

How the digital transformation will change manufacturing
Why you already now need to define a sustainable strategy for your own
production facility



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Agenda

- **Refresh: OPC Foundation and OPC UA technology**
- **Industrie4.0 and key of Information modeling**
- **Changes in smart manufacturing**
- **PLCopen & OPC UA activities / Examples of success**
- **Strategies for adoption**

OPC Foundation

- Vision <https://opcfoundation.org>
Secure, reliable, multi-vendor,
multi-platform, multi domain
interoperability from sensor to enterprise

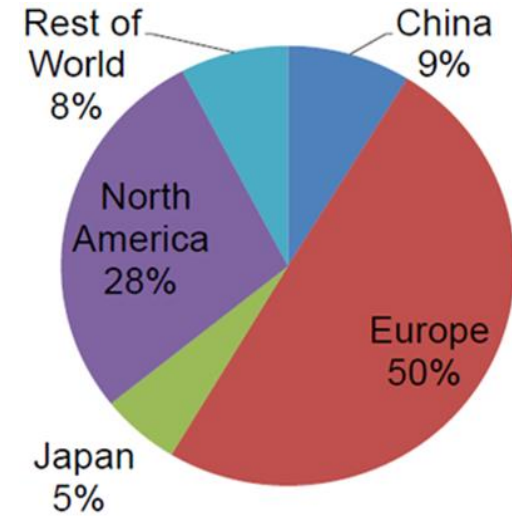
- International
 - Non profit organization (founded 1995)
 - Companies from Automation & IT
 - Standard: OPC UA is IEC62541

- Deliverables
 - Specification: open available
 - Code open source / Stacks in AnsiC/C++, C# .NET Standard, Java
 - Tools: Helpfully to speed up implementations and tests
 - Certification: open labs for OPC members and non-members
- Ecosystem with toolkits and education

GitHub



OPC Member



→ 596 Members (April 10th ,2018)
→ 604 Members (April 20th ,2018)

OPC Board

Microsoft, SAP,
Siemens, Beckhoff, Honeywell
Yokogawa, ICONICS, Ascolab

Topics for 2018: End users



New end users from tobacco vertical initiated a companion spec

- **British American Tobacco**
- **Imperial Tobacco Group**
- **JT International**
- **Philip Morris International**

OPC UA – Technical introduction

OPC Foundation Responsibilities – OPC UA – IEC 62541

OPC Foundation develops and maintains OPC UA as generic and neutral communication architecture with

- ▶ Information Model Framework

**Information
Model Layer**



DI Model
UA for Devices

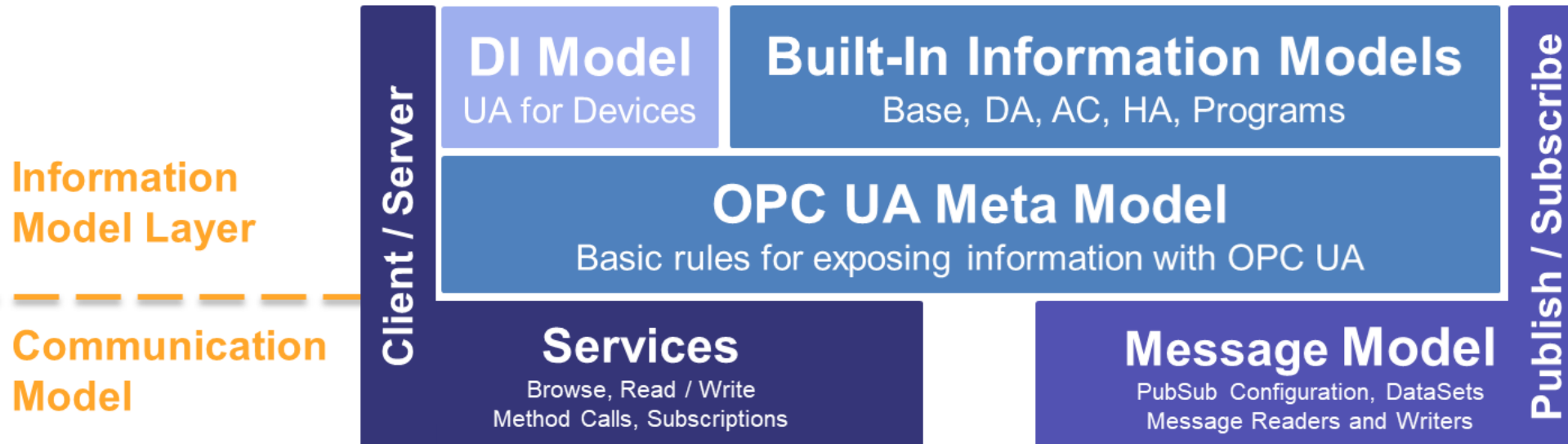
Built-In Information Models
Base, DA, AC, HA, Programs

OPC UA Meta Model
Basic rules for exposing information with OPC UA

OPC Foundation Responsibilities – OPC UA – IEC 62541

OPC Foundation develops and maintains OPC UA as generic and neutral communication architecture with

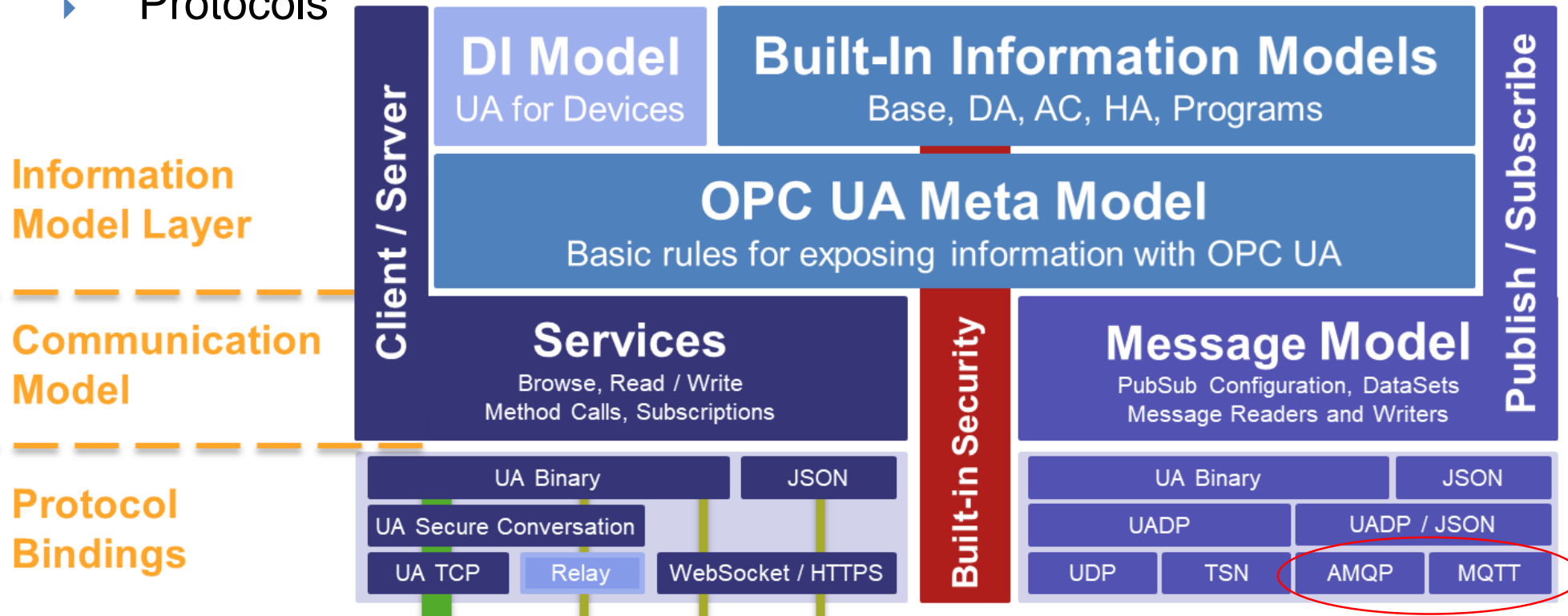
- ▶ Information Model Framework
- ▶ Communication Models



OPC Foundation Responsibilities – OPC UA – IEC 62541

OPC Foundation develops and maintains OPC UA as generic and neutral communication architecture with

- ▶ Information Model Framework
- ▶ Communication Models
- ▶ Protocols



OPC Foundation Collaboration with Partners

Specific Models

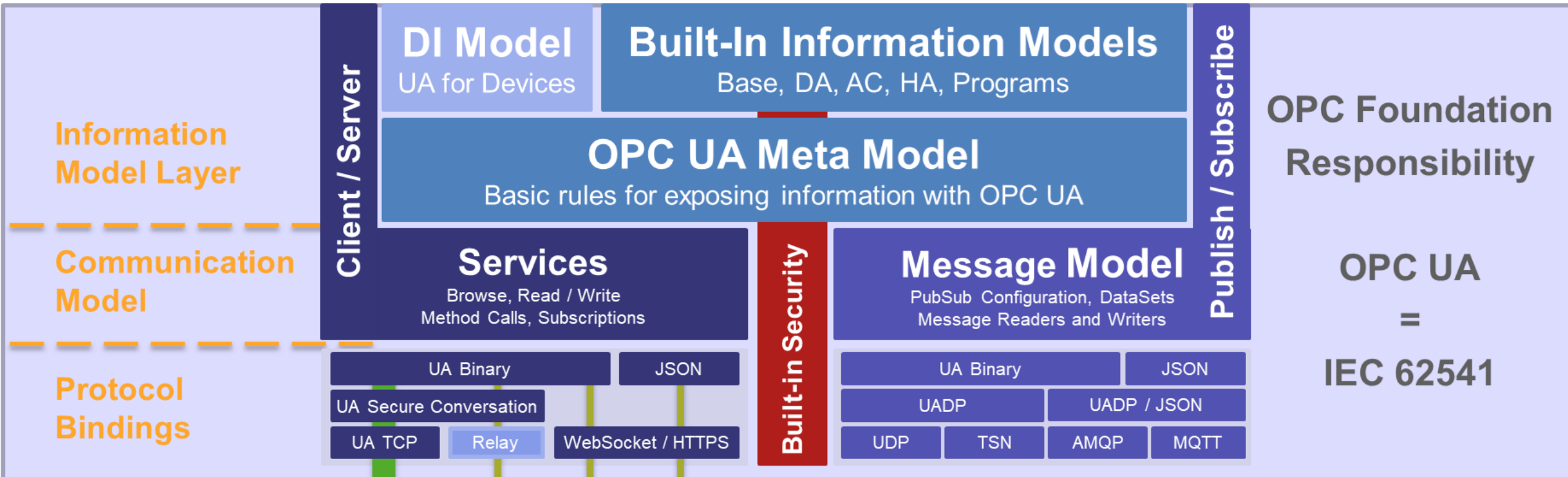
Use case specific models
 Industry specific models
 Device / machine specific models

Vendor Specific Extensions

Companion Information Models

[PLCopen](#), [ADI](#), [FDI](#), [FDT](#), [BACnet](#), [MDIS](#), [ISA95](#), [AutomationML](#),
[MTConnect](#), [AutoID](#), [VDW](#), [EUROMAP](#), [Robotics](#), [Vision Systems](#)
[IEC 61850/61400](#), [Sercos](#), [Powerlink](#), [PROFINet](#) and more coming

Developed with partner organizations

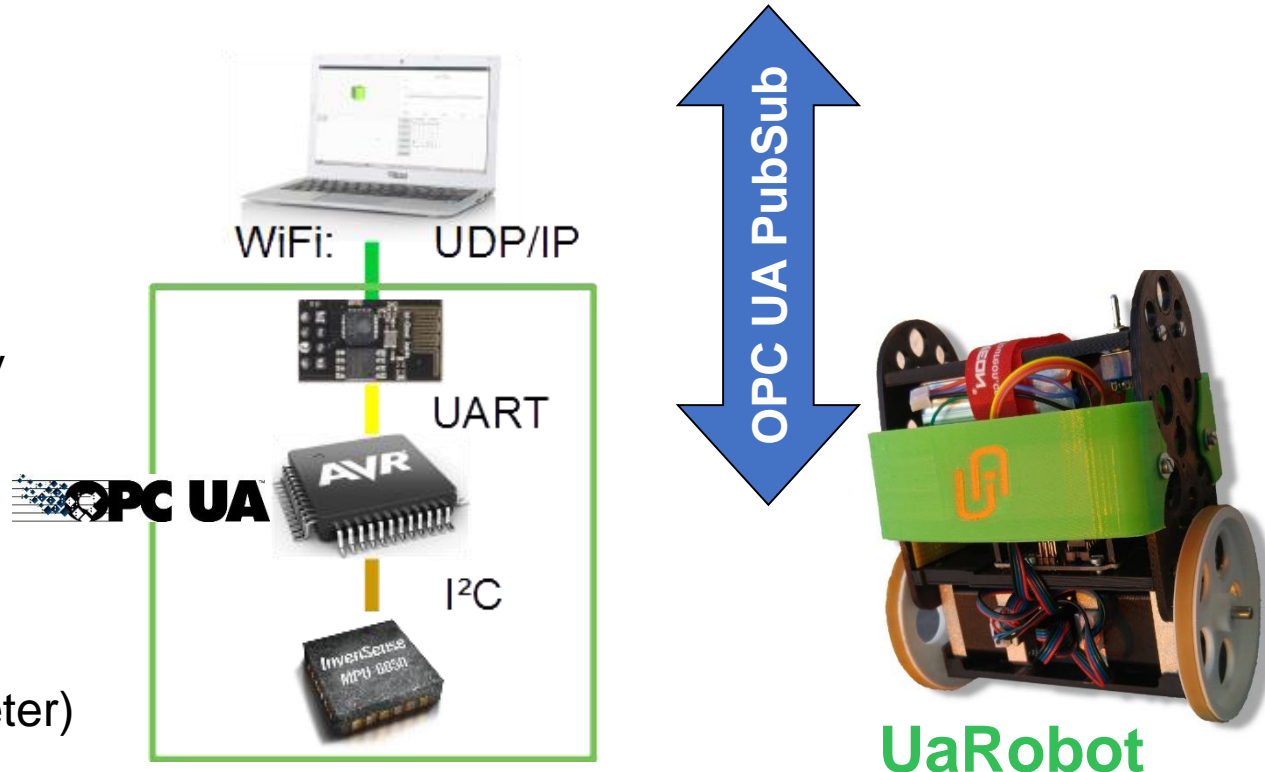


OPC UA PubSub – HW requirements

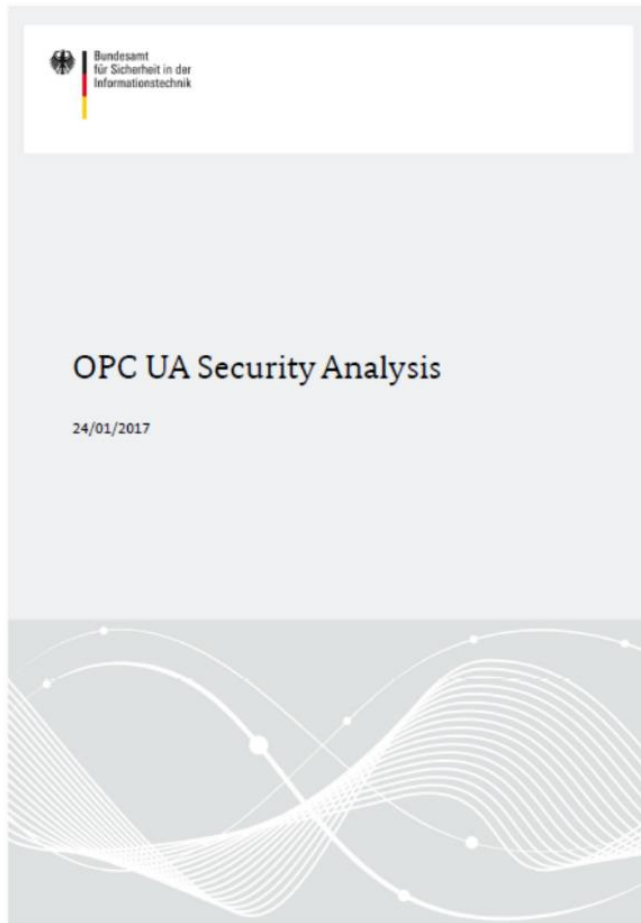
- Perception: OPC UA is too complex – require to many resources
Also often compared with MQTT → Comparison “apple and fruits”
- **OPC UA PubSub: 2kb SRAM in a 8bit CPU**

