

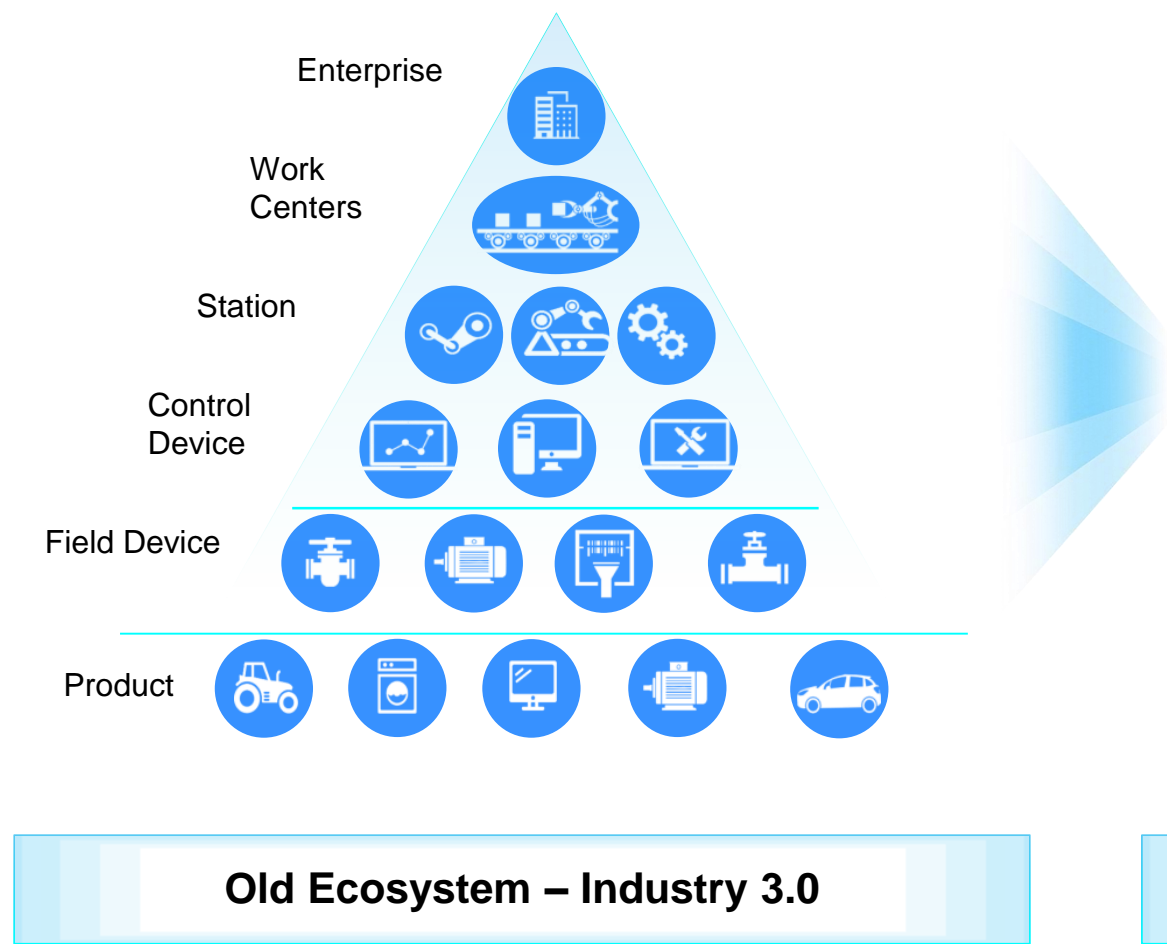
How to bridge the boundaries between ICT and the OT areas to unleash full added value of digital transformation

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Convergence of OT and ICT



“Plattform Industrie 4.0 - Graphics © Anna Salari, designed by freepik”

Technology Directions are leading Digitalization

- Active in Definition of Global 5G Standards
- Board Member of the 5GPPP
- Founding Member of the 5GIC
- Key Member of the IMT-2020 (5G) in China
- Key Member of the 5GMF in Japan
- 300 top Scientists
- Joint 5G Test environments with 30+ leading Carriers

