

OPC DAY FINLAND 2018

NOVEMBER 13TH 2018 #OPCUA #INDUSTRY40 #IIOT #OPCDAY #OPCDAYFINLAND #AUTOMAATIO

OPC UA Enables Smart Manufacturing

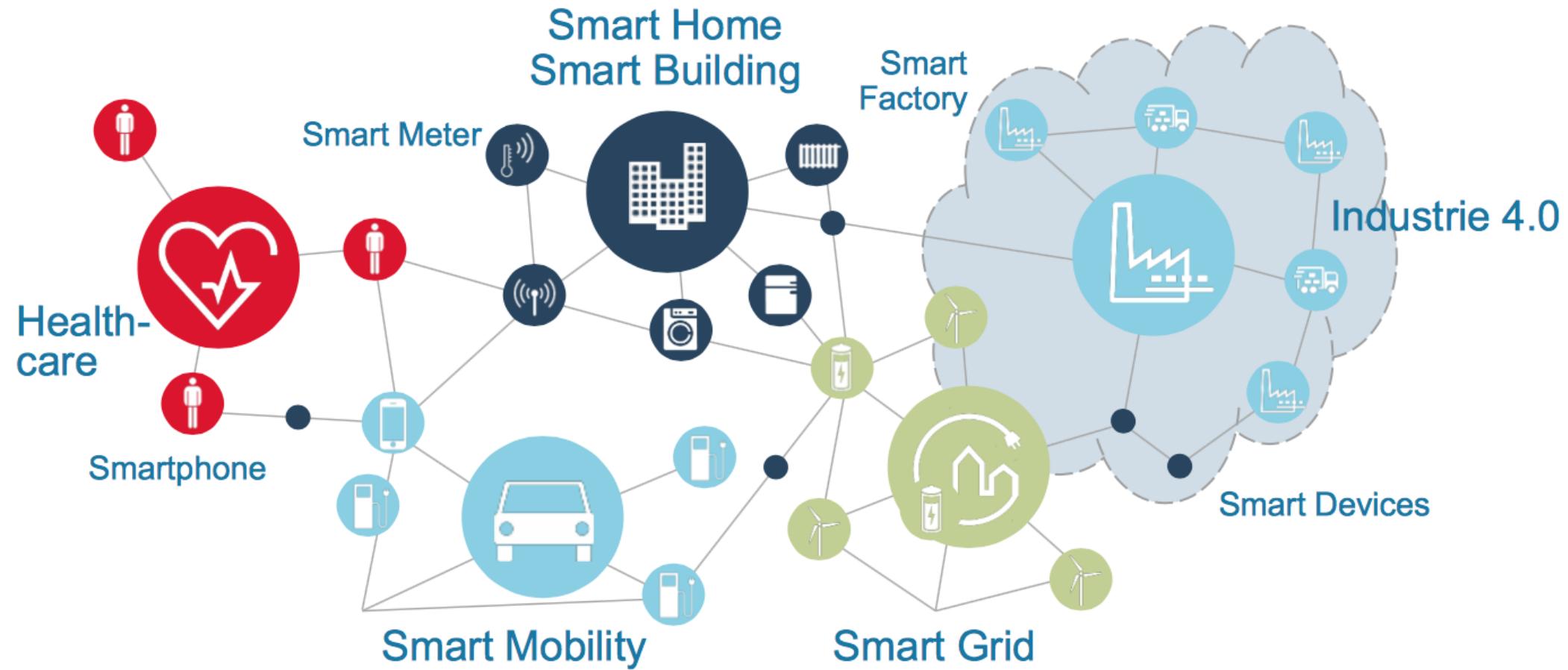


Jouni Aro
CTO, Prosys OPC
Chairman, OPC Committee
Member, Technical Advisory Council, OPC Foundation





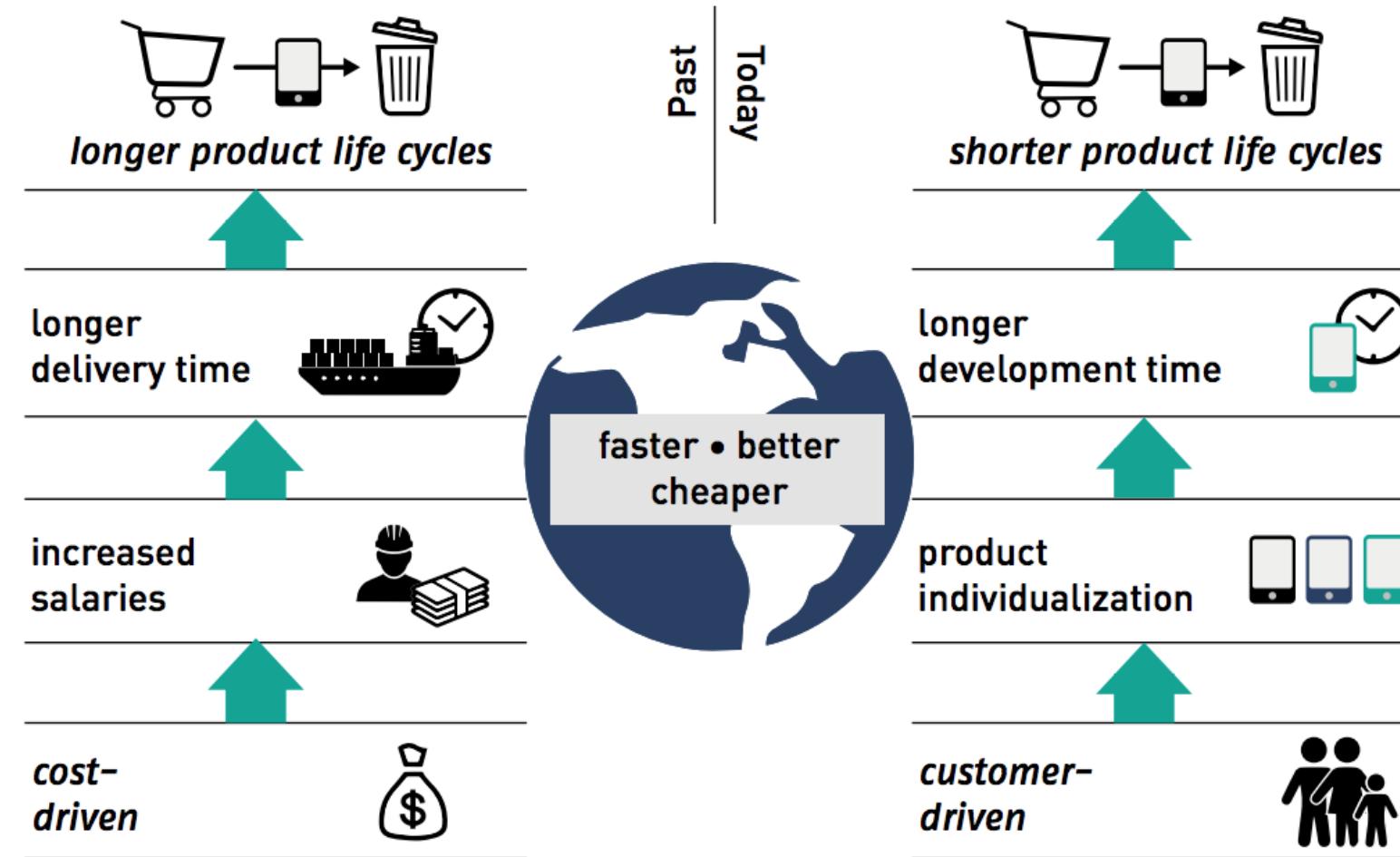
The Internet of Things and Services



(Graphics Bosch Rexroth AG)