PC/Laptop
UaExpert / HP-SDK

ESP8266
UART/Wifi-Gateway
ATMEGA328P
8 bit MCU
2KB SRAM
MPU6050
Six Axis MEMS
(Gyro + Accelerometer)



OPC UA: Security analyzed



Who: Federal Office for Information Security (German Government BSI)

Why: Because of relevance of OPC UA for German Industry

What: Security Evaluation of OPC-UA – finalized March 2016

- Analysis of specification
- Analysis of Reference Implementation

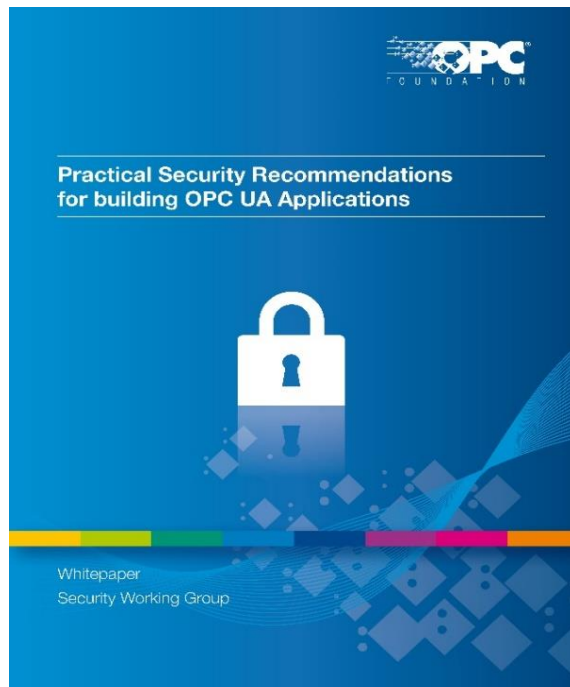
Result: Available on BSI web and OPC web

- Commented version available (English + German)
- www.opcfoundation.org/security

OPC UA Security User Group:

Practical Security Recommendations for OPC UA

- ▶ Chairman: Uwe Pohlmann, Fraunhofer IEM, Paderborn / Co-Chair Prof. Sikora, University Offenburg
- ▶ Members of the group are:
Ascolab, Beckhoff Automation, DS Interoperability, exceet Secure Solutions, Fraunhofer IEM, Hochschule Offen
Microsoft Corporation, Software AG, Sparhawk Software Inc, and TE Connectivity



Goals:

- Guidelines for **securely configuration OPC UA servers**
- Clear, concise, easy to read
- Quickly understand OPC UA security concepts
- Best practices

Availability

- Online <http://opcfoundation.org/security/>

Technical roadmap: Public & 3 timelines

Recent innovations in v1.04

PubSub

- New communication schema to enable and optimize OPC UA for one-to-many, many-to-one, or many-to-many configurations.

JSON Web Token, OAuth2

- User identification using the authorization service well-established in modern cloud applications (Azure, Google, Facebook, ...)

Reverse Connectivity

- Servers behind firewalls can use reverse connectivity.

SessionLess Services

- Avoids session establishment for use cases where Servers are called infrequently.

Security

- New policies that use SHA256

2018/2019 – Features worked on

Deterministic UA: Mappings to TSN

- This project will add a transport mapping of OPC UA PubSub to Time Sensitive Networking (TSN). Based on this mapping, deterministic data exchange between UA applications is possible.

Cloud-Relay

- The cloud-relay capability allows for connectivity between UA applications even when both Client and Server are behind separate firewalls.

Topic-based PubSub

- With topic we mean a named PubSub channel. By introducing topics we advance the late-binding philosophy. The PubSub actors will simply be configured with a topic name and will discover additionally required attributes at runtime.

Relate with established semantic models

- Although OPC UA provides extensive capabilities to create information models it will often be beneficial to make use of existing models like IEC CIM, eCI@ss, or IEC Common Data Dictionary. This project will define means to relate Nodes in a UA AddressSpace with other models or dictionaries.

2020 and beyond – Vision

The following features are under consideration. No concrete specification work has been initiated.

Transactions

- With the increasing popularity of OPC UA in various industries, we also see more and more scenarios where OPC UA is used for configuration. Simple configuration tasks can be solved with Methods, for more complex scenarios, transactions will be needed.

MetaData in the Cloud

- When data are published to cloud applications, most of the meta information that is in the Server's AddressSpace is not part of these data. The "MetaData in the Cloud" project targets this deficiency.

Harmonization of companion standards

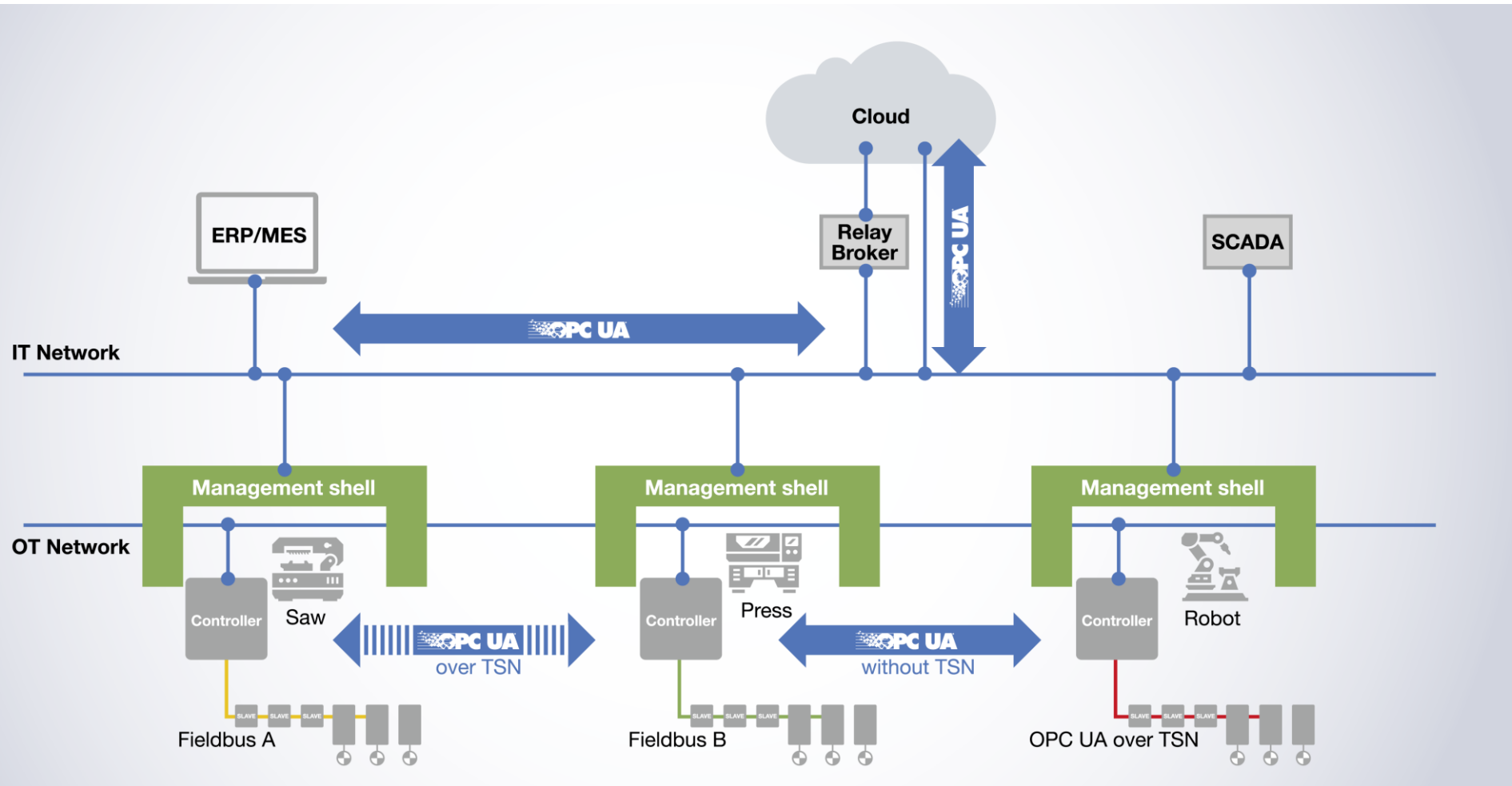
- Today, many organizations use OPC UA to model and expose their existing information. More and more, however, the definitions overlap or are identical. This project supports companion working groups to harmonize their models.

Deterministic communication using 5G

- The 5th generation wireless systems will provide better performance and determinism. Similar to the TSN mapping a mapping of PubSub to 5G protocols may be considered

Future: OPC UA over TSN

Deterministic real-time for OPC UA Pub/Sub



**OPC UA based
Controller-to-Cloud
communication can
be done**

- **directly**
- **via Gateway**
- **via MQTT or AMQP**

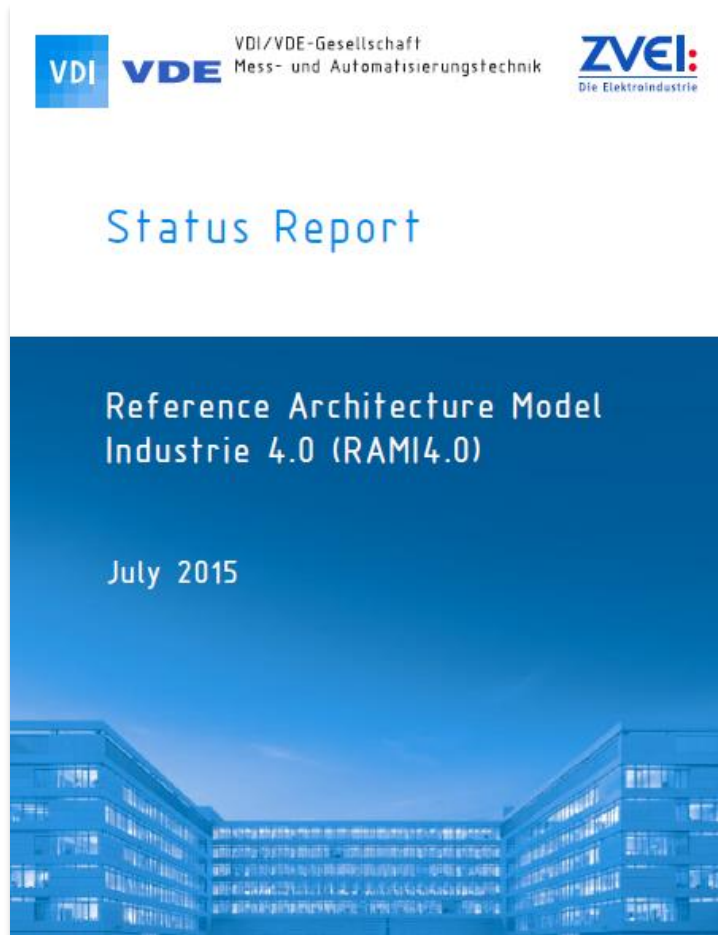
**OPC UA based
Controller-to-Controller
communication can
be done**

- **without TSN or 5G**
- **with TSN**
- **with 5G**

Industrie4.0 and key of information modeling

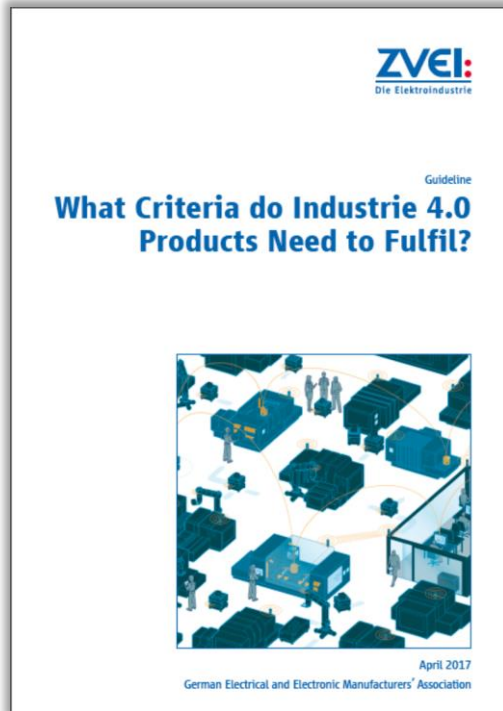
2015: RAMI4.0 recommends OPC UA

[http://www.zvei.org/Downloads/Automation/5305 Publikation GMA Status Report ZVEI Reference Architecture Model.pdf](http://www.zvei.org/Downloads/Automation/5305_Publikation_GMA_Status_Report_ZVEI_Reference_Architecture_Model.pdf)



- Approach for implementation of a Communication Layer
 - OPC UA: Basis IEC 62541
- Approach for implementation of an Information Layer
 - IEC Common Data Dictionary (IEC 61360 Series/ISO13584-42)
 - Characteristics, classification and tools to eCl@ss
 - Electronic Device Description (EDD)
 - Field Device Tool (FDT)
- Approach for implementation of a Functional and Information Layer
 - Field Device Integration (FDI) as integration technology
- Approach for end-to-end engineering
 - AutomationML
 - ProSTEP iViP
 - eCl@ss (characteristics)

2017: German Industrie 4.0 requires OPC UA

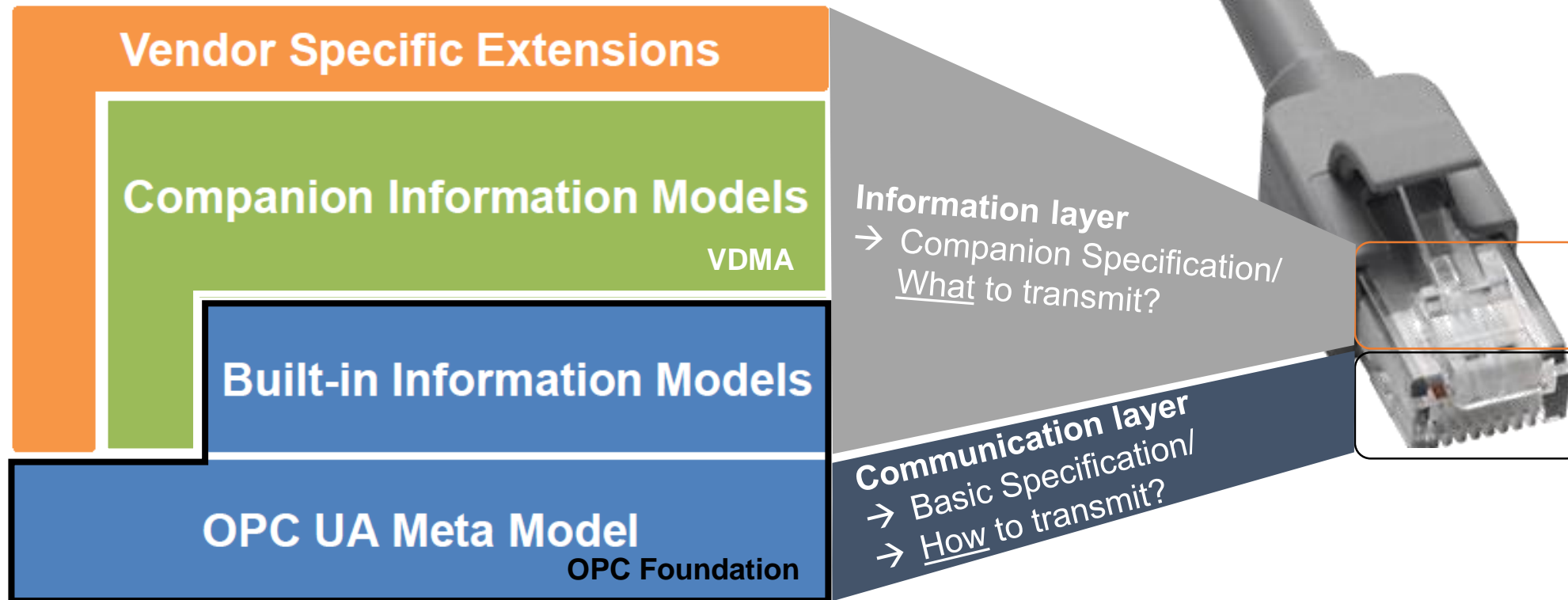


Source: ZVEI

- There are 3 levels to reach: Basic / Ready / Full
- Industrie 4.0 Basic → 7 criteria – 2 of them are OPC UA

