EtherCAT and Industrie 4.0 & Industrial Internet of Things

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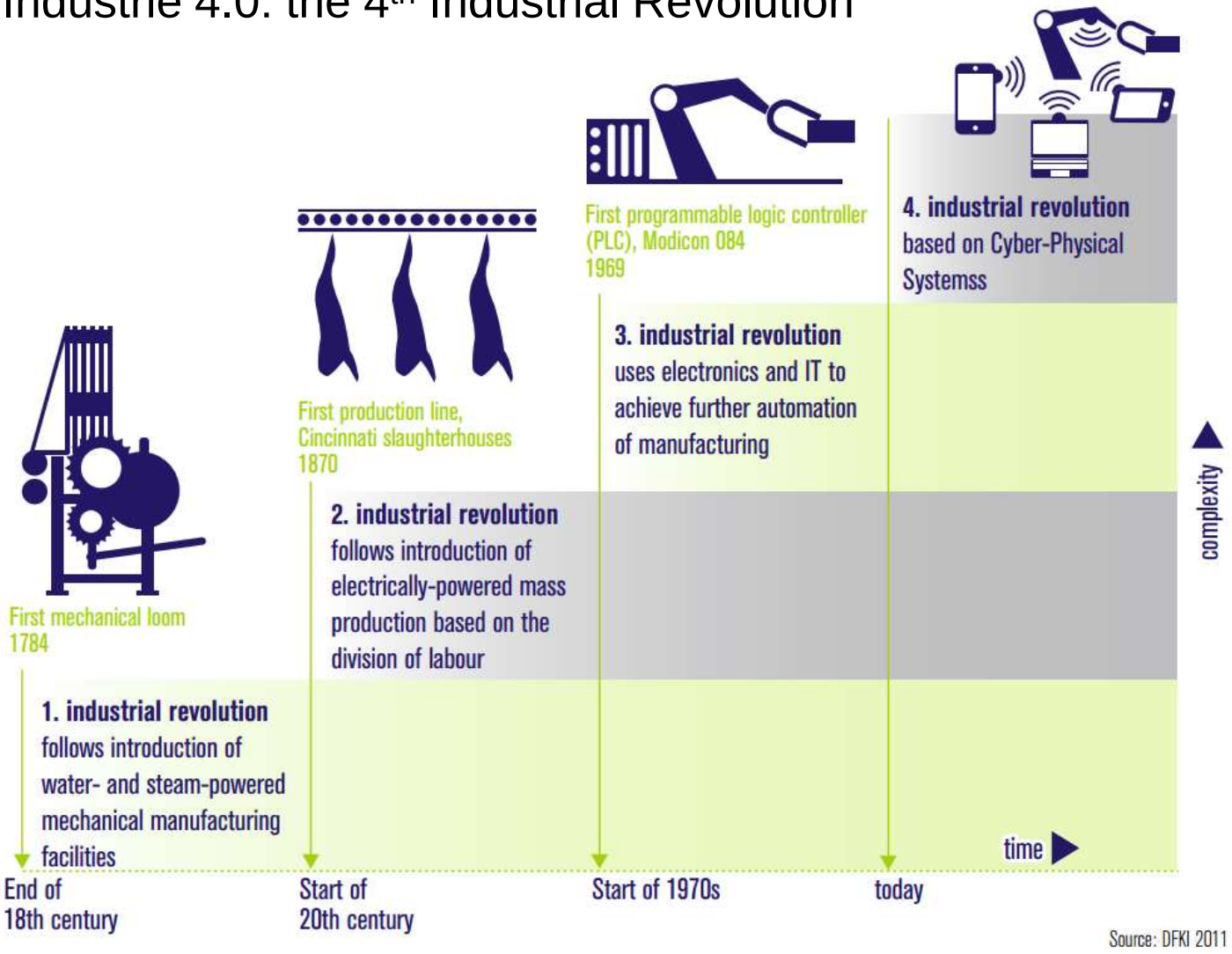
EtherCAT® Technology Group

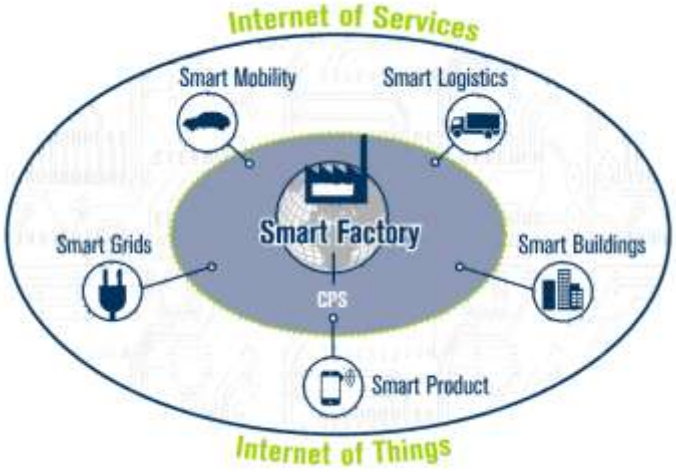
What is Industrie 4.0?

Industrie 4.0: the 4th Industrial Revolution



Industrie 4.0:
Smart Factories within the Internet of Things

- Introducing the Internet of Things and Services into the manufacturing environment



