



赛灵思工业物联网研讨会

XILINX IIoT SEMINAR

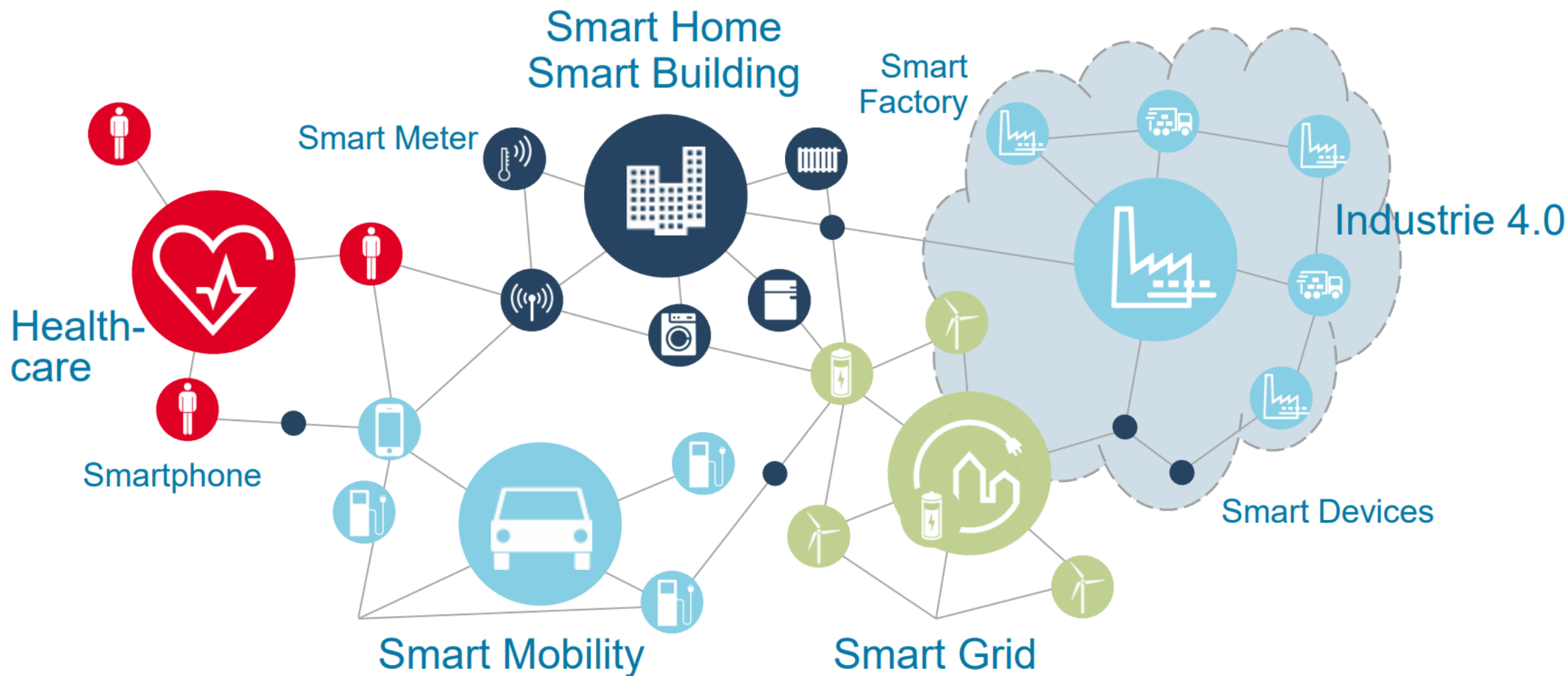
面向工业4.0的通信协议的现状 与演进

Name: 北京盟通科技有限公司 张晓朋

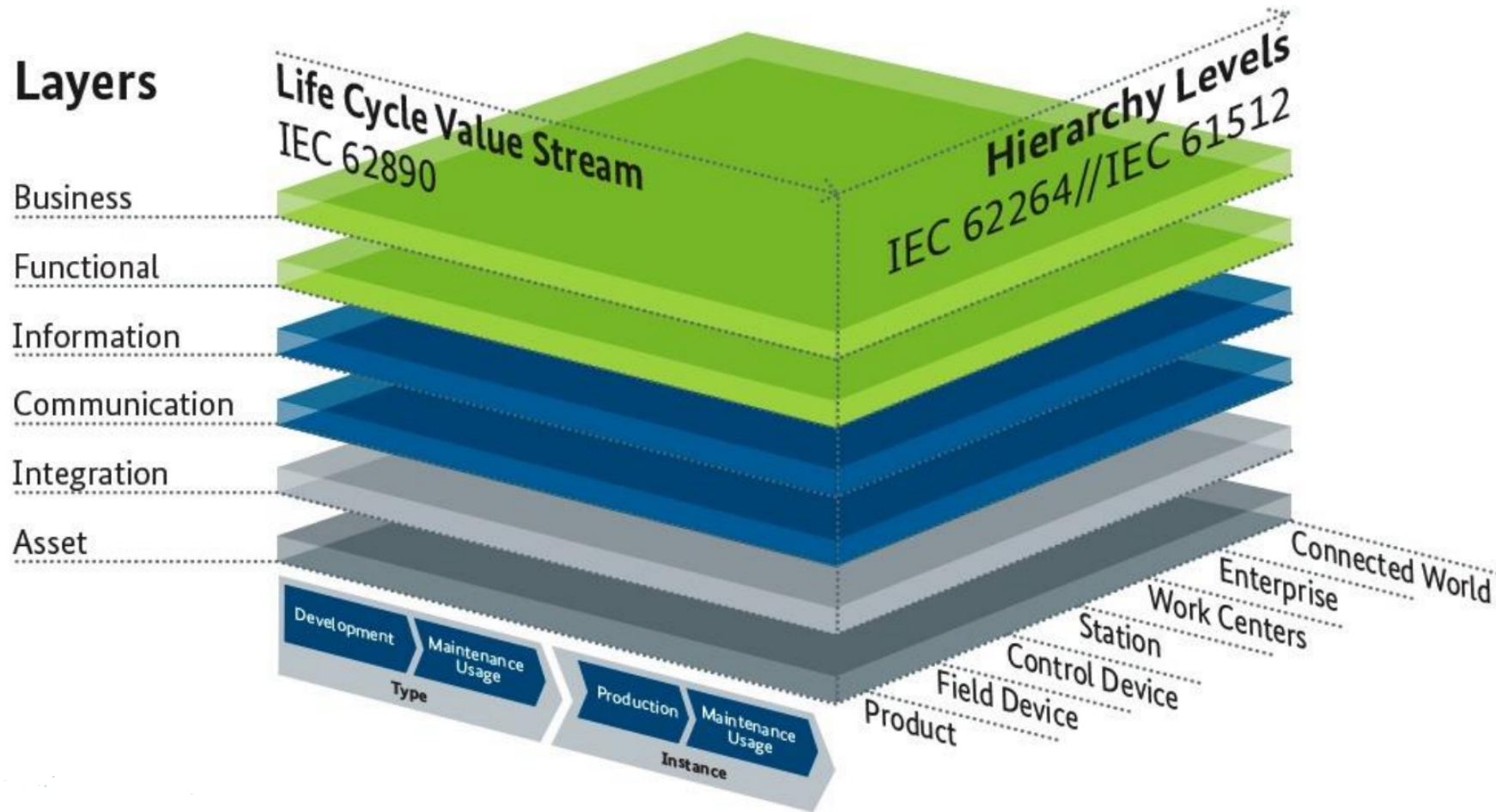
Title: 技术总监

Date: 2019年5月21日

物联网和服务



RAMI 4.0 - 工业4.0模型参考框架





The Industrial Interoperability Standard

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

Interoperability

Independent: Vendor, Platform, Market and OS

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 to field bus protocols, e.g. BACNet | PLCopen | MTConnect | ...