2.	Industrie 4.0 communication	Transfer of product data and data files for interpretation or simulation, for example; product data in standardised form The product can be addressed via the network, supplies and accepts data, Plug & Produce via Industrie 4.0-compliant services	T	M	Manufacturer makes data that is relevant for the customer available/accessible online with the aid of identification, e.g. PDF via http(s)
			I	M	Product addressable online via TCP/UDP&IP with at least the information model from OPC-UA
5.	Industrie 4.0 services and conditions	Definition still open (service system) General interface for loadable services and messages regarding statuses Essential basic services that an Industrie 4.0 product must support and provide	T	O	Description of the device interface available digitally
			I	O	Information such as statuses, error messages, warnings, etc. available via OPC-UA information model in accordance with an industry standard

Delimitation between VDMA and OPC Foundation

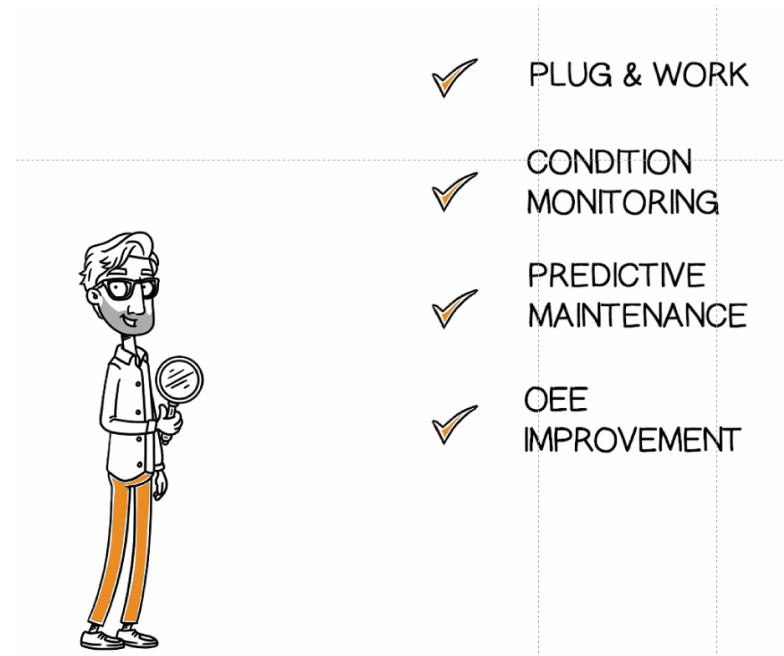
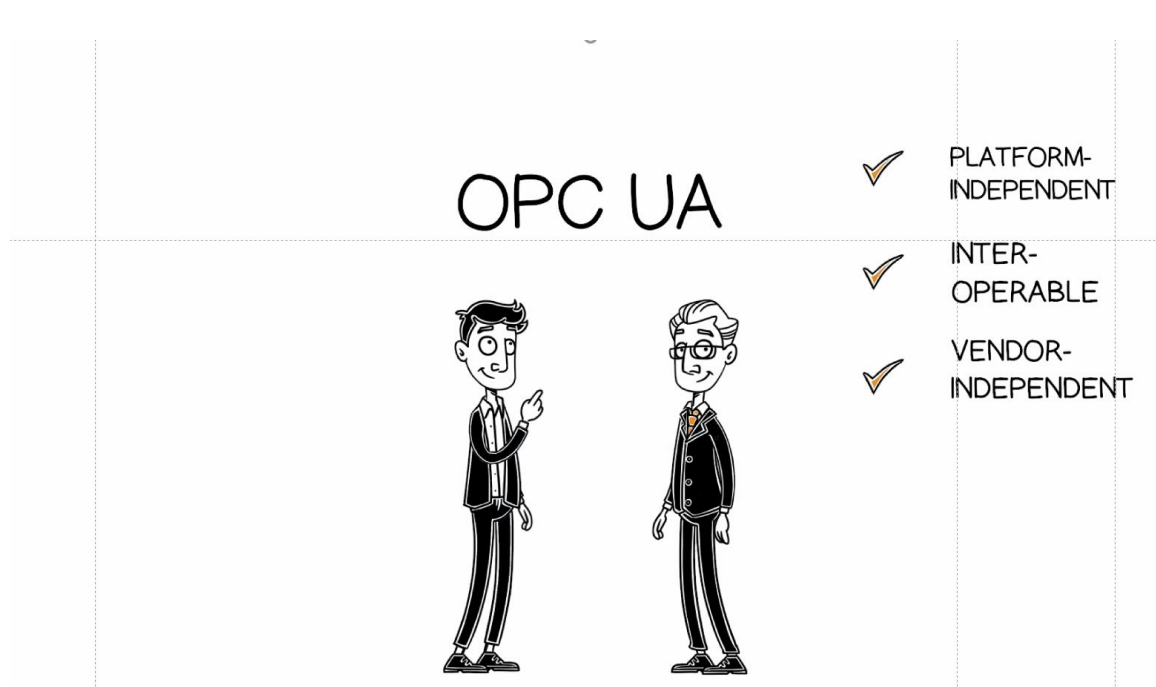




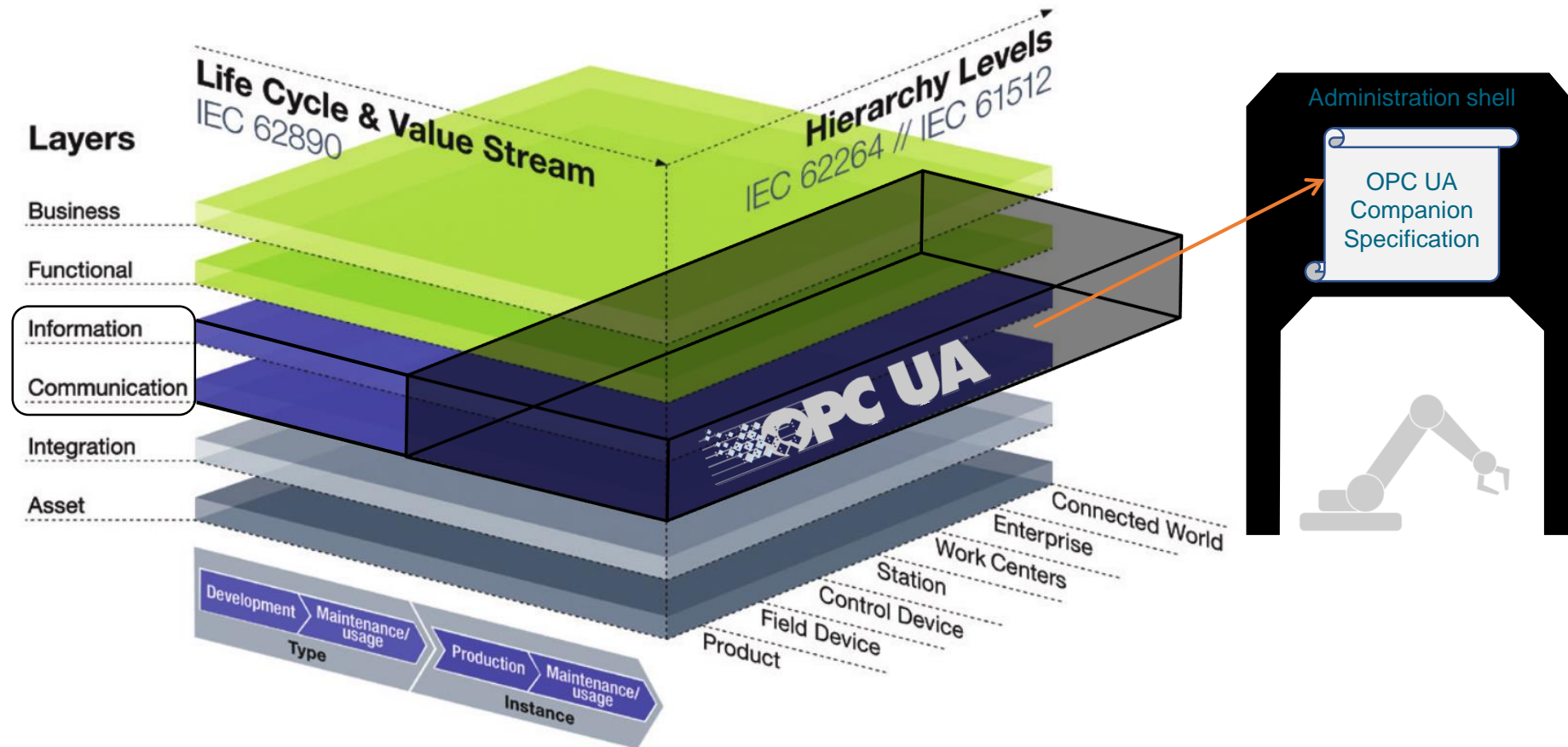
industrie40.vdma.org

Movie

2min video - start here: <https://youtu.be/odDQ83bzoWE>



OPC UA fits into Industrie 4.0



VDMA represents the breadth of the manufacturing industry

VDMA has more than 3200 member companies

- Agricultural Machinery
- Air Conditioning and Ventilation
- Air Pollution Control
- Air-handling Technology
- Building Control and Management
- Cleaning Systems
- Compressors, Compressed Air and Vacuum Technology
- Construction Equipment and Building Material Machines
- Drying Technology
- Electrical Automation
- Electronics, Micro and Nano Technologies
- Engine Systems for Power and Heat Generation
- Engines and Systems
- Fire Fighting Equipment

- Fluid Power
- Food Processing Machinery and Packaging Machinery
- Foundry Machinery
- Gas Welding
- Hydro Power
- Integrated Assembly Solutions
- Large Industrial Plant Manufacturing
- Lifts and Escalators
- Machine Tools and Manufacturing Systems
- Machine Vision
- Materials Handling and Intralogistics
- Measuring and Testing Technology
- Metallurgical Plants and Rolling Mills

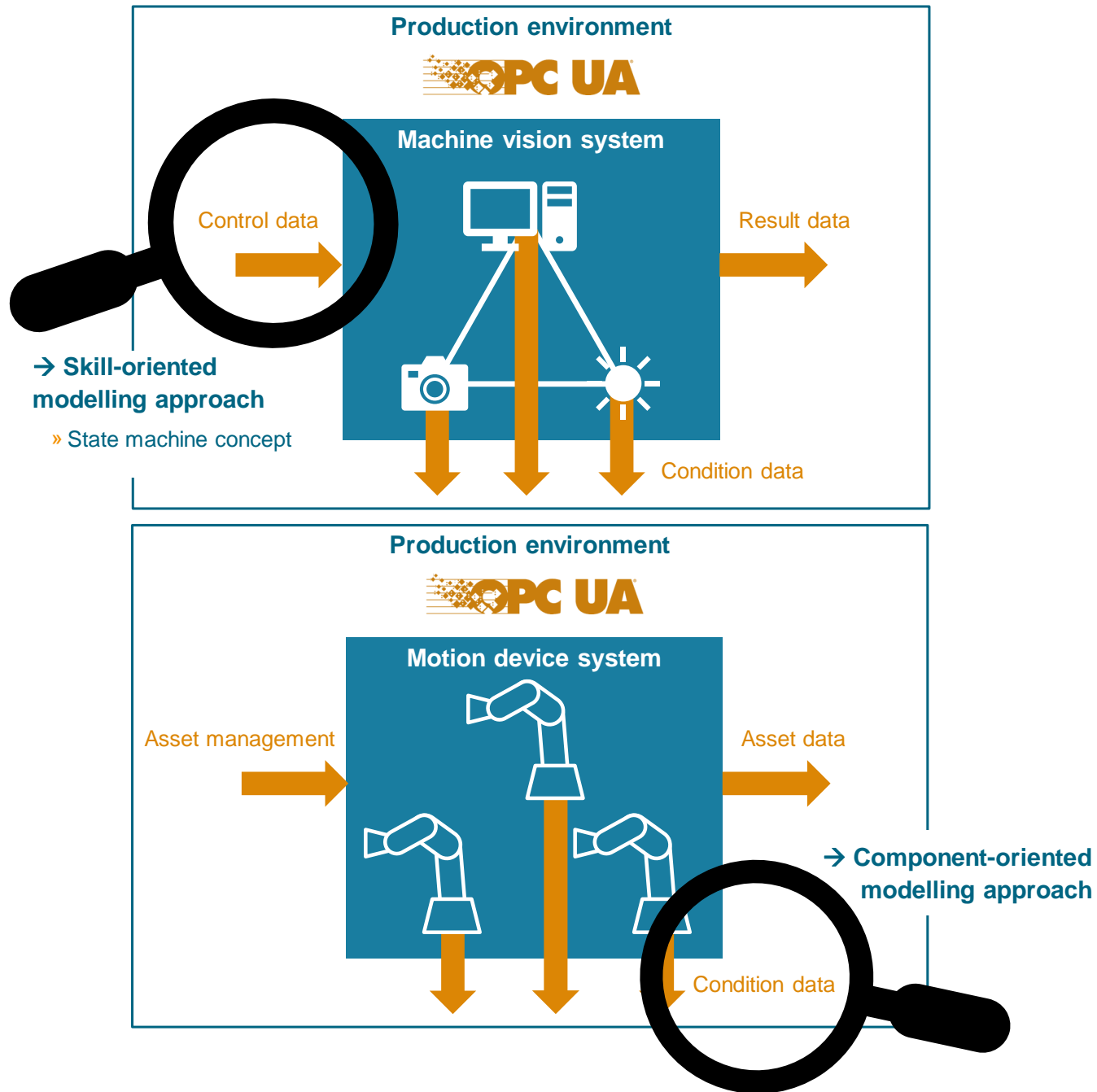
- Metallurgy
- Micro Technologies
- Mining
- Plastics and Rubber Machinery
- Power Systems
- Power Transmission Engineering
- Precision Tools
- Printing and Paper Technology
- Process Plant and Equipment
- Productronic
- Pumps + Systems
- Refrigeration and Heat Pump Technology
- Robotics
- Robotic + Automation
- Security Systems
- Software and Digitization

- Surface Treatment Technology
- Textile Care, Fabric and Leather Technology
- Textile Machinery
- Thermal Turbines and Power Plants
- Thermo Process Technology
- Valves
- Waste Treatment and Recycling
- Wind Energy
- Woodworking Machinery

OPC UA CS Release (Candidate)