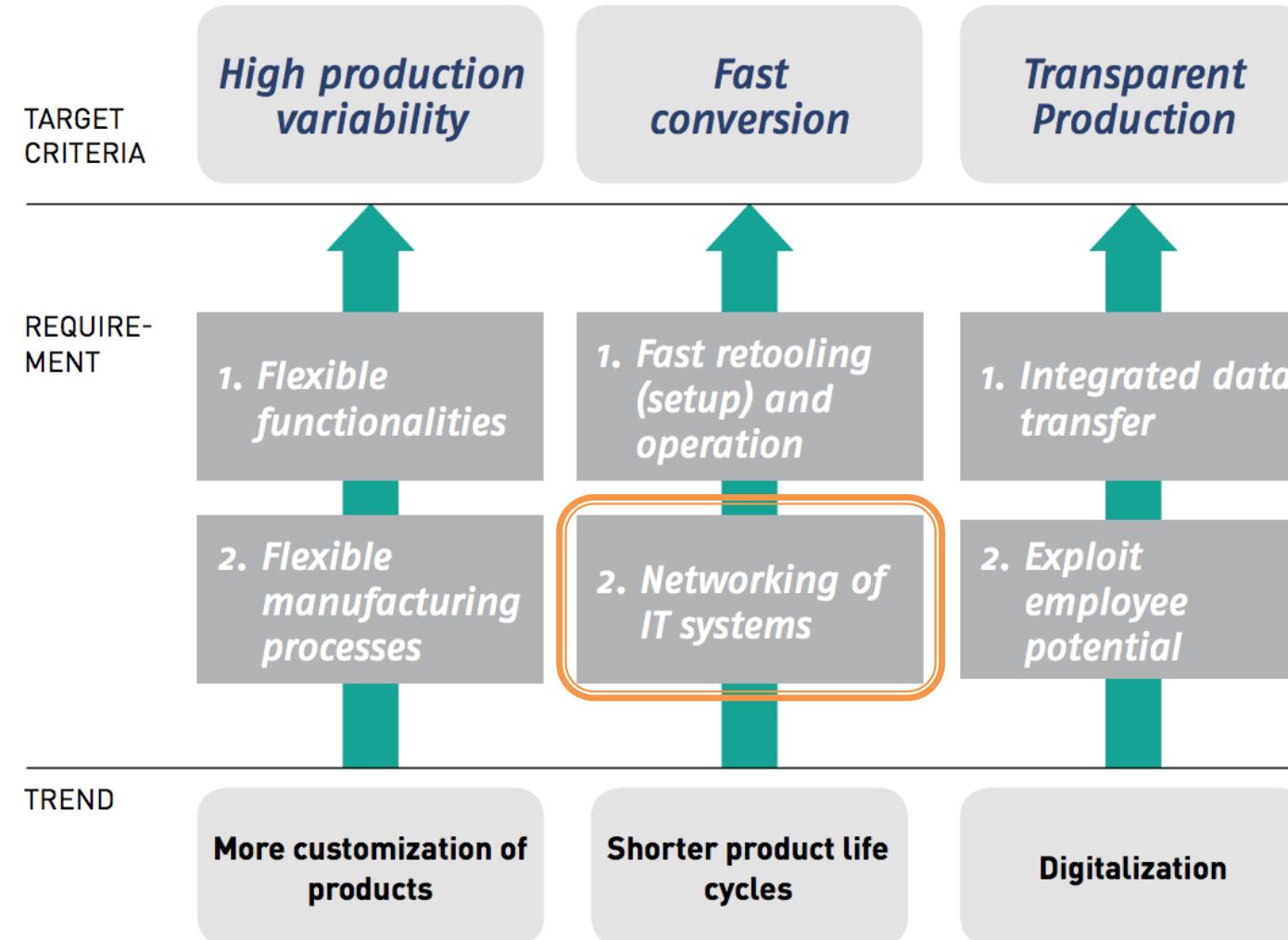
Global Trends of Manufacturing Requirements



(SmartFactory^{KL} System Architecture for Industrie 4.0 Production Plants - Whitepaper SF-1.2: 04/2018)



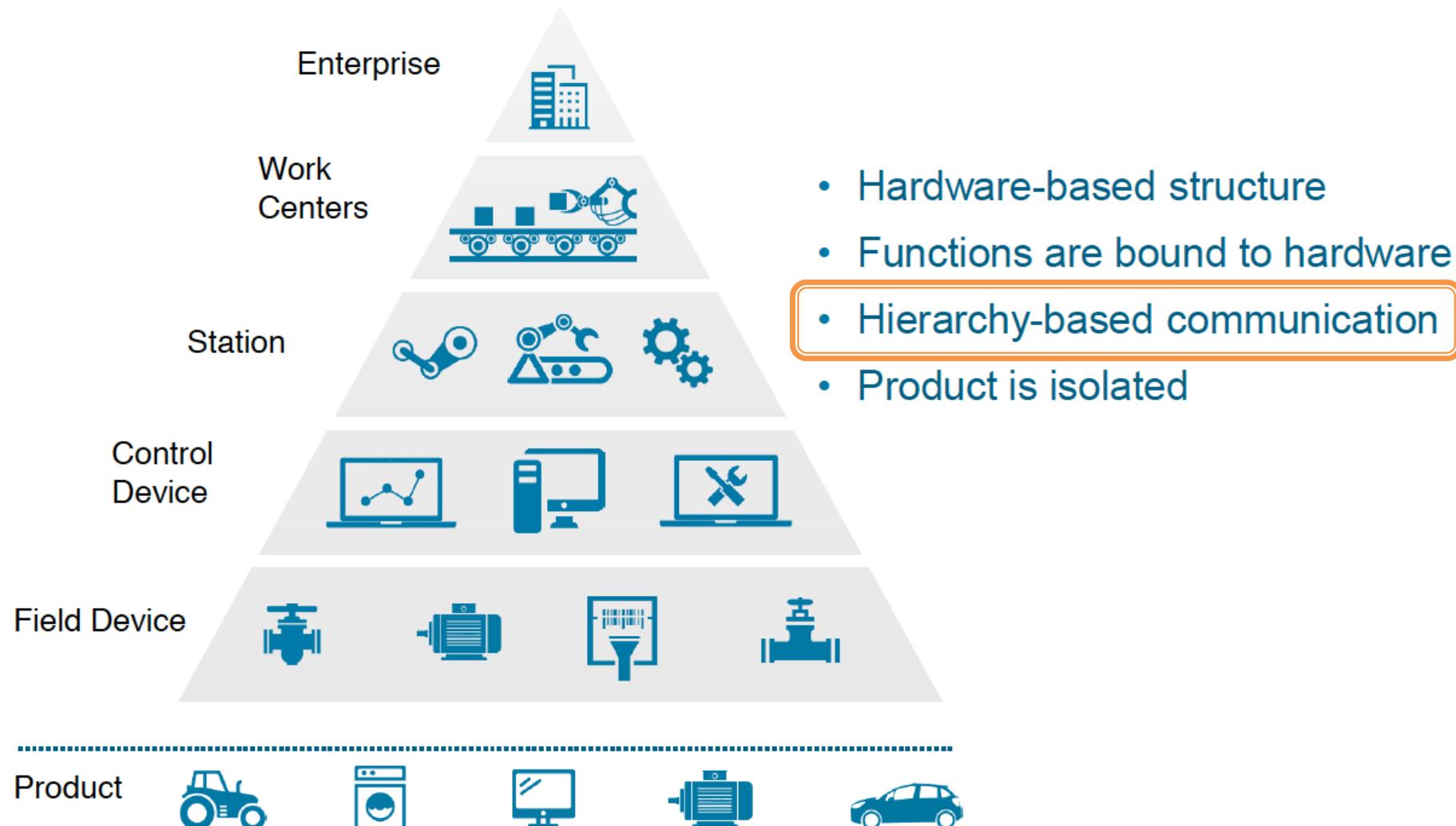
Target Criteria for a Smart Factory



(SmartFactory^{KL} System Architecture for Industrie 4.0 Production Plants - Whitepaper SF-1.2: 04/2018)



The Old World: Industry 3.0



(Martin Hankel, Plattform Industrie 4.0 / Graphics © Anna Salari, designed by freepik)