Security

Secure Design from group-up

Based on **open security standards**

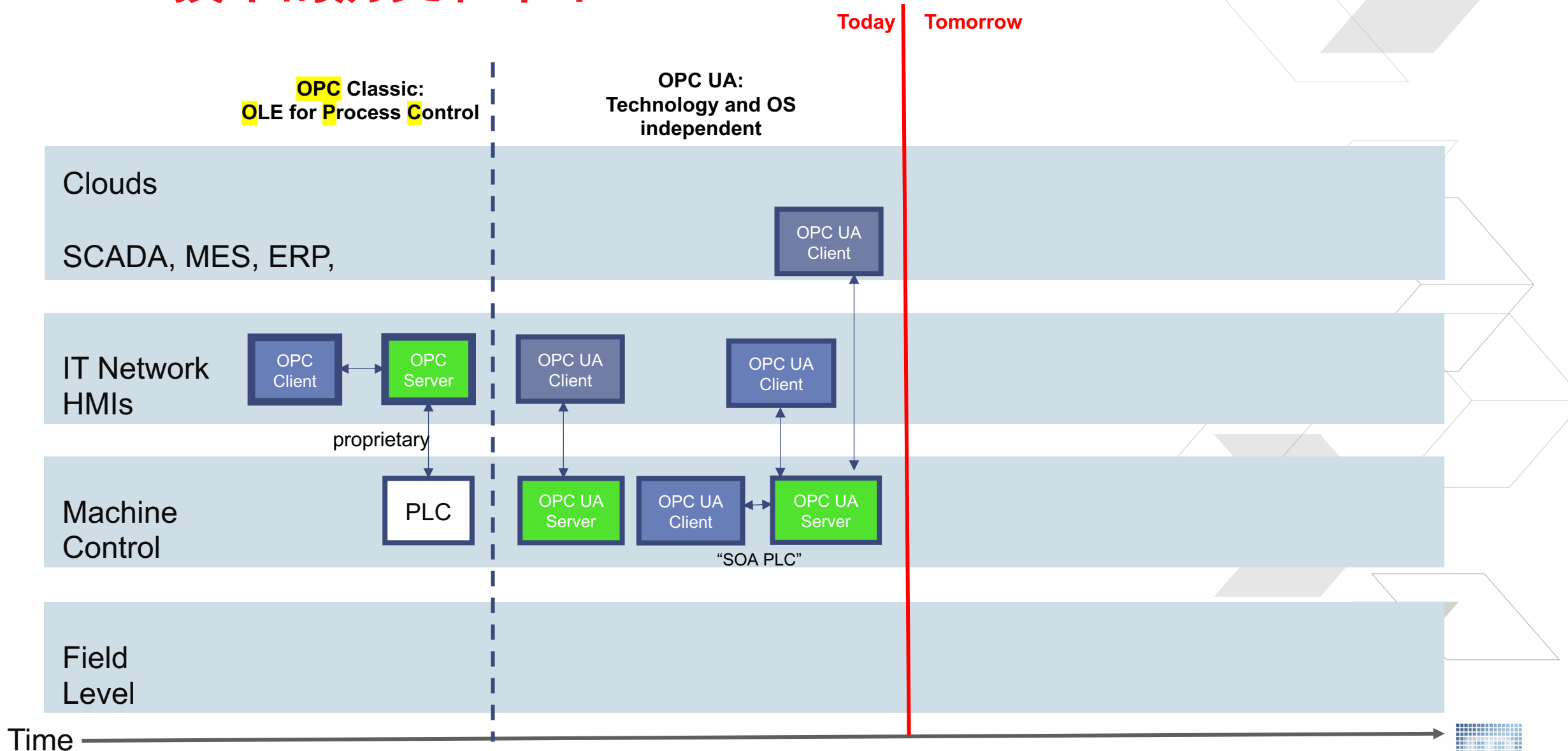
Authentication | Encryption

Evolves as security technologies evolve

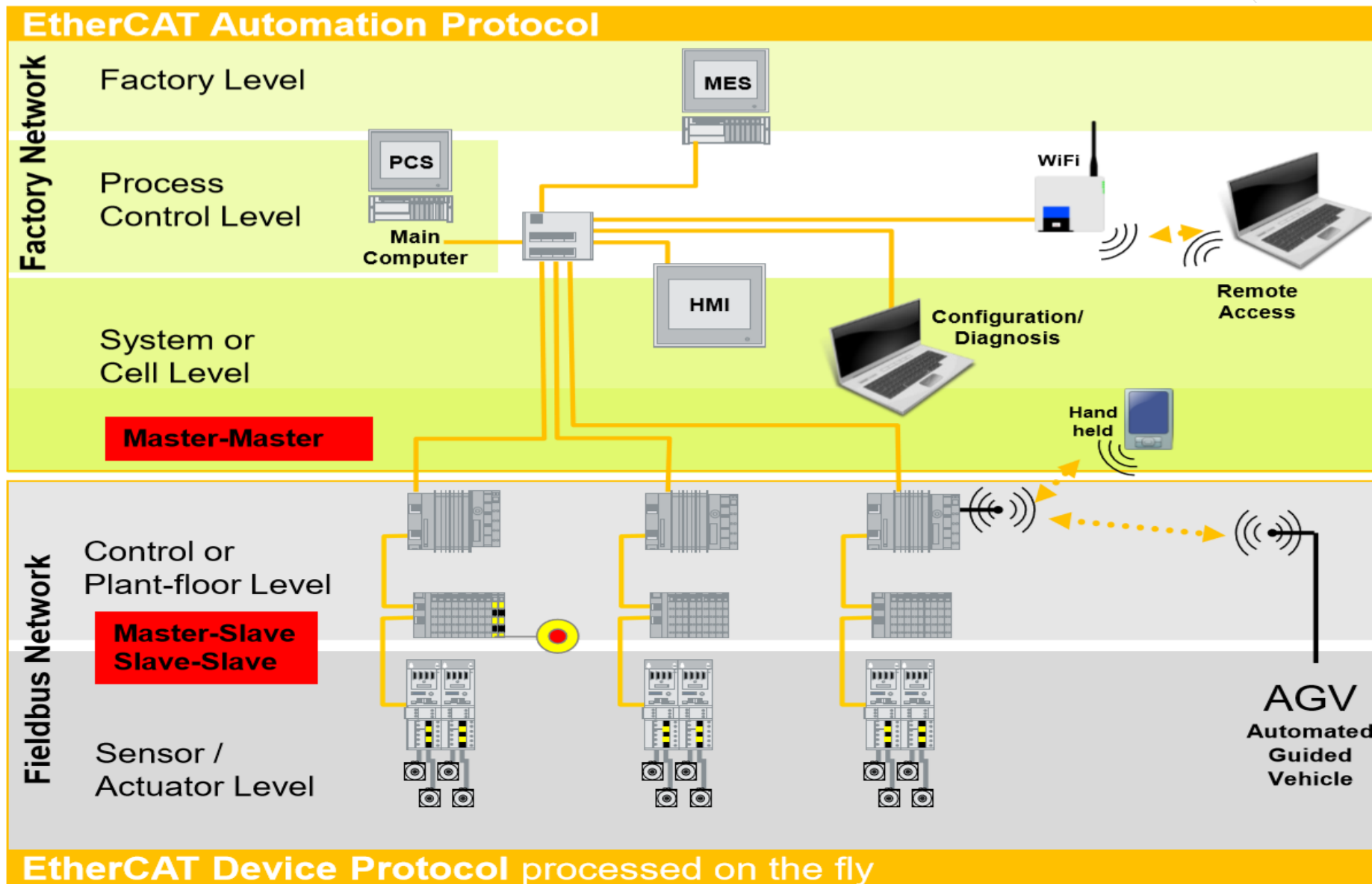
Vendors/Users can choose level of security