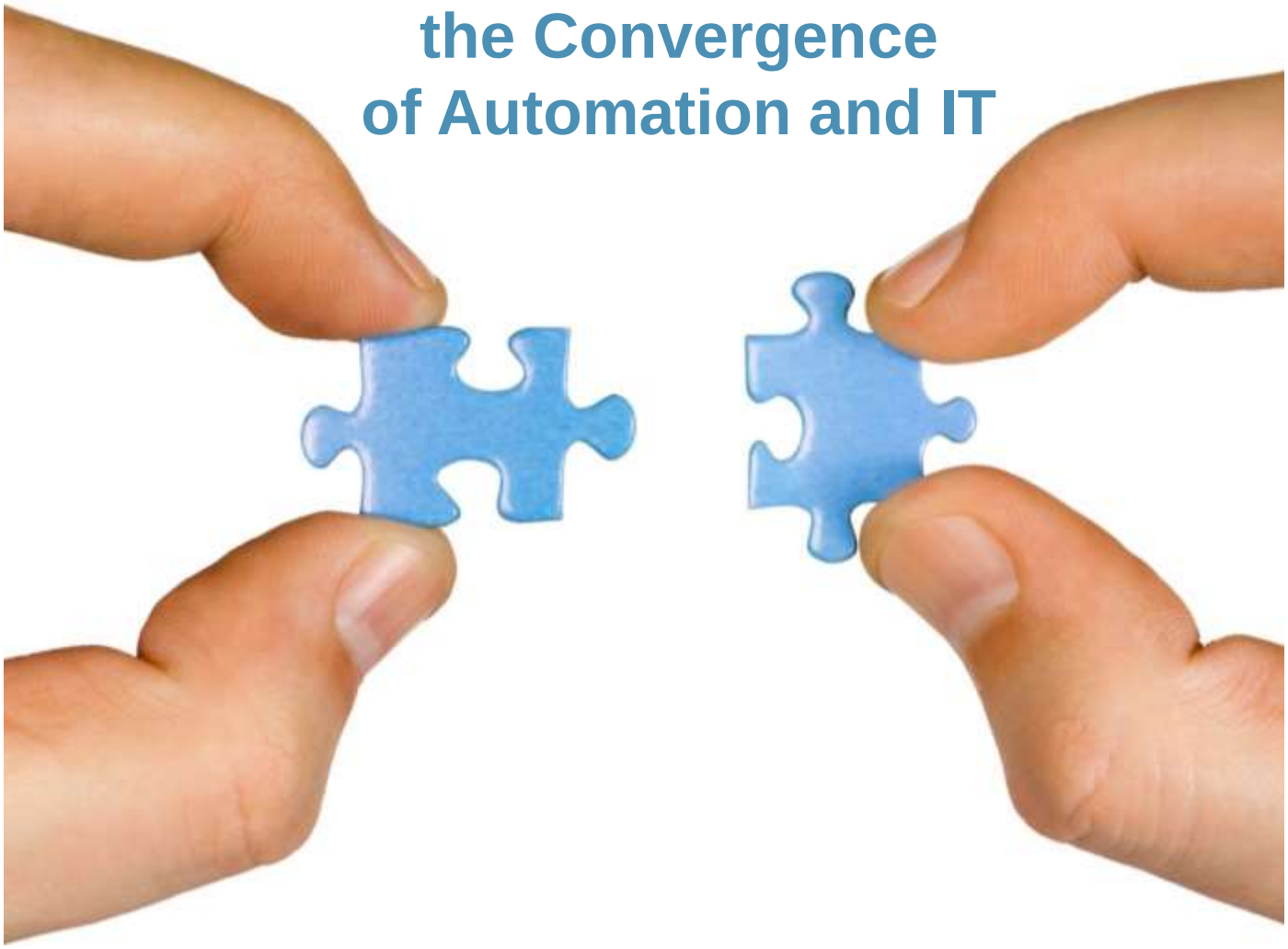
- Cyber-Physical-Systems (CPS)
  - Smart machines and production facilities capable of autonomously exchanging information, triggering actions and controlling each other independently
- Smart Factories with Smart Products
  - Smart Products are uniquely identifiable, know their history, current status and alternative routes to achieving their target state

Industrie 4.0 and IoT Goals

- Automatic engineering
- Seamless integration from sensor to MES
  - From shop floor into the cloud
- Scalable production
- Self organization and optimization
- Goal: flexible, dynamic and transparent production