Wireless 5G / Wi-Fi 6

Edge Computing IoT



- First mobile AI chip Kirin 970
- First AI embedded Edge (Atlas Serie)
- Basic Research
- Better Market Position
- Higher internal Efficiency & Quality



AI

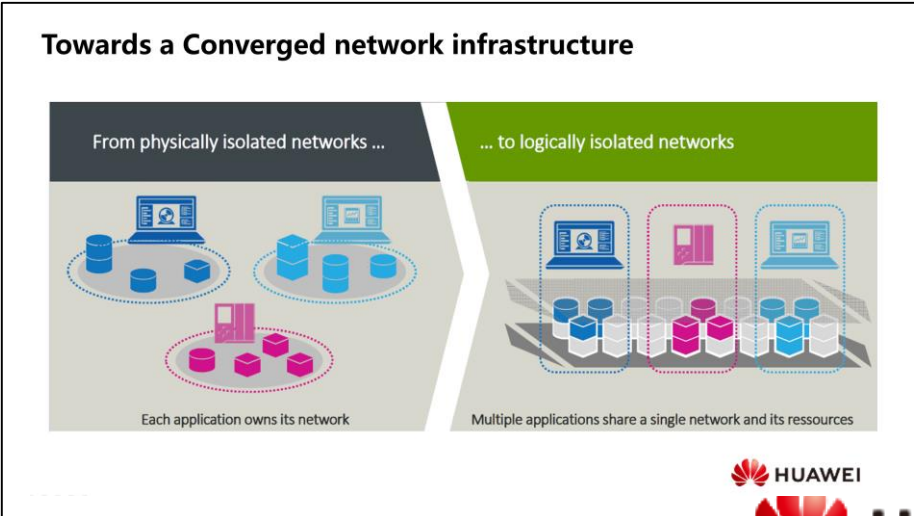
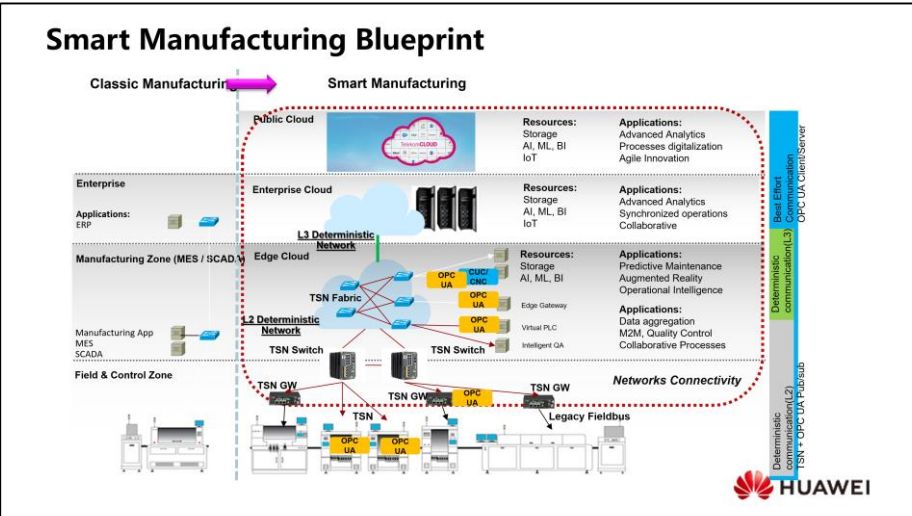
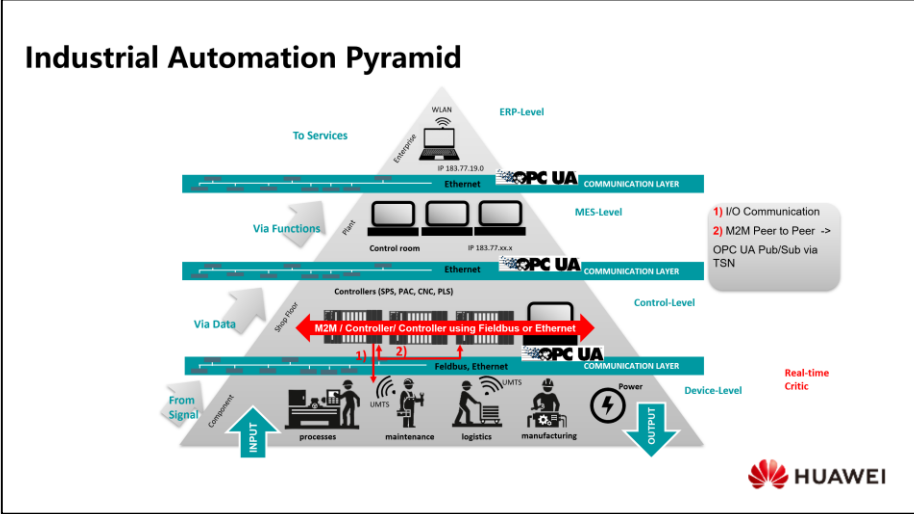
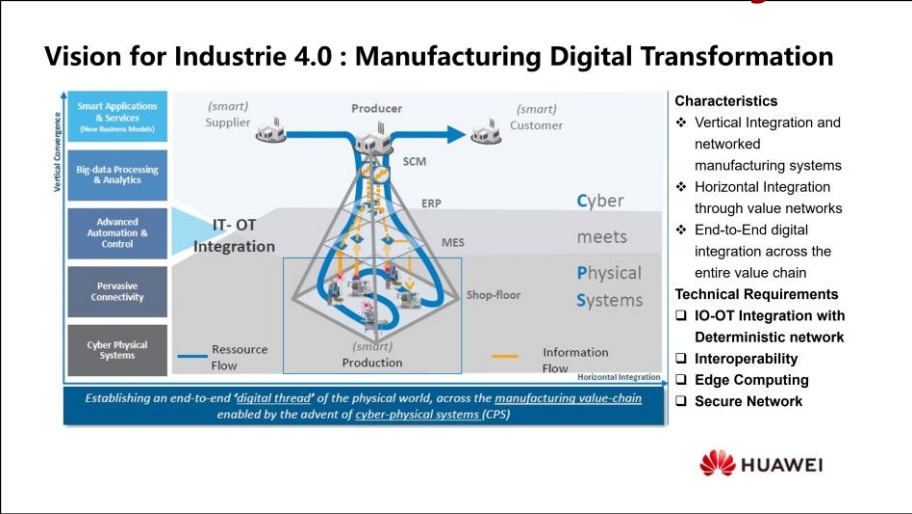
Cloud / IoT