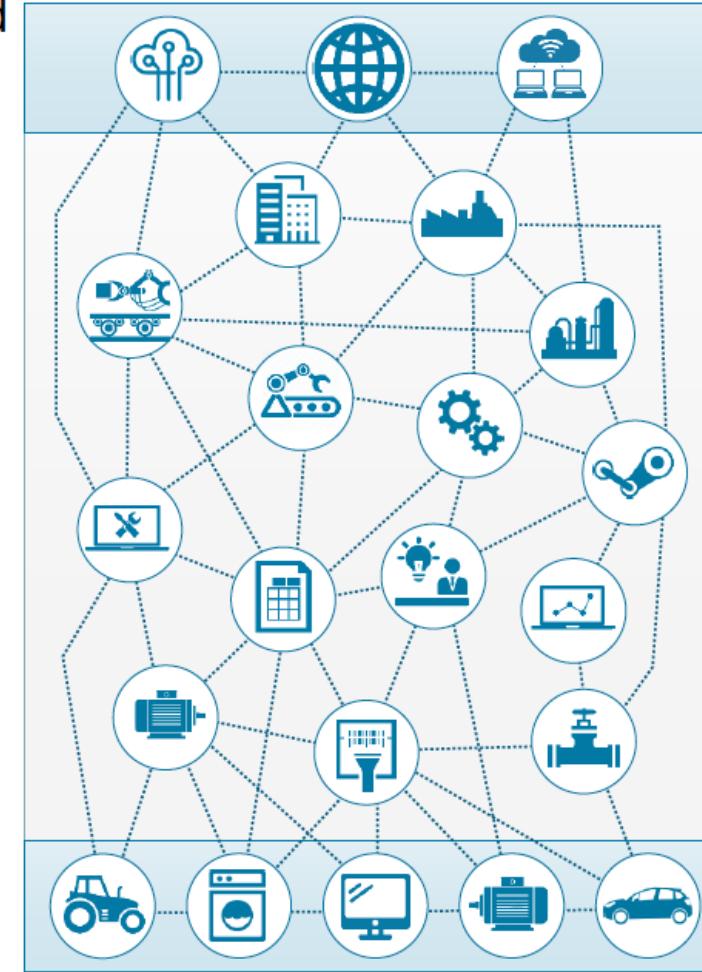
The New World: Industry 4.0

- Flexible systems and machines
- Functions are distributed throughout the network
- Participants interact across hierarchy levels
- Communication among all participants
- Product is part of the network

Connected
World

Smart
Factory

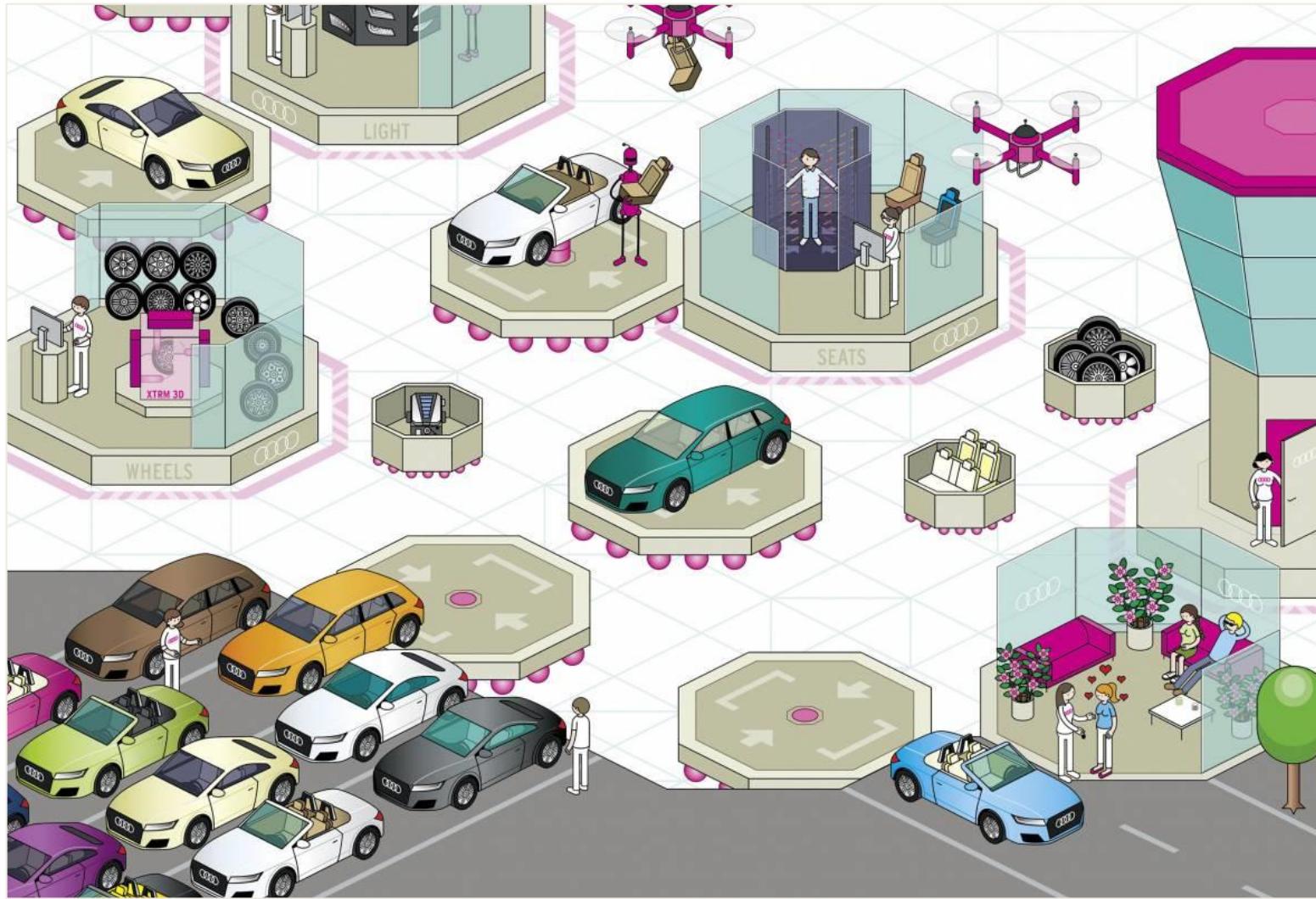
Smart
Products



(Martin Hankel, Plattform Industrie 4.0 / Graphics © Anna Salari, designed by freepik)



Modular Assembly



(<https://blog.audi.de/modulare-montage-bei-audi/>)

- ▶ Individually customized products
- ▶ Flexible production "line"



Matrix Production



KUKA Matrix Produktion: Intelligente und durchgängig digital vernetzte Wertschöpfungsketten

- ▶ Configurable Production Cells
- ▶ Automated Guided Vehicles
- ▶ Dynamic Process
- ▶ Active Communication

(<https://www.kuka.com/en-de/industries/solutions-database/2016/10/matrix-production>)