Industrie 4.0 in one statement

Industrie 4.0 is the Convergence of Automation and IT

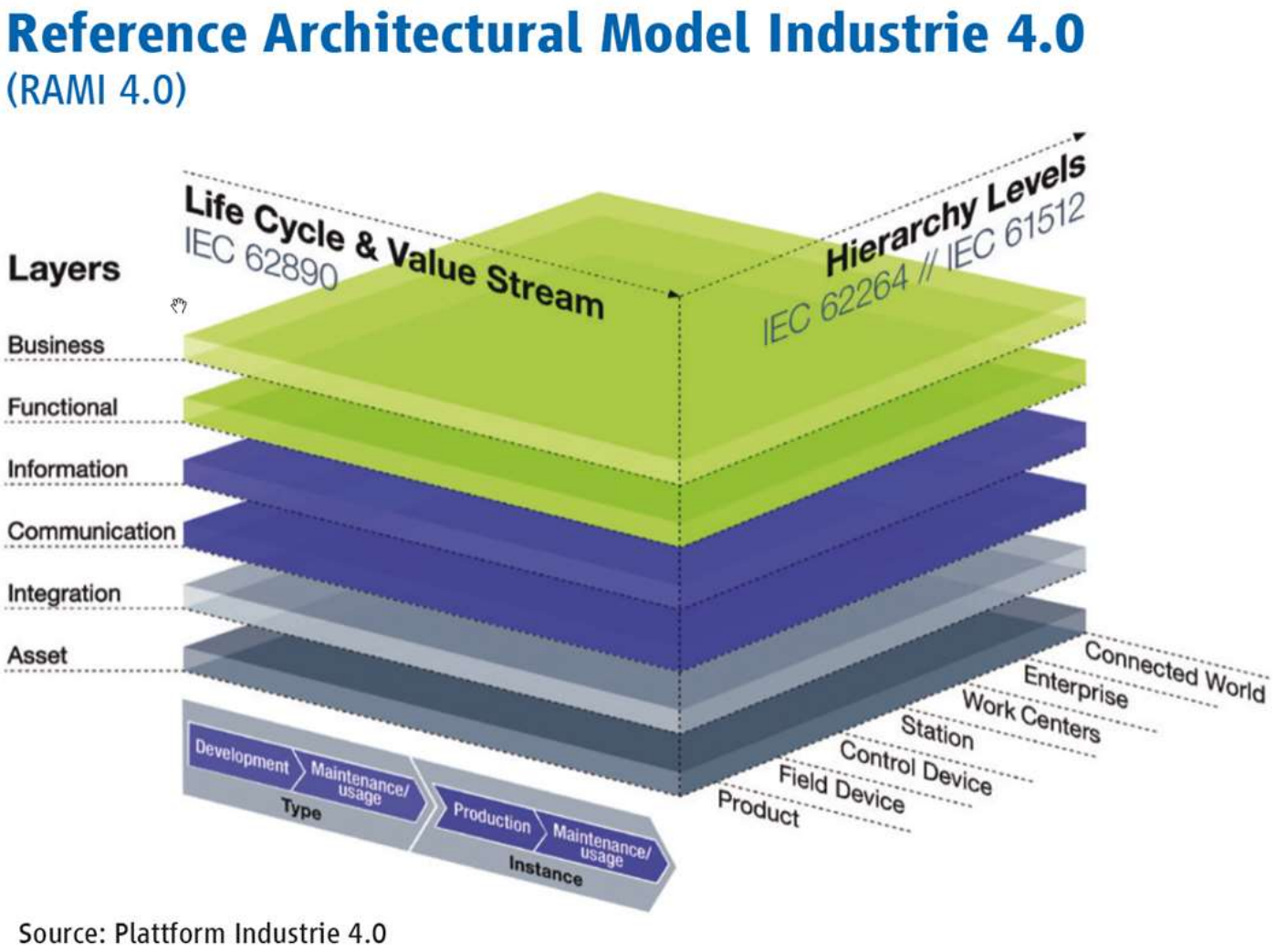


Organizational Change in Industrie 4.0 Platform

- Originally set up by
  - the Federal Association for Information Technology, Telecommunications and New Media (BITKOM),
  - the German Engineering Federation (VDMA),
  - and the German Electrical and Electronic Manufacturers' Association (ZVEI)

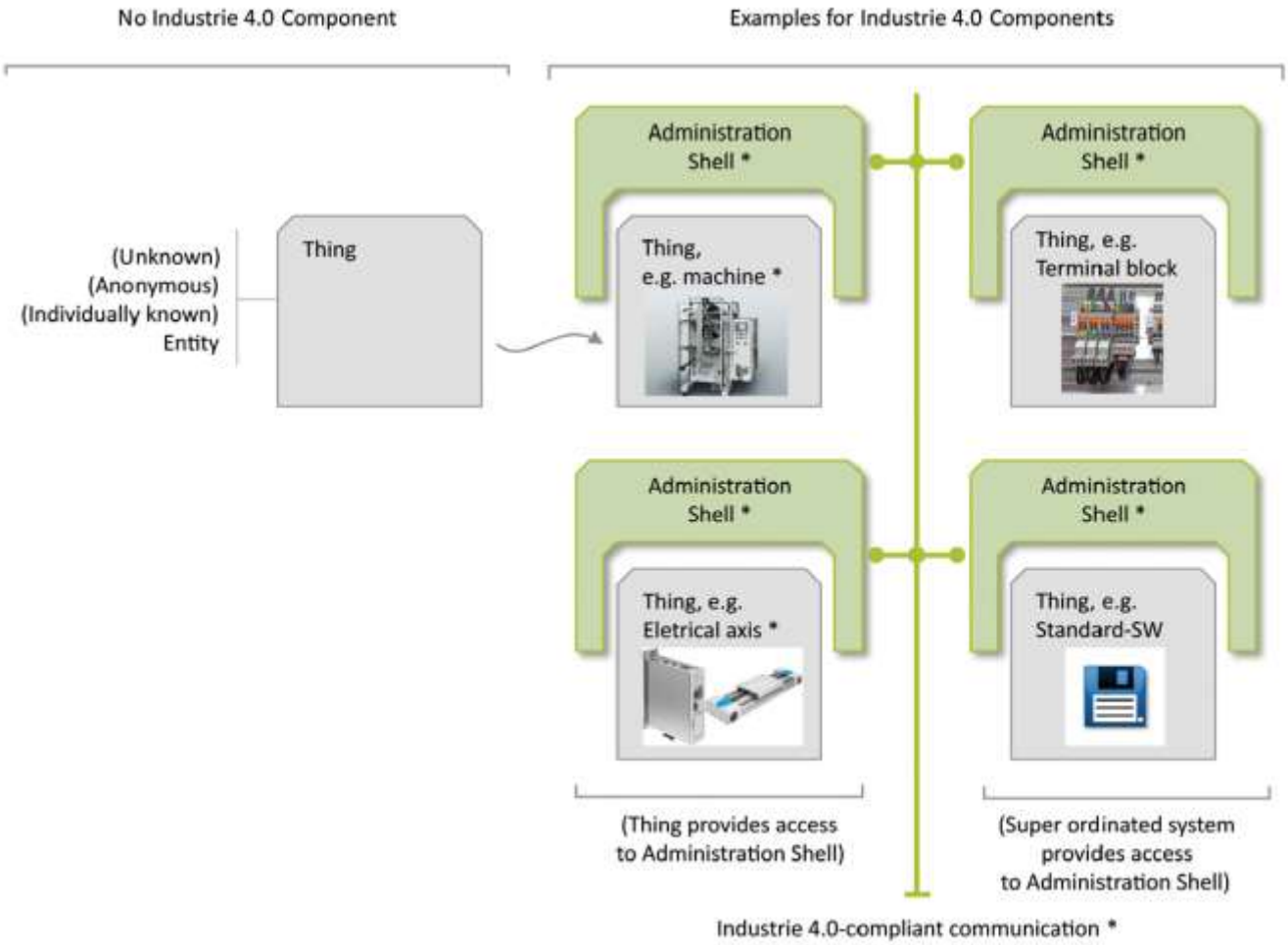
- The new Industrie 4.0 platform is headed by the German Economic Affairs Minister Sigmar Gabriel, Research Minister Johanna Wanka, as well as key representatives from industry and industrial associations, the German Metalworker' Union, and the Fraunhofer Society.

