...
OPCF started working group „UA for smart elements“ already
Security summit planned for June 2024

Summary:

OPCF takes care and offers easy to implement solutions based on OPC UA

Let's talk about Twin's



OPC UA: Interoperability in the Cloud

Year 2022:



I am the Digital Twin of the robot with standardized information and secure exchange

digital twin
CONSORTIUM
Open Source

Year 2023:



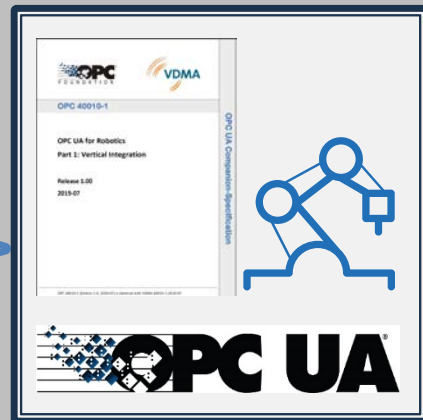
I am the Digital Twin of the robot supporting EU regulations DPP, PCF and standardized information and secure information exchange

digital twin
CONSORTIUM
Open Source

Cloud

Field & Edge

OPC UA
over MQTT



I am "the real" robot with standardized information and secure exchange

Technical details

1. Information modelling: OPC UA Including Companion Specs, AAS, DPP, PDF, ...
 2. Packaging: AAS Office Open XML (AASX file format)
 3. Interface: REST-AAS and OPC UA REST supported
- DPP and PCF is independent from AAS
 - Anyway: OPC UA technology is ready to host AAS, DPP, PCF Can be hosted in OPC UA server in field, edge, cloud

OPC UA feature set is scalable!

- Perception: OPC UA is too big and too powerful!

Question: Do all OPC UA functions always have to be provided in the OPC UA Server?

Answer: No!



Examples:

- PLC controllers may not need a REST-Interface
- Edge devices may not require Ethernet-APL or TSN functionality
- Data Spaces, Digital Twin ... may not required TCP, UDP but REST , „OPC UA over MQTT“ and file transfer
-

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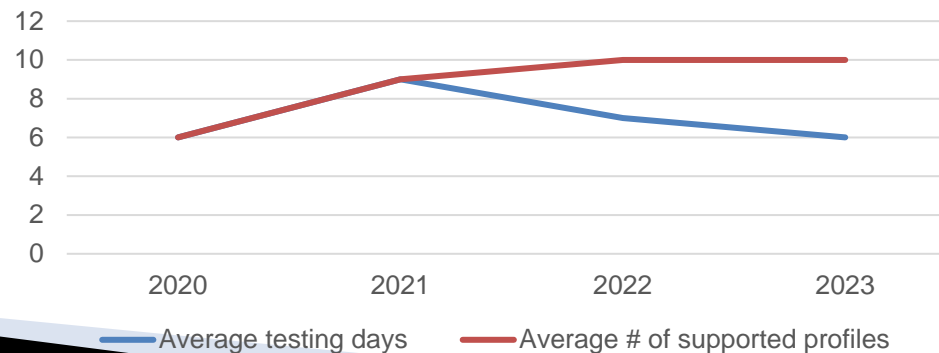
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OPC Certification Updates

- ▶ New OPC UA Certified Logo
- ▶ Product certification
 - ~20% increase in testing products in 2023
 - New product types like robot controllers (Seiko Epson)
- ▶ 3 CTT Releases this year
 - Introducing OPC UA PubSub UDP Testing
 - Introducing first set of UAFX Tests
 - Usability enhancements
 - Bug fixes

▶ Reduced testing efforts by ~33% Product complexity











Future Logo:



Current versions:



 <p>VT Series</p> <p>VT Series All-in-One 6-Axis robots feature great performance at an ultra low price, offering many of the same features as Epson high-end robots. VT Series robots include a built-in controller and simplified cabling, allowing fast, easy integration. S...</p> <p>Show details</p>	 <p>N Series with RC700-A</p> <p>The N Series lineup features a revolutionary compact folding arm design that maximizes motion efficiency for faster cycle times. Packed with unique technology, the N Series significantly reduces workspace requirements when compared to typical 6-Axis ...</p> <p>Show details</p>
 <p>C Series with RC700-A</p> <p>C Series 6-Axis robots provide great cycle times and a unique Slim-Line design, backed by remarkable precision and motion range. These compact robots offer exceptional performance for even the most demanding and complex applications. Specifica...</p> <p>Show details</p>	 <p>RS Series with RC700-A</p> <p>RS Series robots are some of the most unique and flexible SCARA robots available in the market today. With the ability to cross back under, as well as reach behind themselves, RS Series robots are able to utilize the entire workspace underneath the a...</p> <p>Show details</p>
 <p>T Series</p> <p>T Series All-in-One SCARA robots are the perfect alternative to complex slide-based solutions. These space-saving robots install in minutes. And, they include the same intuitive software and powerful features found in Epson's high-end robots. ...</p> <p>Show details</p>	 <p>LS Series with RC90-B</p> <p>LS Series SCARA robots offer the high performance and great reliability that users have come to expect from Epson, but at a lower cost. LS Series SCARAs were created for factories looking for maximum value without giving up performance. Specif...</p> <p>Show details</p>
 <p>G Series with RC700-A</p> <p>G Series SCARA robots feature a high-rigidity arm design that delivers high speed, high precision, and low vibration. G Series SCARA robots offer a wide variety of sizes from 175 to 1,000mm in reach, with up to 20 kg payloads. Specifications M...</p> <p>Show details</p>	 <p>OPC UA Server for RC700/90 Series</p> <p>This OPC UA Server is installed on Epson Controller RC700/90 series. A release of firmware containing the certified OPC UA Server will be announced later. Links for Epson Controller with Robot C Series with RC700-A G Series with RC700-ALS Ser...</p> <p>Show details</p>

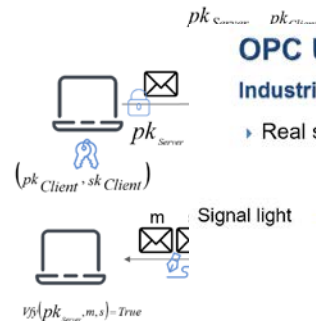


OPC UA Academic: Content

- ▶ Introduction to OPC UA
- ▶ The History of OPC and OPC UA
- ▶ The Specifications
- ▶ OPC UA Communication
- ▶ Security in OPC UA
- ▶ OPC UA Address Space Model
- ▶ OPC UA Services
- ▶ OPC UA Information Models
- ▶ OPC FLC Initiative
- ▶ OPC UA Service mappings
- ▶ OPC UA Profiles
- ▶ OPC UA Aggregation & Discovery
- ▶ OPC UA Pub/Sub
- ▶ Companion Specifications
- ▶ Implementation of OPC UA
- ▶ Tools and frameworks
- ▶ Use cases
- ▶ Architectures
- ▶ Introduction to practical exercises

OPC UA Security Cryptography Models

Public Key infrastructures



OPC UA Information model

Industrial Example

- ▶ Real states can be assigned by the representation and thus can be retrieved and changed

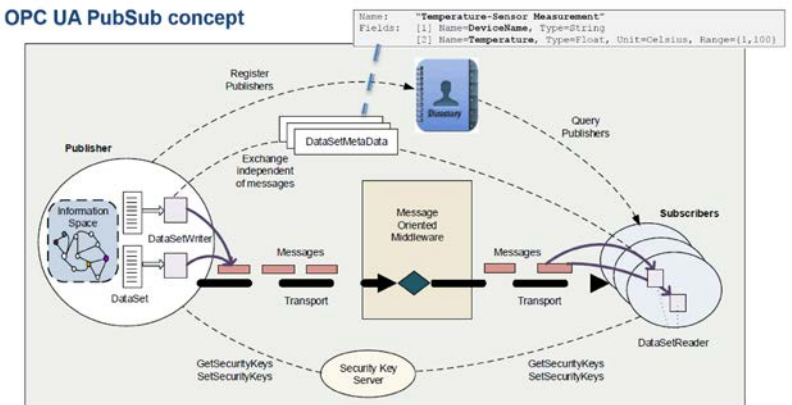
OPC UA Academic
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Conveyor belt

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OPC UA Publish-Subscribe

OPC UA PubSub concept



OPC UA Academic
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OPC
FOUNDATION