OPC UA CS under development

Awareness existent



• Machine Vision

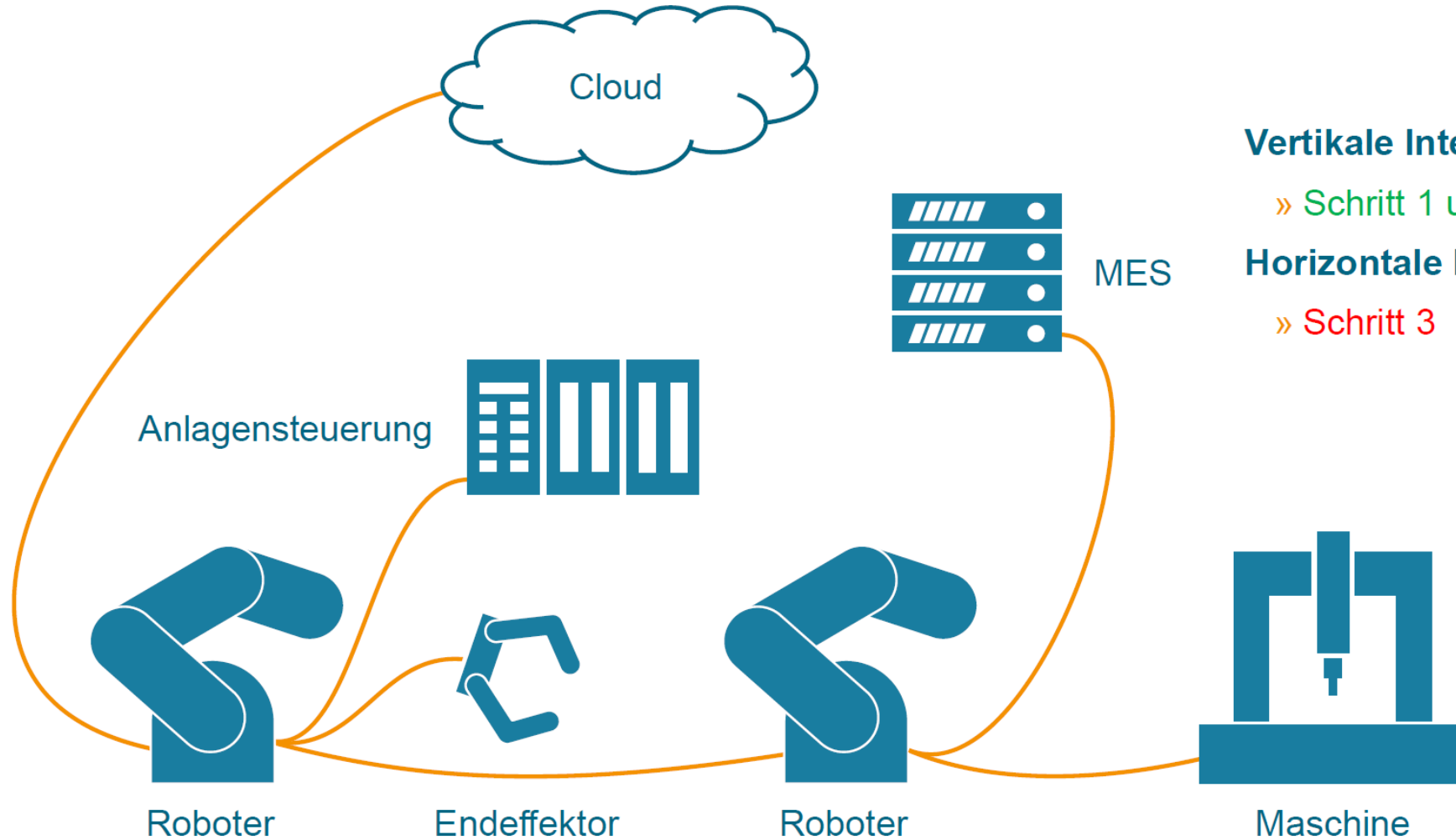
- Involved companies: 60
- Number of participants: > 100
- Kick-off: 28.03.2017
- Due Date: Draft until OPC Day June 20th 2018

• Robotics

- Involved companies: 39
- Number of participants: > 55
- Kick-off: 13.02.2017
- Due Date: Draft until OPC Day June 20th 2018

Distribution of the 39 involved companies in the VDMA Working Group Robotics

OPC-UA-Standardisierung im VDMA Robotik



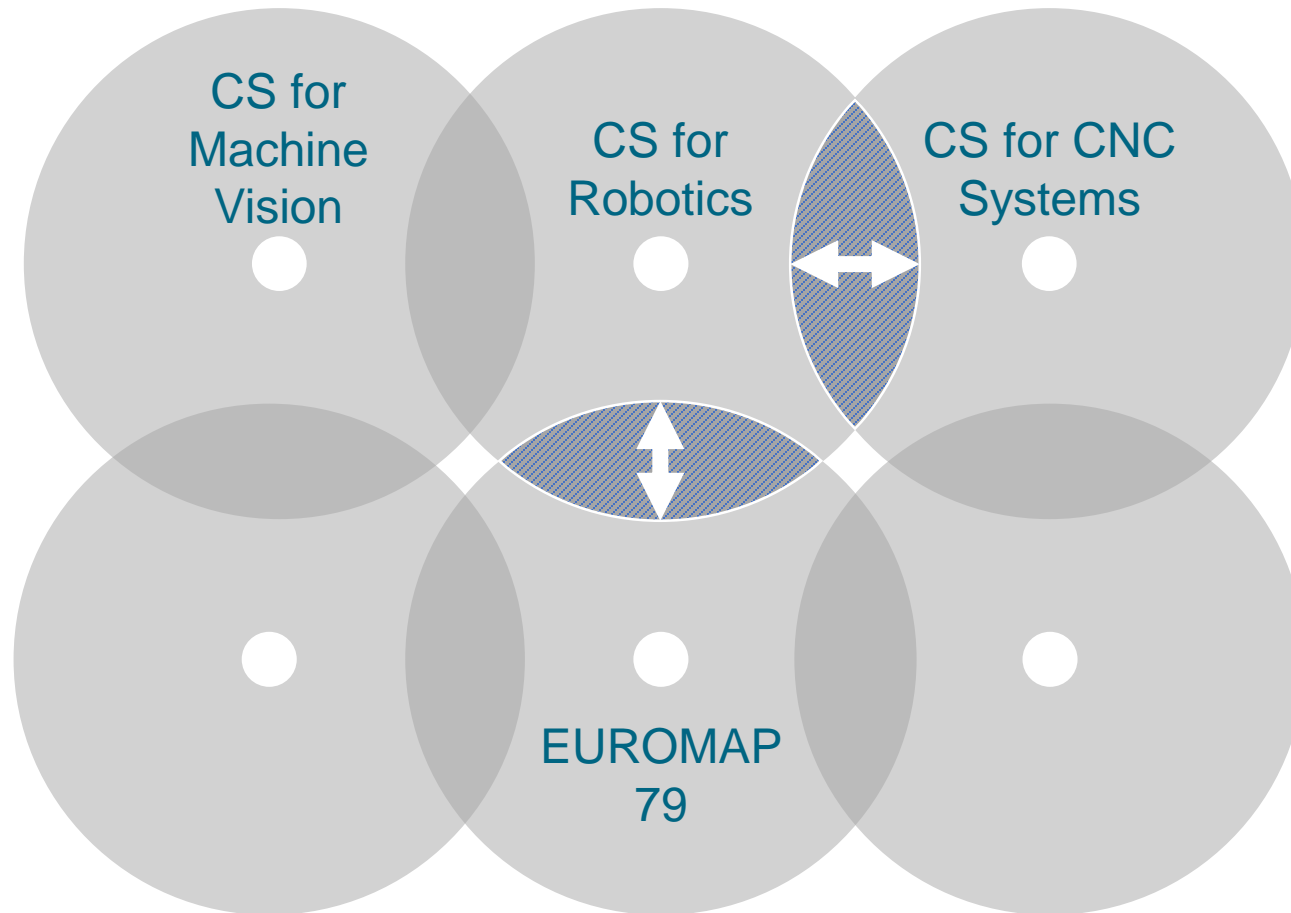
Vertikale Integration

» Schritt 1 und Schritt 2

Horizontale Integration

» Schritt 3

Risk of double work and competitive approaches in the CSs



Impressions VDMA OPC UA Demonstrator booth at automatica 2018 trade show

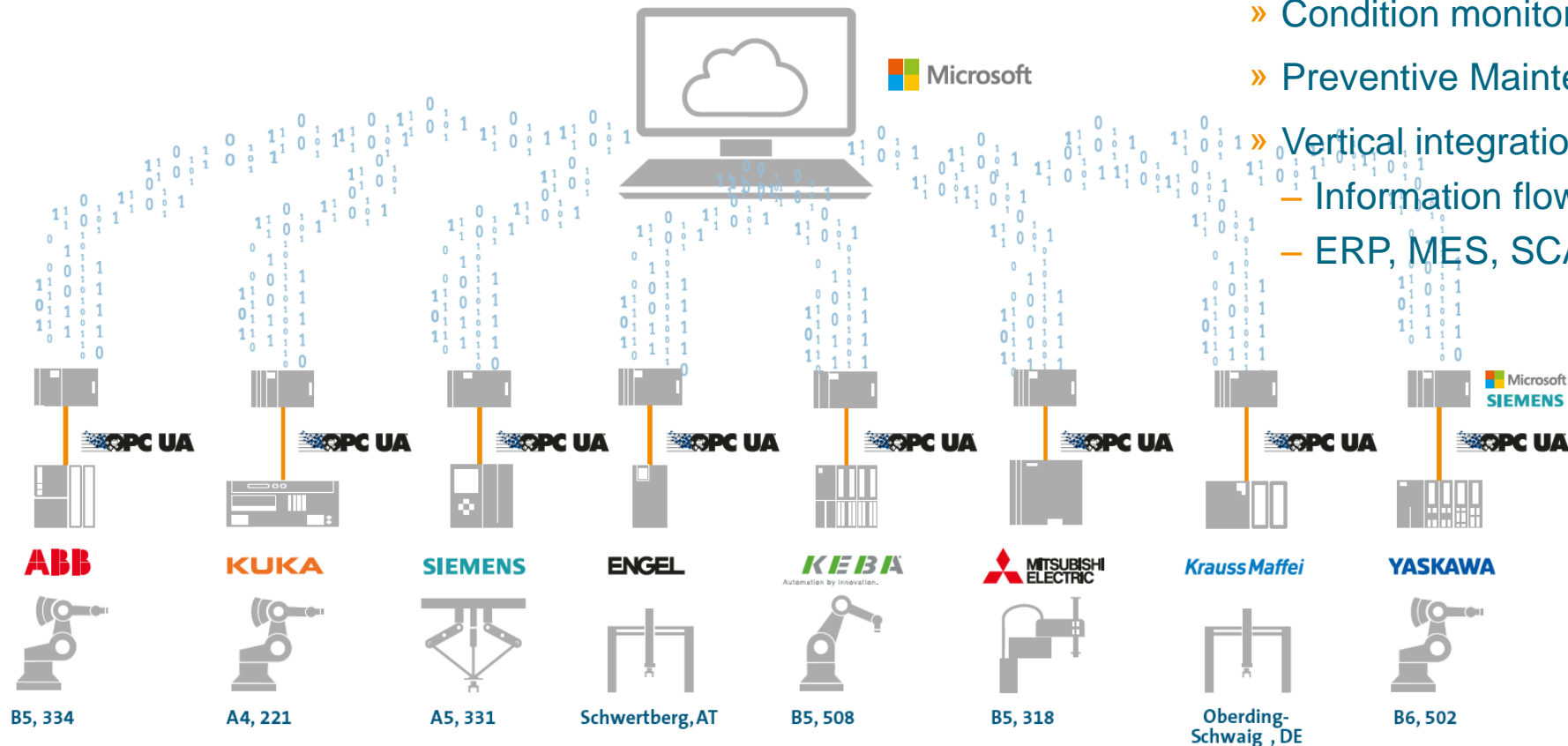


OPC UA Demonstrator

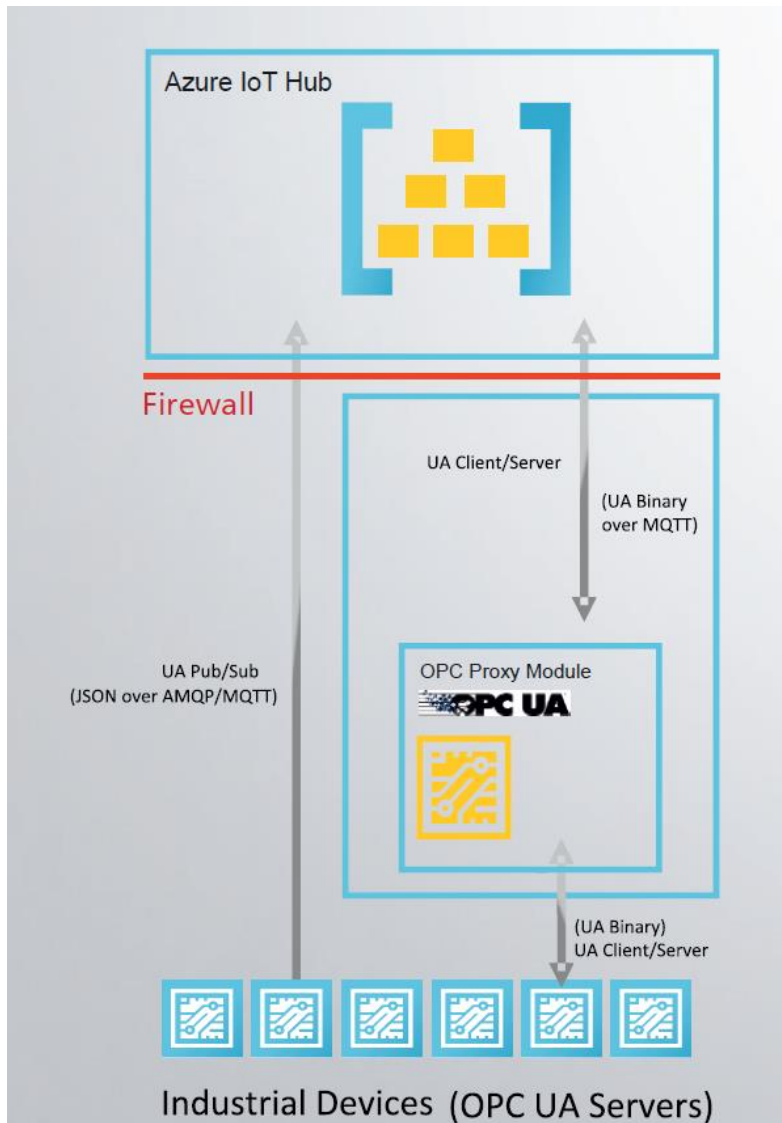


Applications of this demonstrator

- » Asset management
- » Condition monitoring
- » Preventive Maintenance
- » Vertical integration
 - Information flow from shop floor to cloud
 - ERP, MES, SCADA



Microsoft: OPC UA integration into Azure IoT



Microsoft Proxy Module (open source)

- „South Port“
Act as OPC UA client to Third Party devices

Support

- complex data
- method calls
- Everything!

- „North Port“
Tunnel OPC UA binary via MQTT into Azure

- Benefit
Transparent OPC UA from Cloud to Field level

Robotics condition monitoring dashboard demonstrates vendor-independence



The screenshot shows a web-based dashboard for VDMA Robotics + Automation. The interface is dark-themed and includes a navigation menu on the left with logos for ABB, ENGEL, KEB, KraussMaffei, KUKA, MITSUBISHI ELECTRIC, SIEMENS, and YASKAWA. The main content area displays 'ABB Details' for a robot named 'Motion Device ROB_1'. A table lists the following details:

NAME	WERT
Manufacturer	ABB Ltd
Model	IRB 1200
Serial Number	1200-509874
Device Class	Articulated Robot
FlangeLoad Mass	0 kg
Axis j1	
Motion Profile	Rotary
Actual Position	-34.00 deg

To the right of the table is a 3D model of a white ABB industrial robot arm. Below the table, a status bar shows: 'Motion Device System Name: ABB Robot 1200-509874', 'OperationalMode: Manual Reduced Speed', 'EmergencyStop' (disabled), 'ProtectiveStop' (disabled), 'UnderControl' (indicated by a green circle), and 'Speed: 25' (shown on a gauge).

Access any of your robots,
of any robot brand, at any time,
anywhere in the world!