Reference Architectural Model Industrie 4.0



Source: Plattform Industrie 4.0

Industrie 4.0 Component Model



Source: Plattform Industrie 4.0

* = Interfaces/ data formats Industrie 4.0-compliant designed

http://www.zvei.org/Downloads/Automation/ZVEI-Industrie-40-Component-English.pdf

ETG Industrie 4.0 and IoT Initiative

- Industrie 4.0 and the Internet of Things are all about

Communication

- EtherCAT is the Ethernet Fieldbus with outstanding real-time capabilities
- OPC UA is about scalable communication with integrated security by design
- Both complement each other in an ideal way

ETG & OPCF: Memorandum of Understanding

Memorandum of Understanding (MoU)
Between
EtherCAT Technology Group and the OPC Foundation
in the Development of Interface Specifications

1. Purpose

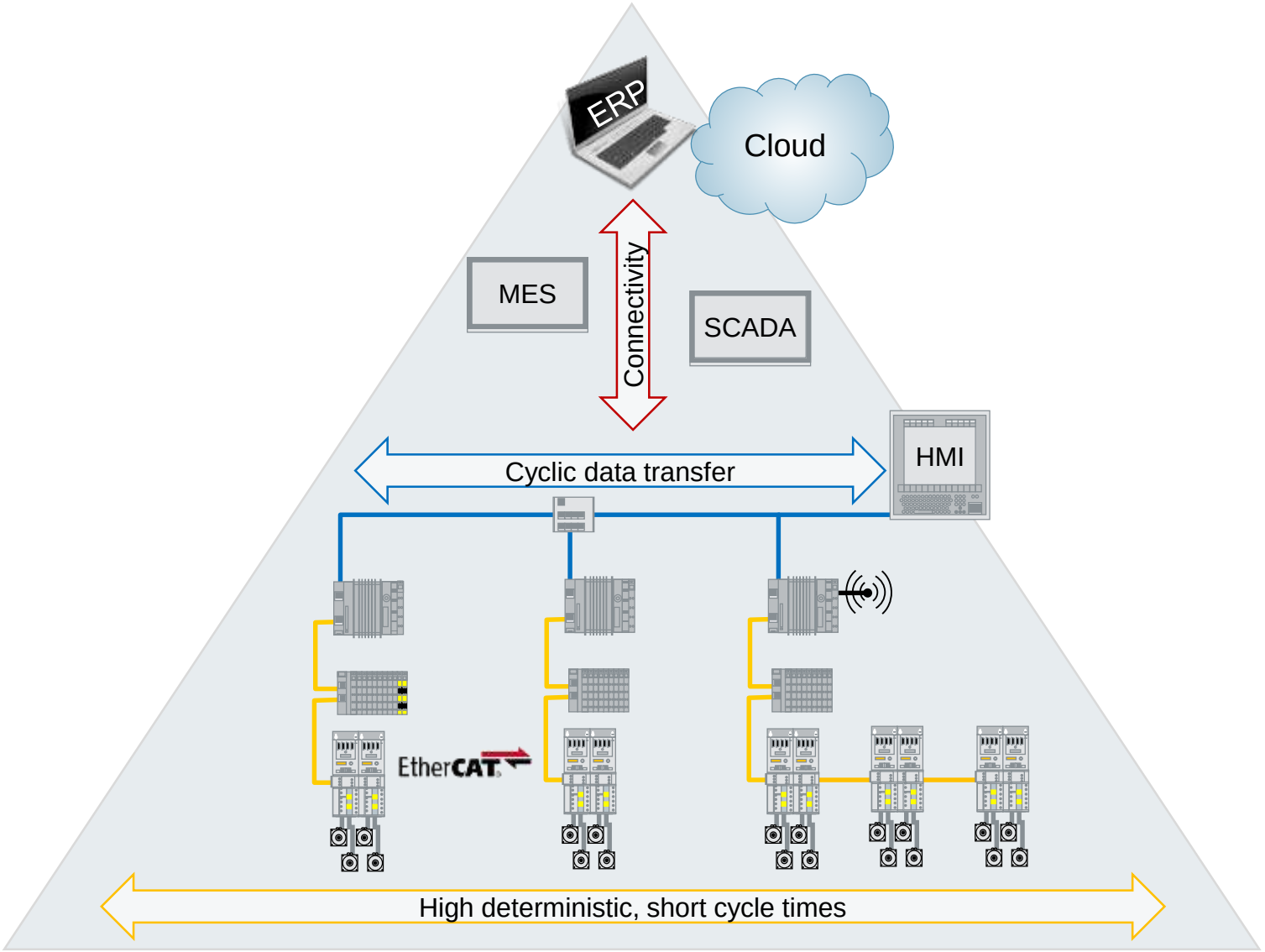
This Memorandum of Understanding ("MoU") establishes a cooperative forum between the EtherCAT Technology Group ("ETG") and the OPC Foundation ("OPC") and is effective as of 15 April 2015. The purpose of this MoU is to define the desired level of cooperation between the parties to this MoU to contribute to the goals of interface definitions as outlined below.

2. Background and Objectives

The EtherCAT Technology Group is an organization in which key user companies from various industries and leading automation suppliers join forces to support, promote and advance the EtherCAT technology. With over 3000 members and strong support in Europe, Asia and the Americas ETG has become the largest fieldbus organization in the world. Founded in November 2003, it is also the fastest growing fieldbus organization. The EtherCAT standard is the Industrial Ethernet technology that stands for high-performance, low-cost, ease of use and a flexible topology. It was introduced in 2003, and has been an international IEC standard since 2007. The EtherCAT Device Protocol (EDP) implements a master/slave architecture where the master device sends Ethernet frames which are processed on the fly by the slave devices. The EtherCAT Automation Protocol (EAP) aims at exchanging data between EtherCAT master devices (master-master communication) using a switched Ethernet infrastructure. Cyclic process data exchange with EAP follows either the „Push" or „Poll" principle. In "Push" mode, each node sends its data either with its own cycle time or in a multiple of the own cycle time. Each receiver can be configured to receive data from specific senders. In "Poll" mode, a sender sends a telegram to the other nodes, and each node responds with its own telegram.