- ▶ Registration form on OPC Foundation Website:
<https://opcfoundation.org/resources/opcuacademic/>

World first OPC UA success story 2009

Areva Wind Turbines
with OPC UA enabled PLC (BEKCHOFF)
to connect to Land IT (Unified Automation)

OPC UA connects Wind Turbines in Germanys first Offshore Wind Park

10/31/2009 General News

Unified Automation's Software Development Kit (SDK) was the favored technology to integrate OPC UA in 'Alpha Ventus', an offshore wind park test site in the North Sea. OPC Unified Architecture is ensuring fast, reliable and secure communication with onshore control applications and enterprise information systems.

Permanently strong and steady wind guaranties effective wind energy generation 45 kilometers from the German coast. Each wind mill is designed as an autonomous, fully automated, self-monitoring energy plant. Offshore wind parks, build far away from the coast and waterways, have very low environmental impact. They must run under rough conditions like humidity, salt and extreme temperatures and their autonomous control system must guaranty most effective operation at all times. Depending on weather condition accessibility might be infrequently, therefore all components must be construed for long maintenance intervals and of course this includes the software components. The need for long term operation leads to high requirements in terms of reliability and robustness.



Essentials for choosing OPC UA

AREVA Multibrid GmbH equipped their M5000 - a 5MW offshore wind mill - with Beckhoff CX1020 Embedded PC running on Windows CE. Even though the fully automated wind turbine has self controlling capabilities, operators need a way to constantly monitor plant and equipment conditions remotely from onshore control room. Considering different possibilities for software communication the favored technology was OPC UA. Compared to other open standards the inbuilt security and authentication mechanism of OPC UA was the determining factor for this decision.

In a complex networking infrastructure including different subnets and domains, connected through routers and protected by firewalls, configuration and administration becomes a difficult and time-consuming task. Multiple use cases and scenarios of operation were elaborated to find sustainable solution. In the past VPN tunnel for secure transmission and remote desktop connections were used, but OPC UA includes encrypted transmission and adds user authentication and audit functionality down to individual data points. The OPC UA communication is directly integrated into the embedded PLC. There is no accessory hard- or software and no extra configuration required. The risk of additional sources of failure was eliminated.

Success Stories



equinor Microsoft prediktor OPC FOUNDATION

OPC SUCCESS-STORY HERE!

STRATEGIES FOR DATA-DRIVEN DIGITAL TRANSFORMATION IN THE PLANT



DIGITAL TRANSFORMATION AT GROUPE RENAULT

OPC FOUNDATION

OPC SUCCESS-STORY HERE!

RENAULT Google Cloud



Miele OPC FOUNDATION

OPC SUCCESS-STORY HERE!

MIELE'S BUSINESS UNIT LAUNDRY OPTIMIZES THE PRODUCTION OF WASHING MACHINES WITH OPC UA



ROSENDAHL KNILL GRUPPE OPC FOUNDATION

OPC SUCCESS-STORY HERE!

DATA COMMUNICATION WITH OPC UA IN MECHANICAL ENGINEERING



Scatec prediktor OPC FOUNDATION

OPC SUCCESS-STORY HERE!

PREDIKTOR DRIVES THE STANDARDIZATION OF OPC UA IN SOLAR ENERGY PRODUCTION



BÜHLER OPC FOUNDATION

OPC SUCCESS-STORY HERE!

„HIDDEN GIANT“ BÜHLER AUTOMATES FOOD PRODUCTION WITH OPC UA

▶ <https://opcfoundation.org/resources/case-studies/>

Looking to the future

*Hello, I am OPConic.
Please select from the
following options:*

Managing Director ▾

Select Industry ▾

Security ▾

OK

- ◆ HOMEBASE
- ◆ INDIPENDENT
- ◆ MODELING
- ◆ TRANSPORT
- ◆ SCALEABLE
- ◆ FIELD
- ◆ **SECURITY**



PROFESSION:

Managing Director ↑

INDUSTRY:

Select Industry ↑

INTEREST:

Security ↑





- ◆ HOMEBASE
- ◆ INDIPENDENT
- ◆ MODELING
- ◆ TRANSPORT
- ◆ SCALEABLE
- ◆ FIELD
- ◆ **SECURITY**
 - ◆ TRANSPORT: ENCRYPTION AND SIGNING
 - ◆ APPLICATION: AUTHENTICATION
 - ◆ PROVEN BY INTERATIONAL EXPERTS
 - ◆ AUDIT CONCEPTS
 - ◆ USERS: AUTHENTICATION
 - ◆ INTEGRATED BY DESIGN
 - ◆ APPLICATION: AUTHENTICATION
 - ◆ APPLICATION: AUTHENTICATION



PROFESSION:

Managing Director ↑

INDUSTRY:

Select Industry ↑

INTEREST:

Security ↑

Looking into the future → OPC UA get adopted in cloud apps

- OPC UA is De-facto standard ...

- OPC UA Client/Server ... is the de-facto standard for PLC/SCADA/MES/ERP interaction
- OPC UA over MQTT ... is the de-facto standard for interaction between edge and cloud ... and also interaction between digital twins
- OPC UA REST ... is the de-facto standard for easy access from IT/cloud to standardized field information

- EU regulations: DPP, PCF, RCA...

OPC UA offer easy to integrate and implement solutions on proven technology

- IT relevant groups realize more and more

- OPC UA's rich semantic data models and standardized interfaces
- Stability over 17 years without any compatibility break
- Eco-system with rich commercial offerings but also open source, education etc
- World largest pool of standardized domain models
- Legal protection umbrella

→ OPC UA is used to model complete factories already

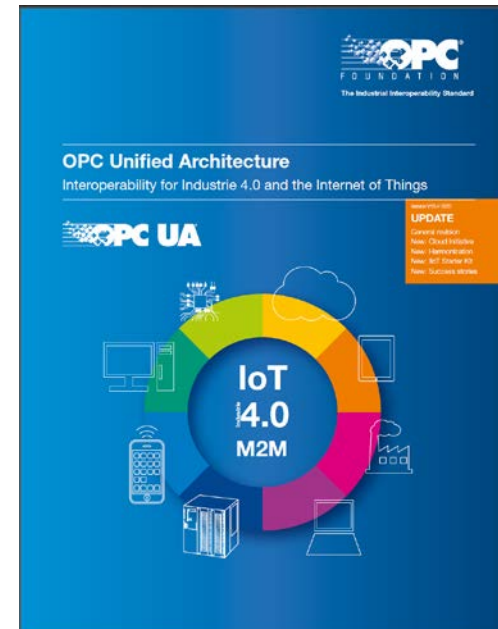
→ Make your life easy .. by using OPC UA for Digital Twins and Cloud solutions

Call for action

- **OPC UA success stories**
 - Lot of countries provided success stories from end-users
 - Finland?
- **OPC UA podcast**
 - What about Finalnd podcast edition?
- **OPC UAcademic**
 - Only 3 Professors from Finland are registered
 - Action: Who to contact & advertise more for Finland Professors and Universities!
- **Companion specs: OPC UA products including companion specs**
 - Significant trend from end-users to request support of companion specs (like Automotive Industry)
- **OPC UA get adopted in cloud applications**
 - Who is the Finland collaboration partner to educate and make cloud community aware?

OPC Foundation Information

- ▶ Compliance: Self-testing tools (CTT) and official OPC Foundation Test Labs
- ▶ Open Source (GitHub): OPC UA .NET code including major contributors like ABB, Microsoft, SAP
<https://opcfoundation.org/developer-tools/samples-and-tools-unified-architecture/net-stack-and-sample-applications/>
- ▶ IIoT Starter Kit: easy quick start for OPC UA over MQTT
<https://github.com/OPCFoundation/UA-IIoT-StarterKit>
- ▶ OPC UAacademic program: Free of charge lecture for professors
<https://opcfoundation.org/resources/opcuacademic/>
- ▶ Success stories by end users
Like equinor, Renault, Miele, Rosendahl, Scatec, ...
<https://opcfoundation.org/resources/case-studies/>
- ▶ Podcast with interesting guests
<https://opcfoundation.org/resources/podcast/>
- ▶ Marketplace
<https://opcfoundation.org/products/>



<https://opcfoundation.org/resources/brochures/>

OPC Foundation: The United Nations for Industrial Automation



Thank you! - Questions?



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