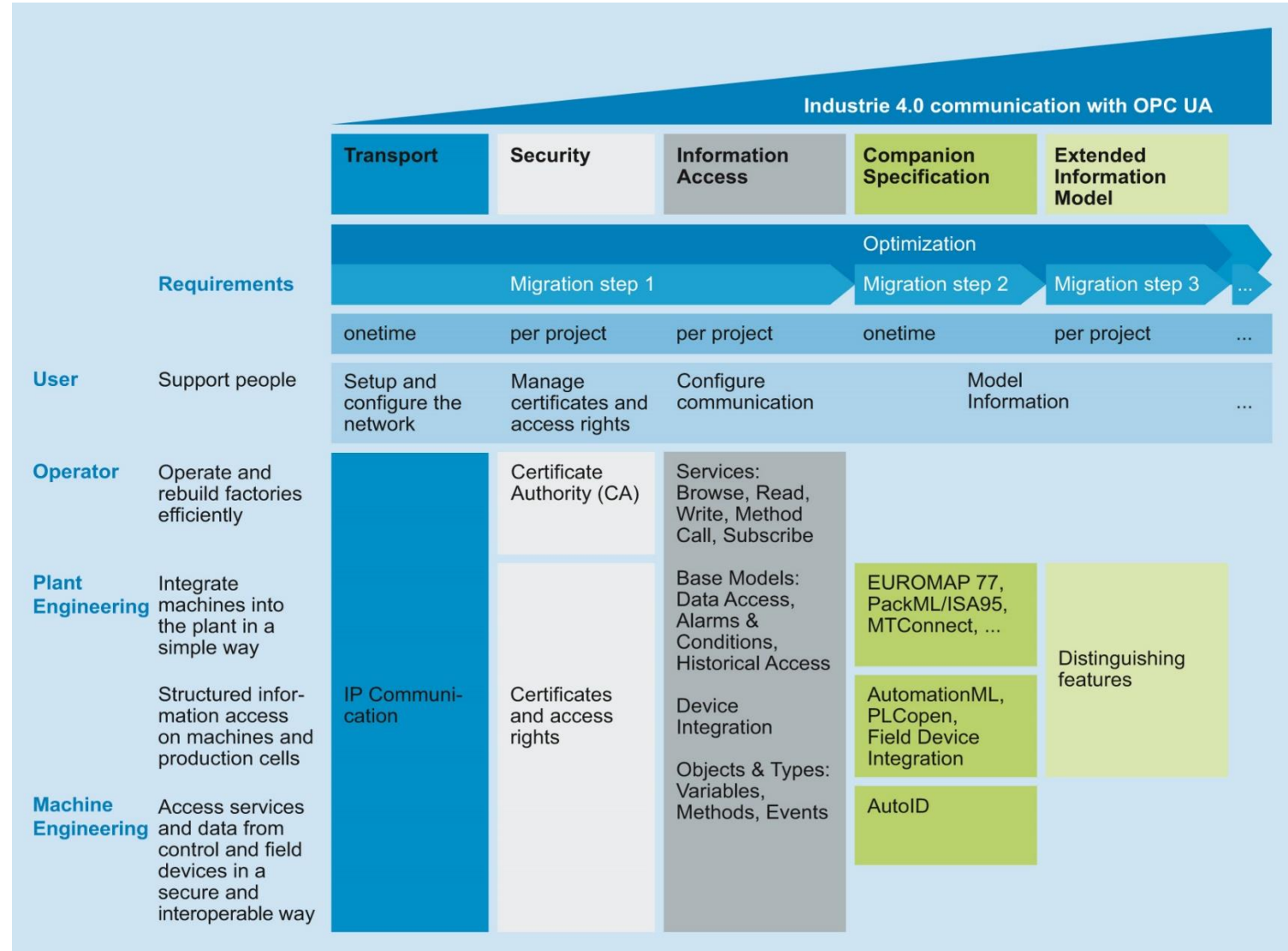
Migration steps making use of OPC UA

... and what does this mean for business?



Published 2017

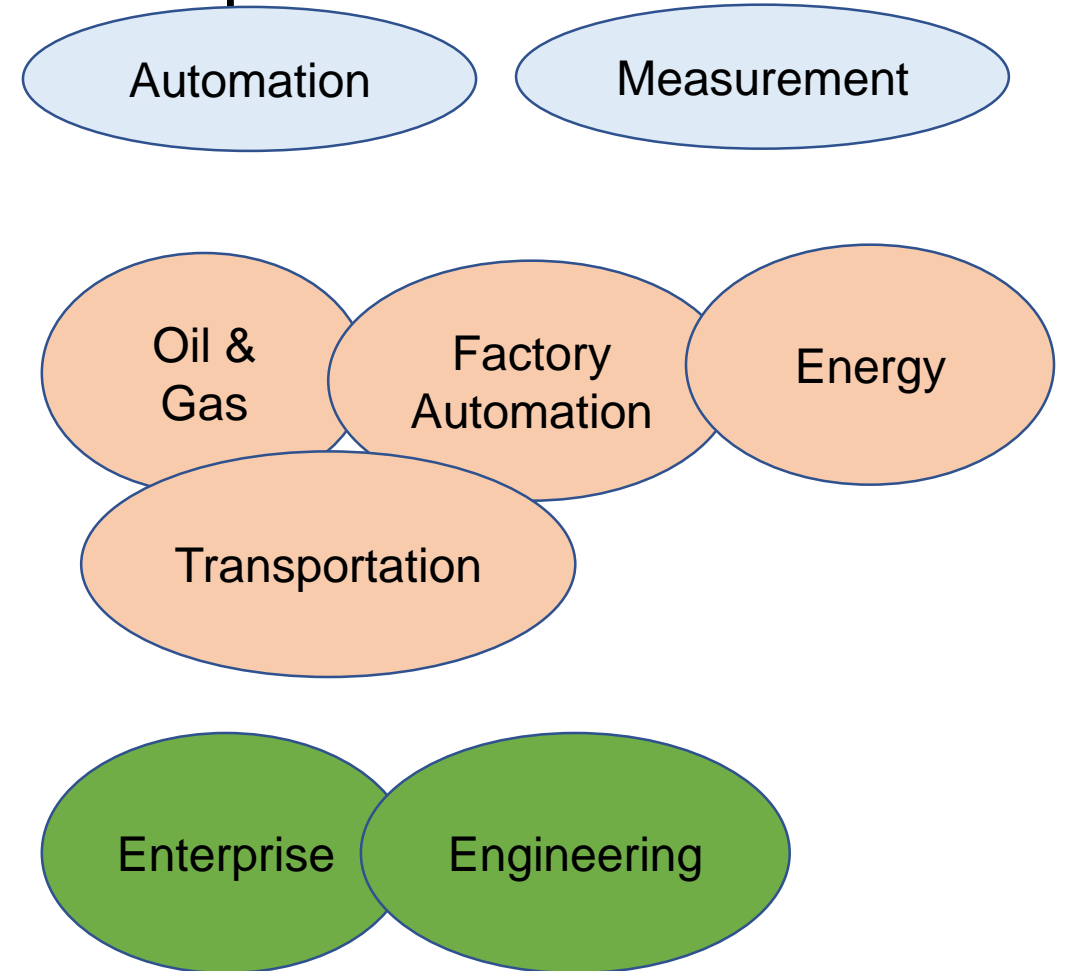
Available German & English



Collaborations

Collaboration / Companion Specs

- Lower level modeling
 - Profibus/NET, SERCOS, EtherCAT, CLPA , CAN, Powerlink, IO-Link
- Verticals
 - MDIS, WITSML, PackML, IEC61850, MTConnect, VDMA (38!)
- Higher levels
 - ISA-95, MIMOSA, OpenFog...
- Engineering
 - PLCopen, AutomationML



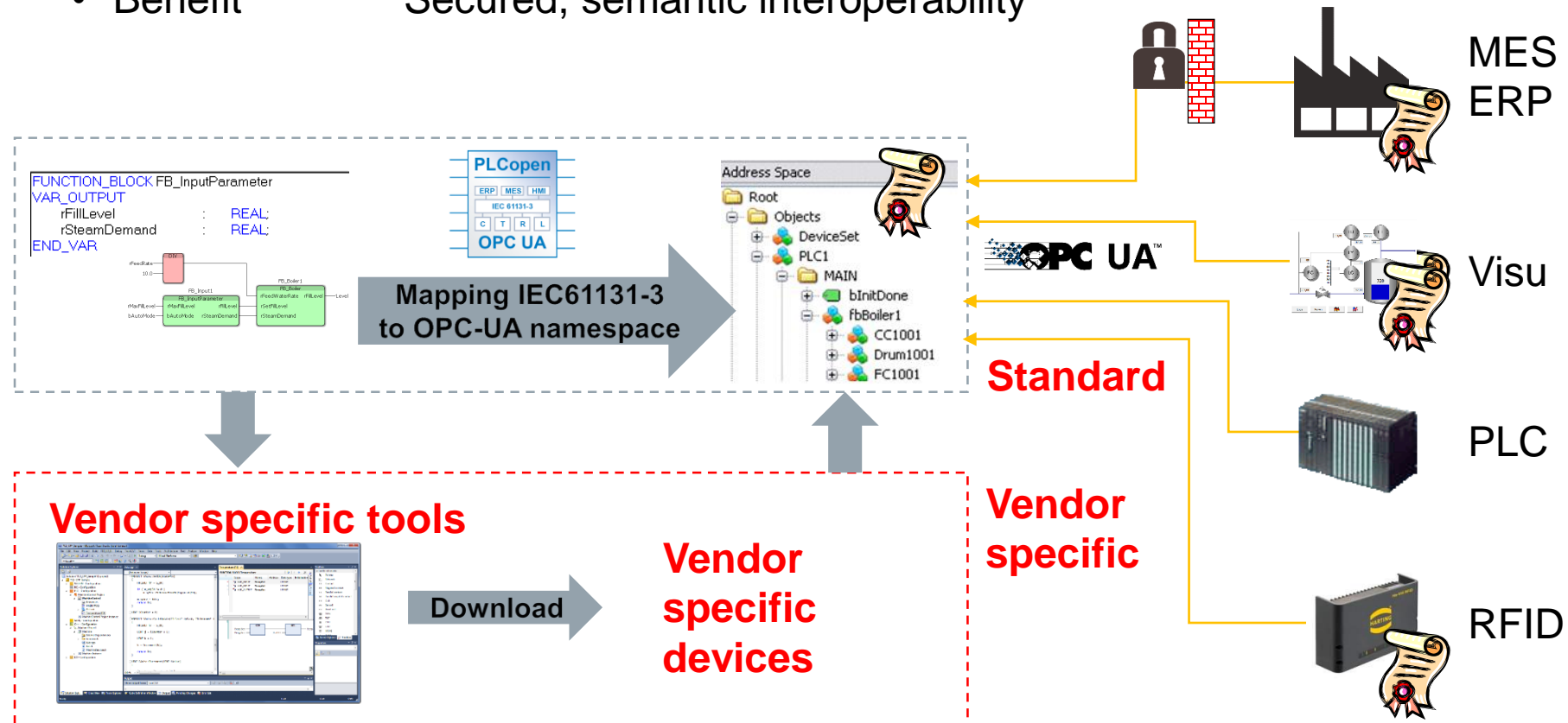
PLCopen and OPC: The group

Companies behind (Status 2017-Sept)

- 3S
- ABB
- Ascolab
- BECKHOFF
- Bosch-Rexroth
- B&R
- Fuji Electric
- GE
- HIMA
- Honeywell
- KEBA
- Mitsubishi
- Oldi
- OMRON
- OPC Foundation
- Phoenix Contact
- PLCopen
- Rockwell
- Siemens
- University Harz
- Wago

#1: OPC-UA model for IEC61131-3: Results: Semantic interoperability

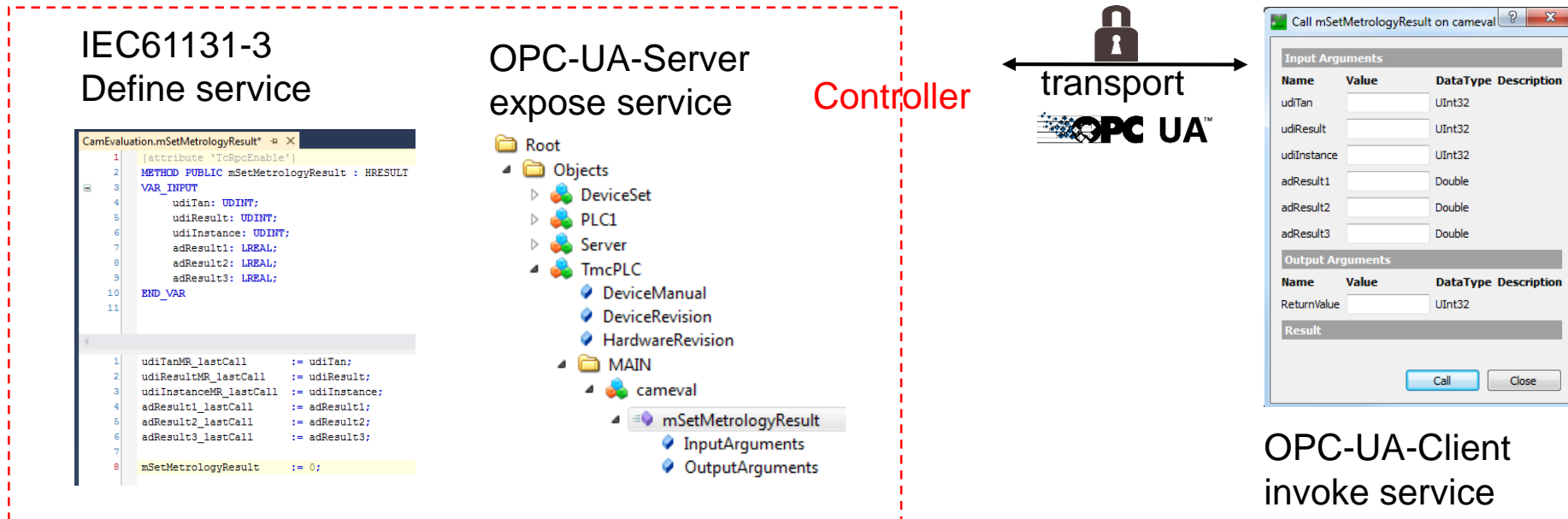
- Connection >to the controller <
- Integrated: OPC-UA server expose PLC information model
- Mapping: Support official mapping IEC61131-3 to OPC-UA
- Benefit: Secured, semantic interoperability



SoA-PLC IEC61131-3 and OPC-UA

Define service in IEC61131-3

- “SoA PLC”: Service oriented architecture is the key for industrial communication
 - IEC61131-3: Easy implementation of services
FUNCTIONBLOCK can be invoked from outside from any OPC-UA client
 - SoA-PLC: Remote-procedure-call (RPC)
based on international standards: IEC61131-3 + OPC-UA



SoA-PLC IEC61131-3 and OPC-UA

Define service in IEC61131-3

IEC61131-3:
Definition Service

Controller with
OPC-UA Server

Transport 

OPC-UA-Client
Invoke Service

```
{attribute 'TcRpcEnable'}  
METHOD Add2 : INT  
VAR_INPUT  
    a : INT;  
END_VAR  
VAR_IN_OUT  
    b : INT;  
END_VAR
```

```
Add2 :=a+b;  
b:= 1234;
```

Call Add2 on myPou

Input Arguments			
Name	Value	DataType	Description
a	<input type="text" value="5"/>	Int16	
b	<input type="text" value="6"/>	Int16	

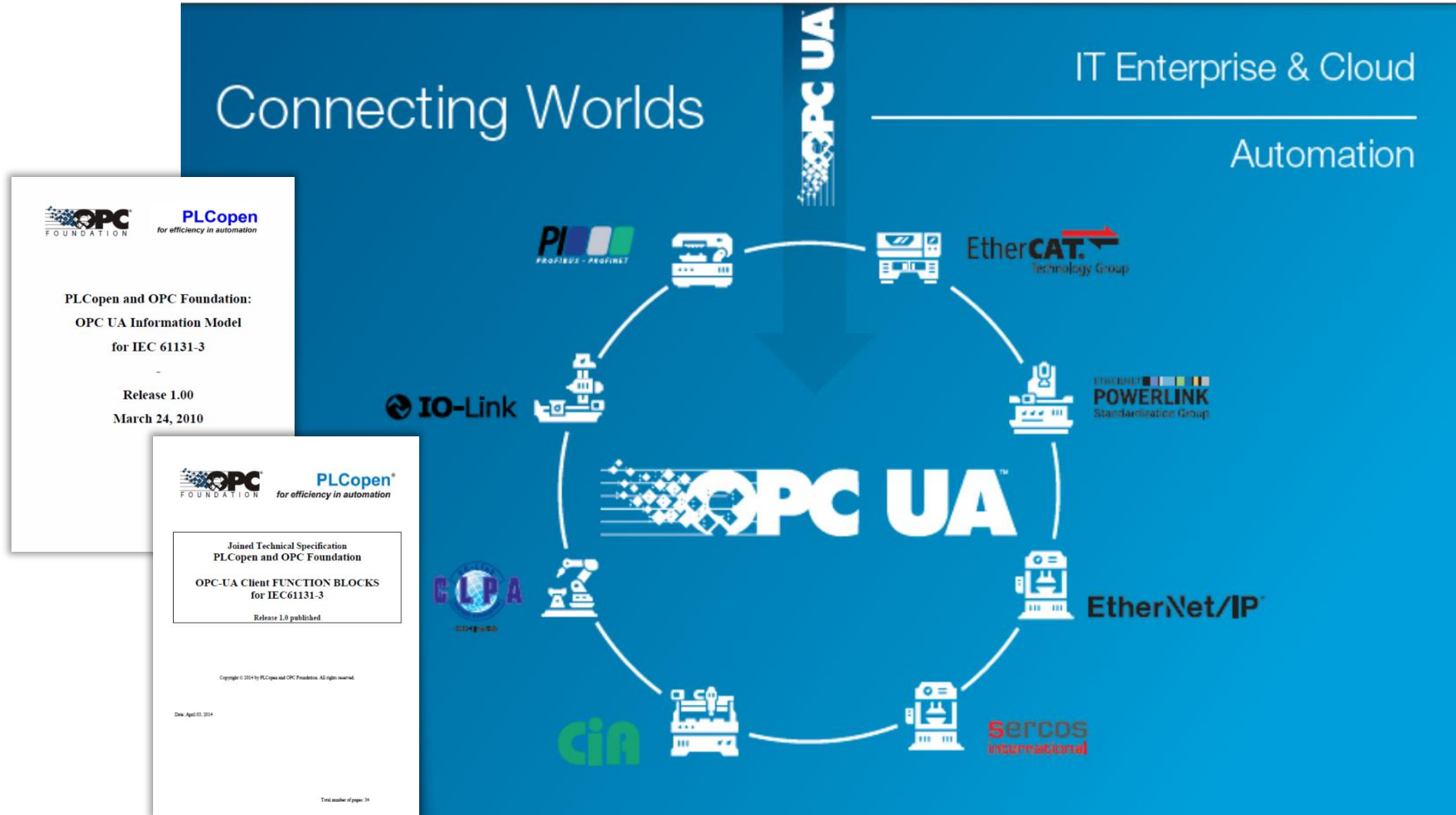
Output Arguments			
Name	Value	DataType	Description
ReturnValue	<input type="text" value="11"/>	Int16	
b	<input type="text" value="1234"/>	Int16	

Result

Succeeded

#2: OPC-UA Client FBs for IEC61131-3 Status – Scenarios for communication

PLCopen OPC UA FB's: Horizontal & vertical communication, fieldbus independent
It's fast, but not a fieldbus!