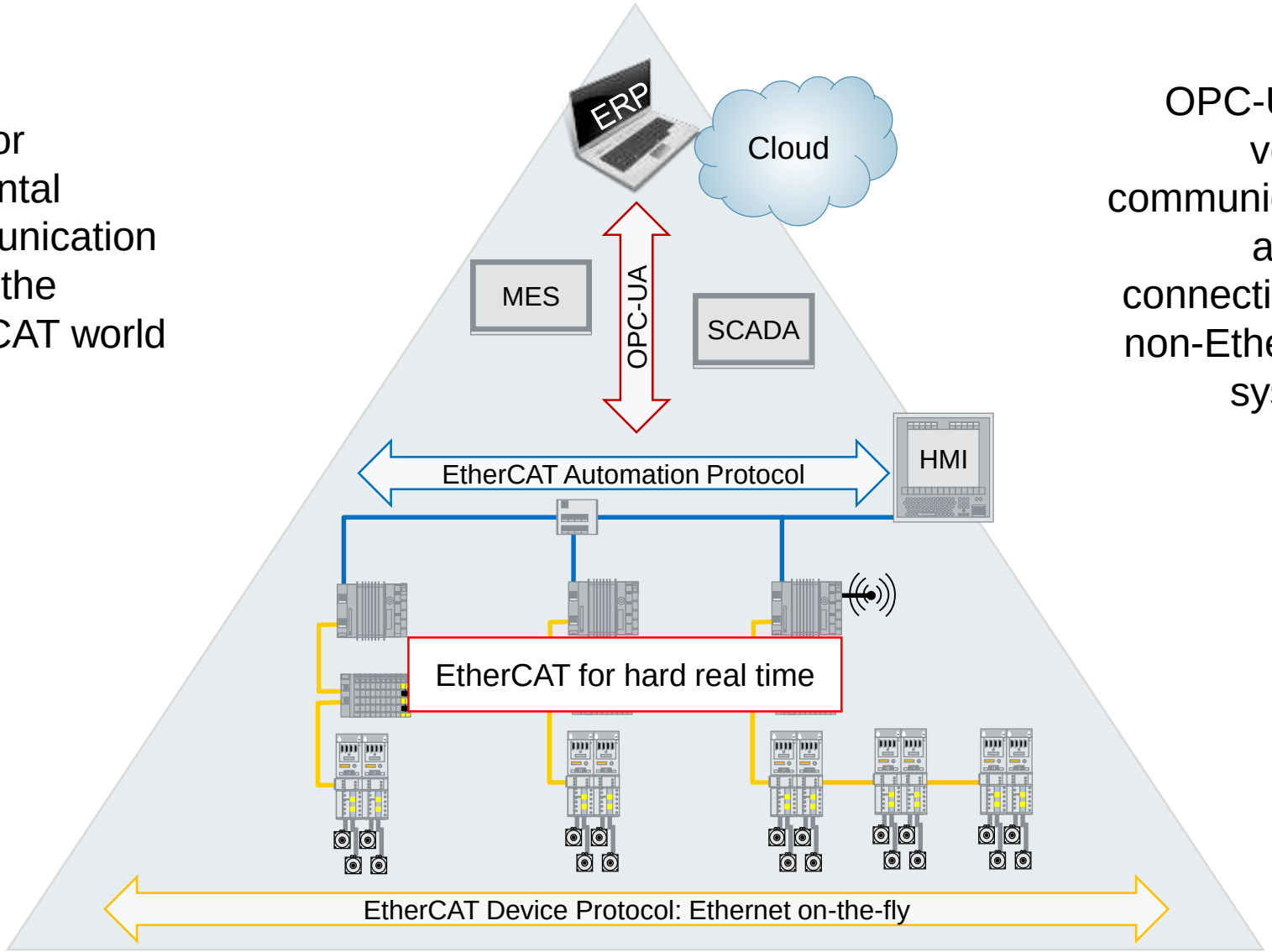
The OPC Foundation pursues interoperability in industrial automation by creating and maintaining open specifications that standardize the communication of acquired process data, alarm and event records, historical data, and batch data to multi-vendor enterprise systems and between production devices. Production devices include sensors, instruments, PLCs, RTUs, DCSs, HMIs, historians, trending subsystems, alarm subsystems, and more as used in the process industry, manufacturing, and in acquiring and transporting oil, gas, and minerals. The goal for OPC is for it to be the foundation

Communication Requirements



Communication Technologies

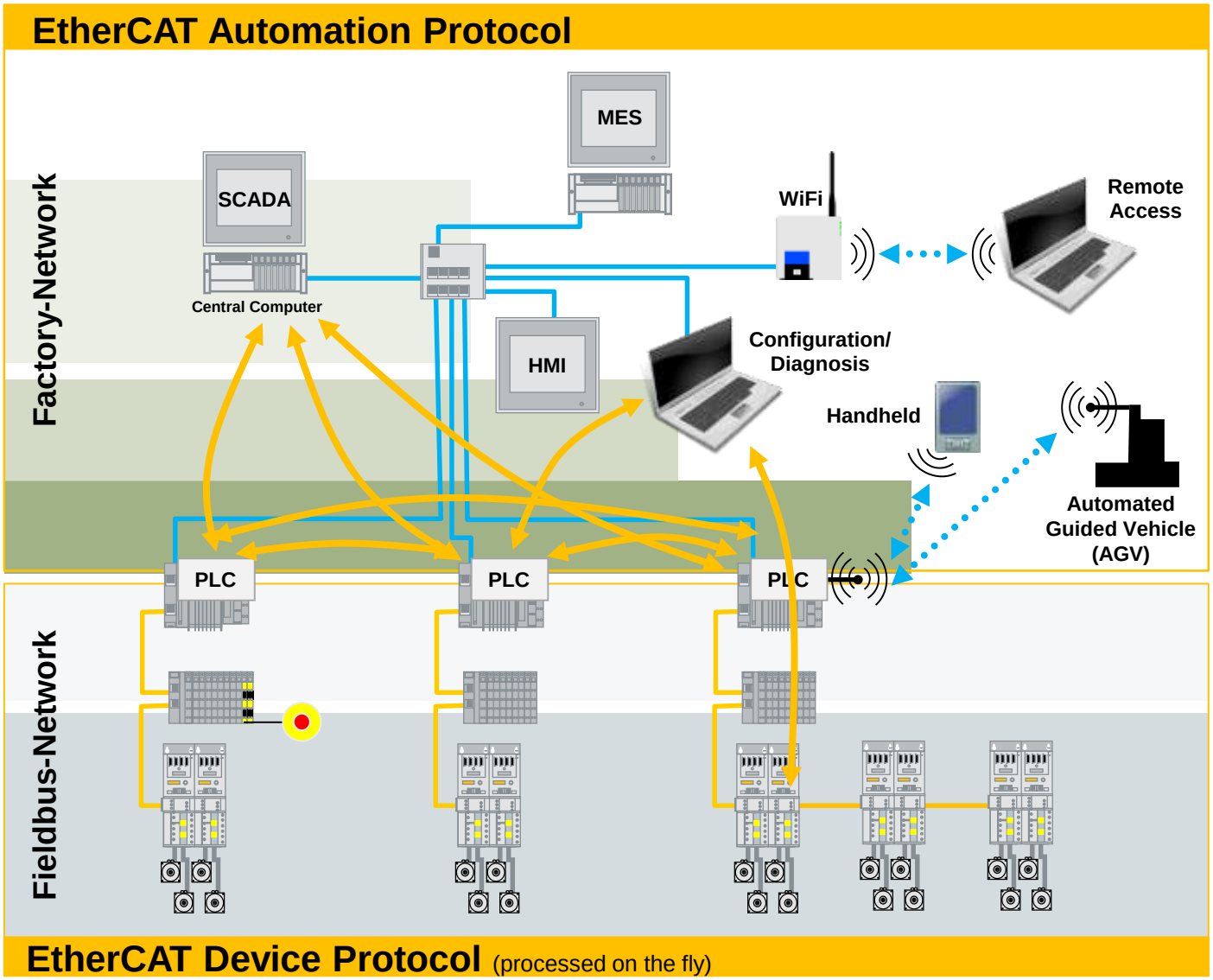
EAP for horizontal communication within the EtherCAT world