Matrix Production

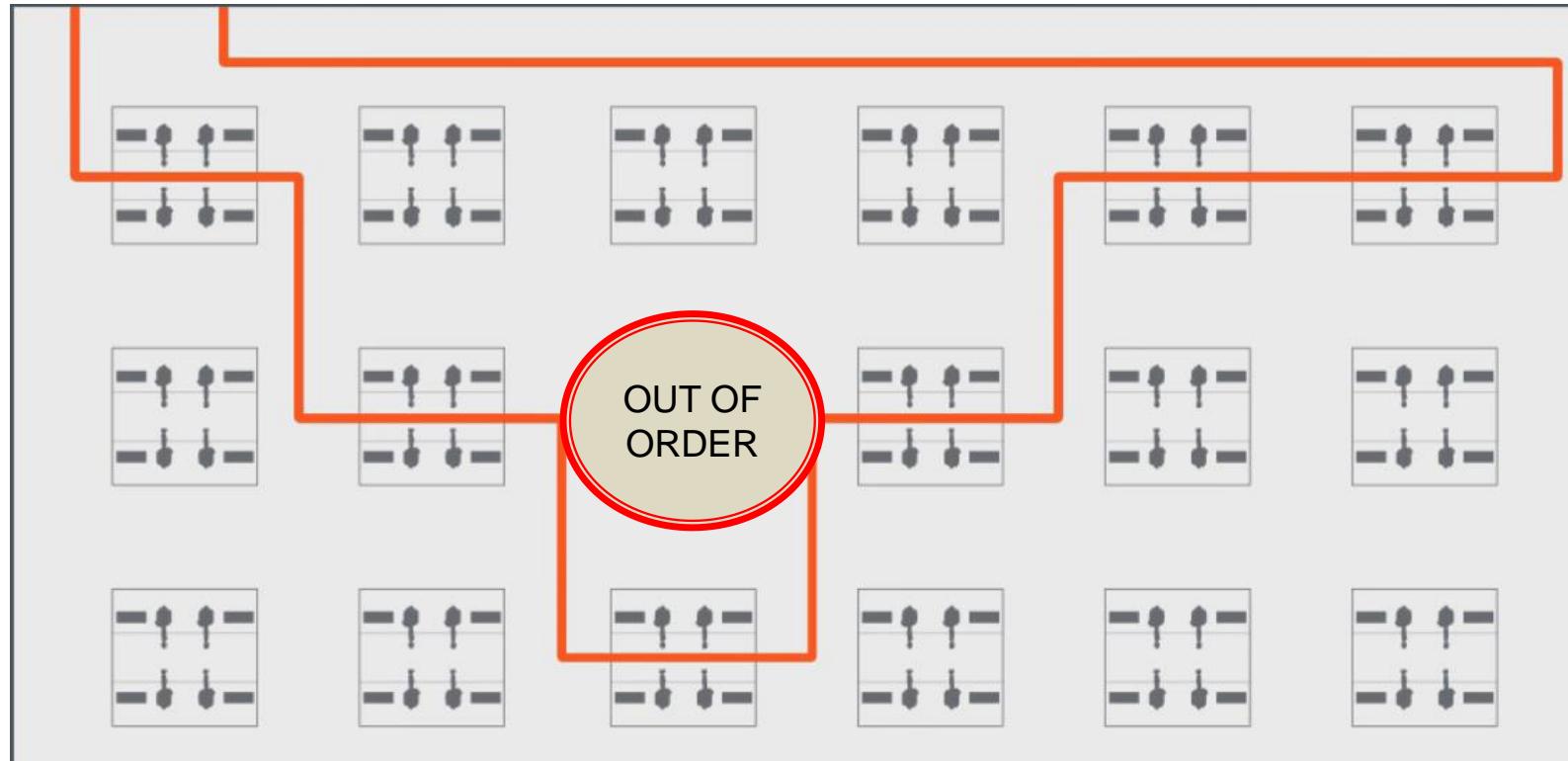


- ▶ Logistics Separated from Production

(<https://www.kuka.com/en-de/industries/solutions-database/2016/10/matrix-production>)



Matrix Production

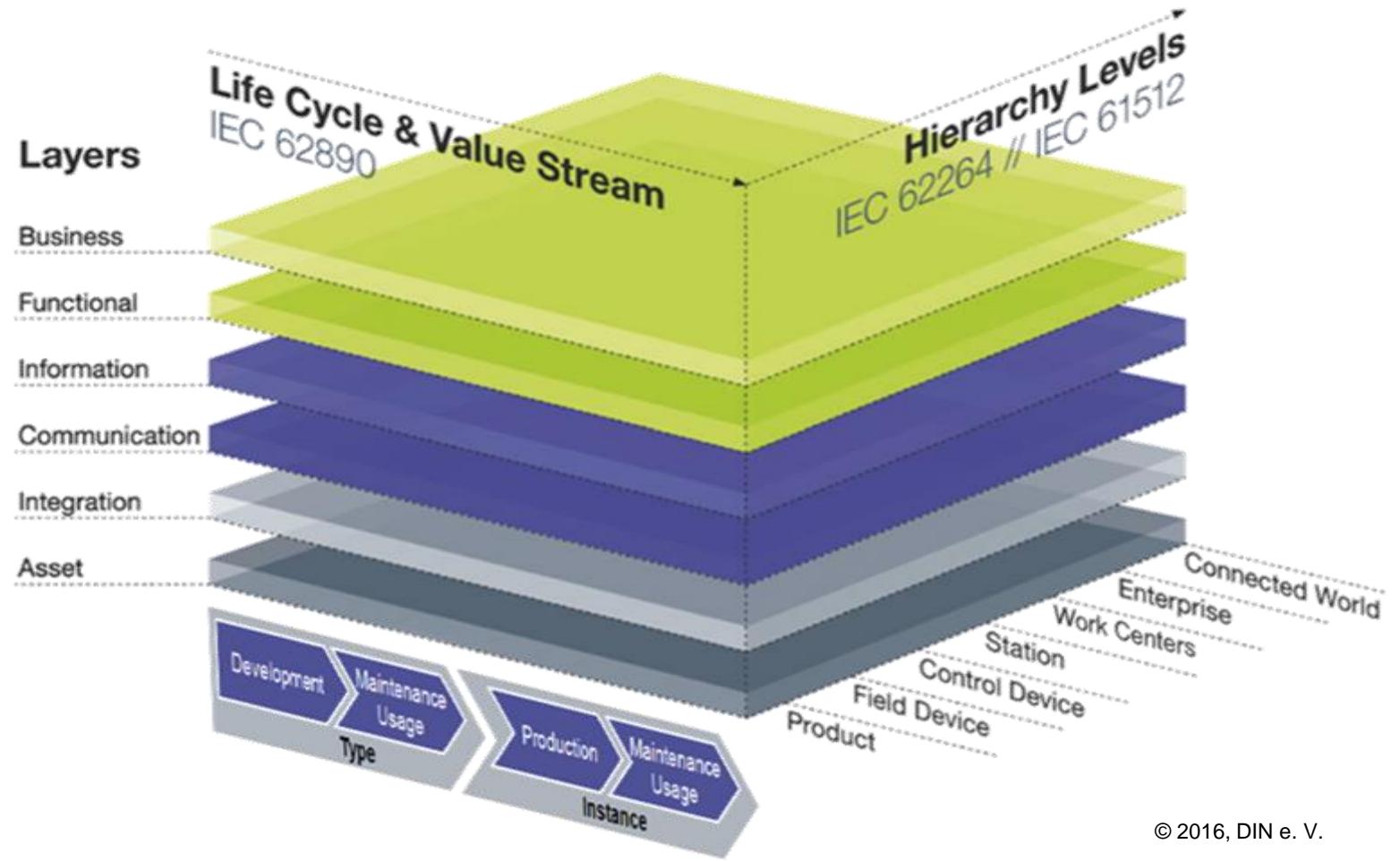


- ▶ Reconfigurable Assembly Path
- ▶ Flexible Production Capacity

(<https://www.kuka.com/en-de/industries/solutions-database/2016/10/matrix-production>)



Reference Architecture Model for Industrie 4.0 (RAMI4.0)

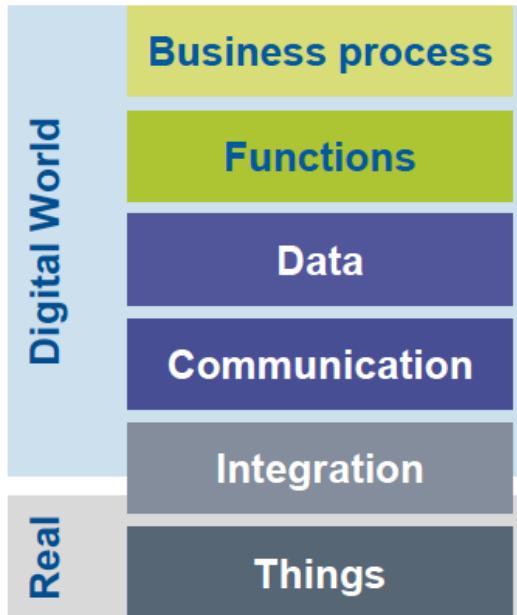


RAMI 4.0 ensures that all participants involved in Industrie 4.0 discussions understand each other.