Europe's Leading Machine Tool Builders Team Up to Overcome the Connectivity Obstacle

Europe's Leading Cutting Machine Tool Builders

Company	Country	Turnover 2016 Mill €
DMG MORI AG	DE	2370 (2017: 2755)
Grob Group	DE	1300
EMAG Group	DE	550
Heller Group	DE	538
United Grinding Group	CH	500*
Chiron Group	DE	461
Index Group	DE	413
Hermle Group	DE	394
Niles Simmons Hegenscheidt	DE	360*
Starrag Group	CH	348
SW Machines	DE	276
GF Milling	CH	272
Mikron	CH	238
Liebherr-Verzahntechnik	DE	219
EMCO Group	AT	155

Source: Produktion No. 30/2017, *) estimate

- EMO 2017: VDW announces joint project
 - „Connectivity for Industrie 4.0“
- Core team of 8 companies: **CHIRON, DMG MORI, EMAG, GROB, HELLER, LIEBHERR- Verzahntechnik, TRUMPF, UNITED GRINDING**
- Aim: interface specification for „outside“ vertical connectivity of machine tool → „world“ (IT

Collaborations

The OPC Foundation closely cooperates with organizations and associations from various branches. Specific information models of other standardization organizations are mapped onto OPC-UA and thus become portable.



- **Markets** <https://opcfoundation.org/markets-collaboration/>
-
- **Automation**
- **Building Automation**
- **Energy**
- **Engineering**
- **Measurement**
- **Oil & Gas**
- **Transportation**

SAP & OPC UA SoA Reshape Automation Pyramid

Demo at Hannover Messe 2016 and 2017 and 2018



SAP Demo: The assets to make it happen

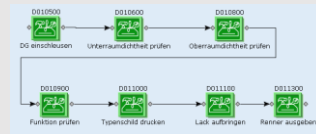


SAP HANA Cloudsystem
SAP MES

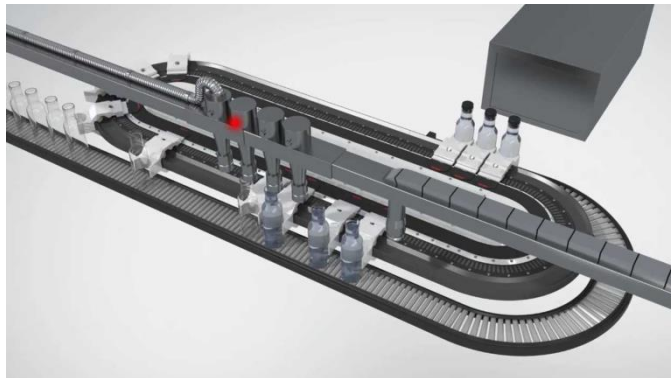
PCo (Plant Connectivity)



Cache



XTS Transport System
Beckhoff



Robot
Stäubli



Vision Camera
Asentics



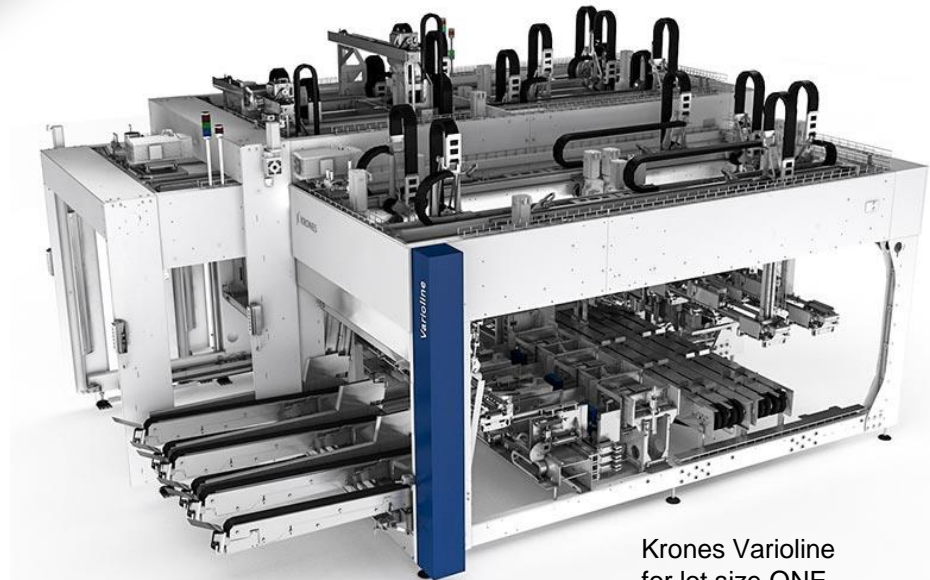
Laser Printer
CAB



Partner Consortium

Hardware Partners

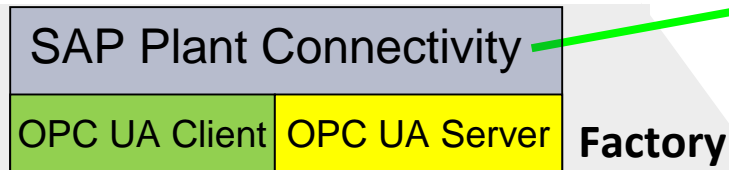
- » **Beckhoff** | Extended Transport System
- » **KUKA** | Robotics
- » **Asentics** | Visual Cameras
- » **CAB** | Laser Marker
- » **Mettler Toledo** | Weighing Scale
- » **Atlas Copco** | Torque Tools
- » **Proglove** | Smart Glove
- » **EOS** | Additive Manufacturing
- » **Krones** | Products to assemble and line
- » **Serva TS** | AGV
- » **Fujitsu** | INTELLIEDGE
- » ...



Krones Varioline
for lot size ONE

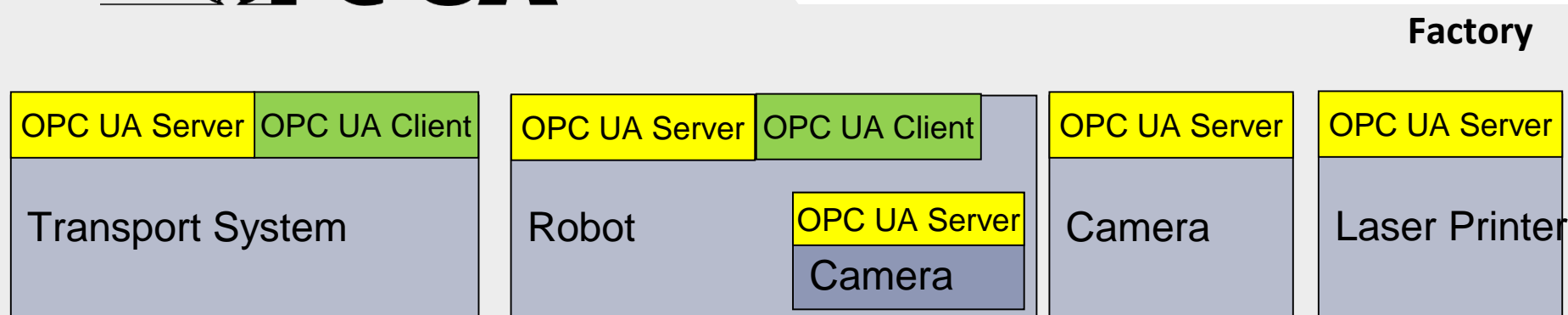
Architecture: SoA enabled by OPC UA

- Assets provide services (exposed as OPC UA Server)
- Assets can initiate actions (as OPC UA Client)
 - "DoJob(OrderNr)"
 - Confirm "JobDone(OrderNr)"



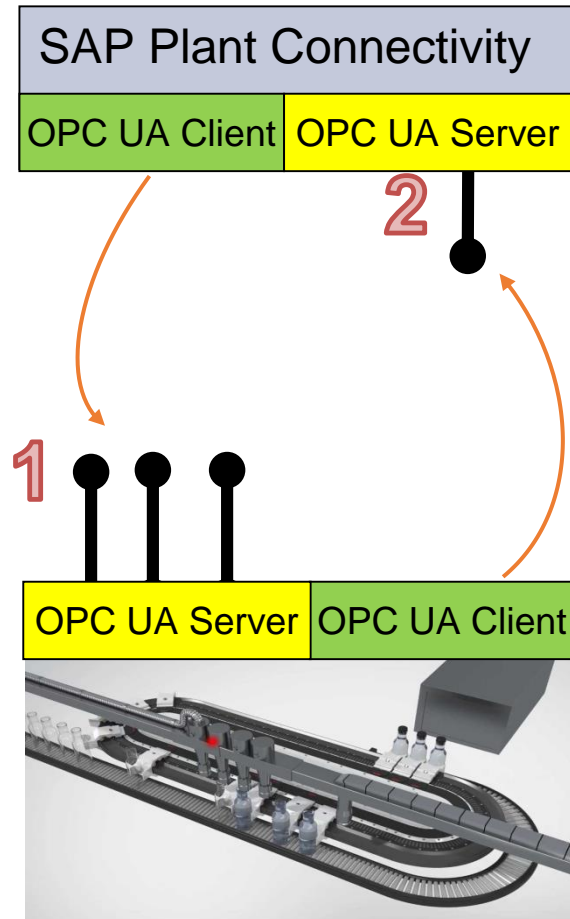
OPC UA Client / Server Communication done ONLY via OPC UA method calls

(NO HANDSHAKE MECHANISM)



Architecture: What is an asset? 1/3)

- Asset is an intelligent device / machine providing functionality



1 XTS Transport system provide functionalities:

- ProvideEmptyTransport (OrderNr, TargetPos)
- ProvideTransport (OrderNr, TargetPos)
- CleanTransport (OrderNr)

2 XTS Transport to confirm actions

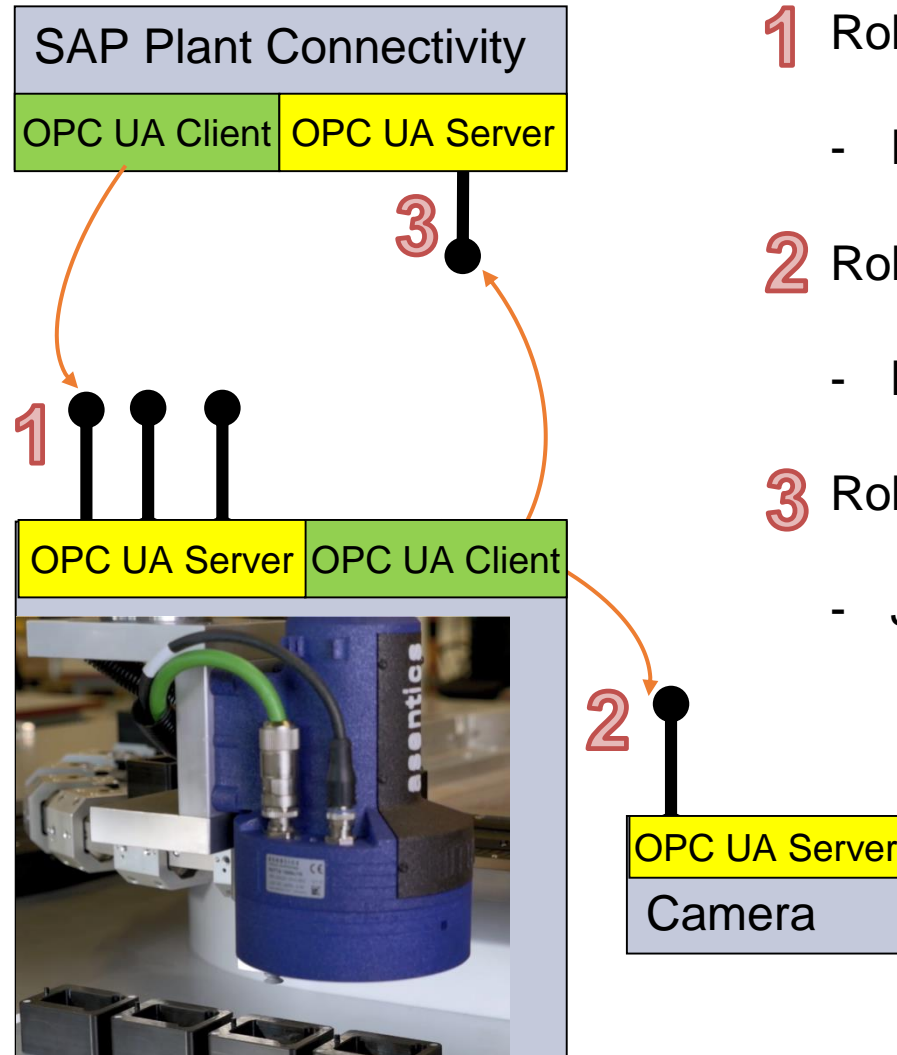
- JobDone (OrderNr)
- InitializationDone()

SAP \leftrightarrow XTS
Only vertical communication

The transport system is not aware of any other asset!

Architecture: What is an asset? (2/3)

- Asset is an intelligent device / machine providing functionality



1 Robot provide functionalities:

- DoPickandPlace(OrderNr, PreTeachedNr)

2 Robot call service from camera

- MakePictureAndAnalyze(OrderNr)

3 Robot can confirm job

- JobDone(OrderNr)

Vertical & horizontal communication

- SAP is not aware of vision camera
- The robot appears as a “Smart Robot”

Architecture: What is an asset? (3/3)



SAP Plant Connectivity

SAP can handle both...what does customer need?