Easily acceptable by IT departments

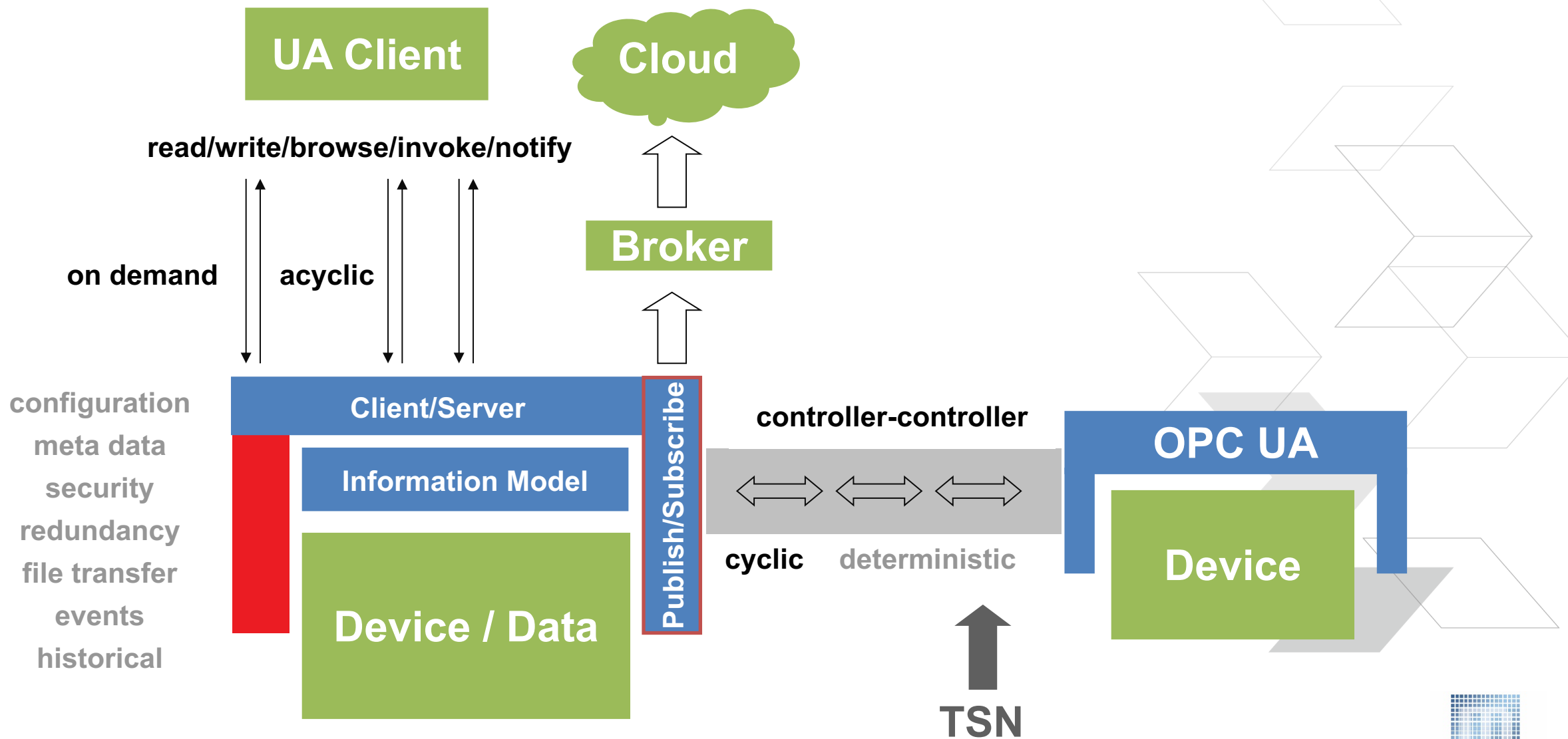
OPC 技术的历史和未来



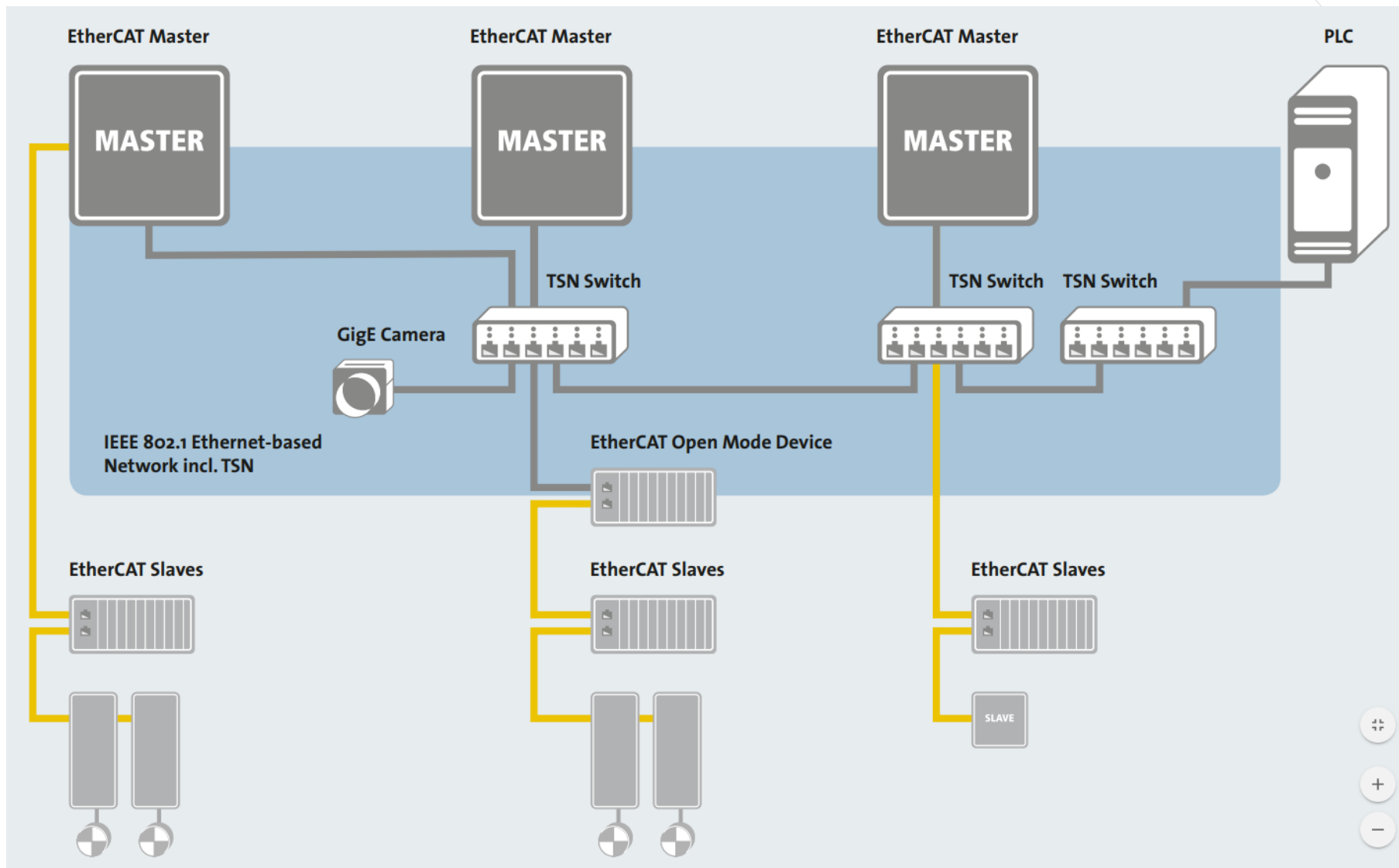
EtherCAT技术



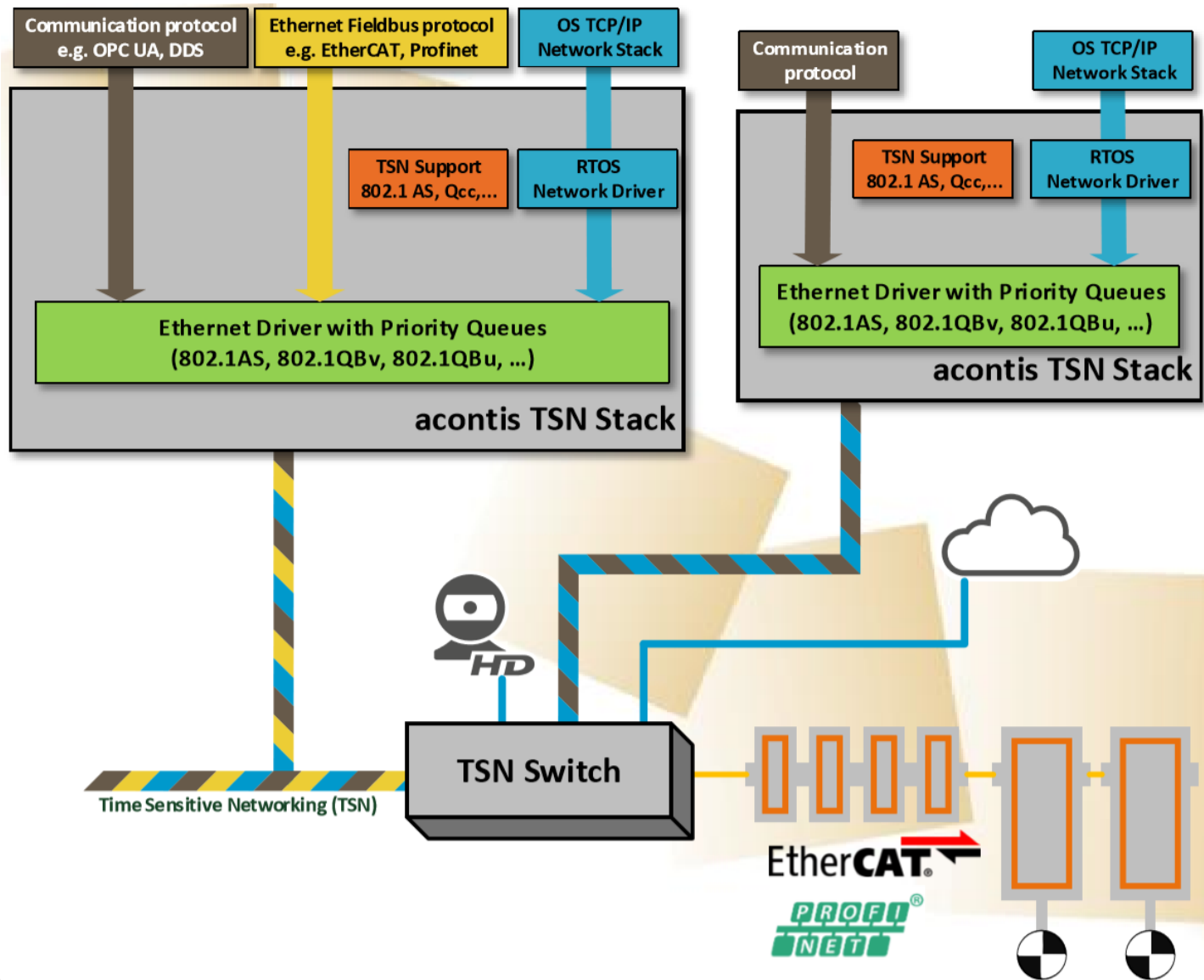