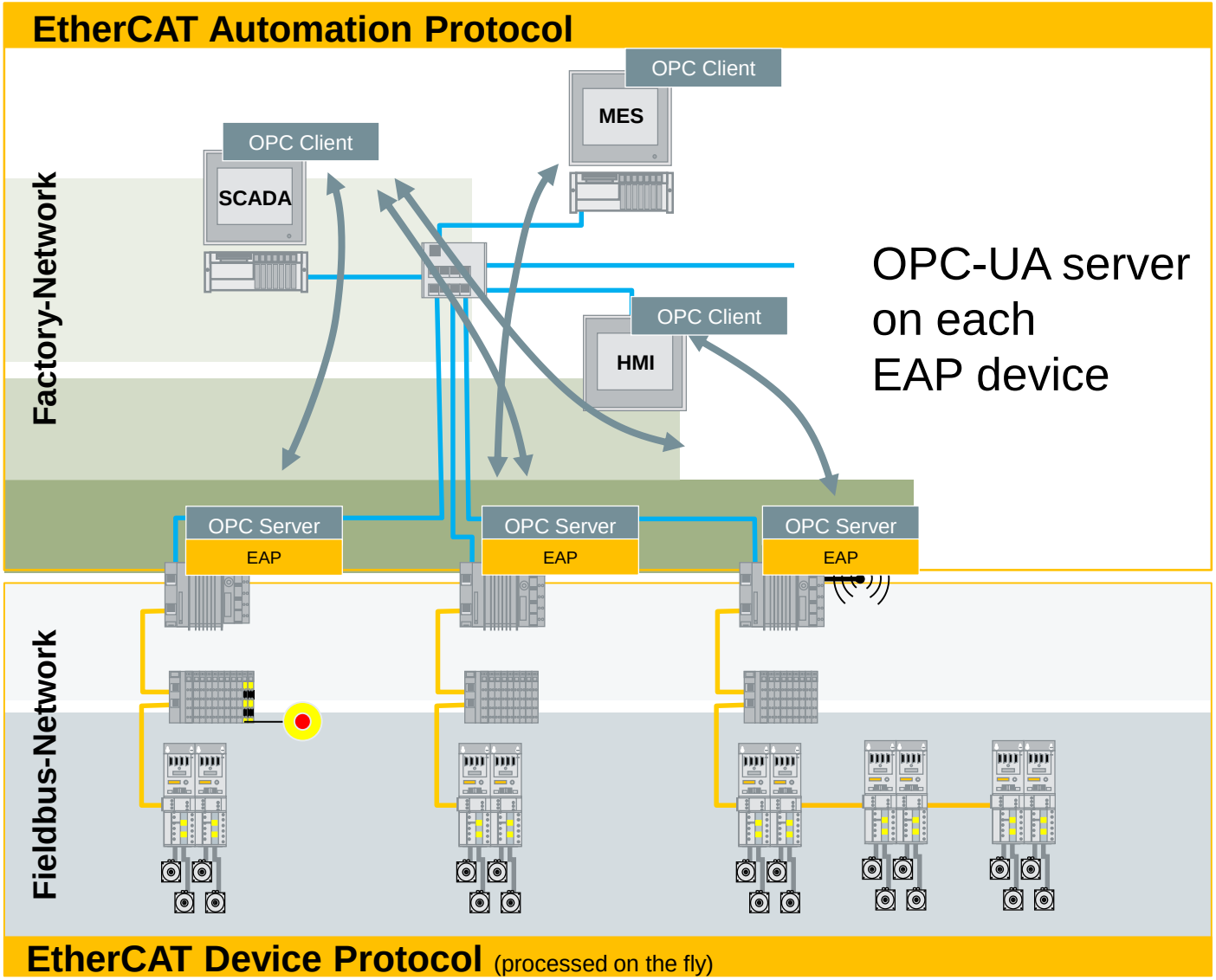
OPC-UA for vertical communication and for connectivity to non-EtherCAT systems

EtherCAT Automation Protocol

1. What is Industrie 4.0?
2. The Industrie 4.0 Platform
3. Reference Architectural Model
4. ETG I4.0 & IoT Initiative: EtherCAT & OPC UA
5. Use Cases
6. MoU
7. EtherCAT and Industrie 4.0 Today!