Industrie 4.0 Component

RAMI4.0



The connection is made via the I4.0 communication

The Administration Shell is the digital content

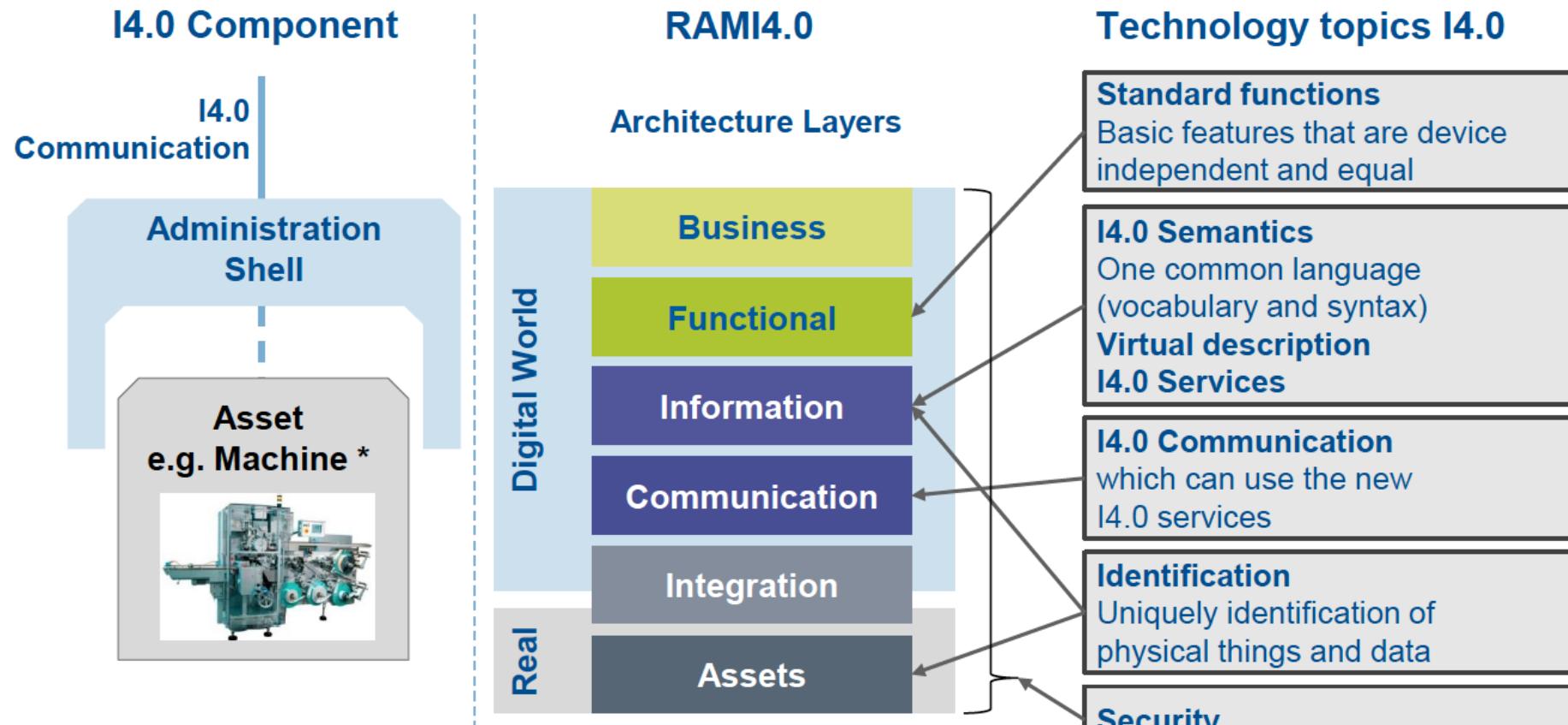
The Thing is the real content

Every Thing needs an Administration Shell, to be able to integrate into Industrie 4.0 network

(Martin Hankel, 2016)



The Industrie 4.0 Topics



Worldwide standards for the main technology topics are needed

* Refers to individual components such as Sensors, actuators, controllers, software, ...

(Martin Hankel, 2016)



The Industrial Interoperability Standard

OPC UA: The industrial framework enabling secured, standardized data and interfaces

Interoperability

Independent:
Vendor, Platform, Market and OS

Open Source on GitHub

Discoverable Services Oriented Architecture (SOA) independent of the transport method

Owned by a Non-Profit (OPC Foundation)

50M installed base and exponential growth

Scalability: From Sensor to Cloud

Data Modelling

Rich data modeling preserves source context

Vendors can extend the data model of each product (Companion Specification)

Maps domain specific protocols, e.g. BACNet | MTConnect | Weihenstephan...

Maps domain specific information e.g. Robotics, Machine Vision, Energy, ...
Today 50 initiatives!

Security

Secure Design from group-up
Based on **open security standards**

Authentication | Encryption

Evolves as security technologies evolve
Vendors/Users can choose level of security
Easily acceptable by IT departments





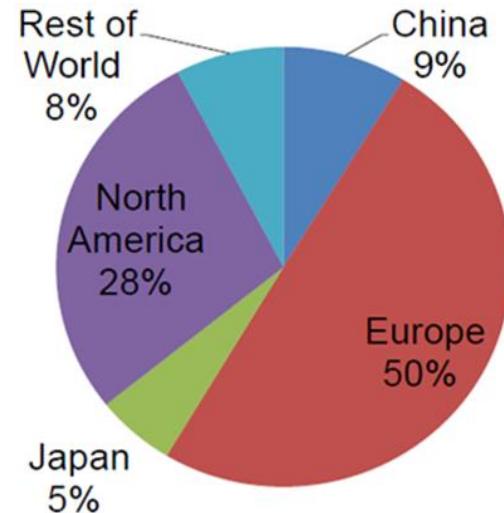
OPC Foundation

- ▶ Vision
 - 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

<https://opcfoundation.org>



OPC Member



→ 612 Members (August ,2018)

OPC Board

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





OPC Foundation Announces New President

10/31/2018

**Stefan Hoppe is elected President and Executive Director of the OPC Foundation after
Thomas J. Burke nominates Mr. Hoppe as his successor**



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.



«AutomationML»