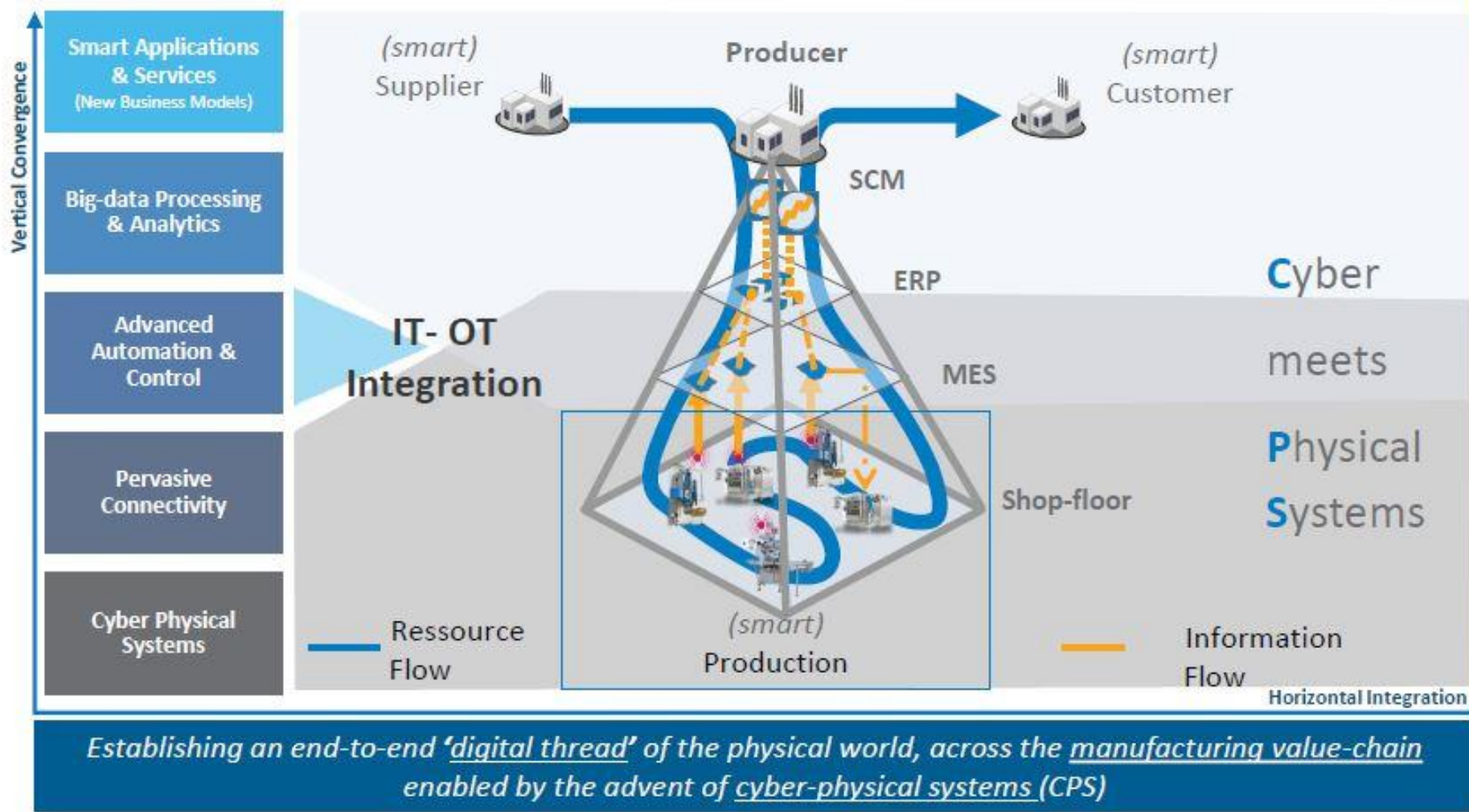
- Strategic Partnerships with Deutsche Telekom, Orange, Telefónica and China Telecom
- 3 Basic Principles:
 - We don't monetize data
 - We don't develop applications
 - We don't make equity investment
- Connected Vehicles, Connected Lifts, Connected Machines
- 450+ IoT Partners
- 30+ Industry Applications