Individual assets

- Only easy pick & place
- No high speed coordinated actions
master slave coupling etc



Smart assets

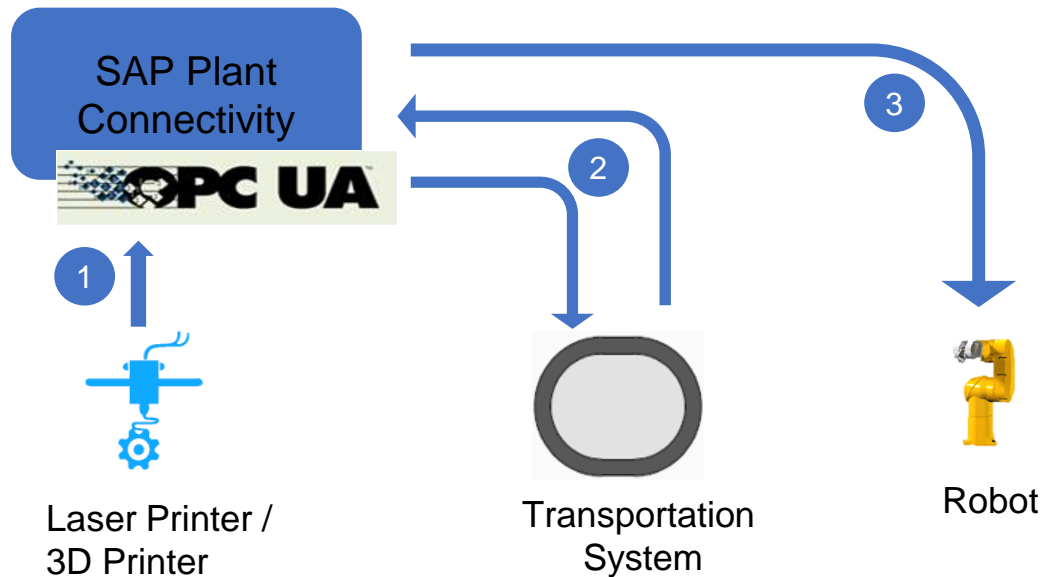
- Internally combined functionality
- High speed coordinated actions
on the flyer pick & place etc



Orchestration & Synchronization done by SAP

Orchestration:

- Event occurs on Unit X
- Unit Y is triggered by SAP Plant Connectivity



Example:

1. Upper Shell for customer order 4711 is printed (Laser Printer ready)
2. Carrier with subshell ordered to assembly station
3. As soon as carrier arrives Robot is triggered to start assembly process

Benefits:

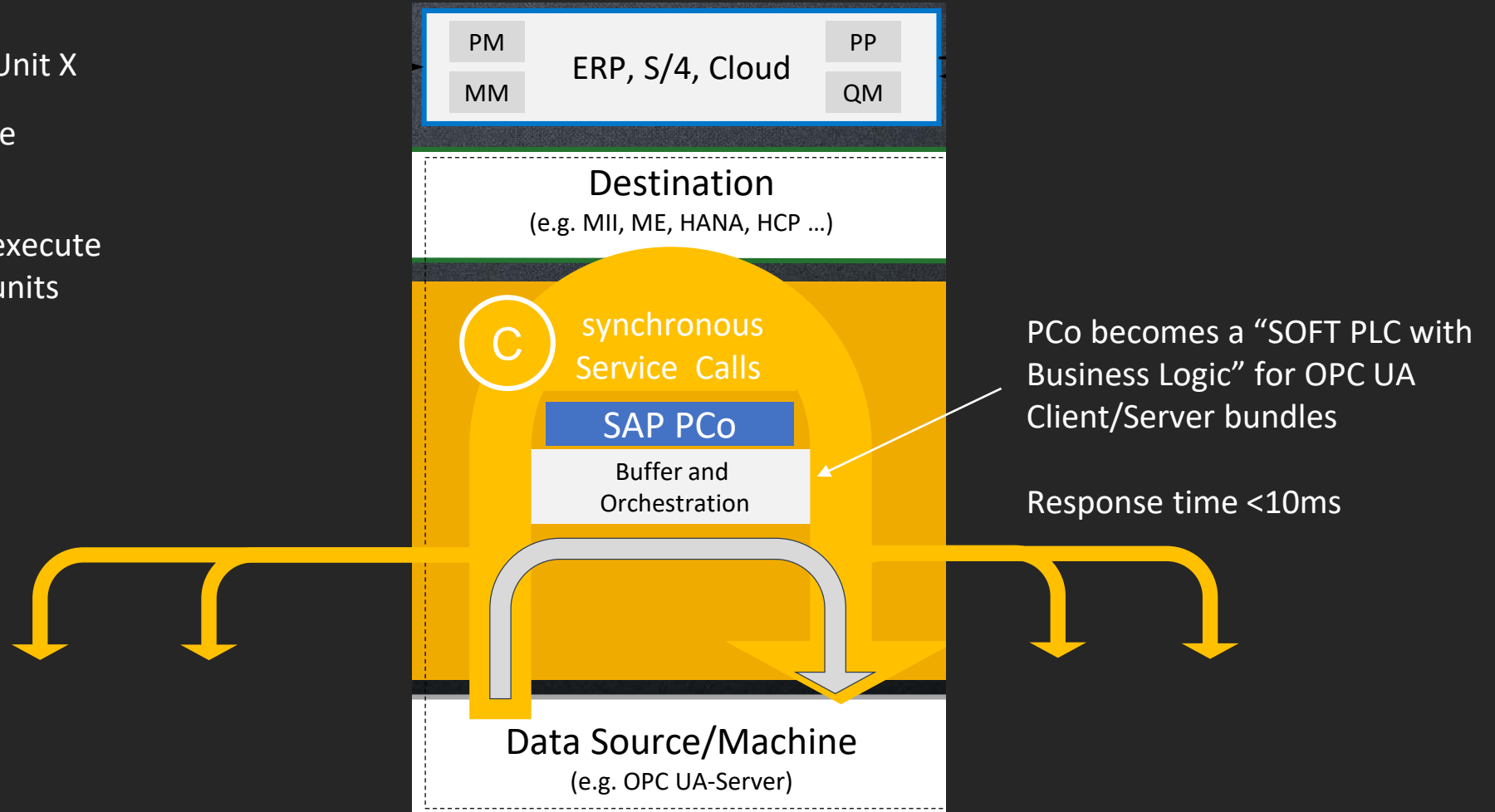
- Simplified System Landscape
- Flexibility / no hard coded steps

SAP Plant Connectivity (PCo)

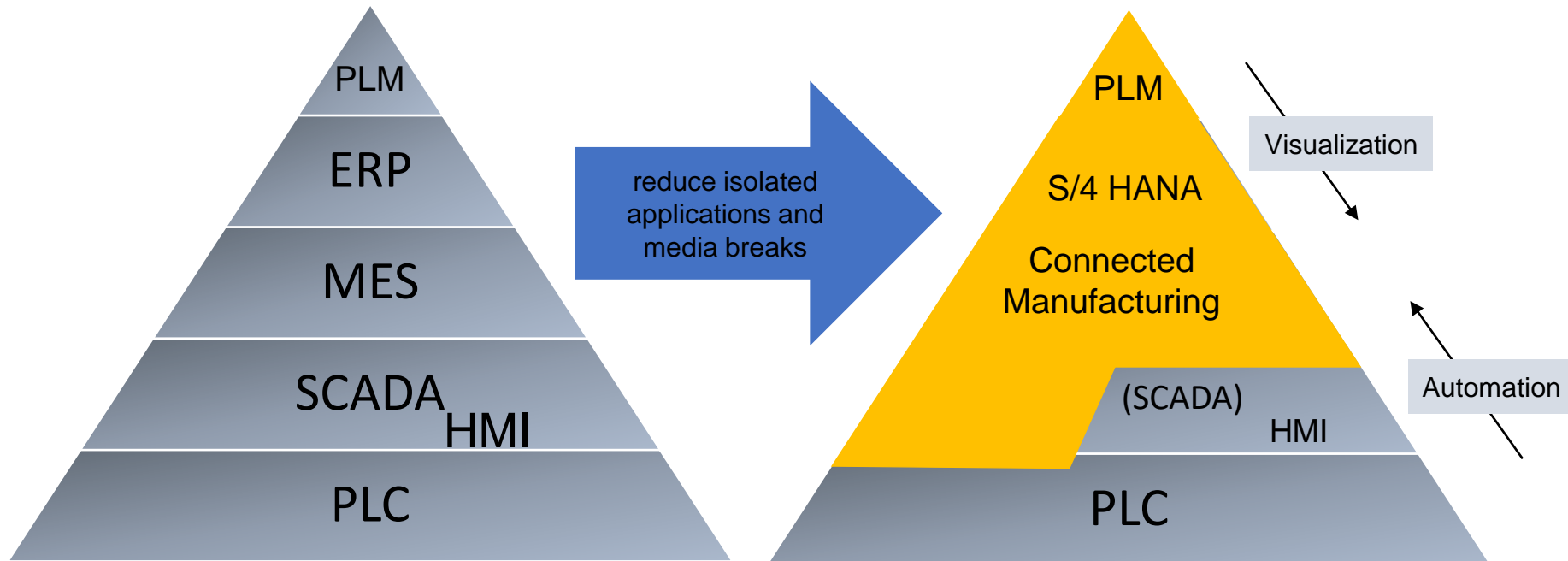
2. orchestrate independent machine units



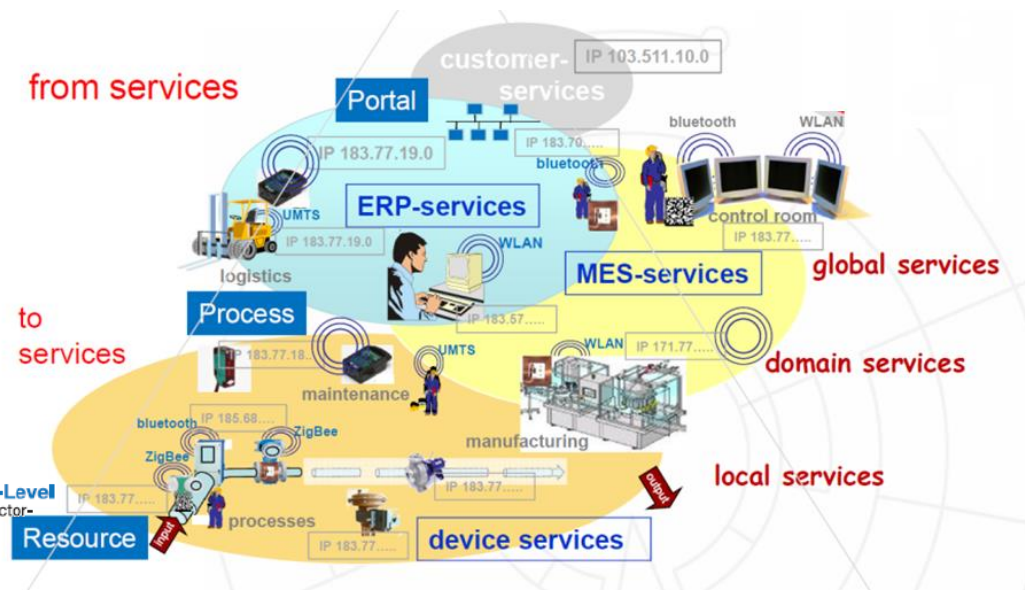
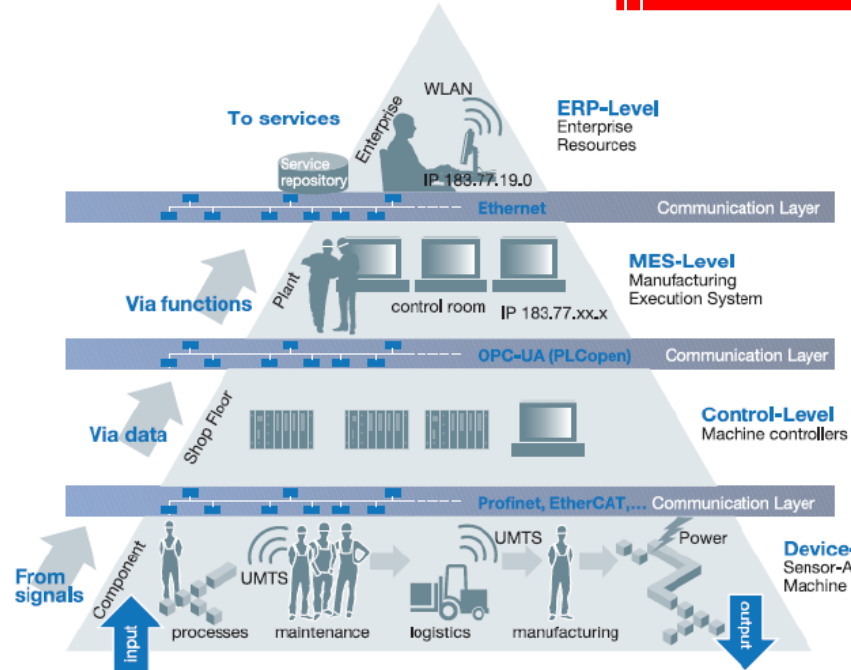
- (1) Event occurs on Machine Unit X
- (2) Machine Unit Y needs to be notified/triggered
- (3) PCo can be configured to execute communication between units



SAP Reshapes Automation Pyramid for simplified system landscape



Trend SoA: From service to service



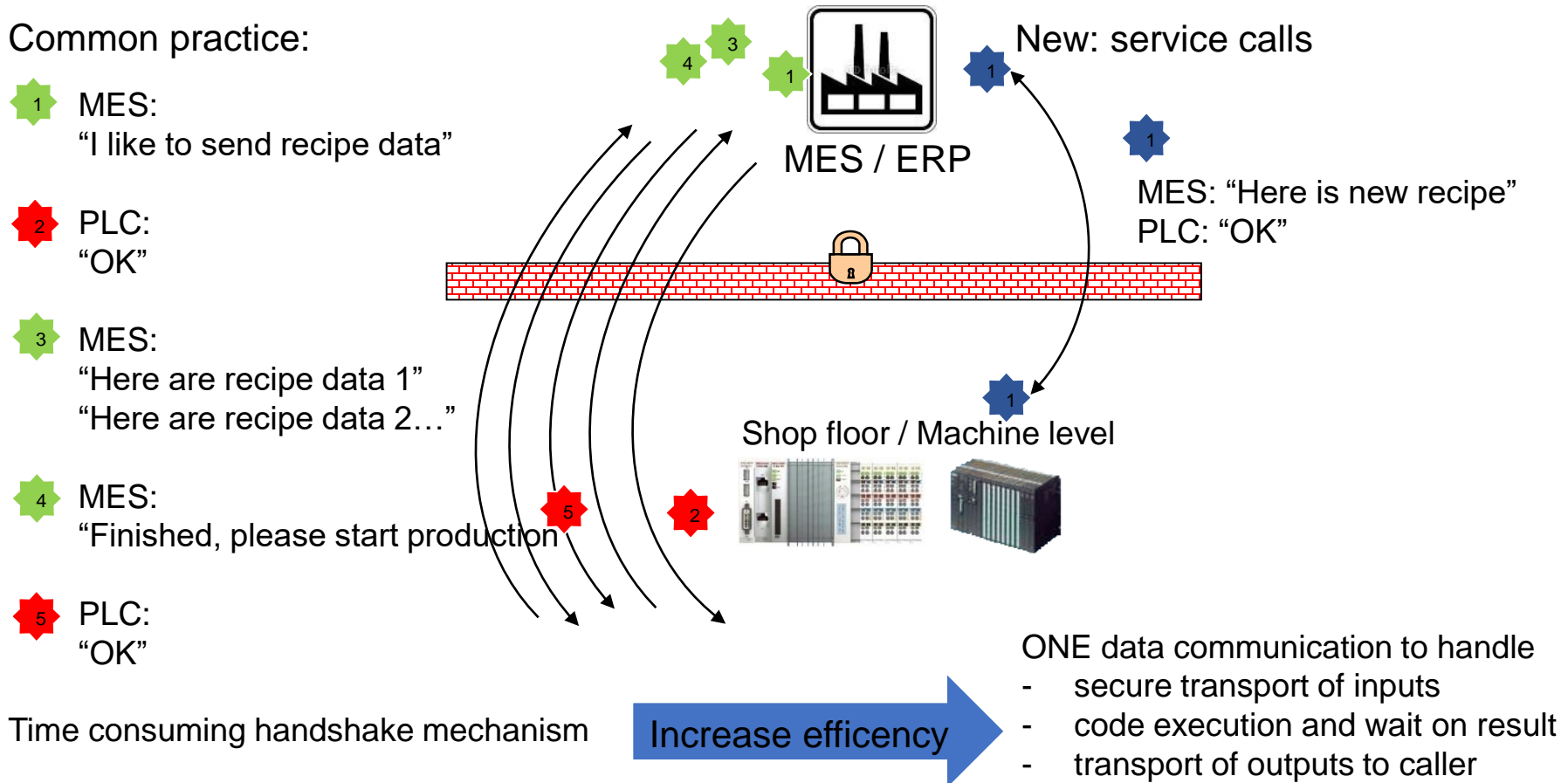
Grafik: Prof. Zühlke, DFKI

SOA-PLC: IEC 61131-3 and OPC-UA

Increase efficiency and data consistency

- SOA-controller as enabler for IoT and M2M optimized communication
Service oriented architecture: service calls instead of data (property) exchange

Common practice:



equipment

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

Who?

Joint Water and Wastewater Authority

Vogtland, Germany

Silvio Merz, Divisional Manager, s.merz@zwav.de

What?