OPC UA in the world



IIC



Made in China2025



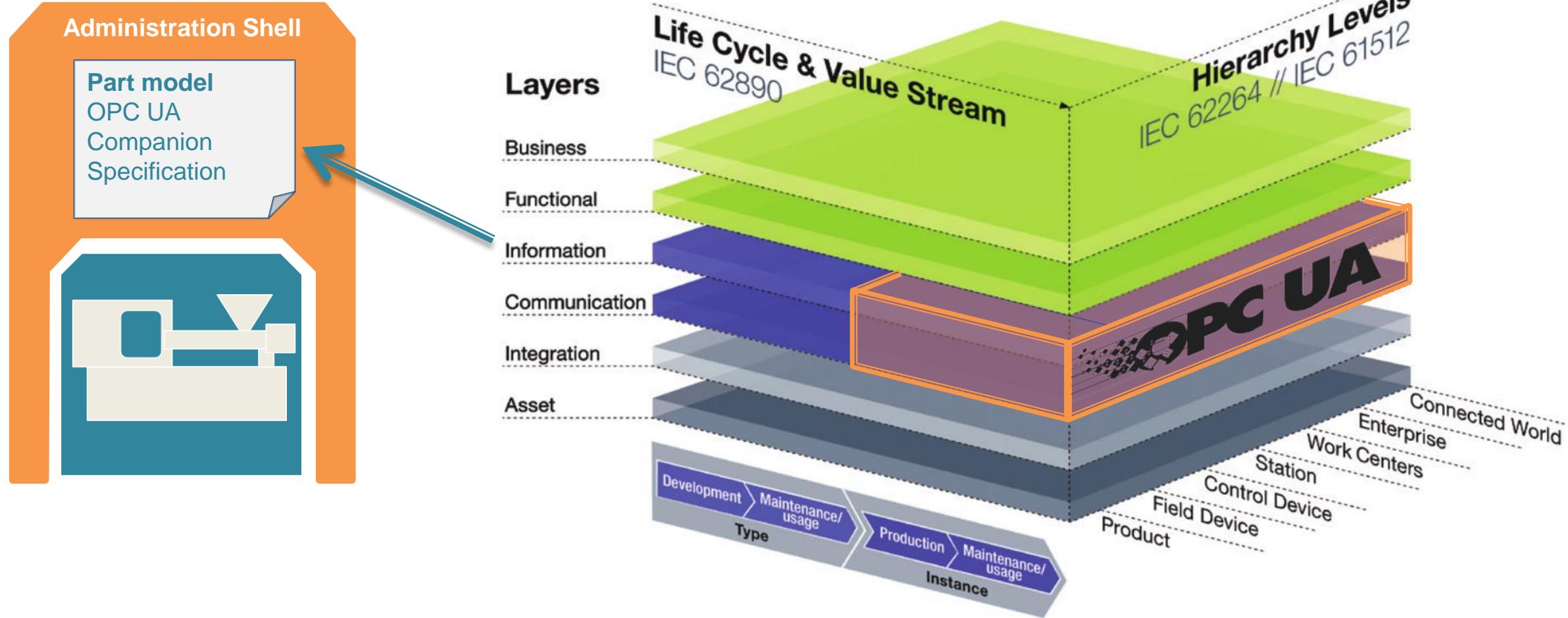
Japan IVI



Korea MII3.0



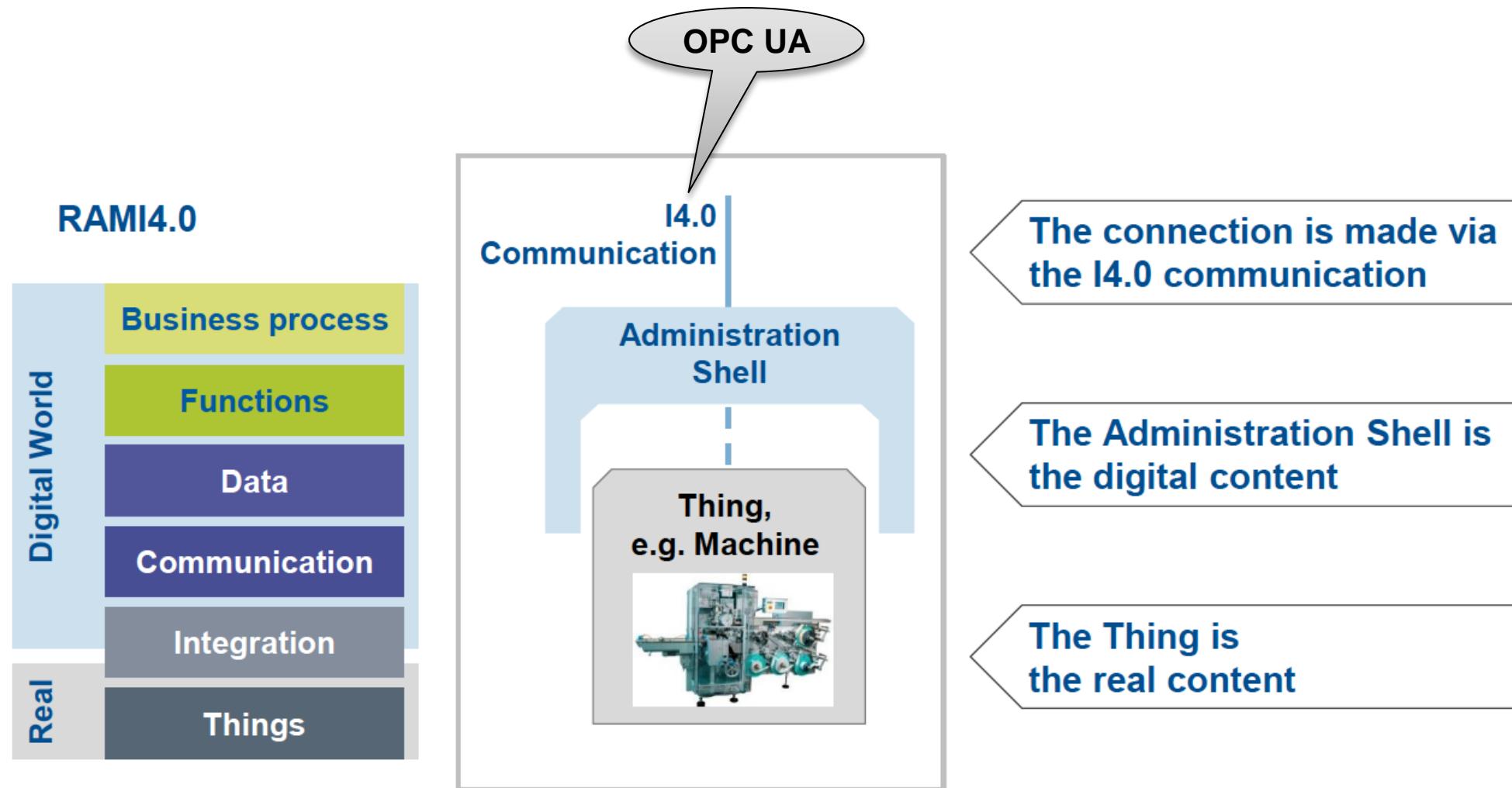
OPC UA in RAMI (Industrie 4.0)



(Andreas Faath, VDMA Forum Industrie 4.0)



Industrie 4.0 Component





OPC UA: Security analyzed

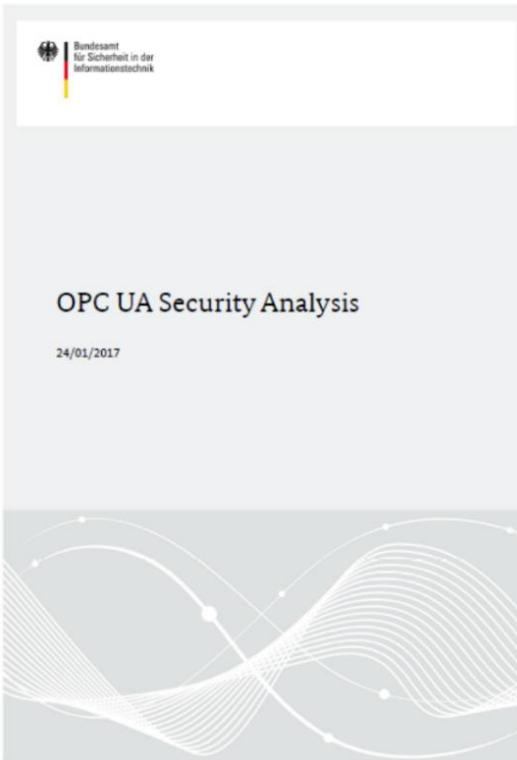
Who: Federal Office for Information Security (German Government BSI)

Why: Because of Relevance of OPC UA for German Industry

What: Security Evaluation of OPC UA – March 2016

- Analysis of Specification
- Analysis of Reference Implementation

Result: OPC UA is Secure



Bundesamt
für Sicherheit in der
Informationstechnik

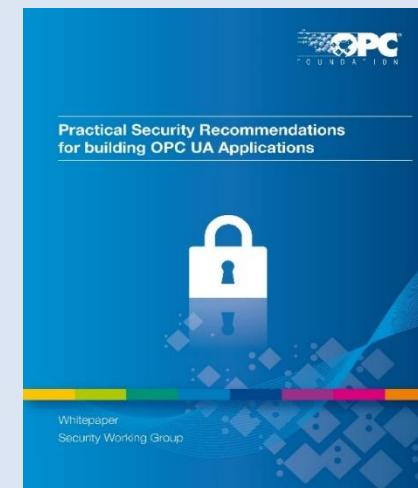
Download documents here
www.opcfoundation.org/security