EtherCAT & OPC-UA: Option 1



EtherCAT & OPC-UA: Option 2

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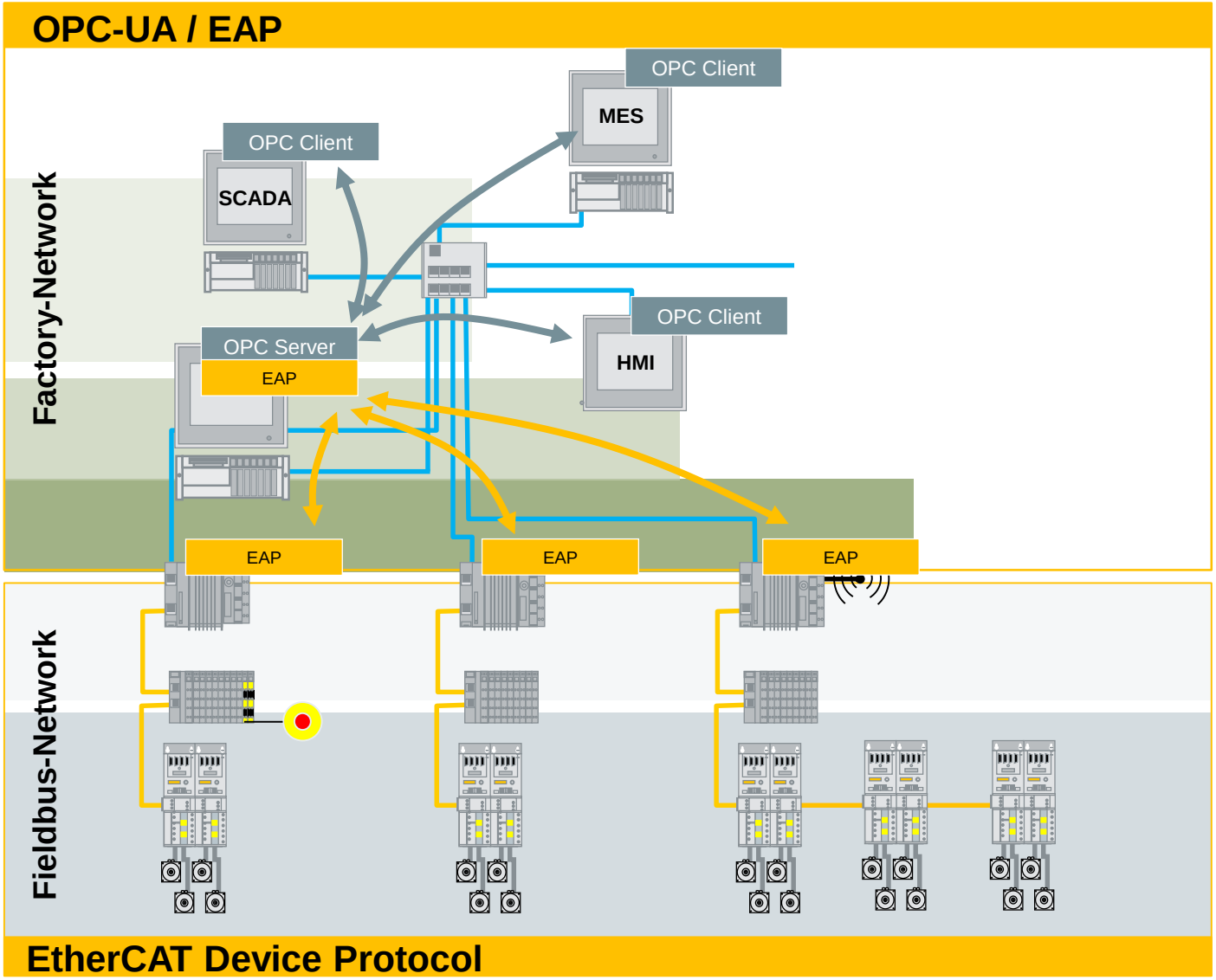

EtherCAT & OPC-UA: horizontal connectivity

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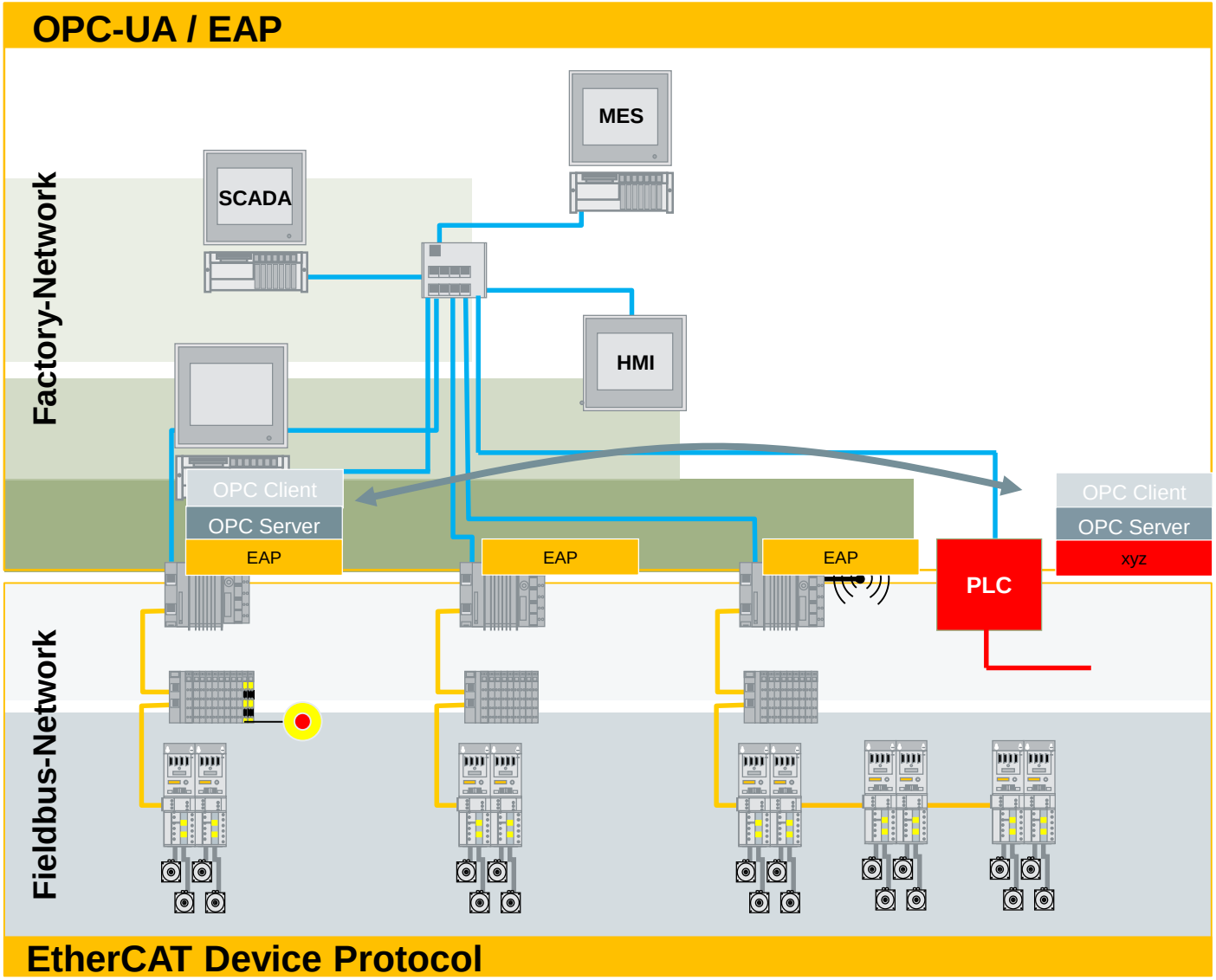