Force ICT and OT convergence across standardization organizations, industry alliances and research cooperation via test beds and lighthouse projects

No doubt of visions and digital platform models – implementation is now the key to business success



Vision for Industrie 4.0 : Manufacturing Digital Transformation



Characteristics

- ❖ Vertical Integration and networked manufacturing systems
- ❖ Horizontal Integration through value networks
- ❖ End-to-End digital integration across the entire value chain

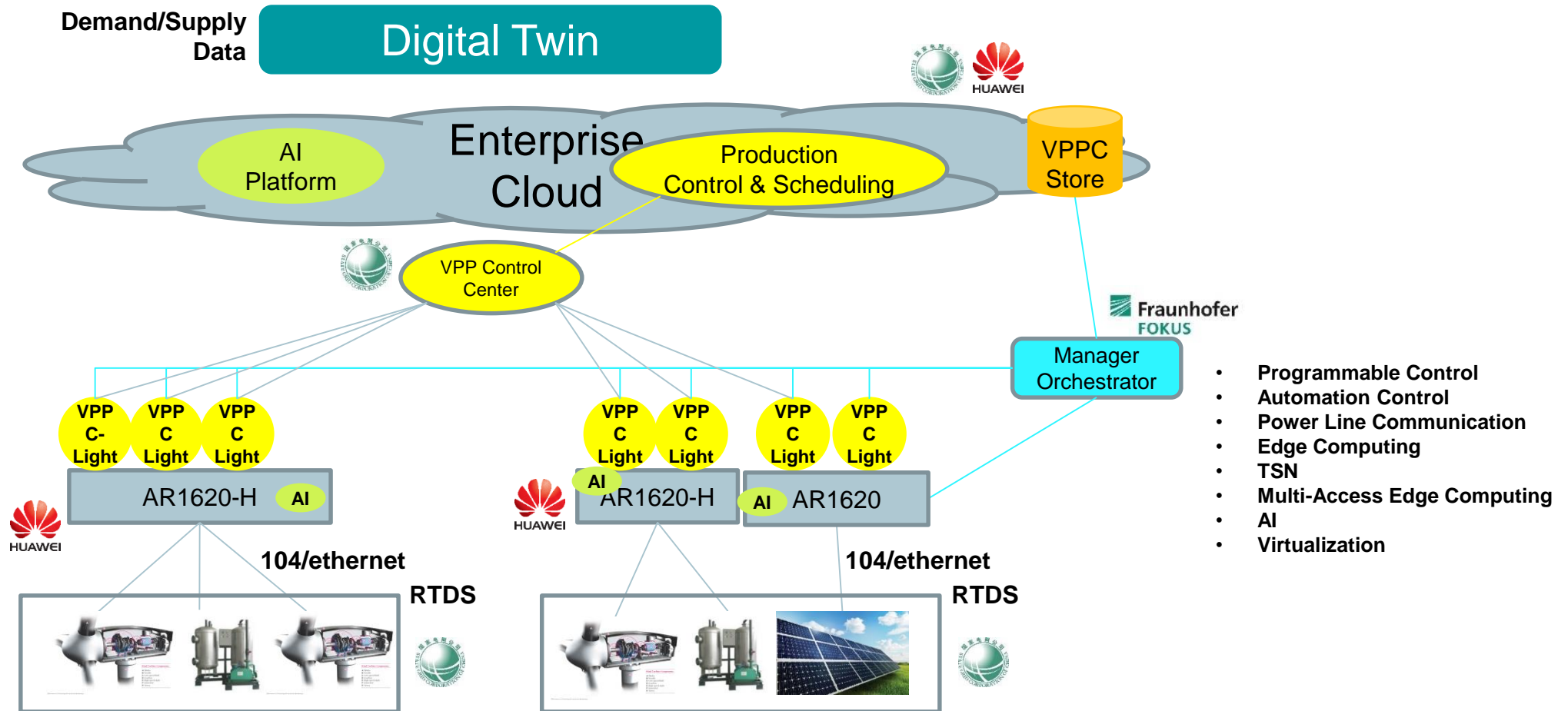
Technical Requirements

- ☐ IO-OT Integration with Deterministic network
- ☐ Interoperability
- ☐ Edge Computing
- ☐ Secure Network

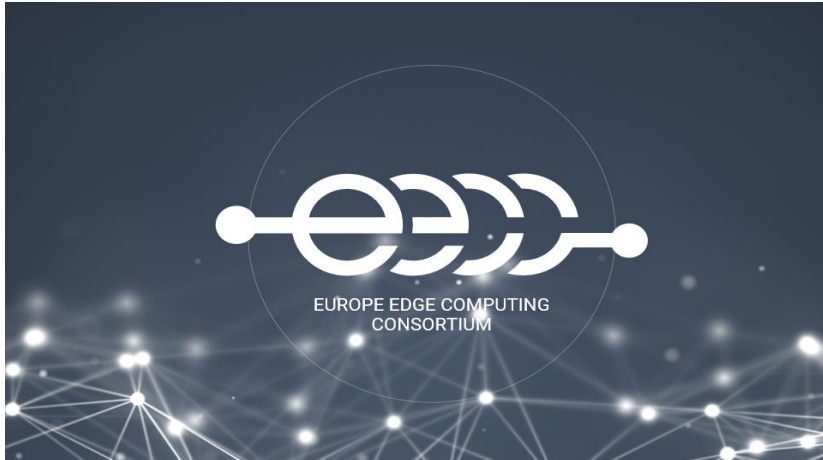
Edge Computing OPC UA over TSN Testbed at HMIndustry-19