OPC UA – TSN通讯框架



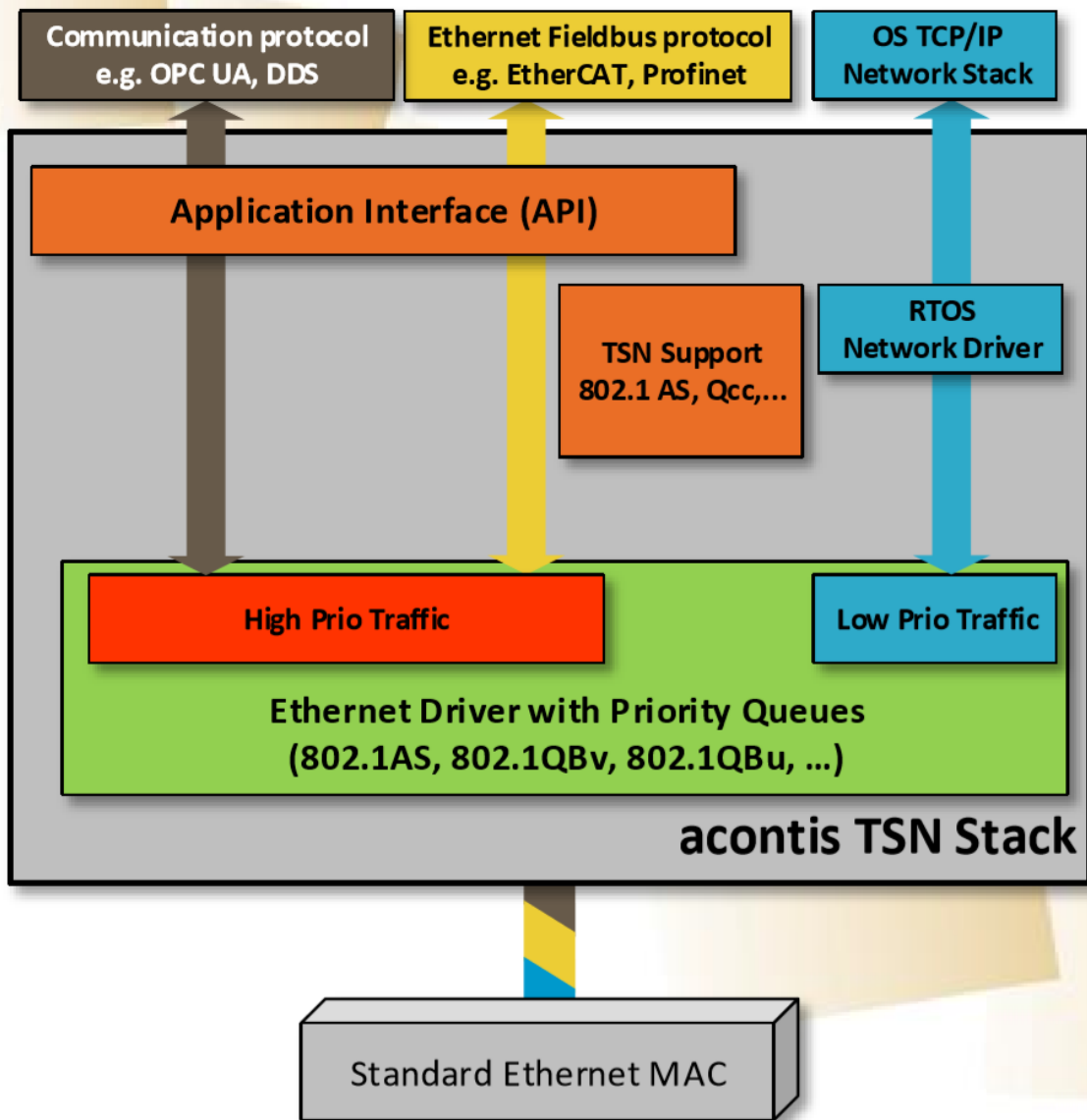
EtherCAT技术 – TSN通讯框架



TSN通讯框架



TSN协议栈框架



Application Interface with well defined API