OPC UA Security User Group: Practical Security Recommendations

Guidelines for **secure configuration**

Clear, concise, easy to read

Best practices





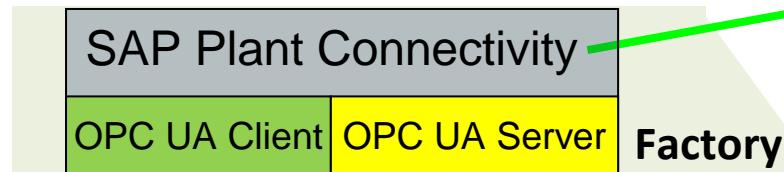
Service-oriented Architecture (SoA) Reshapes the Automation Pyramid

Demo at Hannover Messe 2016 and 2017 and 2018



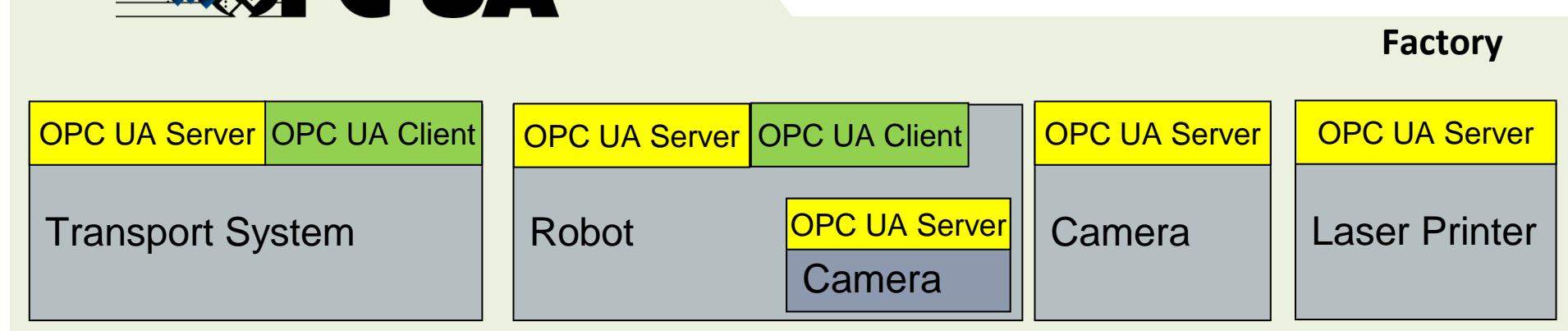
Intelligent Assets

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

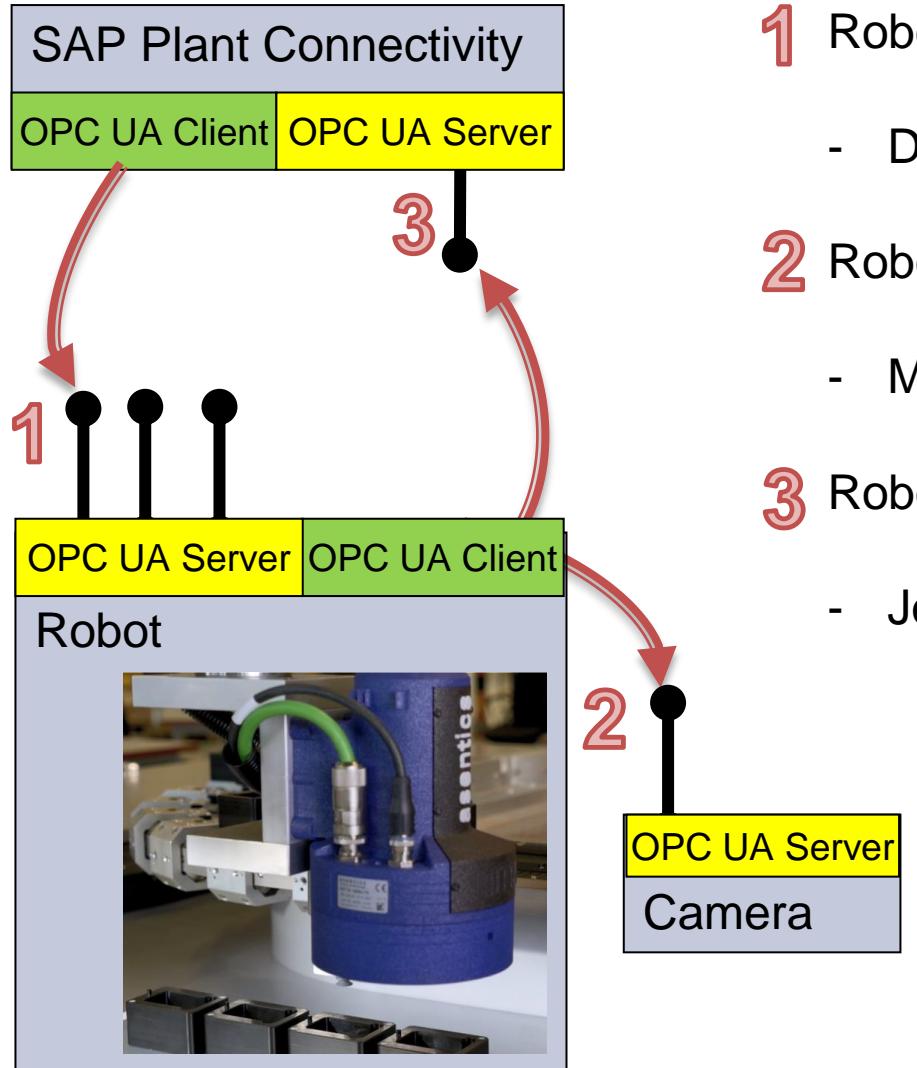


OPC UA Client / Server Communication
done ONLY via OPC UA method calls

(NO HANDSHAKE MECHANISM)