Example of Use Case for Convergence ICT and OT: IEC Test Bed Virtual Power Plant



EECC – An Initiative Supported by Main EU Industrial Players, Focus on Edge Computing to Accelerate OT/ICT Convergence



2018.11.13 <https://eeconsortium.eu/>

* Europe Edge Computing Consortium

□ Vision

Software-based, interoperable, programmable, secure and easy to use industrial infrastructures.

□ Mission

Building an international Edge Computing ecosystem by interlinking relevant organizations, work on preferred standards and identifying open gaps.

□ Goal

Evaluating technology stacks based on existing open standards with associated implementations and ensure that the gained knowledge will be considered in relevant standardization and development activities.

□ Outcomes

White Paper: Edge Computing reference architecture.

Implementations: Edge Computing reference stacks.

Evaluations: Edge Computing validation scenarios and testbeds.

Recommendations: Preferred Edge Computing standards & implementations.

Open Edge and High Performance Computing Initiative – Accelerating Edge and High Performance Computing for new AI and Big Data applications

Open Edge and HPC Initiative



Our Mission

Foster the development of an open and feature-rich **ecosystem for Arm®-based technologies** to support the evolving needs of the various industries undergoing digitalization and of all their respective stakeholders

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Open Edge and HPC Initiative



Our Goals

- Facilitate **shorter time to market**
- Create an environment where members can **integrate solutions** coming from different suppliers
- Create an open environment for **sharing information**
- Raise awareness for **capabilities** of Arm®-based solutions

2

Open Edge and HPC Initiative



Our initial Focus

- Edge computing
- High-performance computing

Addressing future challenges requires scaling to extreme performance levels by means of HPC solutions as well as bringing compute closer to data sources, i.e. enabling computing at the edge.

New opportunities will arise from bringing both together, e.g. for the realization of digital twins or enabling of smart cities

3

Open Edge and High Performance Computing Initiative – Accelerating Edge and High Performance Computing for new AI and Big Data applications

Edge Computing Objectives



- Address the need for **secure distributed data processing and low latency communications** in emerging 5G and industry 4.0 environments
- Search for and validate **best practices** and author **white papers** illustrating the industry challenges and the requirements to be mastered by means of Arm®-based solutions
- Develop a **reference framework** and an end to end architecture integrating Edge and Server architectures

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Edge Computing Achievements



- Edge computing platforms used within **industrial test beds** for smart manufacturing and smart energy.
- Edge Computing platforms are designed with support for **Artificial Intelligence** and **Time Sensitive Networking**.
- Standard hardware technologies used within the platform, such as **ARM64 Processors, Neural Processors** and **FPGA based acceleration**

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HPC Objectives



- Establish the value of **Arm®-based solutions for HPC workloads**
- **Generate and share knowledge** on what needs to be done to deliver competitive performance on such systems.
- Enable the development of **commercial offerings from ISVs**, e.g. by providing quick and easy access to Arm®-based HPC systems to explore the capabilities of these new solutions.
- Provide its members with a **unique opportunity to collaborate** on identifying market needs for Arm®-based HPC solutions
- **Exploring new market segments** not yet occupied by established technologies and solutions

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HPC Achievements



- Profiled OpenFOAM to spotlight the time critical parts and the performance roadblocks
- Ported and optimized codes for Arm: Lattice-Boltzmann, Lattice QCD, brain simulators, KKRnano
- Ported application kernels to SVE and analyzed the performance

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Communication Technologies - Fragmented Standardization Landscape



Thank you.

把数字世界带入每个人、每个家庭、
每个组织，构建万物互联的智能世界。

Bring digital to every person, home, and
organization for a fully connected,
intelligent world.

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