- For higher level protocols (OPC UA PubSub, EtherCAT,...)
- Send/Receive raw Ethernet frames

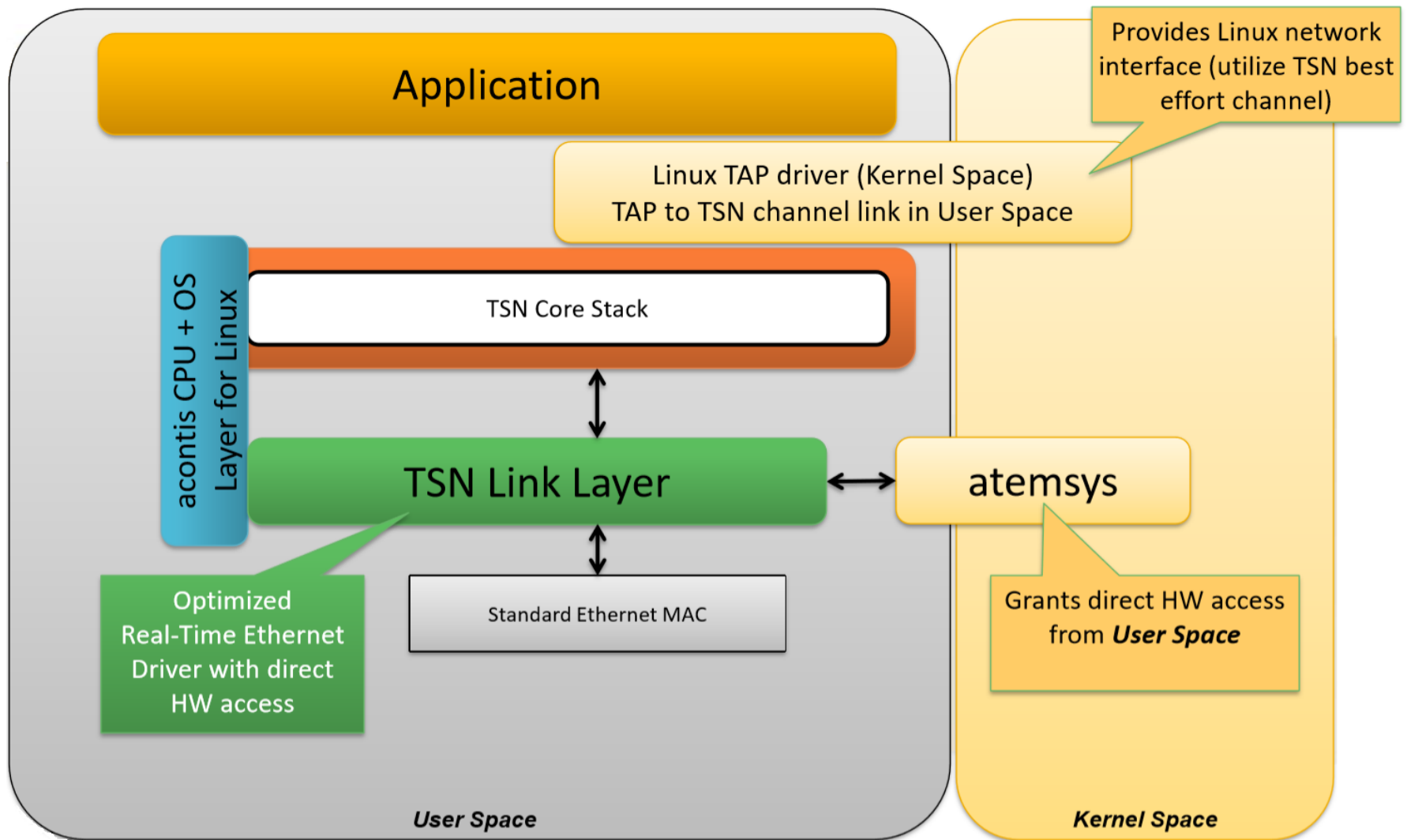
TSN Support: 802.1 AS, Qcc, ...