EtherCAT & OPC-UA: vertical connectivity

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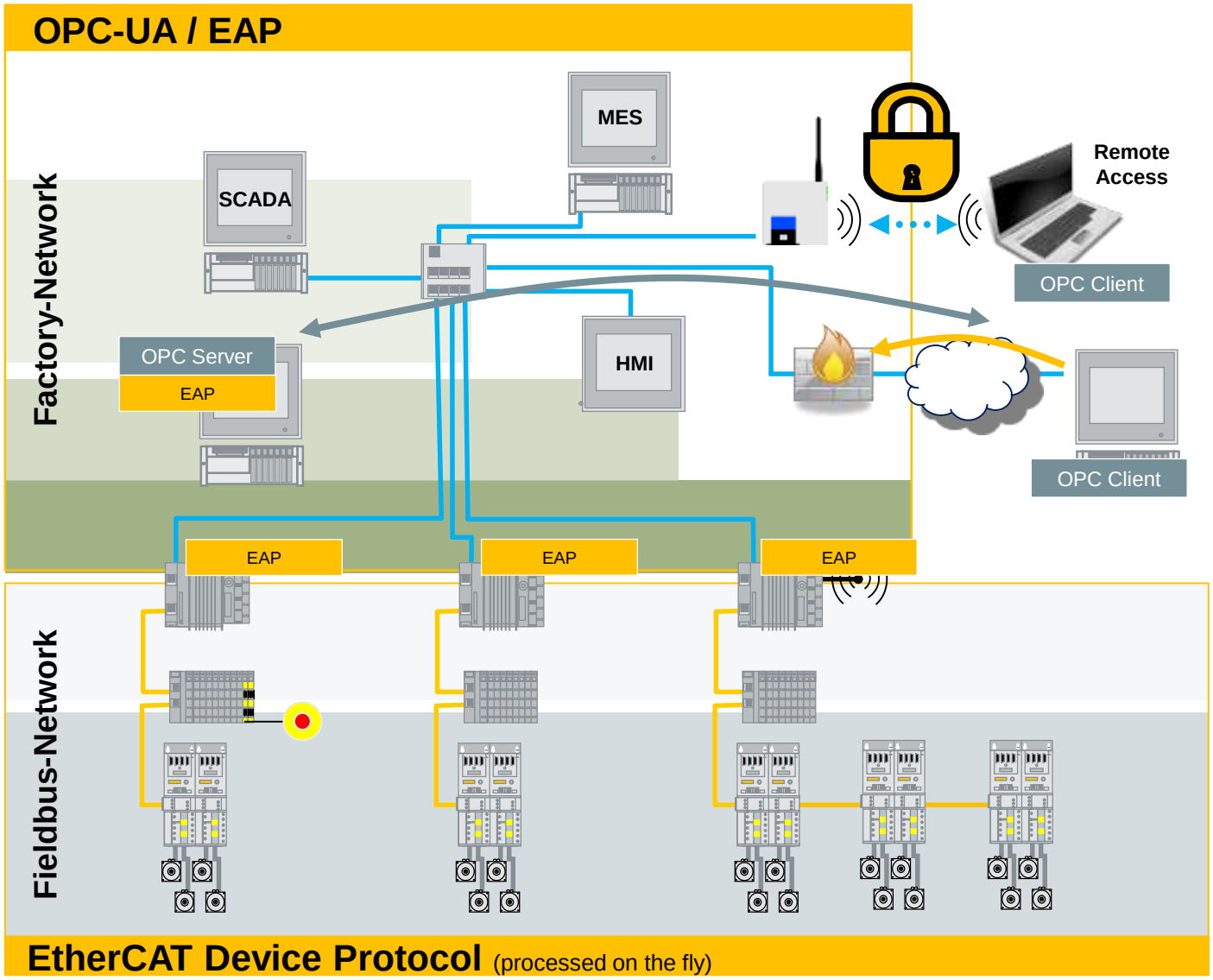

EtherCAT & Industrie 4.0: Reality today!

Example: Nobilia-Werke J. Stickling GmbH & Co. KG, Verl, Germany

- Oracle Data Base
- 540 PC clients
- Lot size 1 manufacturing
- >1 million transactions/day
- Part identification by barcode and RFID
- No intelligence or data storage in manufactured parts!
- centralized data ware housing
- „Manufacturing by wire“
- EtherCAT enabled
- Low cost manufacturing in high cost Germany!
- Europe's leading manufacturer of kitchen
- 2700 kitchen/day = 30.000 cupboards/day, 500.000 kitchen/year!
- 2600 employees, 946 Mio. € sales (2014)

Industrie 4.0:
not only Future, but Reality today!

Merci pour votre attention!

EtherCAT® Technology Group

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About…

About EtherCAT Technology Group (ETG):

The EtherCAT Technology Group (ETG) is an association in which key user companies from various industries and leading automation suppliers join forces to support, promote and advance the EtherCAT technology. With over 3,700 members from 62 countries, the EtherCAT Technology Group has become the largest fieldbus organization in the world. Founded in November 2003, it is also the fastest growing association of its kind.

About EtherCAT®:

EtherCAT is the fastest Industrial Ethernet technology and stands for high-performance, low-cost, ease of use and a flexible topology. It was introduced in 2003 and became an international standard and a SEMI standard in 2007. The EtherCAT Technology Group promotes EtherCAT and is responsible for its continued development. EtherCAT is also an open technology: anyone is allowed to implement or use it.

For further information please visit: www.ethercat.org