Case: Smart Robot



1 Robot takes a Job Order:

- `DoPickandPlace(OrderNr, PreTeachedNr)`

2 Robot calls the Camera

- `MakePictureAndAnalyze(OrderNr)`

3 Robot confirms the Job

- `JobDone(OrderNr)`

Vertical & horizontal communication

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

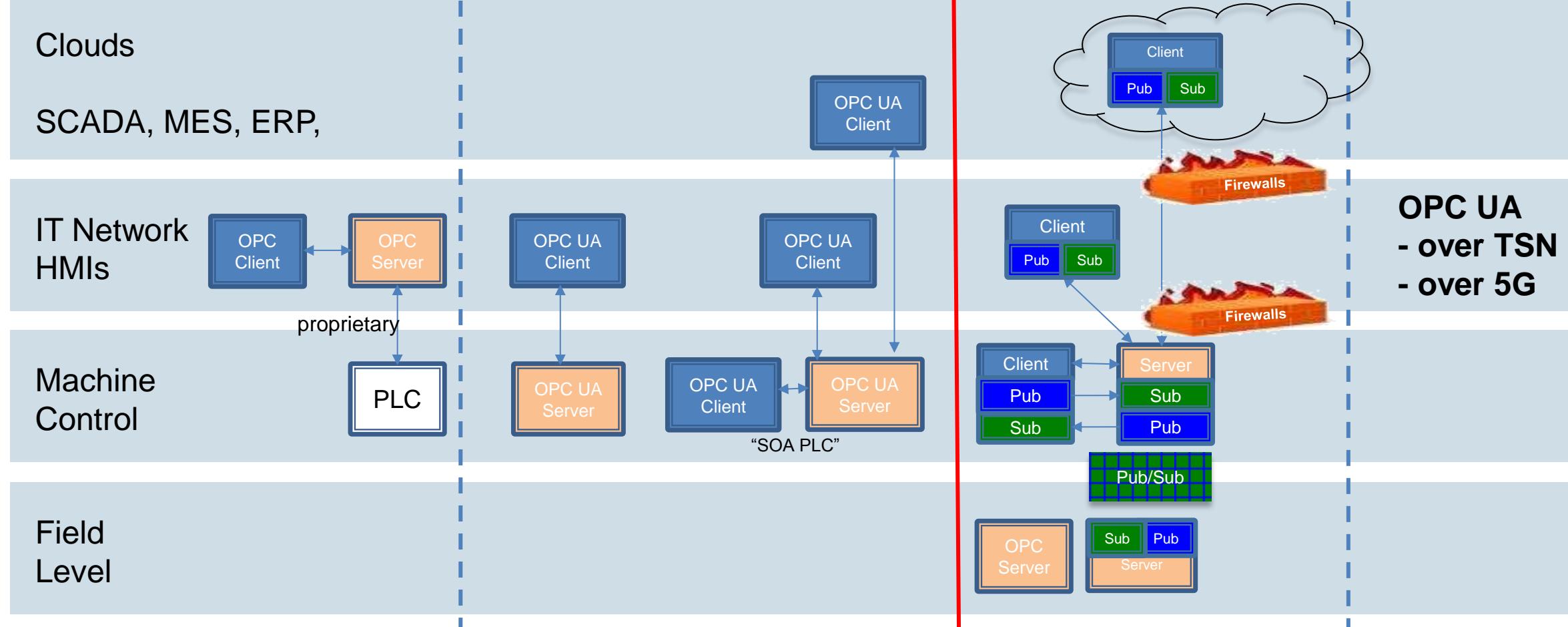
OPC Technology: History and Future



OPC Classic:
OLE for Process Control
- Data Access
- Alarms & Events
- Historical Access

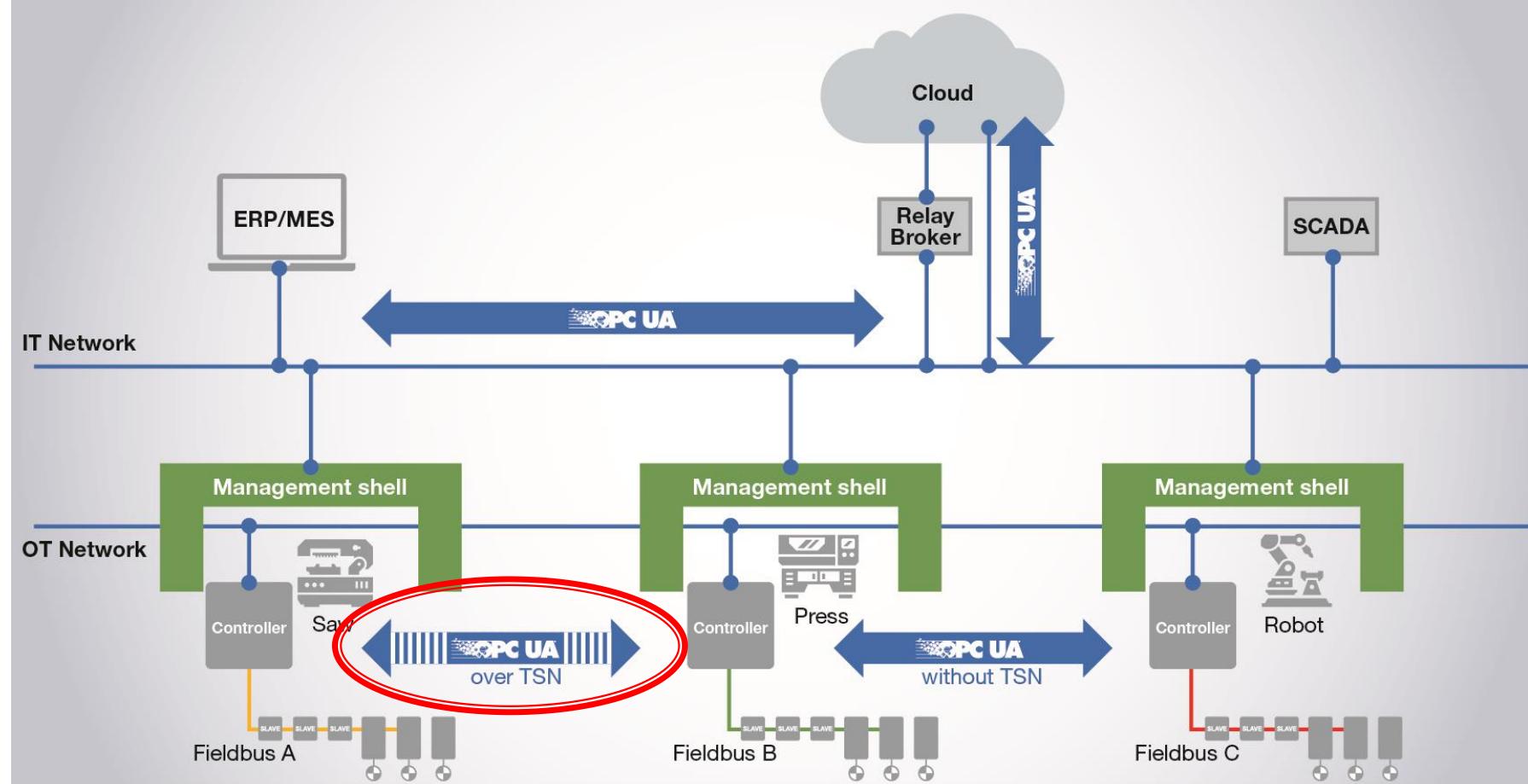
OPC UA:
Unified Architecture
Technology and OS
independent

Today



Time

Future: Deterministic real-time for OPC UA Pub/Sub “OPC UA over TSN” and “OPC UA over 5G”



Vertical: OPC UA based Controller-to-Cloud communication can be done

- directly
- via Gateway
- via MQTT or AMQP

Horizontal: OPC UA based Controller-to-Controller communication can be done

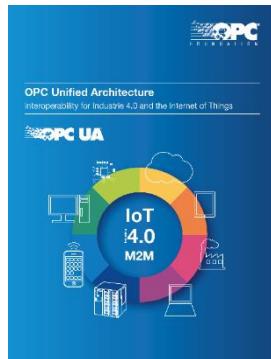
- without TSN or 5G
- with TSN
- with 5G



Information: Brochures Updated (V8)

- ▶ “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



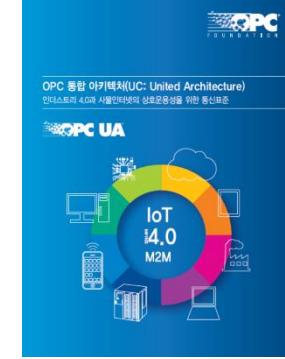
Under
translation

China



Under
translation

Korea



Under
translation



OPC UA Videos



- ▶ Landing page
<https://opcfoundation.org/resources/multimedia/>
- ▶ YouTube Channel: TheOPCFoundation
<https://www.youtube.com/user/TheOPCFoundation>
 - ▶ OPC UA Technical Introduction, Uwe Steinkrauss
 - ▶ OPC UA Security, Darek Kominek
 - ▶ All About Certification, Alexander Allmendinger
 - ▶ Getting Started with OPC UA, Jouni Aro
 - ▶ Part 1: End User Products
 - ▶ Part 2: Developer Kits
 - ▶ Azure Industrial IoT – Overview, Erich Barnstedt
 - ▶ Plus more about Companion Specifications, etc.



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/>

The screenshot shows the OPC Foundation website homepage. At the top is a blue navigation bar with dropdown menus for About, Membership, Products, Certification, Markets & Collaboration, Resources, and News & Events. Below the navigation bar is a main content area. On the left, there's a video player showing a video titled "Minute OPC UA YouTube Video". To the right of the video is a large orange button labeled "SUBSCRIBE NEWSLETTER", which is circled in red. Below the video, there's a section for "Newest Members" with a small profile icon. At the bottom of the page, there are two prominent buttons: a yellow one labeled "BECOME A MEMBER" and a white one with a blue border labeled "FREE ACCOUNT". The "FREE ACCOUNT" button also has explanatory text: "You need a Free/personal account to access public information and downloads". The OPC Foundation logo is visible in the bottom right corner.

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Thank you!

BECKHOFF

PERFECTION IN AUTOMATION
A MEMBER OF THE ABB GROUP



Elkome

NAPCON

kepware®
NOVOTEK

OMRON

PROSYS OPC

SIEMENS

Unified
Automation

Valmet
FORWARD