Network Driver for Embedded RTOS (TCP/IP)

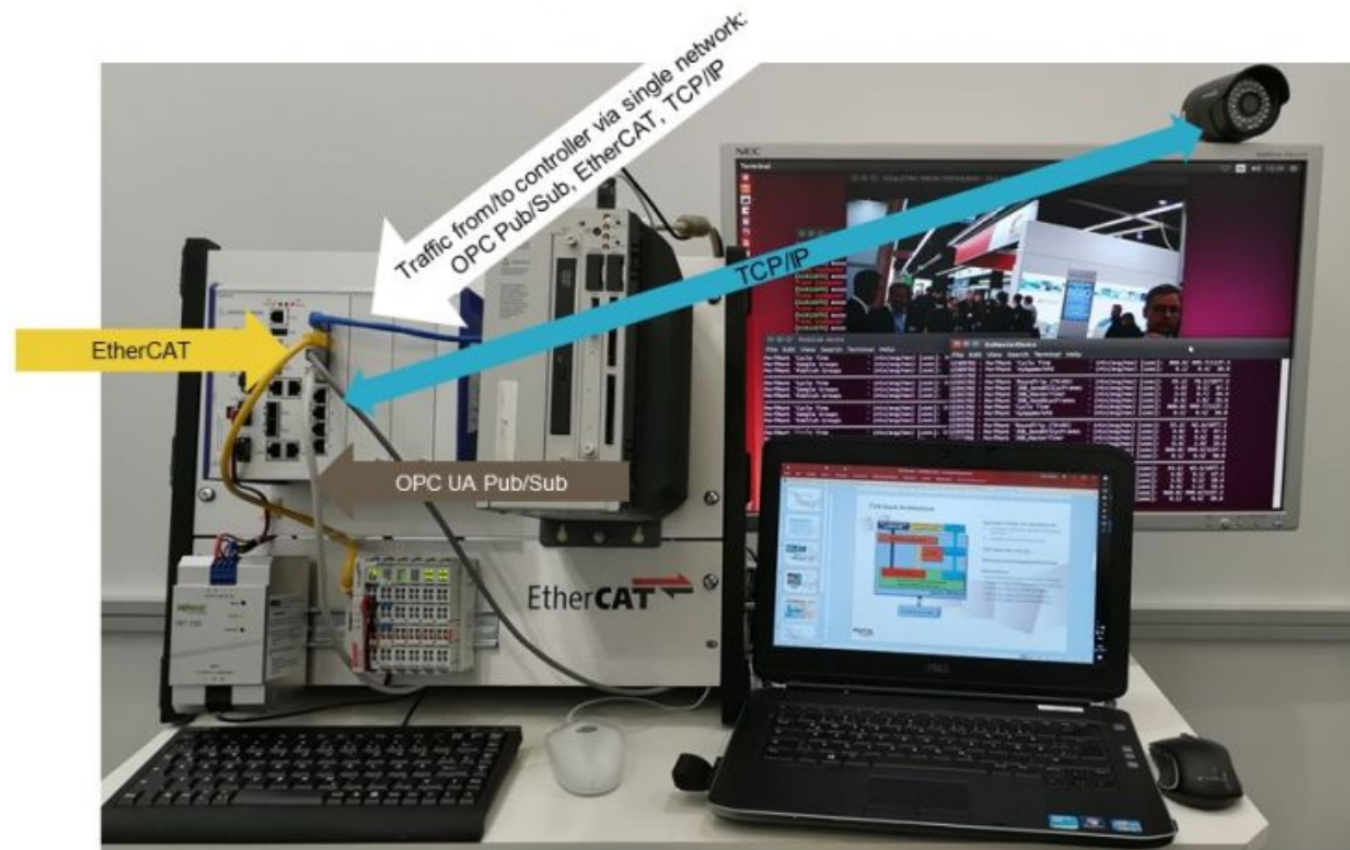
Ethernet Driver

- Standard and prioritized traffic (traffic shaping)
- + 802.1 AS support (Timing and Synchronization)
- + 802.1 Qbv support (Scheduled Traffic)
- + 802.1 Qbu support (Frame preemption)
- + 802.1 Qcc support (Stream Reservation)