- Supply water to about 240,000 people and treating their wastewater as well
- Operate almost 600 Water and Wastewater treatment plants
 - Waterworks
 - Water pumps
 - Water reservoirs
- Distributed over about 1400 Km²

Success Story

Branch: Water Treatment

Intelligent Water Management with OPC-UA Enabled Smart Devices
M2M Communication Based on PLCopen OPC-UA Client Function Blocks

60 reservoirs, etc.) distributed over 1,400 km² and covering 40 cities with 240,000 people.

Real objects (e.g. pumps) were modeled in the TwinCAT EC 6113-3 PLC software from Beckhoff Automation as complex objects with interactive possibilities. Thanks to the OPC-UA server integrated in the controller, these objects are automatically available to the outside world as complex data structures for semantic interoperability. The result is decentralized intelligence that makes decisions independently and can transmit information to neighboring systems. In addition, it can query equipment status and values for its own process in order to ensure trouble-free process cycles.

With the standardized PLCopen function blocks, the devices independently initiate communication from the PLC to other process devices such as OPC-UA clients, while at the same time being able to respond to their requests or to requests from higher-level systems (SCADA, MES, ERP) as OPC-UA servers.

The devices are connected by wireless radio; a physical interruption of the connection does not lead to a loss of information, since information is automatically buffered in the OPC-UA server for a time and can be retrieved as soon as the connection has been restored - a very important property in which a great deal of proprietary engineering effort was invested beforehand. The authentication, signing, and encryption safety mechanisms integrated in OPC-UA were used in addition to a closed mobile radio group to ensure the integrity of this party-sensitive data.

OPC-UA is used for M2M communication between plants for the intelligent networking of decentralized, independently acting, very small embedded controllers. For example, an application with the Joint Water and Wastewater Authority, Vogtland (ZWAV) has around 300 potable water plants and 300 wastewater plants (pumping plants, wastewater, elevat-

The vendor-independent interoperability standard OPC-UA opens up the possibility for end users to subordinate the selection of a target platform for the required technology in order to avoid using proprietary products or devices that don't meet the needs of the application.

Testimonial: Licensing Costs Reduced by 90%

The replacement of a proprietary solution with a combined OPC-UA client/server solution in small, but powerful, embedded controllers provided ZWAV with savings on the total licensing costs of more than 90 % per device. Milestones in the field result in significant additional savings for maintaining several hundred water facilities within an area of 1,400 km².

For the engineering part, better standardization results in:

- Efficient engineering
- Cost reductions
- Fusion of technology/equipment
- Improved interoperability
- Increased availability
- Increased choice of providers
- Higher interoperability

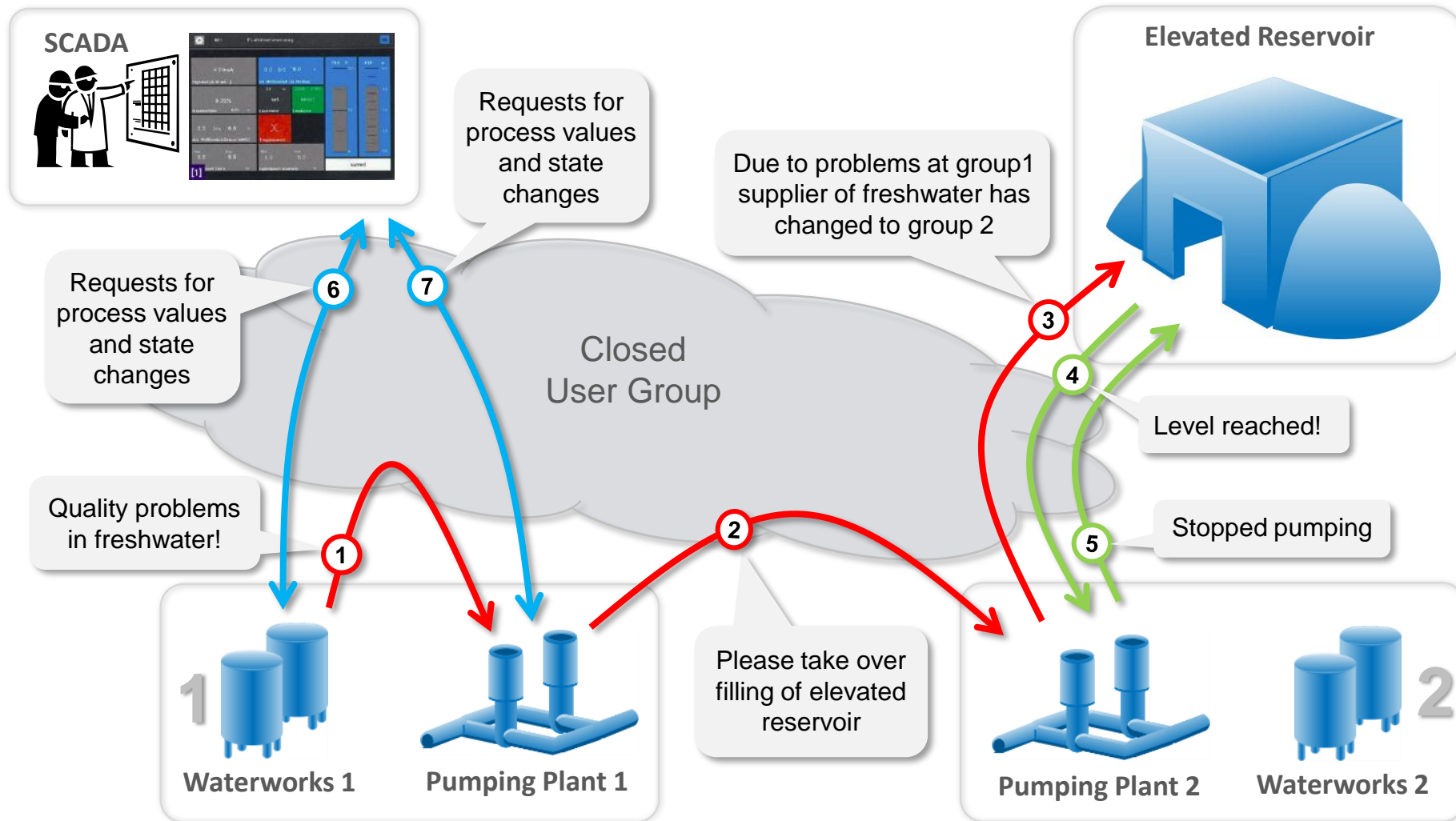
The considerable potential for business management optimization is more than worth putting together existing and new technologies.

ZWAV
www.zwav.de

Silvio Merz, Divisional Manager
Electromechanical Technology
Joint Water and Wastewater Authority,
Vogtland



M2M & IoT in decentralized, intelligent equipment

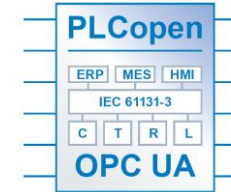


M2M & IoT in decentralized, intelligent equipment



Implementation 2/3

Every substation fitted with controller and IT router



- OPC-UA client:
 - Standardized PLCopen function blocks enable the devices independently initiate communication from the PLC to other process devices
- OPC-UA Server
 - automatically provides PLC objects to the outside world as a complex data structure
OPC-UA server namespace always in sync with PLC project
 - respond to requests from others horizontal devices (pumps) or from higher-level systems like SCADA, MES, ERP

M2M & IoT in decentralized, intelligent equipment

Cost saving effects

- Modeling in IEC61131-3 PLCOpen
- Transmission of complex data structures
-> there's no configuration of every single datapoint required
- Replacement of a proprietary solution with a combined OPC-UA client/server.
Standardization of data communication reduces interfaces, just the OPC-UA client and server.
- A physical interruption of the connection does not lead to a loss of information -> automatically buffered in the OPC-UA server for a time and can be retrieved as soon as the connection has been restored
- Using security mechanisms like authentication, signing and encryption integrated in OPC-UA in addition to a closed mobile radio group to ensure the integrity of the confidential data
- **“The solution provided us with a saving on the initial licensing costs of more than 90 % per device.”**

Specifications

Old days: From internal to external

- Select an OS
- Select logic implementation language
e.g. PLCopen to reduce engineering
 - Re-usable code blocks
 - Reduce error searching / fixing
 - Higher acceptance for PLC programmer
 - Higher flexibility to switch vendor platforms
- Add multiple protocols for data exchange

Now: From external to internal

- Customers request to support standardized, secured machine/device interfaces
 - OPC UA Companion Specs
e.g. by VDMA
- Brownfield
How to map OPC UA interface to internal existing logic like Plcopen, C++, Matlab
- Greenfield
Requested: New approach for PLCopen to provide open source, standardized PLC libraries for vertical OPC UA companion spec

Required: PLC code generator

→ input: OPC UA Nodeset

→ output: PLC library

Microsoft supports OPC UA



See demo wall @ Microsoft in Copenhagen!

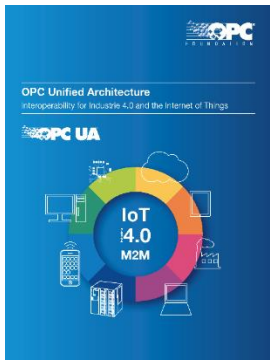
- OPC UA demo walls for 40 worldwide Microsoft Technology Center (MTC) showrooms
- Show existing, real world industrial scenarios „From Sensor to IT Enterprise and Azure Cloud“
 - Telemetry data from devices to Azure
 - Control & Command from Azure to devices
- 9 devices from different international vendors different vertical markets
 - Hewlett Packard Enterprise (Gateway)
 - Rockwell, Siemens, Mitsubishi, Schneider (PLC)
 - Beckhoff (IoT / PLC device)
 - Harting (RFID Reader)
 - Leuze (Bar Code Reader)
 - Honeywell (Smart Meter)



Information: Brochures Updated (v7)

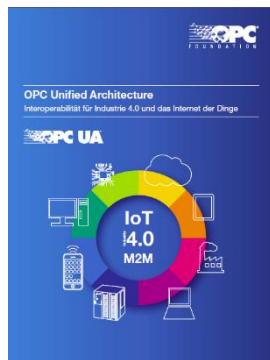
- ▶ “Interoperability for Industrie 4.0 and the Internet of Things”
- ▶ Edition 2018: Extended with
 - ▶ Made in China 2025
 - ▶ North America IIC related OPC UA testbeds
 - ▶ Korea Manufacturing Initiative 3.0
 - ▶ Japan Industrial Value Chain Initiative
- ▶ <https://opcfoundation.org/resources/brochures/>

English



Updated

German



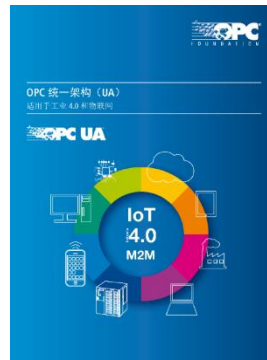
Updated

Japan



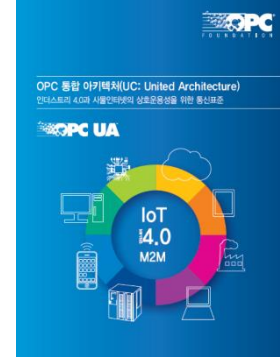
Under
translation

China



Under
translation

Korea



Under
translation

OPC UA Videos



- ▶ Landing page <https://opcfoundation.org/resources/multimedia/>
- ▶ Basic video's
 - ▶ OPC UA Vision, Thomas Burke
<https://youtu.be/7mUmfq0M29U>
 - ▶ OPC UA Technical Introduction, Uwe Steinkrauss
<https://youtu.be/nYMbQiRqK74>
 - ▶ OPC UA Security, Darek Kominek
<https://youtu.be/NFQfZeU90Kw>
 - New** ▶ OPC UA All about certification, Alexander Allmendinger
<https://youtu.be/LoYLqvRlyYk>
 - New** ▶ How to start a new collaboration group, Stefan Hoppe
https://youtu.be/1R_5e3Ozl6E

OPC UA Videos



▶ Collaborations

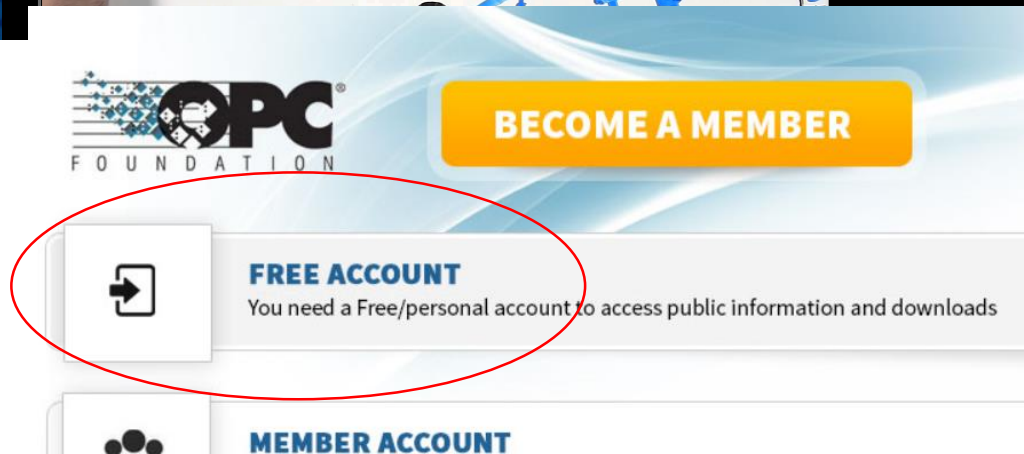
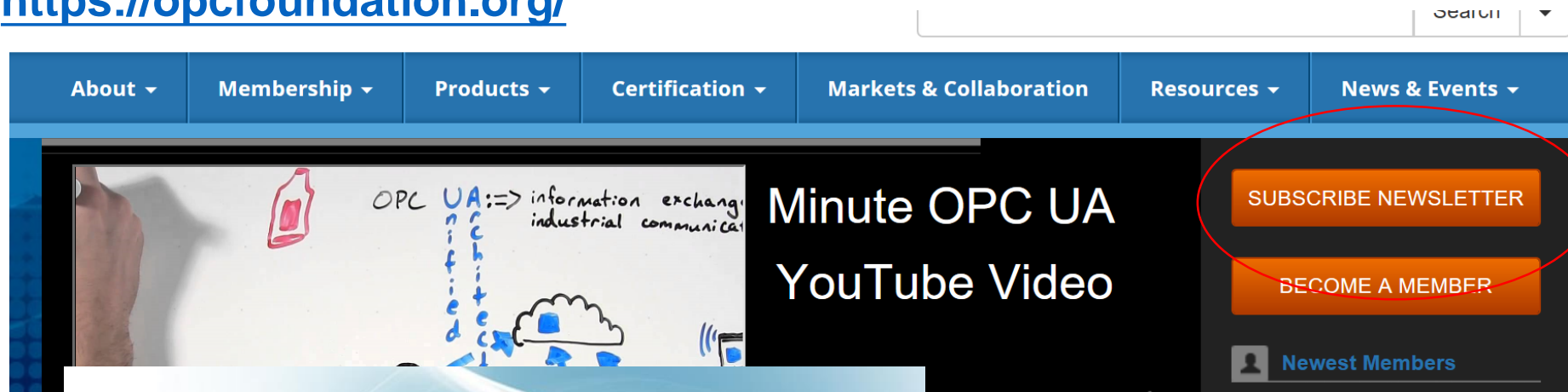
New	VDMA Overview	VDMA Overview 3min, https://youtu.be/5roRSuNIEF0 VDMA Overview in detail 9min https://youtu.be/LhOIC7GNcml
New	VDMA Plastics and rubber machinery	VDMA Plastics and rubber machinery - 6min https://youtu.be/jSvSRjFX_RI VDMA EuroMAP 12min, https://youtu.be/wwAl2D_fyMw
New	VDMA Machine Vision	VDMA Machine Vision Overview - 4min, https://youtu.be/BUywlZ1oong VDMA Machine Vision Overview in details - 12min, https://youtu.be/zK8yhyugGNI
New	VDMA Robotics	VDMA Robotics - Overview - 2min, https://youtu.be/-xgFKg1hXTg VDMA Robotics - Overview in details - 8min, https://youtu.be/ZdLVFI_1S54

Information: Subscribe to OPC Newsletter

Subscribe to “monthly Newsletter” of OPC Foundation

- Announcements about new working groups / status update on working groups
- Technology highlights

<https://opcfoundation.org/>



Thank you!

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



... or send email to
Stefan.hoppe@opcfoundation.org