Linux下TSN协议栈框架

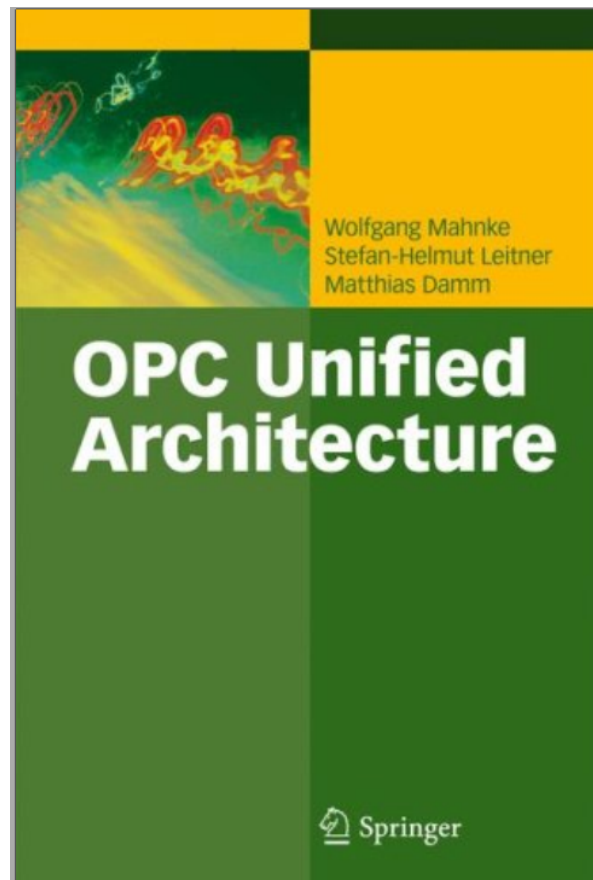


EtherCAT/OPCUA/TSN Live Demo



Unified Automation

OPC 统一架构

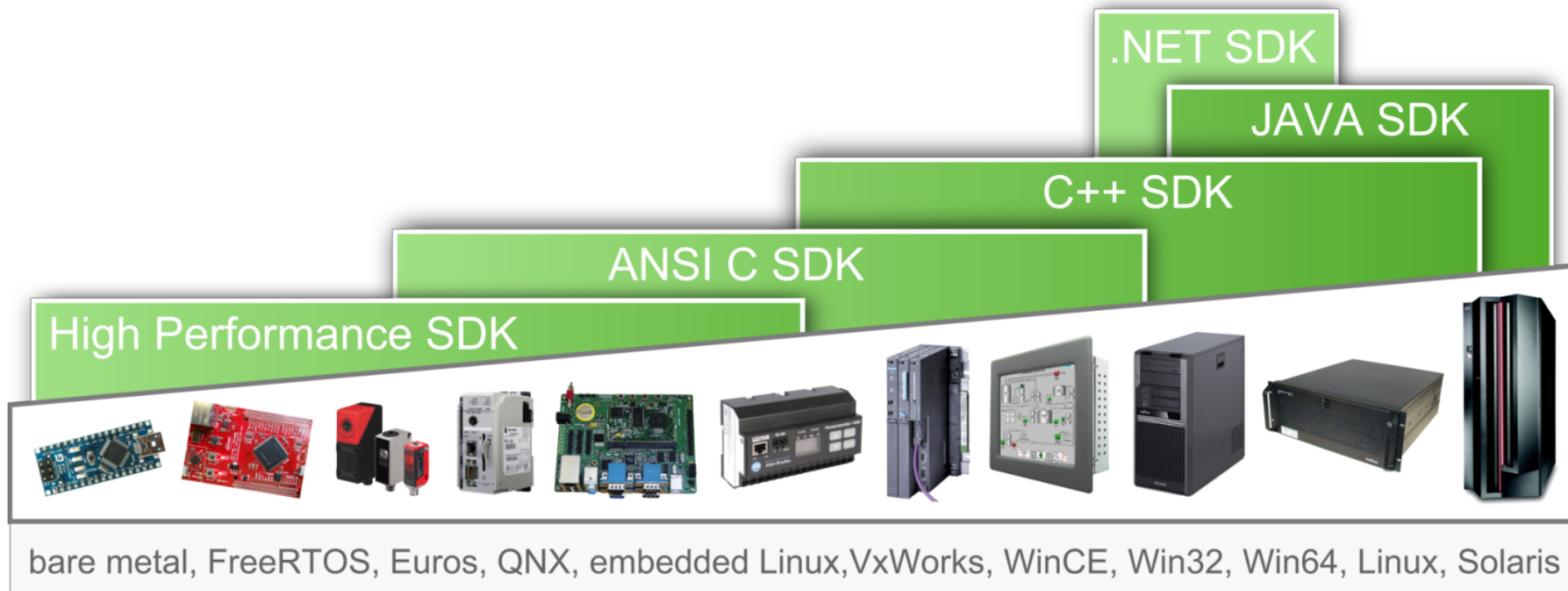


Matthias Damm



SDK 简介

- > Largest OPC UA SDK & Toolkit Vendor
- > All Languages available
- > Scaling on all Targets



SDK 简介

- > **All Large Automation Suppliers**

ABB, Siemens, B&R, Bosch, General Electric, Mitsubishi, KEBA, Hollysys...

- > **Large Machine Builders**

Trumpf, Voith Paper, Weber, I5CNC...

- > **Process Industry Suppliers**

Schneider Electric, Yokogawa, Honeywell, Endress Hauser, ...

- > **<https://www.unified-automation.com/references.html>**

acontis technologies GmbH

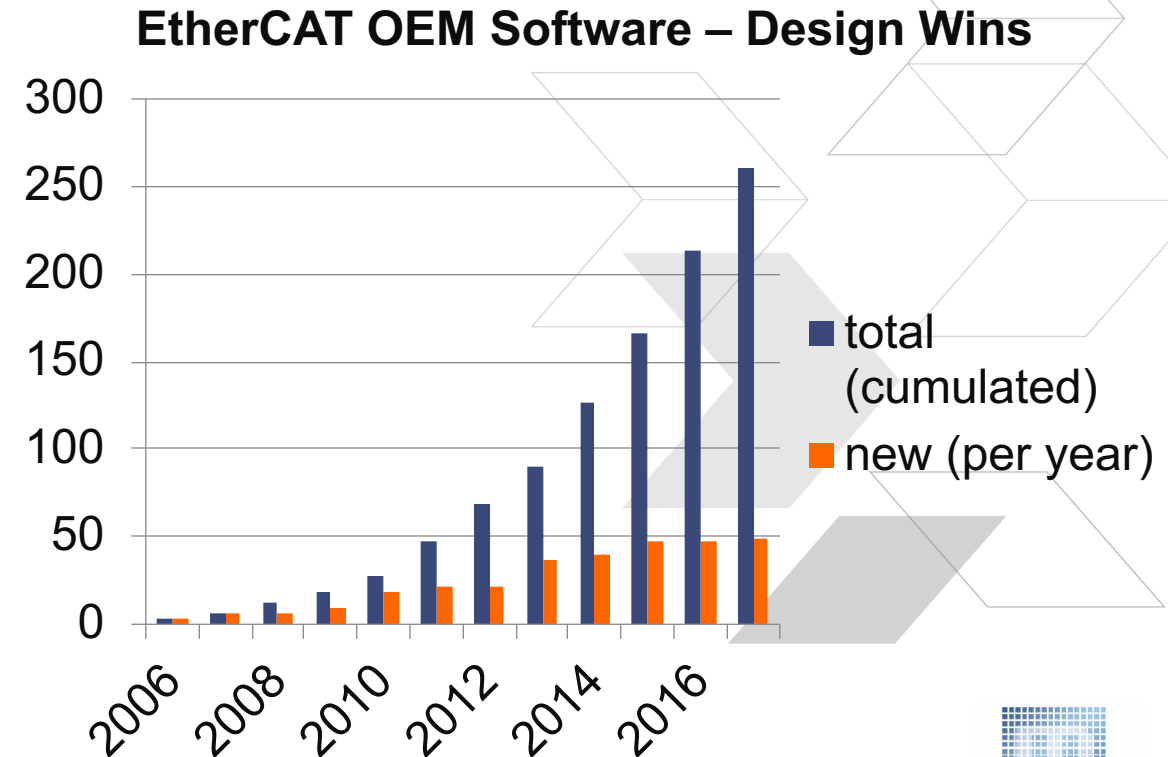
- **Founded** in 2001
- 18 employees, 4000 TEUR turnover in 2017
- General Managers: Stefan Zintgraf and Christoph Widmann



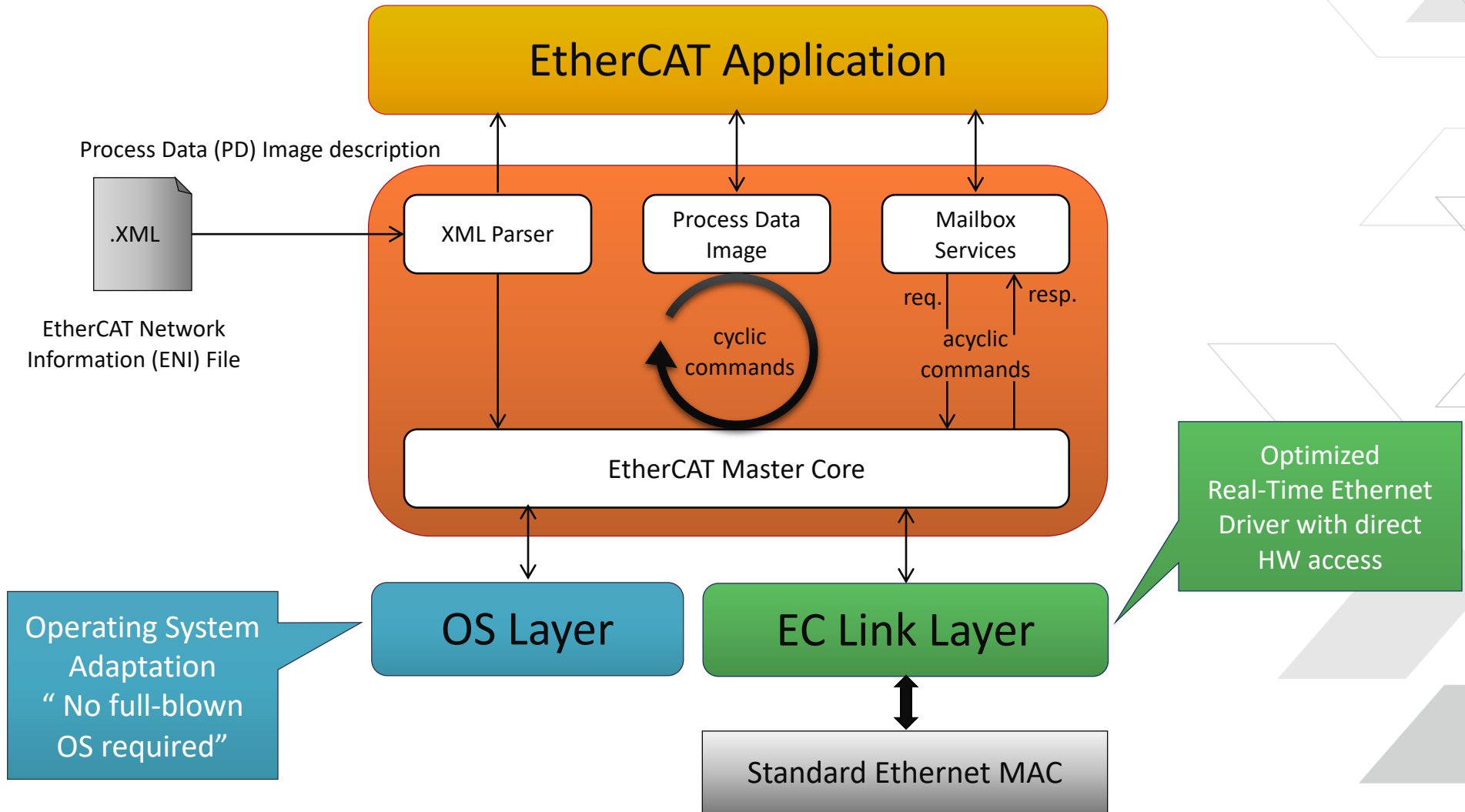
Stefan Zintgraf



Christoph Widmann



EC-Master 结构



EtherCAT 产品 - 客户

Industrial Automation

Omron (JP)
Yaskawa (JP/US/DE)
Kollmorgen (US)
Bosch/Rexroth (DE)
Panasonic SUNX (JP)
Adlink (TW)
Hanwha Techwin (KR)
Shanghai Electric (CN)
Lenze (DE)
Delta Electronics (TW)
Bachmann elect. (AT)
Prima Electro (IT)
fscut (CN)
Krones (DE)
ACS Motion Control (IL)
Bobst Group (CH)
Precitec (CH, DE)
Ricoh (JP)
ITRI/MSL (TW)

Semiconductor

No. 1 Equipment Provider (US)
No. 1 Wafer Fabrication Provider (US)
No. 1 Lithography Provider (US/NL)
Zeiss SMT (DE)
Varian Semiconductor (US)

Robotics

KUKA Roboter (DE)
Cloos (DE)
Yaskawa (JP/US)
energid (US)
ABB (CN), Panda (CN), HIT Robot (CN)
Turin (CN), Jari (CN)

Energy

GE/Alstom (ES)
AREVA (FR)
Enerflow (CA)
Mitsubishi Heavy Industries (JP)

Test/Measurement

Math. Software (US)
Measurement Equip (US)
Jenoptik (DE)
MKS Instruments (US)
Leica Geosystems (CH)
Formula 1 team (UK)
Brooks Instruments (NL)
JUMO (DE)
Instron (DE and UK)
Toyota (JP)
ABB (SE)
Weiss Umwelt (DE)

Others

No. 1 Agric Mobiles (US)
No. 1 Show Biz. (US)
No. 1 Smart Phone (US)
MEN (DE)

Aerospace

No. 1 US Gov. Organization
No. 1 US Airplane vendor
CAE (CA)
Clemessy (FR)
IHI Aerospace (JP)

Medical

“Under NDA” (NL)
Curexo/Robodoc (US)
Medtronic (US)
Hocoma (CH)
Cascination (CH)

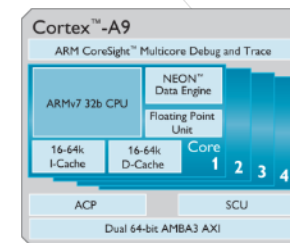
CNC

Hurco (US)
ISG (DE)
Prima Electro (IT)
ESAB/ATAS (DE)
GSK (CN)

ZYNQ下不同数量的从站对CPU的负载

CPU: Xilinx Zynq SoC - Dual-Core Cortex-A9, 666 MHz

Software: Linux with EC-Master V2.6.2, Link Layer GEM



Number of Slaves	16	32	64
Network cycle time	250 usec	500 usec	1000 usec
Payload	128 Bytes	256 Bytes	512 Bytes
EC-Master Function			
Process Inputs [usec]	33.7	34.1	36.1
Send Outputs [usec]	17.0	17.9	18.8
Administration [usec]	13.8	21.0	49.4
Send Acyclic Frame [usec]	13.6	15.4	15.6
Total Time [usec]	78.1	88.4	119.9
CPU Load [percent]	31 %	18 %	12 %

Adaptable.
Intelligent.

